

Christa Krijgsman



*A Self-Determination Theory Perspective
on Performance Grading, Goal Clarification
and Process Feedback in Physical Education*

Assessment and Motivation

A Self-Determination Theory Perspective on Performance Grading,
Goal Clarification and Process Feedback in Physical Education

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ISBN 978-94-93184-68-8

NUR 840

<https://doi.org/10.33540/463>

Printed by AIO – proefschrift-aio.nl

Cover design Merel Brouns – burobrouns.nl

Cover illustrations children silhouettes Freepik - Octopusgraphic,
Getty images – Hypergon / SongSpeckels

Layout Merel Brouns – burobrouns.nl

Author photo Pim Geerts – pimgeerts.nl

This research was supported by the Netherlands Organisation for Scientific Research (NWO) under project number: 023.004.015, and by the Association Ons Middelbaar Onderwijs, the Netherlands.

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Assessment and Motivation

A Self-Determination Theory Perspective on Performance Grading,
Goal Clarification and Process Feedback in Physical Education

Evaluatie en Motivatie

Een Zelf-Determinatie Theorie Perspectief op Cijfers, Doelen en
Groei Gerichte Feedback in de Les Lichamelijke Opvoeding
(met een samenvatting in het Nederlands)

Proefschrift

ter verkrijging van de graad van doctor aan de
Universiteit Utrecht
op gezag van de
rector magnificus, prof.dr. H.R.B.M. Kummeling,
ingevolge het besluit van het college voor promoties
in het openbaar te verdedigen op

vrijdag 12 maart 2021 des ochtends te 10.30 uur

door

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geboren op 6 februari 1981
te Heerlen

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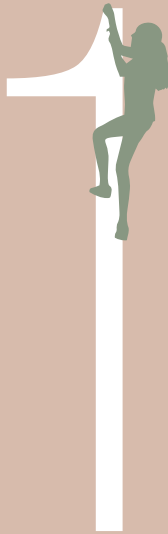
Dr. L.B. Borghouts

The degree is awarded as part of a Joint Doctorate with Ghent University.

Dit proefschrift werd mede mogelijk gemaakt met financiële steun van de Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO), onderzoeksprogramma Promotiebeurs voor Leraren met projectnummer 023.004.015, en met financiële steun van vereniging Ons Middelbaar Onderwijs (OMO).

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General Introduction

“...some educators and policymakers mistakenly assume that grades are an effective *motivational* strategy. They believe that by grading students they are “incentivising” effort as well as providing “feedback”. Yet as research by Butler (1987) and our own work has shown, grades *by themselves* typically provide little competence relevant feedback; they merely let students know where they stand relative to others”.

Ryan and Deci (2020, p. 6)

Introduction

At the start of today's physical education (PE) lesson in which endurance-interval training is the central topic, Anna (13) asks me – a bit anxious – whether she will get graded for her running-performance. Julian, Mohammed and Caroline come up to me and tell me that they are terribly bad at running and don't want to participate. I kindly ask them to listen to my instruction first. I start my lesson by clarifying the goals for the upcoming series of lessons. I explain that I find it important that all students challenge themselves on the level of difficulty of their choice. During practice, I notice that Anna, Julian, Mohammed and Caroline participate well. At the end of the lesson, I ask all students to evaluate their performance of the endurance-interval training. Was the chosen level of difficulty too easy, just right or too difficult? If necessary, they can make an adjustment in their difficulty level for the next PE lesson. Anna, Julian and Mohammed tell me that the level of difficulty was just right and that they felt effective. Caroline tells me that she felt effective, but that she can do even more next time! So, she chooses to challenge herself during the next lesson by increasing the level of difficulty.



This illustration, an example from my own experience as a PE teacher, shows that clarifying goals and providing process feedback has the potential to benefit students' motivation to participate in a physical education lesson. However, in many current educational systems this potential is not fully realised. Using goal clarification and process feedback as strategies to structure students' learning activities (Leahy et al., 2005; Wiliam, 2011; Wiliam & Thompson, 2008), is not common practice in general school subjects (Black, 2015; OCW, 2019) nor in PE (López-Pastor et al., 2013). Grading students' performance, however, is fully integrated in most educational systems around the globe (Ames, 1992; Lingard, 2010; Strain, 2009) as grades are firmly anchored in educational curricula (European Commission/EACEA/Eurydice, 2013).

There is accumulating evidence that, especially if grades are perceived as a judgment of one's performance, this comes with a motivational cost (Butler, 1987, 1988; Butler & Nisan, 1986; Grolnick & Ryan, 1987; Pulfrey et al., 2011). When being graded, students want to avoid looking bad in front of classmates, have stronger fear of failure or display greater feelings of incompetence (McDonald, 2001; Ryan & Weinstein, 2009). Yet, does the motivational cost of grading also apply in the PE context? The scarce evidence that is available indicated that performance grades affected girls negatively in their motivation to participate in PE lessons, yet did not affect boys (Johnson et al., 2011).

In contrast, when teachers manage to clarify the goals or to provide process-oriented feedback, students may perceive the assessment predominantly as information about their learning. Informational forms of assessment can be positively related to students' motivational functioning (Carpentier & Mageau, 2016; Grolnick & Ryan, 1987; Johnson et al., 2011; Levesque et al., 2004; Pat-El et al., 2012). Yet, this potential is not fully realised in PE lessons, as student are often ill-informed about PE goals and unaware about what PE assessment is based on (Redelius & Hay, 2012; Zhu, 2015). Therefore, assessment quality in PE is suggested to be worrisome (Hay & Penney, 2009; López-Pastor et al., 2013).

Students' positive motivational functioning in PE is important, because one of the main aims of PE is to provide students with competencies that enable and encourage them to participate in sports and physical activities in and outside of the school setting (Brouwer et al., 2011; European Commission/EACEA/Eurydice, 2013). In order for students to develop

a wide range of competencies in the psychomotor, cognitive and affective domain, they are ideally volitionally motivated to actively participate in PE lessons. Yet, students' most volitional form of motivation decreases as students grow older from primary school to secondary school (Lepper et al., 2005; van Rooijen et al., 2016).

As a consequence of the assessment issues and the importance of motivation in PE, it is strongly debated how PE assessment can become more meaningful, relevant and motivating (Hay & Penney, 2009; López-Pastor et al., 2013; Lorente-Catalán & Kirk, 2014). More empirical research investigating the motivating role of assessment in the context of PE is needed to guide this debate. In accordance with this, the recently developed Position Statement on Physical Education Assessment (AIESEP, 2020), written by an international group of PE assessment scholars and teacher-educators, signals the impact of various assessment strategies on student motivation and learning outcomes as a pressing direction for future research. Next to researchers and teacher educators, also PE teachers have a need for more evidence-based guidelines and insights for assessment to stimulate positive student experiences (Lucassen, 2014; Lucassen & Komen, 2020). This is because teachers struggle with questions such as “What is the impact of grading on students' motivation to participate in PE?” and “How can we assess students in a more motivating way?”. For these reasons, it is essential for practice to develop an evidence base that can support PE teachers' motivating assessment practices.

In line with this, the overarching research question addressed in this dissertation is:

“How are performance grading, as well as goal clarification and process feedback, related to students' motivational functioning and fear during PE?”

Performance Grading as a Judgment of Quality

Usually, physical education students' learning is regularly assessed throughout the school year by means of a performance-based assessment system (European Commission/EACEA/Eurydice, 2013). By grading students, teachers provide a judgment of the quality of students' performance, serving a summative purpose, and respond to demands of accountability which includes documenting students' individual achievements at a point in time. Grades can be awarded relative to criteria (i.e., criterion referenced grading; Pulfrey et al., 2011; Redelius & Hay, 2012) or relative to other students (i.e., norm referenced grading; Chan et al., 2011; Elliot & Moller, 2003; Johnson et al., 2011). Either way, assessing performance through grades conveys information, which allows and triggers students to compare their performance with other students. Thereby, performance-based grades possibly stimulate normative and social comparison (Ames, 1992; Elliot & Moller, 2003). Especially in PE, performance is “visible” and fosters such social comparison (Annerstedt & Larsson, 2010; Johnson et al., 2011; Redelius & Hay, 2012).

Goal Clarification and Process Feedback from an Assessment for Learning Perspective

Besides assessing students through grading for accountability, students' learning could also be assessed with a more informational or formative purpose. Assessment for learning (William, 2011) serves such a purpose and is defined as “the process of seeking and interpreting evidence for use by learners and their teachers to decide where they are in their

learning, where they need to go and how best to get there” (Broadfoot et al., 2002). For assessment for learning to be successful in the classroom, teachers need to use all relevant information, generated from assessment that identifies gaps in students’ learning, to adapt future instructions and learning activities (Desrosiers et al., 1997). Subsequently, students need to use this information to affect their future performance (Sadler, 1989; Wiliam, 2011). For instance, when students are practising the handstand and the teacher sees hollow backs or said differently, bodies that are not in a straight line, it is helpful to point out what needs to be done to improve (e.g., try to tuck in your belly-button to straighten your back).

Goal clarification and process feedback are two essential teaching strategies in the framework of assessment for learning (Leahy et al., 2005; Wiliam, 2011; Wiliam & Thompson, 2008). By communicating clear, specific and transparent goals (i.e., goal clarification or also more in general referred to as goal specificity; Hattie & Timperley, 2007; Sadler, 1989; Wirth et al., 2009), teachers provide the necessary information for students to decide where to direct their learning to. If students understand the goals of the lesson, they can become more self-regulated, because they are able to evaluate their current performance in relation to the desired goal (Andrade & Du, 2005; Moeller et al., 2012; Winstone et al., 2017). Process feedback (or more in general, formative feedback; for an overview see Shute, 2008) provides students with concrete suggestions on how to improve (Butler & Winne, 1995; Harks et al., 2014; Hattie & Timperley, 2007; Peterson & Irving, 2008). The most motivating and effective process feedback includes elements of both verification (i.e., the judgment of whether performance is correct) and elaboration (i.e., providing relevant cues for improvement) (Kulhavy & Stock, 1989; Shute, 2008). Although goal clarification and process feedback are well-defined in the assessment literature (Hattie & Timperley, 2007; Sadler, 1989; Shute, 2008), both are not mutually exclusive or statistically unrelated (Pat-El et al., 2013) because possibly, goal clarification provides information about process feedback and vice versa.

A Self-Determination Theory Perspective on Motivation

Many theories of motivation, such as Achievement Goal Theory (Nicholls, 1984), Social Cognitive Theory (Bandura, 2001), Self-Efficacy Theory (Bandura, 1977), Need Achievement Theory (Atkinson, 1957) and Expectancy Value Theory (Eccles & Wigfield, 2002), are relevant to the study of students’ motivation, also in PE (Gao et al., 2008; Halvari et al., 2011; Martin et al., 2009). The current dissertation relies on Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2017; Ryan & Deci, 2020) because of its strong focus on the *quality* of motivation (Vansteenkiste et al., 2006), hereby distinguishing different motivational regulations that allow for a refined examination of the motivational impact of assessment. SDT emphasises the importance of the kind of motivation that drives people’s behaviour, alongside considerations of how much they are motivated. Central to the theory is the distinction between self-determined or autonomous, and non-self-determined or controlled forms of motivation (Deci & Ryan, 2000; Ryan & Deci, 2017). These motivational subtypes reflect the degree to which actions are fully self-endorsed by the individual. Different types of motivation are likely to be engendered, depending on whether different forms of assessment are perceived to be more informational and helpful (i.e., informational significance) or evaluative and judgmental (i.e., controlling significance; Ryan & Deci, 2020). Students display autonomous motivation when they find their class enjoyable and interesting, for instance because they just love making handstands. In such a case, SDT refers to intrinsic motivation. Students can also experience personal



relevance, for instance because they find it important to improve their handstand, as they want to be able to show a good example in an effort to enrol for Physical Education Teacher Education. In such a case SDT refers to identified regulation. In contrast, students display controlled motivation when they put effort in their PE class because they experience feelings of guilt or shame and contingent self-worth when receiving a bad grade and may thus want to avoid such feelings. In these cases, SDT refers to introjected regulation. Students may not only pressure themselves to do well, but sometimes also feel externally pressured to obtain good grades. For instance, to please their teacher or parents, or to avoid criticism. In such a case, SDT refers to external regulation. While students are – quantitatively speaking – motivated when they display either autonomous or controlled motivation, amotivation within SDT reflects a lack of motivation. Amotivated students typically invest minimum effort in PE classes because they experience incapability to perform activities, or because they do not experience any personal value. See Figure 1 for a schematic overview of the motivational continuum according to SDT.

Dozens of previous studies in- and outside the PE context have indicated that autonomous motivation, relative to controlled motivation and amotivation, relates to a host of desirable outcomes (for an overview see Vasconcellos et al., 2019). For instance, autonomous motivation is predictive of students' observed engagement (Aelterman et al., 2012), rated performance (Vansteenkiste et al., 2004) and health related behaviour (Ntoumanis et al., 2020), whereas controlled motivation and amotivation relate to undesirable outcomes, including boredom (Ntoumanis, 2001), low engagement (Aelterman et al., 2012), and fear of exams and test situations (Schaffner & Schiefele, 2007).

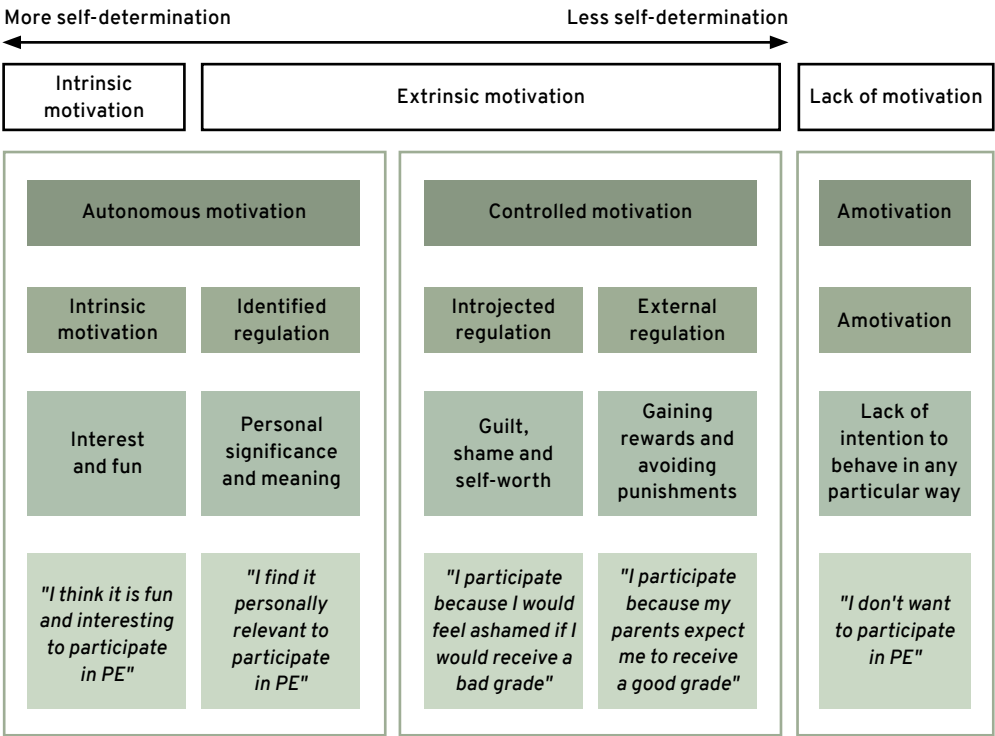


Figure 1
The motivational continuum according to Self-Determination Theory (Deci & Ryan, 2000).

Assessment and Motivation from a Self-Determination Theory Perspective

By examining associations between different types of assessment and the composite scores of autonomous and controlled motivation or the separate motivational regulations (Gagné et al., 2015; Taylor et al., 2014), a more refined insight in the motivational and learning consequences of assessment can be obtained. The first studies on assessment and motivation, which were conducted in the 1980s, focused on performance grading and predominantly included intrinsic motivation as an outcome (Butler, 1987, 1988; Butler & Nisan, 1986; Grolnick & Ryan, 1987). These studies, which were all situated in general education, showed that grading, particularly when students experience it as a judgment of their performance, results in lower levels of intrinsic motivation. These studies thus showed that students are unlikely to experience joy or interest when being graded. More recently, although the inclusion of exclusively intrinsic motivation remained prevalent (Koka & Hein, 2003; Kunter et al., 2007; Pat-El et al., 2012; Pulfrey et al., 2013), studies included composite scores of both autonomous and controlled motivation (Carpentier & Mageau, 2016; Pulfrey et al., 2011) and separate motivational regulations as outcomes (Johnson et al., 2011). These studies showed that, when being graded, students were less intrinsically motivated and identified regulated (Johnson et al., 2011), less autonomously motivated (Pulfrey et al., 2011) and more externally regulated and amotivated (Johnson et al., 2011). Students are thus not only more likely to lose interest and joy, they also experience the lessons as less valuable and more pressuring when being graded. In contrast, studies showed that when students were provided with goal clarification and process feedback, particularly when they experienced goals and feedback as information about their learning, they were more autonomously motivated (Carpentier & Mageau, 2016), and intrinsically motivated and identified regulated (Johnson et al., 2011; Kunter et al., 2007). Students are thus more likely to experience more joy, interest and personal value when provided with the lessons' goals and feedback on how to improve their task.

Three pressing gaps can be identified in this literature. First, most available studies focused on performance grading at the expense of other assessment strategies such as goal clarification and process feedback. Second, to truly understand the motivational correlates of assessment in a more refined way, it would be worthwhile to consider more motivational regulations than predominantly intrinsic motivation. Indeed, the investigation of the composite scores of autonomous motivation and controlled motivation, yet also the investigation of all separate motivational regulations (i.e., intrinsic motivation, identified regulation, introjected regulation, external regulation) as outcomes, would provide insight in a more refined way. For example, it is possible that strategies such as process feedback make students feel self-determined (i.e., autonomous motivation) to participate in a learning task, because they want to grow in their learning. Yet, if process feedback is perceived as too difficult, students perhaps feel pressured (i.e., controlled motivation) to participate in a task. Moreover, goal clarification could not necessarily increase joy (i.e., intrinsic motivation), but perhaps predominantly helps to understand the value of the learning tasks (i.e., identified regulation). In such a situation, the use of composite scores could mask some effects. Similarly, the impact of grading may most dominantly affect external regulation rather than introjected regulation. Because such speculations warrant further examination, there is a need for studies considering the wide spectrum of motivational regulations beyond the investigation of exclusively intrinsic motivation. Third, most of the existing work is situated in general education, while studies in PE are much scarcer. Only two empirical studies in the context of PE (Johnson et al., 2011; Koka & Hein, 2003)



examined the relations between performance grading, as well as goal clarification and process feedback, and students' quality of motivation. Johnson et al. (2011) found that girls who participated in assessment with an informational or formative purpose, experienced higher self-determined situational motivation compared to girls who received performance grades. Koka and Hein's (2003) study revealed that positive information-based feedback, and perceived competence satisfaction and intrinsic motivation were unrelated.

Understanding How Assessment Impacts Motivation: A Need-Based Approach

In order to understand how assessment can elicit more self-determined forms of motivation, SDT's distinction between the three basic psychological needs, that is, the need for competence, autonomy and relatedness, is highly relevant (Deci & Ryan, 2000; Ryan & Deci, 2017). Competence satisfaction refers to students' experiences of effectiveness, autonomy satisfaction refers to students' experiences of volition and self-endorsement and relatedness satisfaction refers to students' experiences of connection and mutual care. While the satisfaction of these needs has received considerable attention, it is only since the last decade that the notion of need frustration has been researched more intensively in the context of sports (Bartholomew et al., 2011; Bartholomew et al., 2011) and PE (De Meyer et al., 2016; Haerens et al., 2015). Need frustration deserves attention in its own right because – theoretically speaking – the absence of need satisfaction does not necessarily denote the presence of need frustration (Vansteenkiste & Ryan, 2013). Indeed, need frustration requires more active thwarting of students' needs. When students feel like a failure, they experience competence frustration. If students feel pressured, for instance to perform well, they experience autonomy frustration. Relatedness frustration refers to feelings of rejection or disrespect.

SDT stresses the importance of assessment to have an informational significance in order to stimulate the satisfaction of students' need for competence, autonomy and relatedness (Grolnick & Ryan, 1987; Ryan & Deci, 2020; Ryan & Weinstein, 2009). Studies starting from SDT (Deci & Ryan, 2000; Ryan & Deci, 2017) consider goal clarification (i.e., clarifying) and process feedback (i.e., guiding) as components of a motivating teaching style, that is teacher structure (Aelterman et al., 2019; Jang et al., 2010; Skinner & Belmont, 1993). Thus, when teachers set clear goals (Kunter et al., 2007; Pat-El et al., 2012) and provide process feedback (Levesque et al., 2004; Pat-El et al., 2012), they help students to expand their capabilities thereby fostering competence satisfaction (Kunter et al., 2007; Mouratidis et al., 2013; Pat-El et al., 2012). Because students' understanding of the goals of a lesson may also enable them to evaluate where they are in their learning trajectory and process feedback provides them with concrete information on how to improve, students may also be more likely to take ownership of their learning process thereby fostering autonomy satisfaction (Butler & Winne, 1995; Carpentier & Mageau, 2016). By providing goals and feedback, teachers help and support students' learning which might create a caring environment between students and teacher and therefore satisfies experiences of relatedness (Pat-El et al., 2012). Instead, it is possible, yet not empirically proven, that when grading is experienced as evaluative and judgmental, students might feel like a failure, particularly if they receive bad grades despite their efforts. In a similar vein, grading might pressure students to perform well, entailing autonomy frustration (Ryan & Deci, 2020). Or students might feel rejected by their teachers or classmates when receiving (reactions to) a low grade.

In sum, by informing students where to work towards and providing information on how to improve, both goal clarification and process feedback may engender need satisfaction, because they are experienced as informational, resulting in higher levels of competence satisfaction, autonomy satisfaction, relatedness satisfaction (Carpentier & Mageau, 2016; Levesque et al., 2004; Pat-El et al., 2012). Performance grading may instead relate to feelings of need frustration. More insights into how different forms of assessment are related to students' need satisfaction and frustration, will help teachers who want more motivated students.

Five important gaps can be identified in the current literature. First, only one study is available in the context of PE that investigated need-based experiences in relation to process feedback (Koka & Hein, 2003). This study focused on relations between perceived positive information-based feedback and students' experiences of competence satisfaction and found that positive information-based feedback was unrelated to students' feelings of effectiveness. No studies are available investigating the need-based correlates of grading and goal clarification in the PE context. Second, the available research, both in general education as in PE, investigated the role of need satisfaction only, at the expense of frustration, while feelings of failure or pressure may be particularly prevalent in relation to assessment. Third, while theoretically the basic psychological needs are suggested to explain why assessment elicit a particular motivational outcome, only one existing study in general education examined whether need satisfaction could explain (i.e., mediate) why students experience less task interest when being performance graded (Pulfrey et al., 2013). This limited available evidence indicates that when students are performance graded, they experience less task interest because of decreased feelings of volition and ownership of their own learning trajectory. Again only one study in general education is available examining the specific explaining role of need satisfaction in the relationship between goal clarification and motivational outcomes (Pat-El et al., 2012). This study indicates that competence, autonomy and relatedness satisfaction explained the relationship between students' insight in goals and expectations and intrinsic motivation. Moreover, the intervening role of need frustration has not been examined yet. Could it be possible that feelings of failure and pressure are triggered by grading, which then leads students to put effort into the lesson out of pressured reasons? Insight into these motivational processes would help teachers to form their assessment activities. Fourth, during the past decade, scholars have increasingly showed that teaching behaviour and motivational functioning (Bartholomew et al., 2018; Mainhard et al., 2011; Tanaka & Murayama, 2014) can vary substantially from moment to moment or lesson to lesson. As such, it is likely that students vary from lesson to lesson in their feelings of effectiveness, volition and being mutually cared for. For example, in some lessons, students may feel capable of performing a task, while in other lessons they may feel like a failure and feel pressured to do what the teachers tells them to do. More insight in these fluctuations and how they relate to fluctuations in teachers' assessment are needed. Whereas existing research has often relied on cross-sectional designs (Levesque et al., 2004; Pat-El et al., 2012), repeated measures designs are needed to recognise the existence of these fluctuations over time (Murayama et al., 2017). Fifth, although researchers have alluded to an interplay between goal clarification and process feedback (e.g., Sadler, 1989), it has not been empirically studied whether the association between process feedback and students' need-based experiences may, for example, be conditional on the level to which goals have been clarified. It is thus not clear whether it is most beneficial for students' need-based experiences that a teacher provides both goal clarification and process feedback to a great extent, or whether it is satisfactory when a teacher provides either goals or feedback so that the presence of one is sufficient to foster need satisfaction.



Assessment and Motivation in Educational Practice

In current educational practice internationally, performance grades play a dominant role (European Commission/EACEA/Eurydice, 2013) and many teacher educators and teachers search for ways to make assessment more relevant and meaningful for students (AIESEP, 2020; Lucassen & Komen, 2020). Teachers do so, because they struggle with questions as “What impact has grading on students’ motivation to participate in PE?”, when for instance students already know that their performance is unsatisfactory. When grading is primarily used as a judgment of quality, teachers might question “What informational value and meaning does a grade have for students and parents?” besides an indication of “good performance” or “bad performance”. And subsequently “How can I make assessments less judgmental and evaluative and more informational, relevant and meaningful?”. This struggle towards more informational and meaningful assessment in educational practice is reflected in contemporary PE research. Indeed in the last decade, goal clarification and process feedback received more attention as essential components of assessment, also in PE (Hay & Penney, 2009; Leirhaug & Annerstedt, 2016; MacPhail & Halbert, 2010; Ní Chóinín & Cosgrave, 2013). Observations of PE lessons focussing on assessment (i.e., not taking the relation with motivation into account) have demonstrated that the implementation of goal clarification and process feedback shows room for improvement (e.g., Leirhaug & Annerstedt, 2016; Leirhaug & MacPhail, 2015; López-Pastor et al., 2013). Therefore, concrete evidence-based examples on how to provide goal clarification and process feedback are warranted (Georgakis & Wilson, 2012; Ní Chóinín & Cosgrave, 2013). By examining such evidence-based examples, the present dissertation seeks to contribute to the development of an evidence base that can support PE teachers’ motivating assessment practices.

Overview of this Dissertation

The present dissertation comprises four studies (Chapters 2, 3, 4 and 5; see Table 1 for an overview) which address several of the identified gaps in the literature. By means of three separate data collections, gathered in both the Belgian and Dutch secondary school context, this dissertation aims to answer the central question *“How are performance grading, as well as goal clarification and process feedback, related to students’ motivational functioning and fear during PE?”*. A summary and general discussion of the main findings from the four studies are provided in Chapter 6, along with overarching limitations, future directions and recommendations for the educational practice.

The identified gaps in sum suggest that most available studies focused on performance grading at the expense of other assessment strategies such as goal clarification and process feedback. Also in the PE context, empirical evidence investigating both performance grading and goal clarification and process feedback is scarce. To truly understand the motivational correlates of performance grading in a more refined way, it would be worthwhile to consider composite scores of motivational regulations and/ or all separate motivational regulations than predominantly intrinsic motivation, and to examine both need satisfaction and frustration, because feelings of failure or pressure may be particularly prevalent in relation to assessment when assessment is perceived as evaluative and judgmental. It would also be worthwhile to examine the specific explaining (i.e., mediating) role of need satisfaction and frustration in the relationship between assessment on the one hand, and motivational outcomes on the other hand. Our understanding could become even more refined when investigating the lesson-to-lesson variability in

the extent to which teachers clarify goals, provide process feedback, and how this relates to lesson-to-lesson variability in students' experienced need satisfaction and frustration. Moreover, it is not clear whether it is most beneficial for students need-based experiences that a teacher provides both goal clarification and process feedback to a great extent, or whether it is satisfactory when a teacher provides either goals or feedback so that the presence of one is sufficient to foster need satisfaction. By examining evidence-based examples of goal clarification and process feedback, this dissertation seeks to contribute to the development of an evidence base that can support PE teachers' motivating assessment practices.

These identified gaps are translated into the following four themes that need further research (also see Table 1).

- 1 Are performance grades really detrimental for students' motivational functioning and do they elicit elevated levels of fear?
- 2 Can the motivating potential of assessment in PE be augmented by goal clarification and process feedback?
- 3 Can experiences of need satisfaction and frustration explain why assessment impacts motivation and fear?
- 4 Can variability in goal clarification and process feedback explain variability in students' need-based experiences?

Thus, as a first step, the study in **Chapter 2** investigated (1) whether secondary school students reported different levels of need satisfaction and frustration, intrinsic motivation, identified regulation, introjected regulation, external regulation, amotivation and fear in lessons in which they were graded when compared to lessons in which they were not graded, and (2) whether differences in experienced need satisfaction and frustration across both lessons accounted for possible differences in intrinsic motivation, identified regulation, introjected regulation, external regulation, amotivation and fear. A sample of 409 Belgian 12-18 year-old PE students participated in this study. Multilevel regression analyses were applied to take into account differences within students, between students and between classes.

While Chapter 2 investigated associations between performance grading and students' motivational functioning and fear, Chapter 3 build on this work by examining associations between goal clarification and students' motivational functioning and fear.

The study in **Chapter 3** investigated (1) whether and how goal clarification related to students' autonomous motivation, controlled motivation, amotivation and fear, (2) whether need satisfaction and frustration accounted for these relationships and (3) whether teachers' general motivating style reinforces or attenuates the relation between goal clarification and students' autonomous motivation, controlled motivation, amotivation and fear. A sample of 659 Belgian 12-18 year-old PE students completed a questionnaire directly after a non-grading lesson. Multilevel structural equation modelling was applied to take into account differences between students and between classes.



While Chapter 3 examined the motivating role of goal clarification in a cross-sectional design, Chapter 4 builds on this work by (a) examining the motivating role of goal clarification in a longitudinal lesson-to-lesson study design, and (b) by simultaneously addressing the role of process feedback.

The study in **Chapter 4** investigated to what degree lesson-to-lesson variability in students' perceptions of teachers' goal clarification and process feedback, and their potential dependency, covaried with lesson-to-lesson differences in students' need satisfaction and frustration. A sample of 570 Dutch 11-18 year-old PE students completed a questionnaire directly after the second last and last PE lesson of three series of lessons on three different topics. Based on repeated measures in six consecutive lessons, students completed questionnaires both for non-grading (i.e., at measurement occasion one, three and five) and grading lessons (i.e., at measurement occasion two, four and six). Multilevel regression analyses were applied to take into account differences within students, between students and between classes.

Moving away from students' perspectives, Chapter 5 targeted teachers' goal clarification and process feedback directly using a quasi-experimental design.

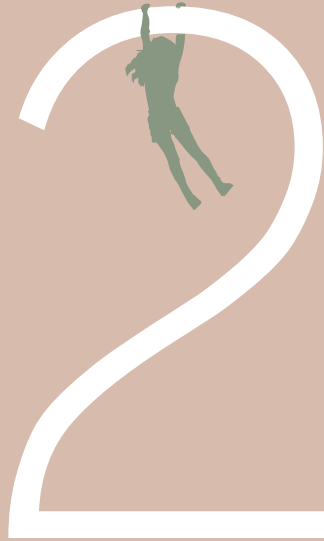
The study in **Chapter 5** investigated the effects of goal clarification and process feedback on PE students' need satisfaction and frustration. A sample of 492 Dutch 10-14 year-old PE students completed a baseline- and effect measure. A 2x2 factorial design was used to experimentally manipulate goal clarification (absence vs. presence) and process feedback (absence vs. presence) in a PE lesson taught by one guest-teacher. The guest-teacher used instructional videos and lesson-scripts per experimental condition which potentially could contribute to an evidence base of PE assessment examples. Multilevel regression analyses were applied to take into account differences within students, between students and between classes.

Table 1
Schematic Overview of the Studies Presented in this Dissertation

Chapter	Themes that need further research	Data collection	Study	Study design	Study population
2	1, 3	1	Performance grading and motivational functioning and fear in physical education: A Self-Determination Theory perspective	Longitudinal; two repeated measures	409 Belgian 12-18 year-old PE students, M_{age} 14.73 at time point one.
3	2, 3	1	How does knowledge about the criteria for an upcoming test relate to adolescents' situational motivation in physical education? A Self-Determination Theory approach	Cross-sectional; one measure	659 Belgian 12-18 year-old PE students, M_{age} 14.72.
4	1, 2, 4	2	Where to go and how to get there: Goal clarification, process feedback and students' need satisfaction and frustration from lesson to lesson	Longitudinal; six repeated measures	570 Dutch 11-18 year-old PE students, M_{age} 13.76 at time point one.
5	2, 4	3	Do goal clarification and process feedback positively affect students' need-based experiences? A quasi-experimental study grounded in Self-Determination Theory	Quasi-experimental; one baseline and one effect measure	492 Dutch 10-14 year-old PE students, M_{age} 12.51 at time point one.

Note. Chapters 2 and 3 report on data from overlapping samples.
Theme 1: Are performance grades really detrimental for students' motivational functioning and do they elicit elevated levels of fear?
Theme 2: Can the motivating potential of assessment in PE be augmented by goal clarification and process feedback?
Theme 3: Can experiences of need satisfaction and frustration explain why assessment impacts motivation and fear?
Theme 4: Can variability in goal clarification and process feedback explain variability in students' need-based experiences?





Performance Grading and Motivational Functioning and Fear in Physical Education: A Self-Determination Theory Perspective

This chapter is based on:

Krijgsman, C., Vansteenkiste, M., van Tartwijk, J., Maes, J., Borghouts, L., Cardon, G., Mainhard, T., & Haerens, L. (2017). Performance grading and motivational functioning and fear in physical education: A Self-Determination Theory perspective. *Learning and Individual Differences*, 55, 202–211. <https://doi.org/10.1016/j.lindif.2017.03.017>

Acknowledgement of author contributions:

CK, JM and LH designed the study; JM collected the data; CK, JM and LH planned the data analyses; CK analysed the data; CK drafted the manuscript; CK, MV, JvT, LB, GC, TM and LH contributed to critical revision of the manuscript; LH supervised the study.

Abstract

Grounded in Self-Determination Theory, the present study examined the explanatory role of students' perceived need satisfaction and need frustration in the relationship between performance grading (versus non-grading) and students' motivation and fear in a real-life educational physical education setting. Grading consisted of teacher judgments of students' performances through observations, based on pre-defined assessment criteria. Thirty-one classes with 409 students ($M_{\text{age}} = 14.7$) from twenty-nine Flemish (Belgian) secondary schools completed questionnaires measuring students' perceived motivation, fear and psychological need satisfaction and frustration, after two lessons: one with and one without performance grading. After lessons including performance grading, students reported less intrinsic motivation and identified regulation, and more external regulation, amotivation and fear. As expected, less need satisfaction accounted for (i.e., mediated) the relationship between performance grading and self-determined motivational outcomes. Need frustration explained the relationship between performance grading and intrinsic motivation, as well as less self-determined motivational outcomes. Theoretical and practical implications are discussed.

Introduction

Using grades to assess students' performance is an integral part of educational systems around the globe (Ames, 1992; Lingard, 2010; Strain, 2009). The motivational impact of grading is likely to depend on its functional significance (Vansteenkiste et al., 2008). When students predominantly perceive a grading event as a judgment of their performance, rather than as a way of receiving information about their learning process, this may come at a motivational price (Ames, 1992; Amrein & Berliner, 2002; Ryan & Brown, 2005). Students' focus on performing well to obtain good grades may then undermine their interest and "love of learning" (Butler & Nisan, 1986; Butler, 1987; Jones, 2007; Pulfrey et al., 2013). Moreover, students may start to avoid looking bad in front of their teachers or peers, which may lead to fear of failure and feelings of incompetence when grades are inferior (Elliot & McGregor, 1999; McDonald, 2001; Ryan & Weinstein, 2009). Using a within-person design, the present research investigated whether students' motivational functioning, fear and need-based experiences varied as a function of whether they were graded or not during their real-life physical education (PE) classrooms (i.e., ecologically valid setting). Moreover, extending past work, we addressed the processes (i.e., need-based experiences) underlying the hypothesised motivational and fear differences between a grading and non-grading class. Because the functional significance of the grading was primarily evaluative and judgmental of student's performance, we refer to this type of grading as "performance grading".



Grading in Physical Education

As in many other countries, in Flanders (Belgium), PE students are regularly assessed throughout the school year. Functions of assessment in PE (as in academic courses) can be positioned on a continuum from "performance-based assessment" (i.e., quality judgment of students' performance) to "informational assessment" (i.e., specifying learning progress and constructing the way forward; López-Pastor et al., 2013; Tunstall & Gipps, 1996). In Flanders (Belgium), PE students are often exposed to a performance-based assessment system. Students' performance is commonly rated with the grades 1 to 10. The grades "1" to "4" designate an insufficient performance, the grades "5" to "7" describe a sufficient performance, and the grades "8" to "10" describe good to excellent performances (i.e., a "multiple grades system"; Barenberg & Dutke, 2013, p.122).

While awarding performance-based grades in PE, teachers typically use criterion referenced grading (i.e., how well do students perform relative to criteria; Pulfrey et al., 2011; Redelius & Hay, 2012) and norm referenced grading (how well students perform relative to others; Chan et al., 2011; Elliot & Moller, 2003; Johnson et al., 2011). Frequently used methods are teacher judgments based on observations with (Borghouts et al., 2017; Svennberg et al., 2014) or without (Annerstedt & Larsson, 2010; Hay & Macdonald, 2008; Svennberg et al., 2014) explicitly communicating criteria. Irrespective of the type of grading that students are submitted to, or which combination of grading systems the teacher employs, assessing performance through the use of a multiple grades system conveys information, which allows (and in fact mostly triggers) students to compare their performance with other students. Moreover, students in Flanders (Belgium) receive a report card at the end of each semester, which contains the average grades for PE along with other subjects (European Commission/EACEA/Eurydice, 2013). This report card again allows students to directly compare performances. It is therefore argued that performance-based grades

stimulate normative and social comparison (Ames, 1992; Elliot & Moller, 2003). Such social comparison (Ames, 1992) might be further fostered by the “visibility” of performance during PE lessons (Annerstedt & Larsson, 2010; Johnson et al., 2011; Redelius & Hay, 2012), and may come with a motivational cost.

Self-Determination Theory and Performance Grading

Motivational Differences

According to SDT, depending on whether the performance grading is perceived to be more evaluative and judgmental or informational and helpful, different types of motivation are likely to be engendered. A refined taxonomy of motives is discerned within SDT, with some of them being more autonomous and others more controlled in nature (Deci & Ryan, 2000; Vansteenkiste et al., 2006). Students are said to display autonomous regulation during a PE class when they find their class to be enjoyable and interesting (i.e., intrinsic motivation) or value its personal benefits (i.e., identified regulation). In contrast, students are controlled motivated when they put effort in their PE class to please their teacher, to obtain good grades, or to avoid criticism (i.e., external regulation). Interestingly, students may not only be externally pressured, but could also pressure themselves to do well (i.e., introjected regulation), for instance by buttressing their activity engagement with feelings of guilt and contingent self-worth. While students are – quantitatively speaking – motivated when they display either autonomous or controlled motivation, amotivation within SDT reflects a lack of motivation. Specifically, amotivated students typically invest a minimum amount of effort in PE classes because they experience incapability to perform activities, or because they do not experience a personal value (Deci & Ryan, 2000).

Dozens of previous studies have indicated that autonomous motivation, relative to controlled motivation and amotivation, relates to a host of desirable outcomes (see Ntoumanis & Standage, 2009 for an overview). To illustrate, autonomous motivation is predictive of students’ observed engagement (Aelterman et al., 2012) and rated performance (Vansteenkiste et al., 2004), whereas controlled motivation and amotivation relate to undesirable outcomes, including boredom (Ntoumanis, 2001), low engagement (Aelterman et al., 2012), and fear of exams and test situations (Schaffner & Schiefele, 2007).

Further, a number of studies have indicated that these different types of motivation get differentially activated under grading versus non-grading circumstances. For instance, experimental research showed that grading, particularly when students experience it as a judgment of their performance, results in lower levels of intrinsic motivation (Butler & Nisan, 1986; Butler, 1987; Grolnick & Ryan, 1987; Johnson et al., 2011; Pulfrey et al., 2011) and identified regulation (Johnson et al., 2011; Pulfrey et al., 2011). Furthermore, two studies found external regulation (Grolnick & Ryan, 1987; Johnson et al., 2011) and amotivation (Johnson et al., 2011) to increase in situations where performance-based grading takes place. Yet, to the best of our knowledge, no previous study specifically examined the relationship between performance grading and introjected regulation. Although it seems rather self-evident that students are more externally regulated during an evaluative grading class, the question remains whether they equally apply such pressure to their own functioning. Presumably, because performance grading “awakens” students’ ego, they may display more introjected regulation as well.

Explanatory Processes: Need-Based Experiences

While the motivational correlates of performance grading are fairly well documented in the literature, less is known about the processes underlying these effects (for an exception see Pulfrey et al., 2013). To predict the motivational impact of performance grading, from a SDT-account, the critical question is whether the grading impacts on individuals' psychological need-based experiences. Three psychological needs have been discerned, that is, the need for autonomy, relatedness, and competence (Deci & Ryan, 2000). Specifically, need satisfaction refers to students' experience of volition and self-endorsement (i.e., need for autonomy), their feeling of connection and mutual care (i.e., need for relatedness) and their experience of effectiveness (i.e., need for competence). Dozens of studies have indicated that the satisfaction of these needs contributes to individuals' autonomous motivation, and their engagement and growth in the classroom (Niemiec & Ryan, 2009).

While the satisfaction of these needs has received considerable attention, it is only more recently that the notion of need frustration, which may particularly be useful in the context of grading, has been researched more intensively (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Haerens et al., 2015). Need frustration deserves attention in its own right because – theoretically speaking – the absence of need satisfaction does not necessarily denote the presence of need frustration (Vansteenkiste & Ryan, 2013). Indeed, for need frustration to occur, a more active thwarting of individuals' needs is required. Specifically, need frustration refers to feelings of pressure and internal conflict (i.e., autonomy frustration), rejection and disrespect (i.e., relatedness frustration), or feelings of failure and inadequacy (i.e., competence frustration). The distinction between need satisfaction and frustration is critical as unfulfilled needs (i.e., low need satisfaction) may not relate as robustly to malfunctioning as frustrated needs may. A metaphor (Vansteenkiste & Ryan, 2013, p.265) may help to account for this assumption: *"If plants do not get sunshine and water (i.e., resulting in low need satisfaction), they will fail to grow and will die over time; yet, if salted water is thrown on plants (i.e., eliciting need frustration), they will wither more quickly"*. Thus, whereas low need satisfaction is likely to yield motivational costs over time, high need frustration will accelerate negative motivational processes. Congruent with this assumption, past research has found need satisfaction to be predictive of autonomous motivation (Haerens et al., 2015), engagement (Jang et al., 2016) and well-being (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011), while need frustration relates to controlled motivation and amotivation (Haerens et al., 2015), disengagement (Jang et al., 2016) and ill-being (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011). Such findings have been documented using cross-sectional, longitudinal and diary designs (Van der Kaap-Deeder et al., 2017).

The question whether performance grading relates to individuals' need-based experiences has received little attention (for an exception see Pulfrey et al., 2013). It is possible that when exposed to grading, especially if the grading is evaluative and judgmental, students might not only experience a lack of choice or freedom (i.e., low autonomy satisfaction), they may also feel pressured to perform well (i.e., high autonomy frustration). Likewise, students might not only experience a sense of disconnection to others (i.e., low relatedness satisfaction), they might also feel rejected by others when anticipating (reactions to) a lower grade (i.e., high relatedness frustration). In a similar vein, students might not only think they will not be able to reach the criteria (i.e., low competence satisfaction), in some situations they might even feel like a failure (i.e., high competence frustration), particularly if they receive bad grades despite their efforts. Consistent with these



prior assumptions, it was indicated that autonomy satisfaction accounted for the link between performance grading and task interest (i.e., intrinsic motivation; Pulfrey et al., 2013). Yet, whether and how experienced need satisfaction and frustration vary as a function of performance grading and whether these need-based experiences can account for the hypothesised link between performance grading and the broad spectrum of students' motivational functioning and fear has not received any attention so far.

The Present Study

Grounded in Self-Determination Theory, the present study, conducted in an ecological valid setting (i.e., during authentic lessons), addressed the following research questions: (1) Do students' display different motivational functioning, fear and need-based experiences in a PE lesson in which performance grading is applied compared with a lesson in which no performance grading is applied and (2) can differences in motivational functioning and fear be accounted for by differences in experienced need satisfaction and frustration across both lessons? While performance grading in PE might be considered low-stake, we posit nevertheless that participating in grading activities in PE might be associated with more fear and a different pattern of motivational functioning and need-based experiences. We formulated the following two hypotheses.

First, based on previous research (Grolnick & Ryan, 1987; Johnson et al., 2011; Putwain & Best, 2011) we hypothesised that students would report lower levels of intrinsic motivation, identified regulation and need satisfaction, and higher levels of introjected regulation, external regulation, amotivation, fear and need frustration, when being exposed to a performance-based grading class versus a non-grading class (also see Butler & Nisan, 1986; Pulfrey et al., 2011).

Second, we investigated the explanatory (i.e., mediating) role of students' experiences of need satisfaction and need frustration in the relationship between performance grading (versus non-grading) and the hypothesised differences in motivation and fear. Given that this question has not received any prior attention (for an exception see Pulfrey et al., 2013), we were open for the possibility that performance grading may come with low need satisfaction or a combination of low need satisfaction and high need frustration. To illustrate, performance grading may reduce feelings of choice or freedom (i.e., low autonomy satisfaction), and may simultaneously increase students' pressure and stress to perform well (i.e., autonomy frustration). If differences in need frustration would surface, they may help to account for why grading versus non-grading relates to students' higher levels of introjected regulation, external regulation, amotivation and fear.

Method

Participants

A convenience sample of thirty-nine PE teachers (24 males; 61.5%) and 724 students (399 boys; 55.1%, $M_{\text{age}} = 14.7 \pm 0.94$) from 39 schools in Flanders (Belgium) participated in the study. Of all 724 participating students, 315 students did not have complete measures, and therefore these students were excluded from the analyses, resulting in a final sample of twenty-seven schools with thirty-one PE teachers (21 males; 67.7%) and 409 students (response rate = 57%, 222 boys; 54.3%, $M_{\text{age}} = 14.7 \pm 1.00$). In Flanders (Belgium), the gender formation of PE classes (i.e., mixed gender grouped or single gender grouped) depends on the districts in which schools are located. In the present sample, of all 31 classes, 14 classes (45.2%) were mixed gender grouped and 17 classes (54.8%) were single gender grouped (11 male classes; 64.7%). Class sizes ranged from eight to thirty students per class ($M = 17 \pm 5.18$). All students attended secondary education: 46.2% of the students attended academic education, 31.1% technical education and 22.7% vocational education.

Ethical Considerations

All participating teachers and their principals gave informed consent to their participation in the current study. With the exception of eleven parents, all parents gave informed consent for their child's participation. All participants were assured that responses were treated confidentially. The Ethical Committee of Ghent University approved the study protocol.

Procedure

For the purposes of the present study, teachers were asked to give their lessons as planned. In Flanders (Belgium), PE is a compulsory subject in secondary schools for at least two 50-min lessons each week. These two 50-min lessons are sometimes combined into one single 100-min lesson. The research leader plus a team of research assistants collected the data. Students filled out a set of questionnaires during the last 15 min of two lessons out of a sequence of lessons on one specific topic (e.g., four basketball lessons). The first measurement took place at the end of the first or second lesson of the series of lessons: a lesson in which students were not graded. The second measurement took place in the final lesson of the series of lessons: a lesson in which students received a performance grade. Students were aware of the fact that they were graded during this specific lesson. The time frame between both measurements was in most classes one to three weeks. No manipulations were made to the normal procedure in the lessons, with the exception of filling out the questionnaires at the end of both lessons.

To understand how students in the present sample were assessed, data were collected with two different types of measurements. First, teachers were questioned about their grading practices by means of open questions. In these questionnaires, teachers indicated that it was usual to grade their students on a specific lesson topic in a relatively short period of time. For most teachers in this sample it was common practice to teach about three to four consecutive lessons on one subject (e.g., four lessons of basketball) with grading taking place in the last lesson. In the lessons in which grading took place, teachers graded students' motor skills on the same specific subject (e.g., grading the lay-up as a



basketball technique in the final lesson of four lessons in which students had practised the lay-up) to obtain a qualification of students' performance. Second, 30 teachers ($n = 1$ missing) were filmed in the lessons in which grading took place. Observations of these lessons provided a good indication of the actual grading practices. It was clear from the videos that all grading lessons had the purpose of qualifying students' performance at the end of a learning process. Except for one teacher (for whom we could not verify from video or questionnaire whether students' performance was qualified by means of a grade), all teachers assessed students by means of a grade. Video observations indicated that, while awarding performance-based grades in PE, the majority of the teachers in our sample informed the students about assessment-criteria. These criteria were designed and used to measure product performance (i.e., purely measuring students' performance at the end of the learning process). After communicating these criteria, with the exception of one teacher, all teachers awarded performance grades based on their own observations and judgments (i.e., one teacher used peer assessment). Almost half of the students received their grade in the grading lesson itself. Other students had to retrieve the grade at a later moment from a digital system. Independent of the method used for grading, largely all students worked in small groups while being graded and hardly any assessment tools were used, such as videos or photos for observation.

Measures

Motivational Regulations

Insights into students' motivational regulations towards the last PE class were obtained by use of the Behavioural Regulations in Physical Education Questionnaire (BRPEQ; Aelterman et al., 2012) in a similar way as it was done in previous research (Aelterman et al., 2012; Haerens et al., 2015). Table 1 reports on the typical items, reliability and number of items per scale and per measurement occasion. Students responded to all items on a 5-point Likert scale ranging from "*not at all true for me*" to "*very true for me*". Factorial validity was examined by modelling a confirmatory factor analysis (CFA) per time point, performed with Mplus (version 7.4; Muthén & Muthén, 2015). The time point 1 model fitted the data well (for recommendations see Hu & Bentler, 1999; Kline, 2011), $\chi^2(142) = 422.32$, $p < 0.001$, RMSEA = 0.07, CFI = 0.92 and SRMR = 0.06. All indicator loadings were above 0.61, $p < 0.001$. The time point 2 model fitted the data reasonably well, $\chi^2(142) = 568.63$, $p < 0.001$, RMSEA = 0.09, CFI = 0.90 and SRMR = 0.06. All indicator loadings were above 0.61, $p < 0.001$.

Fear

Students' level of fear was measured by means of the subscale "fear" of the Learning And Study Strategies Inventory (LASSI; Weinstein, 1987), adapted to the context of PE. Table 1 reports on the typical items, reliability and number of items per scale, and per time point. Students responded to all items on a 5-point Likert scale ranging from "*not at all true for me*" to "*very true for me*". The time point 1 model fitted the data reasonably well, $\chi^2(9) = 56.40$, $p < 0.001$, RMSEA = 0.12, CFI = 0.96 and SRMR = 0.04. All indicator loadings were above 0.69, $p < 0.001$. The time point 2 model also fitted the data reasonably well, $\chi^2(9) = 56.98$, $p < 0.001$, RMSEA = 0.12, CFI = 0.97 and SRMR = 0.03. All indicator loadings were above 0.68, $p < 0.001$.

Need Satisfaction and Frustration

Students' perceived autonomy, relatedness and competence satisfaction and frustration during the last PE lesson were assessed by the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015). Table 1 reports on the typical items, reliability and number of items per scale and per measurement. Students responded to all items on a 5-point Likert scale ranging from "not at all true for me" to "very true for me". For the purpose of the present research, small modifications were made to the original BPNSFS in order to adjust the questionnaire to the PE context. The items were modelled as indicators of six first order factors (autonomy satisfaction, autonomy frustration, relatedness satisfaction, relatedness frustration, competence satisfaction, competence frustration) that, in turn, served as indicators for two higher order factors (i.e., need satisfaction and need frustration). The time point 1 higher order model fitted the data reasonably well, $\chi^2 (245) = 632.94, p < 0.001$, RMSEA = 0.07, CFI = 0.90, SRMR = 0.08. All indicator loadings were above 0.44, $p < 0.001$. The time point 2 higher order model also fitted the data reasonably well $\chi^2 (245) = 829.57, p < 0.001$, RMSEA = 0.08, CFI = 0.89, SRMR = 0.08. All indicator loadings were above 0.50, $p < 0.001$. More detailed information (i.e., all scales and subscales, factor loadings of individual items per time point) on the present study's factorial validity is presented as supplementary online data.

Table 1

Overview of the Scales, Number of Items per Scale, Cronbach's Alphas per Time Point and Example Items

Scale	n items	α		Example item
		T0	T1	Using the stem
BRPEQ				<i>I put effort in the last PE class because...</i>
Intrinsic motivation	4	0.90	0.86	... I enjoyed this PE class
Identified regulation	4	0.79	0.79	... I found this PE class personally meaningful
Introjected regulation	4	0.69	0.79	... I would have felt guilty if I didn't
External regulation	4	0.78	0.90	... because I felt the pressure of others to participate in this PE class
Amotivation	4	0.80	0.87	I thought this PE class was actually a waste of time
Based upon LASSI				<i>During the last PE class...</i>
Fear	6	0.88	0.92	I thought about how bad I performed in comparison to other students
BPNSNF				<i>During the last PE class...</i>
Autonomy satisfaction	4	0.72	0.82	... I felt a sense of choice and freedom in the tasks I was participating in
Autonomy frustration	4	0.79	0.86	... I felt pressured to do certain tasks
Relatedness satisfaction	4	0.76	0.80	... I felt close and connected with other people who are important to me
Relatedness frustration	4	0.84	0.89	... I felt that people who are important to me were cold and distant towards me
Competence satisfaction	4	0.69	0.77	... I felt that I can successfully complete difficult tasks
Competence frustration	4	0.85	0.89	... I felt disappointed with many of my performances

Note. BRPEQ = Behavioural Regulations in Physical Education Questionnaire; LASSI = Learning And Study Strategies Inventory; BPNSNF = Basic Psychological Need Satisfaction and Frustration Scale.



Plan of Analysis

Given the nested structure of the data (measurements within students within classes), multilevel regression analyses were executed for all main analyses, using MLwiN version 2.30 (Rasbash et al., 2014). When executing the main analyses, we controlled for the contextual variables gender (De Meyer et al., 2014; Johnson et al., 2011) and lesson topic (i.e., categorised as individual sports; artistic sports, and interactive sports; Aelterman et al., 2012; Guay et al., 2010) because these variables might affect students' quality of motivation, feelings of fear and need-based experiences.

Prior to the main analyses, dropout analyses, using multilevel regression analyses, were performed to examine differences between students who dropped out and those who remained in the study. Also prior to the main analyses and using multilevel regression analyses, baseline variance components models (Rasbash et al., 2014) or intercept-only models (Hox, 2010) were established for all variables in our study, with only an intercept and no explanatory variables (i.e., Model 0). As class and school level showed overlap, a three-level model (measurement, student, class) better matched the data when compared with a four-level model (measurement, student, class, school). As such, data were treated as a three-level model, in which measurements were nested in students and classes. This allowed us to examine the percentages of variation in these dependent variables situated at the class (i.e., variation between classes), student (i.e., variation between students) and measurement level (i.e., variation within students).

The first part of our main analyses was performed to answer the first research question, in which we investigated the relationship between performance grading (i.e., presence or absence of grading), and motivation, fear and perceived need satisfaction and need frustration. One step was executed in this part of the analyses: the predictor "grading lesson" was inserted into the baseline variance components models, while simultaneously controlling for gender and lesson theme (i.e., Model 1). To answer our second research question, that is whether need satisfaction and need frustration mediated relationships between performance grading and motivational outcomes as well as fear, several steps were followed. First, total effects (τ) were first estimated through a multilevel model (i.e., Model 1), with grading lesson as a single predictor of motivational regulations (i.e., intrinsic motivation, identified regulation, introjected regulation, external regulation and amotivation) and fear, while simultaneously controlling for gender and lesson theme. In a second step, to examine indirect effects, that is whether need satisfaction (Model 2) and need frustration (Model 3) mediated these relationships, these variables were added to the models. In line with Cerin & MacKinnon (2008), to test for mediation, the statistical significance of the product of two regression coefficients ($\alpha\beta$) was calculated, with α representing the relationship between the independent variable (i.e., presence or absence of grading) and the potential mediators (i.e., need satisfaction and need frustration), and β representing the relation between the mediators and motivational outcomes and fear. Simultaneously in these models, the direct relationship (τ') between performance grading and motivational outcomes and fear was adjusted for. Mediation effects represented by $\alpha\beta$ were considered statistically significant when their 95% confidence interval did not include zero. Specific indirect effects ($\alpha\beta$ for need satisfaction and $\alpha\beta$ for need frustration) were estimated. To be able to compare the strength of parameters, all variables in the regression analyses were standardised ($M = 0$, $SD = 1$; Hox, 2010).

Results

Preliminary Analyses

Descriptive statistics and correlations of all latent variables are presented as supplementary online data. Dropout analyses revealed that there was no significant difference in perceived intrinsic motivation ($\chi^2 = 0.85$, $df = 1$, $p = 0.36$), identified regulation ($\chi^2 = 0.00$, $df = 1$, $p = 1.00$), introjected regulation ($\chi^2 = 0.14$, $df = 1$, $p = 0.71$), external regulation ($\chi^2 = 0.15$, $df = 1$, $p = 0.70$), amotivation ($\chi^2 = 0.01$, $df = 1$, $p = 0.94$), level of fear ($\chi^2 = 0.01$, $df = 1$, $p = 0.91$), need satisfaction ($\chi^2 = 0.36$, $df = 1$, $p = 0.55$) and need frustration ($\chi^2 = 1.26$, $df = 1$, $p = 0.26$), between students who completed only the baseline questionnaire and dropped out afterwards and students who completed both questionnaires.

The baseline variance components models showed a significant difference from zero in variance at class, student and measurement level (see Table 2, Model 0), for each of the motivational outcomes, fear and need-based experiences. Variance situated at the class level ranged between 6.61% for identified regulation ($\chi^2 = 4.45$, $df = 1$, $p < 0.05$) and 22.46% for need frustration ($\chi^2 = 10.95$, $df = 1$, $p < 0.001$). Variance at the student level ranged between 21.24% for external regulation ($\chi^2 = 24.13$, $df = 1$, $p < 0.001$) and 49.70% for identified regulation ($\chi^2 = 83.59$, $df = 1$, $p < 0.001$). Variance situated at the measurement level ranged between 43.69% for identified regulation ($\chi^2 = 202.13$, $df = 1$, $p < 0.001$) and 60.02% for external regulation ($\chi^2 = 200.56$, $df = 1$, $p < 0.001$).

The Main Analyses: Motivational Experiences as a Function of Performance Grading

The first part of the main analyses was executed to answer our first research question. The predictor variable grading lesson plus the covariates (i.e., gender and lesson theme) were added to the models examining students' motivation, fear and need-based experiences (see Table 2, Model 1). Except for introjected regulation ($\Delta\chi^2(4) = 8.34$, $p = 0.08$), adding grading lesson and the covariates to the model improved the model for all variables, as the iterated generalised least squares (IGLS) estimation was significant for all models (i.e., ranging between $\Delta\chi^2(4) = 9.81$, $p < 0.05$ for need satisfaction and $\Delta\chi^2(4) = 50.21$, $p < 0.001$ for need frustration). Indeed, with the exception of introjected regulation ($\chi^2 = 3.51$, $df = 1$, $p = 0.06$), differences between types of lessons (i.e., presence or absence of performance grading) were found for all variables, with students experiencing less intrinsic motivation ($\chi^2 = 43.07$, $df = 1$, $p < 0.001$), identified regulation ($\chi^2 = 13.91$, $df = 1$, $p < 0.001$) and need satisfaction ($\chi^2 = 4.91$, $df = 1$, $p < 0.05$), and more external regulation ($\chi^2 = 8.18$, $df = 1$, $p < 0.01$), amotivation ($\chi^2 = 43.43$, $df = 1$, $p < 0.001$), fear ($\chi^2 = 12.00$, $df = 1$, $p < 0.001$) and need frustration ($\chi^2 = 44.16$, $df = 1$, $p < 0.001$), during a lesson in which performance grading took place compared with a lesson in which no performance grading took place. Furthermore, these analyses served as a first step in the mediation analyses (i.e., second research question), because they give an indication of the total effect (τ) of the relation between performance grading and the motivational regulations and fear, without the inclusion of the mediators (see Tables 2 and 3).

In a second step, direct effects (τ') and indirect effects ($\alpha\beta$) were tested to observe if the significant associations between performance grading and motivational outcomes and fear were mediated by need satisfaction and need frustration. In the full model with need



satisfaction as a mediator (see Table 3), a lowered effect size was found for the direct relationship between performance grading and intrinsic motivation (from $\tau = -0.31, p < 0.001$ to $\tau' = -0.26, p < 0.001$) and identified regulation (from $\tau = -0.17, p < 0.001$ to $\tau' = -0.11, p < 0.05$), indicating partial mediation ($\alpha\beta_{\text{intrinsic}} = 0.45, p < 0.001$ and $\alpha\beta_{\text{identified}} = 0.51, p < 0.001$). Because the relationship between performance grading and introjected regulation (from $\tau = 0.10, p = 0.06$ to $\tau' = 0.11, p < 0.05$), external regulation (from $\tau = 0.16, p < 0.01$ to $\tau' = 0.17, p < 0.01$), amotivation (from $\tau = 0.31, p < 0.001$ to $\tau' = 0.32, p < 0.001$) and fear (from $\tau = 0.17, p < 0.001$ to $\tau' = 0.18, p < 0.001$) did not significantly attenuate, need satisfaction was not considered as a mediator in these specific models (Cerin & MacKinnon, 2008).

In the full model with need frustration as a mediator (see Table 3), the direct relationship (τ') between performance grading and external regulation ($\tau' = -0.05, p = 0.36$) and fear ($\tau' = -0.06, p = 0.15$) were no longer significant, with need frustration fully mediating these relationships ($\alpha\beta_{\text{external}} = 0.62, p < 0.001$; $\alpha\beta_{\text{fear}} = 0.69, p < 0.001$). A lowered effect size was found for the direct relationship between performance grading and intrinsic motivation (from $\tau = -0.31, p < 0.001$ to $\tau' = -0.26, p < 0.001$) and amotivation (from $\tau = 0.31, p < 0.001$ to $\tau' = 0.16, p < 0.001$), indicating partial mediation ($\alpha\beta_{\text{intrinsic}} = -0.15, p < 0.001$ and $\alpha\beta_{\text{amotivation}} = 0.49, p < 0.001$). The full models with need satisfaction and need frustration proceeding as mediators are displayed graphically in respectively Figure 1 and Figure 2.

Discussion

Grounded in Self-Determination Theory, the global purpose of the present study was to examine differences in students' motivational functioning, fear and need-based experiences between an authentic grading and non-grading PE class, and to examine the explanatory factors accounting for these differences. The context of the grading lesson in our study was a situation in which a multiple grading system was used in a highly visible PE context (Trout & Graber, 2009). The awarded performance grade contributed to an average grade for PE, which is part of a yearly report. The average grades on this yearly report allow implicit and explicit ranking of students' performance, possibly triggering peer comparison (Ames, 1992; Barenberg & Dutke, 2013; Elliot & Moller, 2003). In this context, the grading is most likely perceived to be evaluative and judgmental of one's performance.

Motivational Differences and Fear

Previous research (e.g., Butler & Nisan, 1986; Butler, 1987; Johnson et al., 2011; Pulfrey et al., 2011) has documented the motivational costs associated with performance grading. The present study replicates and extends this body of work by examining naturally occurring motivational and fear-related differences in real-life grading and non-grading PE lessons. Also, while previous studies have looked into composite scores of autonomous and controlled motivation (e.g., Aelterman et al., 2012; Mouratidis et al., 2008; Pulfrey et al., 2011), herein, we have examined in greater detail whether different subtypes of both autonomous and controlled motivation vary as a function of being exposed to a grading and non-grading class. The necessity to look at subtypes, as advocated by some scholars in the field (Gagné et al., 2014; Taylor et al., 2014), was supported in the current study as not all forms of controlled regulation varied in parallel.

Table 2

Students' Perceived Intrinsic Motivation, Identified Regulation, Introjected Regulation, External Regulation, Amotivation, Level of Fear, Need Satisfaction and Need Frustration, in a Lesson in which Performance Grading was Applied Compared with a Lesson in which No Performance Grading Took Place

Parameter	Intrinsic motivation		Identified regulation		Introjected regulation		External regulation	
	Model 0 β (SE)	Model 1a β (SE)	Model 0 β (SE)	Model 1b β (SE)	Model 0 β (SE)	Model 1c β (SE)	Model 0 β (SE)	Model 1d β (SE)
Fixed part								
Intercept	- 0.01(0.07)	0.02(0.10)	0.01(0.06)	- 0.01(0.09)	0.01(0.08)	0.02(0.11)	0.01(0.09)	0.05(0.12)
Students' gender ^a		0.13(0.10)		0.09(0.10)		- 0.17(0.10)		- 0.25(0.09)**
Lesson theme ^b								
Individual		- 0.31(0.25)		- 0.37(0.21)		- 0.33(0.30)		- 0.33(0.32)
Artistic		0.22(0.13)		0.22(0.12)		0.09(0.15)		0.03(0.17)
Grading lesson ^c		- 0.31(0.05)***		- 0.17(0.05)***		0.10(0.05)		0.16(0.05)**
	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)
Random part								
Class-level variance	0.11(0.04)**	0.07(0.03)*	0.07(0.03)*	0.04(0.02)	0.15(0.05)**	0.12(0.04)**	0.19(0.06)**	0.15(0.05)**
Student-level variance	0.40(0.05)***	0.42(0.05)***	0.50(0.05)***	0.50(0.05)***	0.31(0.05)***	0.31(0.05)***	0.21(0.04)***	0.21(0.04)***
Measurement-level variance	0.50(0.04)***	0.45(0.03)***	0.44(0.03)***	0.42(0.03)***	0.54(0.04)***	0.53(0.04)***	0.60(0.04)***	0.59(0.04)***
IGLS Deviance reference model	2160.85	2160.85	2140.23	2140.23	2149.85	2149.85	2155.50	2155.50
IGLS Deviance test model		2113.81		2118.38		2141.51		2139.15
χ^2 (df)		47.04(4)***		21.86(4)***		8.34(4)		16.35(4)**



Table 2 (continued)

Parameter	Amotivation		Level of fear		Need satisfaction		Need frustration	
	Model 0	Model 1e	Model 0	Model 1f	Model 0	Model 1g	Model 0	Model 1h
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Fixed part								
Intercept	0.02(0.09)	- 0.03(0.13)	0.01(0.08)	- 0.09(0.12)	- 0.00(0.06)	- 0.03(0.09)	- 0.02(0.09)	- 0.08(0.12)
Students' gender ^a		- 0.15(0.10)		- 0.04(0.10)		0.05(0.09)		- 0.26(0.09)**
Lesson theme ^b								
Individual		- 0.03(0.36)		- 0.28(0.31)		- 0.24(0.23)		- 0.25(0.34)
Artistic		- 0.11(0.19)		0.12(0.16)		0.20(0.12)		0.12(0.17)
Grading lesson ^c		0.31(0.05)***		0.17(0.05)***		- 0.12(0.05)*		0.33(0.05)***
	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)	σ^2 (SE)
Random part								
Class-level variance	0.22(0.07)**	0.20(0.06)**	0.15(0.05)**	0.14(0.05)**	0.07(0.03)*	0.05(0.03)	0.23(0.07)***	0.17(0.06)**
Student-level variance	0.27(0.04)***	0.29(0.04)***	0.33(0.05)***	0.33(0.05)***	0.34(0.05)***	0.34(0.05)***	0.22(0.04)***	0.24(0.04)***
Measurement-level variance	0.51(0.04)***	0.46(0.03)***	0.51(0.04)***	0.50(0.04)***	0.60(0.04)***	0.59(0.04)***	0.56(0.04)***	0.51(0.04)***
IGLS Deviance reference model	2106.93	2106.93	2136.00	2136.00	2200.10	2200.10	2104.65	2104.65
IGLS Deviance test model		2063.03		2122.32		2190.29		2054.44
χ^2 (df)		43.90(4)***		13.69(4)**		9.81(4)*		50.21(4)***

Note. Values in parentheses are standard errors. Reference category = 0. Model presented with covariates, class, student and measurement level variance and deviance drop.

^a 0 = boy, 1 = girl.

^b 0 = interactive PE lesson, 1 = individual PE lesson, 2 = artistic PE lesson.

^c 0 = lesson in which no performance grading was applied, 1 = lesson in which performance grading was applied.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3

Students' Perceived Intrinsic Motivation, Identified Regulation, Introjected Regulation, External Regulation, Amotivation and Level of Fear in a Lesson in which Performance Grading was Applied Compared with a Lesson in which No Performance Grading Took Place, Mediated by Students' Perceived Need Satisfaction and Need Frustration

	Model 2				Model 3			
	Total effect		Direct effect		Need satisfaction		Direct effect	
	(τ) 95% CI _{bc}	(τ) 95% CI _{bc}	(τ) 95% CI _{bc}	(τ) 95% CI _{bc}	α -coefficient 95% CI _{bc}	β -coefficient 95% CI _{bc}	α -coefficient 95% CI _{bc}	β -coefficient 95% CI _{bc}
					Specific indirect ($\alpha\beta$) 95% CI _{bc}	Specific indirect ($\alpha\beta$) 95% CI _{bc}		
Quality of motivation								
Intrinsic motivation	- 0.31*** (- 0.40, - 0.22)	- 0.26*** (- 0.35, - 0.17)	- 0.12* (- 0.23, - 0.01)	0.47*** (0.41, 0.52)	0.45*** (0.39, 0.50)	- 0.20*** (- 0.26, - 0.13)	0.33*** (0.28, 0.38)	- 0.15*** (- 0.22, - 0.08)
Identified regulation	- 0.17*** (- 0.26, - 0.08)	- 0.11* (- 0.20, - 0.02)	- 0.12* (- 0.23, - 0.01)	0.51*** (0.46, 0.57)	0.51*** (0.46, 0.57)	0.02 (- 0.05, 0.09)	0.33*** (0.28, 0.38)	0.05 (- 0.02, 0.12)
Introjected regulation	0.10 (- 0.00, 0.20)	0.11* (0.01, 0.21)	- 0.12* (- 0.23, - 0.01)	0.14*** (0.08, 0.21)	0.15*** (0.08, 0.21)	0.14*** (0.08, 0.21)	0.33*** (0.28, 0.38)	0.15*** (0.08, 0.21)
External regulation	0.16** (0.05, 0.26)	0.17** (0.07, 0.28)	- 0.12* (- 0.23, - 0.01)	0.09** (0.03, 0.16)	0.10** (0.03, 0.17)	0.62*** (0.56, 0.68)	0.33*** (0.28, 0.38)	0.62*** (0.57, 0.68)
Amotivation	0.31*** (0.22, 0.41)	0.32*** (0.22, 0.41)	- 0.12* (- 0.23, - 0.01)	- 0.03 (- 0.09, 0.03)	- 0.01 (- 0.07, 0.05)	0.51*** (0.46, 0.57)	0.33*** (0.28, 0.38)	0.49*** (0.39, 0.55)
Fear	0.17*** (0.07, 0.27)	0.18*** (0.08, 0.27)	- 0.12* (- 0.23, - 0.01)	0.10** (0.03, 0.16)	0.11** (0.04, 0.17)	0.68*** (0.63, 0.73)	0.33*** (0.28, 0.38)	0.69*** (0.64, 0.74)

Note. A positive relation was found between need satisfaction and need frustration (see supplementary online data), and an unexpected positive relationship was found between need satisfaction and external regulation and fear (see Table 3). However, when controlling for need frustration, the positive relationship between need satisfaction and external regulation ($\chi^2 = 0.44$, $df = 1$, $p = 0.51$) and fear ($\chi^2 = 2.50$, $df = 1$, $p = 0.11$) was no longer present, indicating that in the relationship between performance grading and negative motivational functioning, need frustration is the strongest clarifying variable.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.



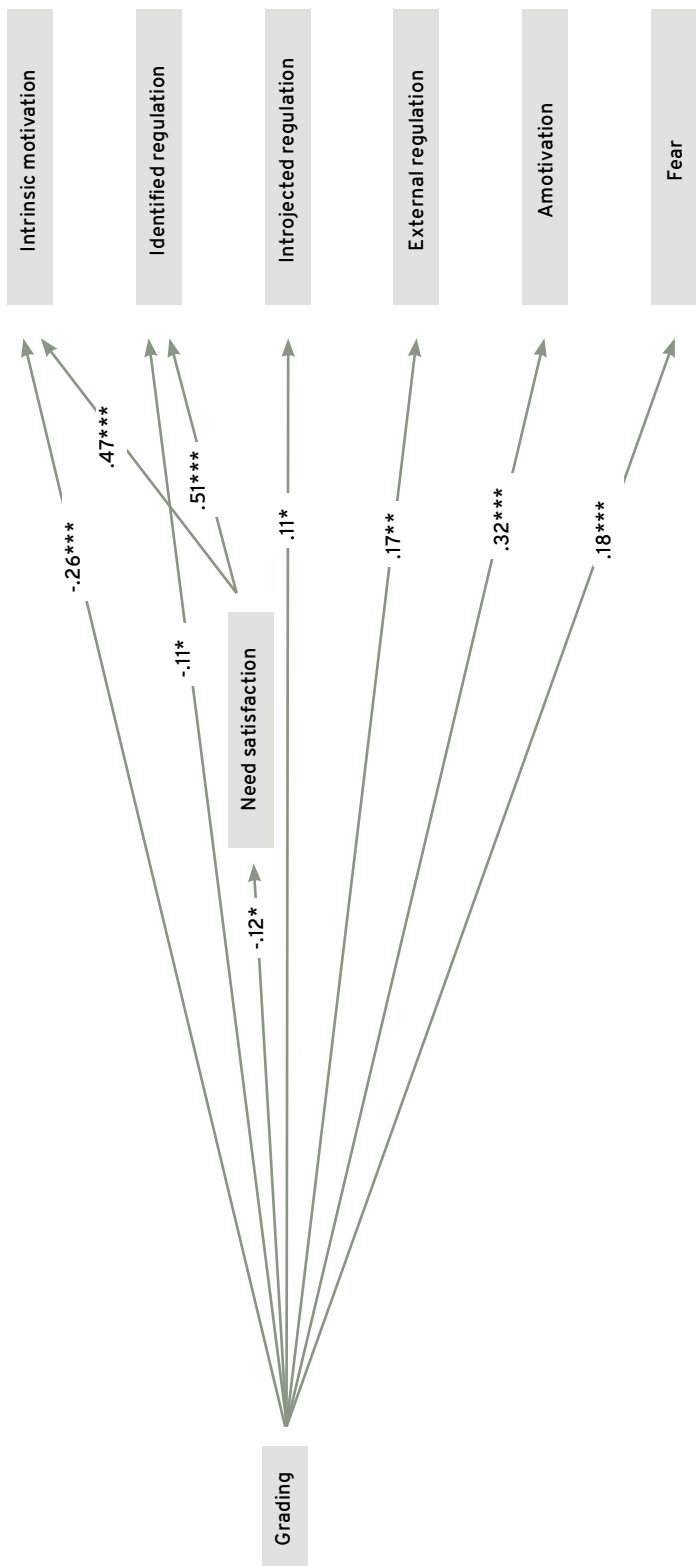


Figure 1

Graphical representation of the direct relationships (τ'), α and β coefficients as estimated in the full model with need satisfaction acting as a mediator. Note. β coefficients are only presented when need satisfaction was considered as a mediator (Cerin & MacKinnon, 2008). For introjected regulation, the direct relationship (τ') was found significant while the total effect (τ) was not found significant, indicating a suppressor effect. For all other variables, direct (τ') as well as total relationships (τ) were significant (see Table 3).

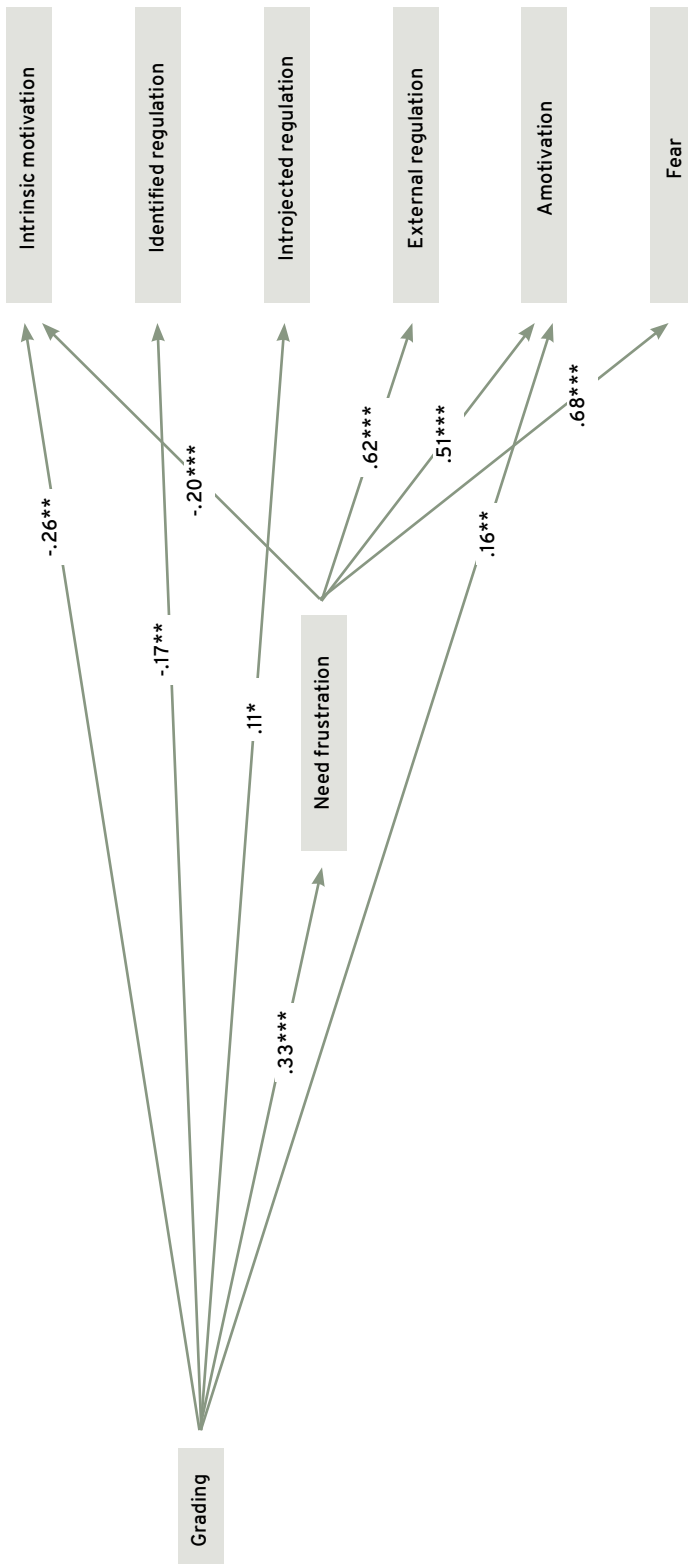


Figure 2

Graphical representation of the direct relationships (τ'), α and β coefficients as estimated in the full model with need frustration acting as a mediator. Note: β coefficients are only presented when need frustration was considered as a mediator (Cerin & Mackinnon, 2008). For introjected regulation, the direct relationship (τ') was found significant while the total effect (τ) was not found significant, indicating a suppressor effect. For intrinsic motivation, identified regulation and amotivation, direct (τ') as well as total relationships (τ) were found significant (see Table 3).



Specifically, during PE lessons in which performance grading occurs, students find the lesson to be less interesting and enjoyable (i.e., intrinsic motivation) and perceived the lesson to be less meaningful (i.e., identified regulation). These findings are in line with previous studies, which showed that performance-based grading undermines love of learning, interest and curiosity (i.e., less intrinsic motivation; Butler & Nisan, 1986; Butler, 1987; Grolnick & Ryan, 1987; Johnson et al., 2011; Pulfrey et al., 2011, 2013) and undermines the relevance of participating in the PE lesson (Johnson et al., 2011; Pulfrey et al., 2011). The costs associated with performance grading also manifested through the presence of more maladaptive forms of motivation. That is, during performance grading classes, students reported more external regulation, more lack of motivation and experienced more fear. These findings are consistent with those from two other studies, in which it was found that students in a graded condition (i.e., students who were judged on their performance by means of a grade) experienced more pressure (i.e., external regulation; Grolnick & Ryan, 1987), and girls who participated in norm-referenced PE assessments experienced more external regulation and amotivation (Johnson et al., 2011). In addition, in previous work, students reported also more negative emotional reactions such as fear when exposed to performance grading (McDonald, 2001; Putwain & Best, 2011).

Yet, in the present study, no differences in introjected regulation emerged as a function of grading. Thus, whereas the pressure imposed by someone else (i.e., external regulation) augmented as a function of performance grading, the pressure imposed by one's self (i.e., introjected regulation) did not increase. This is an interesting and somewhat unexpected finding by itself because one may expect that under grading circumstances, students become increasingly concerned with their self-worth and consider the graded activity as a means to impress others. Future studies may examine whether such internal pressures get activated under particular circumstances.

Explanatory Mechanisms: Need-Based Experiences

The second important aim of the present study was to examine whether need-based experiences would account for any observed motivational differences between grading and non-grading lessons. Following recent developments, we considered both the role of the satisfaction and frustration of students' psychological needs for autonomy, competence, and relatedness (Vansteenkiste & Ryan, 2013). The inclusion of both constructs was critical as need satisfaction predominantly accounted for the link between performance grading and the more self-determined forms of motivation, while need frustration largely explained the less self-determined motivational outcomes and fear. That is, when students were exposed to performance grading, they experienced a lack of choice or freedom (i.e., low autonomy satisfaction), a sense of disconnection to others (i.e., low relatedness satisfaction) and a sense of not being able to reach the criteria (i.e., low competence satisfaction), which then led students to find the lesson less enjoyable (i.e., intrinsic motivation) and valuable (i.e., identified motivation).

Furthermore, as a function of performance grading, students not only reported less need satisfaction, they also felt more pressured to perform well (i.e., high autonomy frustration), were more likely to feel rejected by others (i.e., high relatedness frustration) and more strongly felt like a failure (i.e., high competence frustration). In a similar vein as low need satisfaction partially explained why students found the grading lesson less enjoyable, also experienced need frustration partially explained why students experienced less joy as a function of performance grading. While previous studies already showed that lower levels

of experienced autonomy satisfaction explained the relation between performance grading and intrinsic motivation (Pulfrey et al., 2013), the current study adds to this literature by showing that this relationship is also partially explained by feelings of need frustration.

Moreover, students who reported higher levels of need frustration because of being exposed to performance grading, were more likely to put effort into the lesson out of external pressure (i.e., external regulation), were more likely to lack motivation (i.e., amotivation), or to experience fear. Experiences of need frustration, rather than need satisfaction thus explained differences in external regulation, amotivation and fear (also see Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Haerens et al., 2015).

Interestingly, students' perceived need satisfaction was positively correlated with students' perceived need frustration (see supplementary online data). However, this positive link was only shown during lessons in which performance grading took place. It might have been the case, that students experienced alternating episodes of need satisfaction and need frustration during performance grading. For instance, in the beginning of the lesson, a student might be uncertain about the quality of his performance (i.e., low need satisfaction) and might feel pressured to perform well (i.e., high need frustration). Yet, after performing well during the grading activity, the student might feel capable of his functioning (i.e., high need satisfaction) and the pressure might fade (i.e., low need frustration). Because such episodes of need satisfaction and need frustration were aggregated throughout the entire lesson, these dynamics might possibly explain why we found a positive relation between need satisfaction and need frustration.



Strengths, Limitations and Directions for Future Research

One strength of this study was the use of multi-level regression analyses and more specifically its evaluation of variances at the class, student and occasion level. These analyses revealed that for all motivational outcomes and fear, variances were significantly different from zero at all levels. This suggests that there might be class level factors (e.g., the way the lesson is taught, the way students were graded, the objectives of the lesson) as well as student level factors (e.g., overall motivation for physical education) that can explain motivational differences. Further, these analyses suggested that students experienced a substantial amount of variation in their motivational functioning from lesson to lesson. This implies that there might be within-student level factors (e.g., the provided extent of individualised feedback in both lessons) that explain differences in motivational functioning from lesson to lesson. Since these differences are substantial, this topic could be interesting to explore in future research.

The fact that this study was purposefully situated in the PE context might be regarded as another strength. It was implied that, due to high visibility of performances, this particular context might make students' experiences even more salient (Trout & Graber, 2009). However, that does not imply that the presence of grading in a more academic environment (e.g., maths or literature) might not come at a motivational and affective price. General aspects (e.g., criterion referenced grading and judgment of product performance) of the multiple grading system presented in this study, are existing in other, more academic contexts as well. Given these common grounds, the results found in this study may potentially be generalised to more academic settings (Barenberg & Dutke, 2013; Butler & Nisan, 1986; Butler, 1987; Pulfrey et al., 2011, 2013), an issue that deserves further research.

The present study also has several limitations. First, because students' skill level may have developed over time, this could have interfered with students' feelings of competence (or self-concept about their abilities) which would then possibly reduce the negative impact of performance grading. Several strategies could have been used to control for this issue. For instance, we could have (a) counterbalanced the design with non-grading lessons following grading lessons in half of the classes, (b) measured students' skill level in both lessons as to include it as a covariate, and (c) included a control group that was not performance graded. Yet, this was not attainable in the current study given that it was conducted in a real-life, ecologically valid setting. Also, given that the time frame between both measurements was in most classes one to three weeks, we consider the learning effects to be only of minimal influence.

Second, in the present research we chose a within-student design in which students were measured after a non-grading lesson and after a grading lesson. To get a more refined understanding of students' motivational and affective functioning in relation to performance grading, it would have been even stronger if we had also measured students just before the performance grading lessons, thereby tapping into their anticipated motivation, fear and need-based experiences for the upcoming lesson.

Third, although video observations gave insight in the performance-based assessment practices, these observations did not allow us to provide insight whether the assessment criteria were aligned with the content standards (e.g., practising basketball techniques and being assessed on those techniques versus being assessed on playing a match; Biggs, 1996; Borghouts et al., 2017).

Fourth, no basis was provided to suggest that the presence of performance grading is highly important when explaining students' motivational functioning in PE. It was interesting to note that, although results indicated statistically significant differences in students' motivation, fear and need-based experiences, the differences between both lessons were rather small (i.e., small effect sizes) and the variable grading lesson only explained small amounts of variance. Other factors such as whether the teacher provides insight in assessment criteria or gives feedback (Sadler, 1989), or differences in teachers' motivating style between both lessons (De Meyer et al., 2014; Reeve et al., 2004) that go well beyond the mere presence of a performance grade, might potentially be of greater influence (Ryan & Brown, 2005; Ryan & Weinstein, 2009). It warrants further investigation as to whether it is the presence of performance grading in itself, the lesson content, or that the way the lessons are taught with teachers possibly taking up a more controlling stance when grading, that explain students' motivation.

Fifth, it remains unclear if these negative outcomes represent incidental or lasting experiences and if these negative outcomes affect students' learning in PE. Therefore, it is recommended that future research develops a longitudinal design in which students' motivational functioning, fear and need-based experiences are followed over a greater period of time and in different domains of sports. As such, more detailed insights into students' motivational functioning, fear and need-based experiences may be yielded, when being graded in different sports. Also learning progress could be included as an outcome.

Implications for Education

Results from the present study were gathered in an educational environment in which students were awarded grades that served as a judgment of their performance. Findings

suggest that it is important for teachers to reflect on the meaning or functional significance grading has for students in their educational practice. However, a critical reflection on the curriculum is not only the teachers' responsibility. The extent to which teachers grade their students is also partly due to reasons of selection (Newton, 2007). Thus, in pursuit of positive motivational and affective experiences, we argue that this responsibility should be shared with school boards and policy-makers (Yu et al., 2018).

Whilst students are subjected to performance grades, it seems important for teachers to induce feelings of choice or freedom, feelings of connection to others and opportunities to reach criteria (i.e., need satisfaction) and to reduce feelings of pressure to perform well, feelings of rejection by others and feelings of failure (i.e., need frustration), in order to stimulate positive motivational and affective experiences. This does not imply that, from a motivational perspective, it is per definition unfavourable to apply grading in education. There might be conditions under which grading does not consist a need undermining or frustrating event and may even be conducive to students' needs as well as most volitional forms of motivation (Maes et al., in preparation).



From an SDT point of view and attempting to stimulate students' needs and most volitional forms of motivation in education, assessment with the aim of grading can be applied with an informational function (Ryan & Weinstein, 2009). An informational assessment is referred to when teachers deploy assessment as a non-controlling means to improve learning. When grading students, it is important to follow up with means to improve learning by using strategies that go beyond providing grades, such as providing transparent criteria, discussing assessments among each other, actively involving students within the learning process and providing insight in subsequent learning objectives (Pat-El & Van der Poel, 2011). Thus, the issue raised in the present research is not merely related to the presence of grading in itself, but to what extent assessment is used solely with the function of judging performance rather than with a focus on learning. Unravelling the relation between different functions and meanings of assessment and its motivational outcomes is something that merits further investigation.

Conclusion

This study provides further insight in students' motivational and affective functioning as a function of performance grading. Existing literature has already shown that performance grading potentially undermines more volitional forms of motivation (e.g., Butler & Nisan, 1986; Johnson et al., 2011; Pulfrey et al., 2011) and that this relationship can potentially be explained by lowered experiences of autonomy satisfaction (Pulfrey et al., 2013). The present study adds to this literature by highlighting that the relation between performance grading and intrinsic motivation, as well as negative motivational functioning, can be explained by increased feelings of need frustration. From a practical point of view, since performance grading is part of PE assessment, it seems important for teachers to carefully reflect on their curricula and their current way of assessing, particularly within a highly visible educational environment, where positive motivational and affective experiences are pursued.

Supplementary Data

Supplemental data for this article can be accessed via
<http://dx.doi.org/10.1016/j.lindif.2017.03.017>



How Does Knowledge About the Criteria for an Upcoming Test Relate to Adolescents' Situational Motivation in Physical Education? A Self-Determination Theory Approach

This chapter is based on:

Haerens, L.*, Krijgsman, C.*, Mouratidis, A., Borghouts, L., Cardon, G., & Aelterman, N. (2019). How does knowledge about the criteria for an upcoming test relate to adolescents' situational motivation in physical education? A Self-Determination Theory approach. *European Physical Education Review*, 25(4), 983–1001. <https://doi.org/10.1177/1356336X18783983>

Acknowledgement of author contributions:

*Leen Haerens and Christa Krijgsman contributed equally to this manuscript.
CK and LH designed the study; JM collected the data¹; CK and LH planned the data analyses; AM analysed the data; LH and CK drafted the manuscript; all authors contributed to critical revision of the manuscript; LH supervised the study.

Note:

In this Chapter, in contrast to Chapters 4 and 5, the construct goal clarification is operationalised as “knowledge about the criteria for an upcoming test”. This is because knowledge about the criteria for an upcoming test was measured with only one item that read “During the last PE class I got to know the criteria by which my test will be evaluated”.

1 The authors want to thank Jolien Maes for her help with data gathering.

Abstract

Students' knowledge about the criteria for an upcoming test is a crucial component of assessment quality (e.g., Hay & Macdonald, 2008). Grounded in Self-Determination Theory (Deci & Ryan, 2000), we investigated whether knowledge about the criteria for an upcoming test related to students' situational motivation and experienced fear during physical education (PE). We also examined whether these relations were (a) mediated by need-based experiences, and (b) moderated by teachers' motivating style. Participants were 659 students (55.54% boys, 44.46% girls, M_{age} 14.72 years, $SD = 0.94$) out of 40 classes from 32 schools taught by 39 different PE teachers. Analyses through multi-level structural equation modelling showed that students with more knowledge about the criteria for an upcoming test valued and enjoyed the lesson more (i.e., autonomous motivation), and felt less aloof (i.e., amotivation). Relations between knowledge about the criteria and students' situational motivation were mediated by experienced need satisfaction. Specifically, students who had more knowledge about the criteria for an upcoming test felt more in charge of their learning process (i.e., autonomy satisfaction), felt more effective in reaching their goals (i.e., competence satisfaction) and felt more connected to the teacher (i.e., relatedness satisfaction). Although relations between knowledge about the criteria and students' motivation were not moderated by teachers' motivating style, teachers' motivating style displayed independent relations with students' motivation. Implications for assessment quality and students' motivation in PE are discussed.

Introduction

Assessment is a challenging part of physical education (PE) teachers' pedagogy (Hay & Penney, 2013; López-Pastor et al., 2013). Being assessed in PE may come with a motivational cost and may raise feelings of pressure and fear among students (e.g., Krijgsman et al., 2017). Increasing students' knowledge about the assessment criteria has been identified as a crucial component of assessment quality (Borghouts et al., 2017; Hay & Macdonald, 2008). Yet, no research to date empirically examined whether knowledge about the assessment criteria may foster students' motivation and reduce fear. In the current study, we rely on Self-Determination Theory (SDT; Ryan & Deci, 2017) to address this gap in the current literature.

SDT distinguishes qualitatively different forms of motivation. A distinction is made between autonomous or more volitional forms of motivation, controlled or more pressured forms of motivation, and amotivation or a lack of motivation. According to SDT, students are more likely to be autonomously motivated, and less likely to display controlled motivation or amotivation, when their basic psychological needs for autonomy (i.e., experiencing freedom and self-endorsement), competence (i.e., feeling effective), and relatedness (i.e., experiencing mutual trust and care) are met (Deci & Ryan, 2000; Ryan & Deci, 2017). The purposes of this study are to investigate if knowledge about the criteria for an upcoming test relates to students' motivation (i.e., autonomous, controlled, amotivation) and experienced fear (Research Question 1), and whether experienced need satisfaction mediates this relation (Research Question 2). Moreover, because teachers' motivating style is likely to exert a major influence on students' need-based experiences and their motivation (e.g., Haerens et al., 2015), we also examine whether teachers' motivating style reinforces or attenuates the relation between knowledge about the assessment for an upcoming test and students' motivation or experienced fear (Research Question 3). We address these questions from a situational perspective (i.e., in relation to a specific PE lesson), as recent work revealed that the teaching strategies teachers rely on (Mainhard et al., 2011) as well as students' need-based functioning (Van der Kaap-Deeder et al., 2017) can substantially vary from lesson to lesson (Tsai et al., 2008).



Assessment Criteria in PE

Strong calls for increased assessment transparency apply to all educational contexts (Stiggins et al., 2007), including PE (Hay & Penney, 2013). These claims stem from both a summative (Stiggins et al., 2007) and a formative perspective (Hattie & Timperley, 2007). From a summative or product-oriented perspective, clear and unambiguous assessment criteria guarantee validity and consistency of teachers' assessments, and ensure that teachers can accurately assess and justify students' achievements (Desrosiers et al., 1997). From a formative or process-oriented perspective, students need to know and understand the assessment criteria so that they can accumulate and interpret evidence to recognise their learning progress, select future goals, and be able to determine the best strategies to attain these goals (Hattie & Timperley, 2007; Hay & Penney, 2013). Knowledge about the assessment criteria thus constitutes a necessary precondition that helps students better monitor and regulate their own learning (Hattie & Timperley, 2007). Yet, PE teachers often assess students' performances based on their own tacit professional expertise (Annerstedt & Larsson, 2010; Hay & Macdonald, 2008; Svennberg et al., 2014), and in these cases what teachers base their judgment on may be a mystery for students (Borghouts et al., 2017; Redelius & Hay, 2012).

Students' Motivation and Need-Based Experiences According to SDT

Knowing the criteria for an upcoming test may impact students' motivation. According to SDT (Deci & Ryan, 2000), students display autonomous motivation when they find their PE class to be enjoyable and interesting (i.e., intrinsic motivation) or value its benefits (i.e., identified regulation). Students are controlled motivated when they put effort into the lesson to please their teacher, to obtain good grades, or to avoid criticism (i.e., external regulation), or when they pressure themselves to do well (i.e., introjected regulation) – for instance by buttressing their activity engagement out of feelings of guilt and contingent self-worth. While students are – quantitatively speaking – motivated when they display either autonomous or controlled motivation, amotivation reflects a lack of motivation. Specifically, amotivated students typically invest a minimum of effort in PE classes because they lack competence to perform the activities, or because they ascribe no value to the activities (Deci & Ryan, 2000). Many studies indicated that autonomous motivation, relative to controlled motivation and amotivation, is associated with a host of desirable outcomes (Van den Berghe et al., 2014) such as students' physical activity levels in (Aelterman et al., 2012) and outside PE (Hagger et al., 2009). On the other hand, controlled motivation and amotivation relate to undesirable outcomes, including boredom (Ntoumanis, 2001), disengagement (Aelterman et al., 2012), and fear of test situations (Schaffner & Schiefele, 2007).

SDT further suggests that autonomous motivation is enhanced when students: (a) feel more in charge of their own learning and experience a sense of freedom and self-endorsement (i.e., autonomy satisfaction); (b) feel more effective (i.e., competence satisfaction); and (c) experience more mutual trust and care with their teachers and classmates (i.e., relatedness satisfaction; Ryan & Deci, 2017). In contrast, controlled motivation, amotivation, and negative emotions such as fear rise when students: (a) experience low need satisfaction or feel pressured to perform well (i.e., autonomy frustration); (b) feel incapable (i.e., competence frustration); or (c) feel disrespected or rejected by the teacher (i.e., relatedness frustration; Haerens et al., 2015).

Knowledge About the Assessment Criteria in Relation to Need-Based Experiences and Motivation

SDT poses that when students better comprehend what is expected from them (which would be the case when they are more knowledgeable about the assessment criteria for an upcoming test), their basic psychological needs will be satisfied, which in turn will foster autonomous motivation, and dampen controlled motivation or amotivation. In contrast, when students do not know what is expected from them, need satisfaction will be lower or need frustration may rise (e.g., students feel insecure or incapable), which in turn will diminish autonomous motivation and foster controlled motivation or amotivation (Haerens et al., 2015).

So far, there is a lack of evidence to support the above-mentioned premises in relation to students' knowledge about the assessment criteria. Indirect evidence is provided by empirical studies in the general education context. It has been shown that clarity on classroom rules can promote autonomous motivation (e.g., Kunter et al., 2007; Vansteenkiste et al., 2012), though it may also foster pressured forms of motivation (i.e., controlled motivation; Vansteenkiste et al., 2012). Given the call for more explicit assessment criteria in PE

(Borghouts et al., 2017; Redelius & Hay, 2012) it would be of interest to know in what way knowledge about the assessment criteria relates to autonomous and controlled motivation, as well as amotivation and fear. Moreover, investigating students' need-based experiences may help to increase our understanding of the underlying motivational processes.

The Moderating Role of Teachers' Autonomy Support or Control

Students' need-based and motivational experiences will not only depend on their knowledge about the assessment criteria for an upcoming test. Teachers' general motivating style most certainly will also have a major role to play. SDT suggests that an autonomy-supportive motivating style nurtures students' basic needs and therefore fosters autonomous motivation (Deci & Ryan, 2000). On the other hand, a controlling motivating style may not only undermine these needs, but may also engender need frustration, and in turn elicit controlled motivation or amotivation (e.g., Haerens et al., 2015).

Autonomy-supportive teachers adopt a curious, open and flexible attitude, and are better attuned to their students' feelings and wishes (e.g., Patall, 2013). Autonomy support involves using invitational language (e.g., Vansteenkiste et al., 2004), offering opportunities for input and choice (e.g., Patall et al., 2010), providing a meaningful rationale for expectations and requests (e.g., Assor et al., 2002), following students' pace of progress (Reeve & Jang, 2006) and accepting students' negative affect (Reeve, 2009). A controlling style instead involves a tunnel-view approach by which teachers give priority to their own time-management, agenda and expectations (Aelterman et al., 2019). Controlling instructions involve the use of punishing, commanding, yelling and shouting (Assor et al., 2005; Reeve & Jang, 2006), appealing to feelings of guilt and shame or triggering contingent self-worth (Soenens et al., 2012).

Early SDT-based work (Koestner et al., 1984) showed that when limits and rules were communicated in an informational way (i.e., autonomy-supportive), children's intrinsic motivation for a task remained high, while the opposite was true for a controlling approach. Along similar lines, recent studies in general education (Aelterman et al., 2019; Jang et al., 2010; Vansteenkiste et al., 2012) revealed that the positive consequences of clarifying goals, expectations and rules are more pronounced when combined with an overall autonomy-supportive style. When students perceived expectations to be more clear, yet autonomy support to be low, higher levels of controlled motivation were found (Vansteenkiste et al., 2012).

Present Study

Based on the literature review, we hypothesised in relation to our first research question that knowledge about the criteria for an upcoming test would positively relate to autonomous motivation (Hypothesis 1a), and we considered the possibility to simultaneously find positive relations with controlled motivation. We expected insignificant or negative relations of knowledge about the criteria for an upcoming test with amotivation and fear (Hypothesis 1b). Addressing the second research question, we hypothesised that relations between knowledge about the assessment criteria and student motivation and fear would be mediated by experienced need satisfaction (Hypothesis 2). We also explored the mediating role of need frustration. Finally, in relation to our third research question, we



examined the hypothesis that the positive relation between knowledge about the assessment criteria and need satisfaction or autonomous motivation, and the negative relations with need frustration, amotivation, or fear would be more pronounced when teachers were perceived as highly autonomy-supportive overall (Hypothesis 3a). An opposite pattern of results was expected when teachers would be perceived as highly controlling. Specifically, we expected the positive relationships with need satisfaction and autonomous motivation, and the negative relationships with need frustration, amotivation and fear to attenuate, and even considered the possibility to find a positive relation with controlled motivation (Hypothesis 3b). In addressing these hypotheses, we decomposed the variance at the between-student (i.e., individual) and the between-class (i.e., contextual) level, because the extent to which students know the assessment criteria is likely to depend on both individual (e.g., their familiarity with the topic at hand) and contextual factors (e.g., how well the criteria were explained by the teacher).

Method

Participants

A convenience sample of 40 classes and 39 PE teachers (one teacher taught two classes), out of 32 schools in Flanders, Belgium, participated in this cross-sectional study. In total 659 (366 boys; 55.54%, 293 girls; 44.46% girls) students with a mean age of 14.72 years ($SD = 0.94$) completed all measures directly after they had participated in their regular PE lesson. On average, 16.48 (range 6 – 50) students participated per class. All classes consisted of ninth or tenth grade secondary education classes, except for two classes who were seventh and eighth grade students. All educational types were represented: 43.85% academic education, 33.38% technical education, and 22.61% vocational education.

Ethical Considerations

All participating teachers and school principals gave informed consent to participate in the current study. Both students and their parents received an information letter. With the exception of 11 parents, all parents gave informed consent for their child to participate. It was communicated that there were no right or wrong answers and that students' responses would be treated confidentially. The ethical committee of Ghent University approved the study protocol.

Procedure

For the purposes of the present study no manipulations were made to the PE lesson. Participating PE teachers were asked to teach their lessons as planned. No restrictions were made in terms of lesson content. In Flanders, Belgium, PE is a compulsory subject in secondary schools for at least two 50-min lessons each week. These two 50-min lessons are sometimes combined into one single 100-min lesson. For the present study, students filled out a set of questionnaires during the last 15 min of a 50- or 100-min lesson. The measurements took place at the end of the first or second lesson of a series of lessons on one specific topic (e.g., a set of four basketball lessons).

Measures

Table 1 provides an overview of all questionnaires including exemplary items, reliability coefficients and number of items per scale. Students responded to all items on a five-point Likert scale ranging from “*Not at all true for me*” to “*Very true for me*”.

Knowledge about the Criteria for an Upcoming Test

Students reported on their knowledge about the criteria for an upcoming test by means of one item derived from the Students' Assessment for Learning Questionnaire (SAFLQ; Pat-El et al., 2013). The item read, “During the last PE class I got to know the criteria by which my test will be evaluated”.

Situational Motivation

The Behavioural Regulations in Physical Education Questionnaire (BRPEQ; Aelterman et al., 2012) was used to assess students' situational autonomous motivation, controlled motivation, and amotivation. Confirmatory factor analysis (CFA) using maximum likelihood estimation performed with Mplus version 7.4 (Muthén & Muthén, 2015) indicated reasonable fit (Hu & Bentler, 1999; Kline, 2011), $\chi^2(148) = 672.70$, $p < 0.001$, RMSEA = 0.08 (90% CI [0.074 - 0.085]), CFI = 0.89 and SRMR = 0.08, all indicator loadings being above 0.55, all $p < 0.001$.

Fear

Experienced fear during the past PE lesson was measured by means of six items derived from the fear subscale of the Learning And Study Strategies Inventory (LASSI; Weinstein, 1987). Items were adapted to the context of a regular PE lesson (see Table 1). Except for the RMSEA, CFA indicated reasonable fit, $\chi^2(9) = 80.90$, $p < 0.001$, RMSEA = 0.11 (90% CI [0.089 - 0.133]), CFI = 0.96, SRMR = 0.04. All indicator loadings were above 0.62, all $p < 0.001$.

Need Satisfaction and Frustration

Students' perceived need satisfaction and frustration were measured with the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015). For the purpose of the present research, small modifications were made to the original BPNSFS to adjust the questionnaire to the PE context (Haerens et al., 2015; Krijgsman et al., 2017). CFA indicated reasonable fit, $\chi^2(245) = 911.96$, $p < 0.001$, RMSEA = 0.07 (90% CI [0.060 - 0.069]), CFI = 0.89, SRMR = 0.07. All indicator loadings were above 0.45, all $p < 0.001$.

Autonomy-Supportive and Controlling Teaching Behaviour

Students' perceptions of teachers' engagement in autonomy-supportive and controlling teaching behaviour were measured by means of items from the Teacher As Social Context Questionnaire (TASCQ; Belmont et al., 1988) and the Psychologically Controlling Teaching scale (PCT; Soenens et al., 2012). A two-factor model fit the data reasonably well, $\chi^2(64) = 346.11$, $p < 0.001$, RMSEA = 0.08 (90% CI [0.076 - 0.093]), CFI = 0.91 and SRMR = 0.07, with all indicator loadings being above 0.63, all $p < 0.001$. More detailed information (i.e., all scales and subscales, factor loadings of individual items) on the present study's factorial validity is presented as supplementary online data.



Table 1
Overview of the Scales, Number of Items per Scale, Cronbach's Alphas and Example Items

Scale	n items	α	Example item
			<i>Using the stem</i>
BRPEQ			<i>I put effort in the last PE class because...</i>
Autonomous motivation	8	0.90	... I enjoyed this PE class
Controlled motivation	8	0.83	... because I felt the pressure of others to participate in this PE class
Amotivation	4	0.81	I thought this PE class was actually a waste of time
BPNSFS			<i>During the last PE class...</i>
Need satisfaction	12	0.85	
Autonomy satisfaction			... I felt a sense of choice and freedom in the tasks I was participating in
Relatedness satisfaction			... I felt close and connected with other people who are important to me
Competence satisfaction			... I felt that I can successfully complete difficult tasks
Need frustration	12	0.90	
Autonomy frustration			... I felt pressured to do certain tasks
Relatedness frustration			... I felt that people who are important to me were cold and distant towards me
Competence frustration			... I felt disappointed with many of my performances
Based upon LASSI			<i>During the last PE class...</i>
Fear	6	0.86	... I thought about how bad I performed in comparison to other students
Based upon TASCQ			<i>During the last PE class...</i>
Autonomy support	6	0.85	... my teacher gave me the opportunity to choose how to do certain exercises
PCT			<i>During the last PE class...</i>
Psychologically Controlling Teaching	7	0.87	... my teacher made me feel guilty when I disappointed him/her

Note. BRPEQ = Behavioural Regulations in Physical Education Questionnaire; BPNSFS = Basic Psychological Need Satisfaction and Frustration Scale; LASSI = Learning And Study Strategies Inventory; TASCQ = Teacher As Social Context Questionnaire; PCT = Psychologically Controlling Teaching scale.

Plan of Analyses

Preliminary analyses consisted of descriptive analyses and the calculation of Pearson correlations between all study variables. Moreover, the percentage of students who indicated that they knew the assessment criteria was calculated. We relied on multilevel structural equation modelling in MPlus to investigate all research questions. Specifically, a two-level path model was set up to properly address the nested structure of the data (i.e., students within classes). Before answering our main research questions, we first ran a null model or intercept-only model to estimate how much of the variance was explained at the between-student (i.e., Level 1) and the between-class (i.e., Level 2) level. Next, to answer research question 1, knowledge about the assessment criteria was entered as a predictor at Level 1 and Level 2² (Enders & Tofighi, 2007; Lüdtke et al., 2009) in a model including all the four dependent variables (i.e., autonomous motivation, controlled motivation, amotivation and fear; see Figure 1). In a third step, need satisfaction and need frustration were tested as mediators in this model (see Figure 2). Finally, to test our third research question we investigated the interactions between knowledge about the assessment criteria and teachers motivating style in the prediction of the mediators (i.e., need-based experiences) and the dependent variables (i.e., autonomous and controlled motivation, amotivation and fear). To do so, we built on the previous model by including teachers' autonomy support and control at the student-level, as well as at the contextual level (see Figures 3 and 4). Yet, we opted for four separate models for each of the dependent variables because preliminary analyses showed that the model would not converge with all dependent variables being simultaneously included in one single model. In all the tested models, slopes of the student level relations were fixed. All predictors at the student-level were group-mean centred (i.e., centred the scores around the class mean), whereas predictors at the class-level were grand mean centred (i.e., centred around the sample mean; Enders & Tofighi, 2007).



Results

Descriptive statistics and bivariate correlations between study variables are presented in Table 2.

Preliminary Analyses. To What Extent Do Students Know the Criteria for the Upcoming Test?

Most students indicated that it was “true” (27.0%) or “very true” for them (30.3%) (respectively, score 4 and 5) that during the past PE lesson they got to know the criteria for the test in the forthcoming lesson, 16.5% reported that they knew nothing (8.3%) or only a little about the criteria (8.2%) (score 1-2), and 25.0% were in between (score 3).

Research Question 1. Relationships Between Knowledge about the Assessment Criteria and Situational Motivation for PE, and Fear

Inspection of the unconditional model showed that the variance at the class level ranged between 9% (for need satisfaction) and 18% (for knowledge of the assessment criteria) – see ICCs in Table 2. As can be noticed in Figure 1, and in support of Hypothesis 1a, knowledge about the criteria for the upcoming test was positively related to autonomous motivation both at the student and at the class level, explaining respectively 9.6% and 36.3%

² To check psychometric quality of aggregated constructs, interclass correlations 2 (ICC2) were calculated. With values of 0.78 for knowledge about criteria, 0.74 for autonomy support and 0.72 for controlling teaching, the ICC2s indicated acceptable to good levels of reliability (LeBreton & Senter, 2008; Lüdtke et al., 2009).

of the variance. Knowledge about the assessment criteria was not related to controlled motivation. In support of Hypothesis 1b, negative relationships with amotivation were found both at the student- and at the classroom-level (explaining 1.1% and 35.3% of the variance), but relationships with fear were nonsignificant.

Classroom-level variables

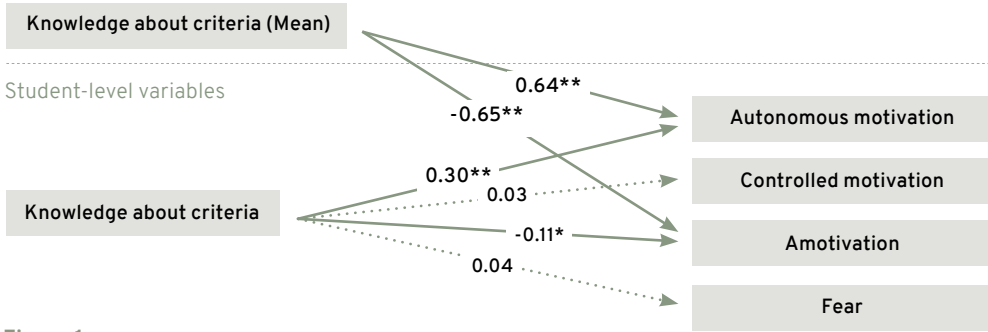


Figure 1

The multilevel model testing the relation between student-level and classroom-level knowledge about assessment criteria and autonomous and controlled motivation, amotivation, and fear. For sake of parsimony, only the statistically significant main-effects and cross-level effects derived from the between-person predictor are depicted. All slopes are fixed and path coefficients are in raw metrics.

* $p < 0.05$. ** $p < 0.01$.

Table 2

Descriptive Statistics, Bivariate Correlations, and Intraclass Correlation Coefficients (ICC) of the Measured Variables of the Study

Variables	1	2	3	4	5	6	7	8	9
1. Knowledge about criteria	-								
2. Need satisfaction	0.30**	-							
3. Need frustration	-0.05	-0.12**	-						
4. Autonomous motivation	0.34**	0.65**	-0.17**	-					
5. Controlled motivation	0.01	0.00	0.64**	0.06	-				
6. Amotivation	-0.21**	-0.27**	0.48**	-0.46**	0.39**	-			
7. Fear	0.04	-0.12	0.69**	-0.08	0.57**	0.35**	-		
8. Autonomy support	0.42**	0.53**	-0.07	0.47**	0.05	-0.19**	0.00	-	
9. Controlling teaching	0.00	-0.01	0.55**	-0.05	0.44**	0.37**	0.38**	0.19**	-
<i>M</i>	3.63	3.27	2.02	3.50	2.00	1.82	2.05	3.03	2.12
<i>SD</i>	1.23	0.74	0.78	0.95	0.83	0.94	0.90	0.91	0.84
ICC	0.18	0.09	0.17	0.10	0.13	0.17	0.13	0.14	0.13

Note. * $p < 0.05$. ** $p < 0.01$.

Research Question 2. Need-Based Experiences as Mediator?

Knowledge about the criteria for the upcoming test, both as a student-level and as a classroom-level predictor, related positively with need satisfaction, which in turn related positively to autonomous motivation and controlled motivation, while relating negatively to amotivation (see Figure 2). A test of indirect effects supported Hypothesis 2, pointing to the mediating role of need satisfaction in the relation between knowledge about assessment criteria and autonomous motivation ($b = 0.12$, $SE = 0.03$, $p < 0.01$) as well as amotivation ($b = -0.04$, $SE = 0.01$, $p < 0.01$) at the student level. Knowledge about the criteria either as a student-level or classroom-level predictor did not significantly relate to need frustration, which however related negatively to autonomous motivation and positively to controlled motivation, amotivation and fear.

Research Question 3. The Moderating Role of Teachers' Motivating Style?

As can be noticed in Figure 3, Hypothesis 3a was almost entirely rejected as interactions with perceived autonomy support were non-significant for all the outcomes, except for need frustration. With regard to this one interaction effect, a test of simple slopes was in support of Hypothesis 3a (see Figure 5). It indicated that the relation between knowledge about the criteria and need frustration at the student level was significantly negative ($b = -0.14$, $SE = 0.06$, $z = 2.45$, $p = 0.014$) only when perceived autonomy support was high (i.e., +1 *SD* above the mean). Instead, this relation was not significant when perceived autonomy support was moderate (i.e., around the mean; $b = -0.04$, $SE = 0.03$, $z = -1.32$, $p = 0.19$), or low (i.e., -1 *SD* below the mean; $b = 0.05$, $SE = 0.04$, $z = 1.22$, $p = 0.22$).

Next, as can be noticed in Figure 4, Hypotheses 3b was not confirmed, as no significant interactions with controlling teaching were found. There was only one exception in the prediction of autonomous motivation at the student-level. Surprisingly, a test of simple slopes revealed that the relation between knowledge of the assessment criteria and autonomous motivation was positive when teachers were perceived to be high (i.e., +1 *SD* above the mean) or moderate on control (respectively $b = 0.20$, $SE = 0.05$, $z = 4.07$, $p < 0.01$ and $b = 0.13$, $SE = 0.03$, $z = 4.10$, $p < 0.01$), whereas it was nonsignificant when the PE teacher was perceived to be low (i.e., -1 *SD* below the mean) on control ($b = 0.05$, $SE = 0.04$, $z = 1.53$, $p = 0.13$). Follow-up analyses revealed that this interaction emerged due to the high correlations between need satisfaction and autonomous motivation. When need satisfaction was removed from the model, the interaction was no longer significant.



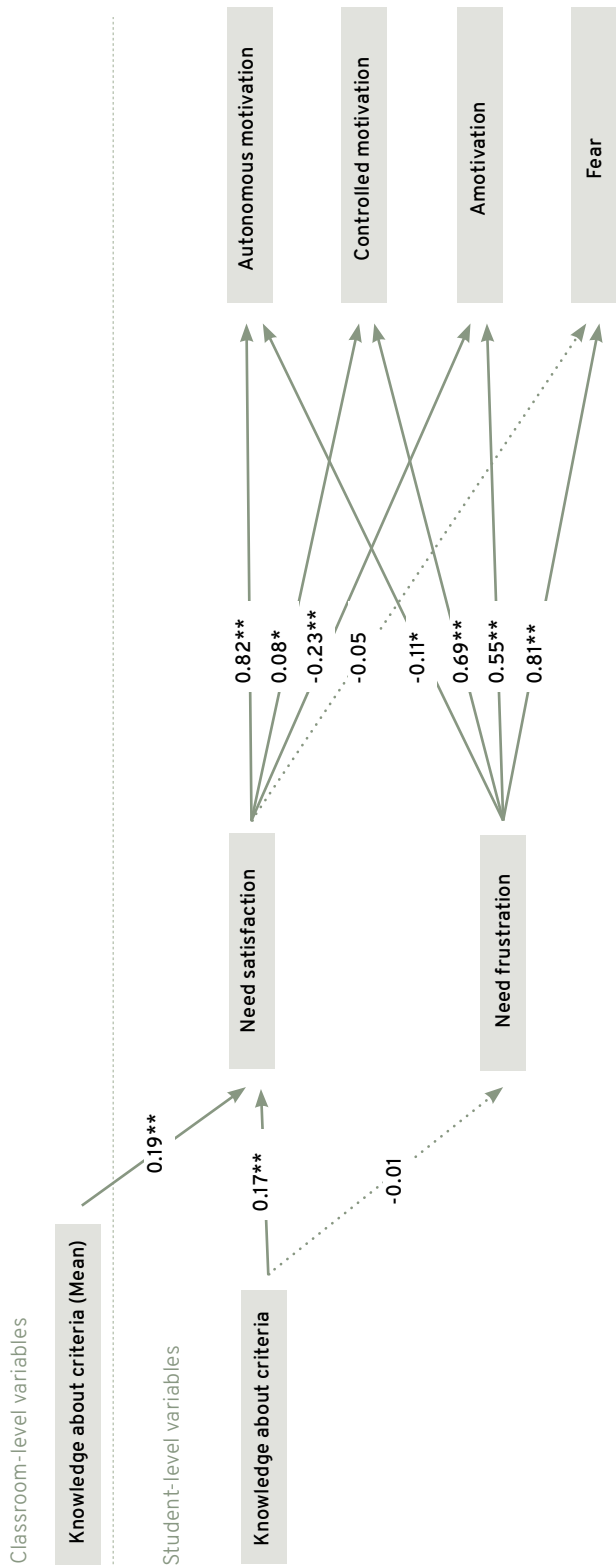
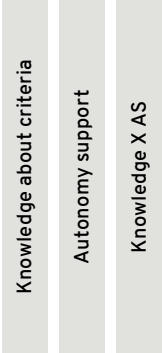


Figure 2

The mediating role of need satisfaction and frustration in the multilevel model testing the relation between student-level and classroom-level knowledge about assessment criteria and autonomous and controlled motivation, amotivation, and fear. For sake of parsimony, only the statistically significant main-effects and cross-level effects derived from the between-person predictor are depicted. All slopes were fixed and path coefficients are in raw metrics.
* $p < 0.05$. ** $p < 0.01$.

Classroom-level variables



Student-level variables

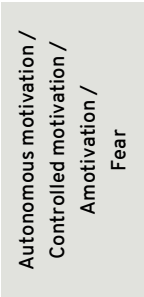
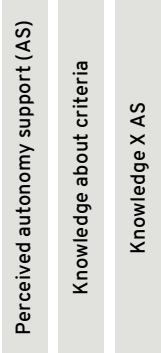


Figure 3

The multilevel path models for the four dependent variables as a function of knowledge about assessment criteria, perceived autonomy support, and their interaction at both the student- and classroom level. All paths are standardised. The first coefficient refers to the model for autonomous motivation, the second to controlled motivation, the third to amotivation and the fourth to fear.

* $p < 0.05$. ** $p < 0.01$. -- = ns.



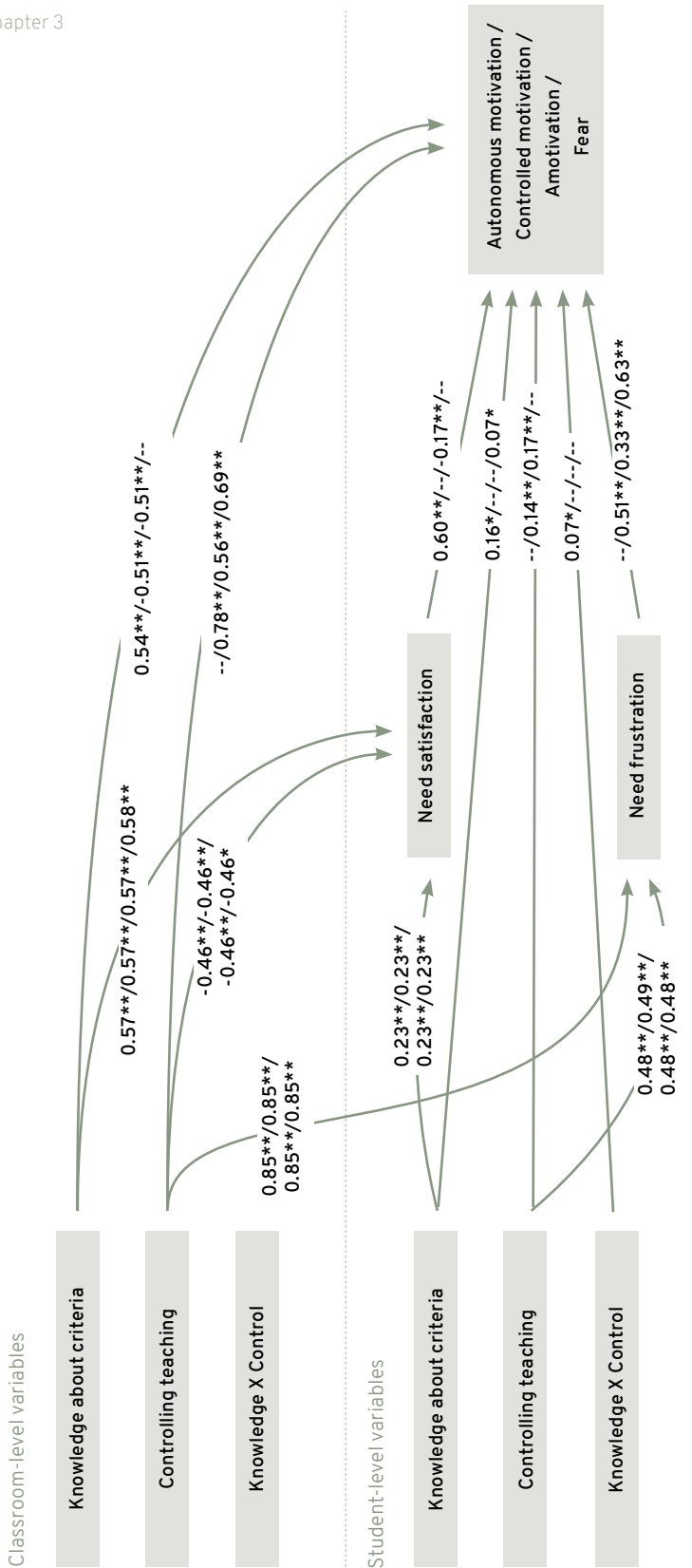
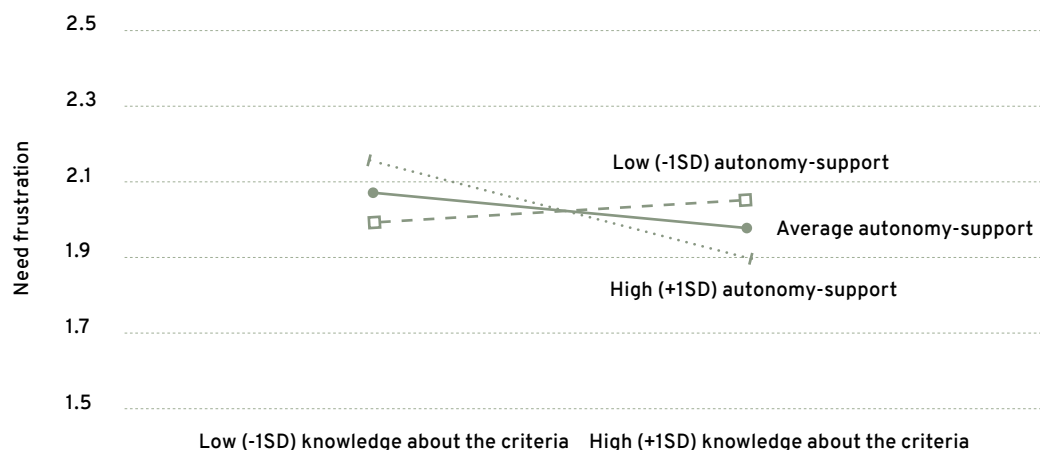


Figure 4

The multilevel path models for the four dependent variables as a function of knowledge of assessment criteria, perceived psychological control, and their interaction at both the student- and classroom level. All paths are standardised. The first coefficient refers to the model for autonomous motivation, the second to controlled motivation, the third to amotivation and the fourth to fear.

* $p < 0.05$. ** $p < 0.01$. -- = *ns*.

**Figure 5**

Interpretation of the interaction between knowledge about the assessment criteria (i.e., the independent variable) and need frustration (i.e., the mediator) under different values of perceived autonomy support (i.e., the class-level moderator) for the model where autonomous motivation serves as an outcome. Similar results were found for all other outcomes.

Discussion

Assessment quality in PE has received increased attention in the PE community internationally (e.g., Hay & Penney, 2009; López-Pastor et al., 2013). In the present study, we focused on one aspect of assessment quality (see Hay & Penney, 2009; Stiggins et al., 2007), namely whether students in PE know the assessment criteria for an upcoming test. Results revealed that, after participating in the first or second lesson of a series of lessons on the same topic, more than half (57.3%) of the students reported that they had become acquainted (i.e., “I agree...”) with the assessment criteria, while another 25% students reported that they “somewhat agreed”. These findings are in line with the results of Borghouts et al. (2017) and Redelius and Hay (2012) among Dutch teachers and Swedish students respectively, and suggest that teachers in PE increasingly create transparency on the assessment criteria, fairly early in the learning process. This is encouraging as knowing what is expected is a precondition for students to be able to monitor their learning process (Hattie & Timperley, 2007).

Results furthermore revealed that there were significant differences between teachers (i.e., between-class differences) in the degree to which their students knew the assessment criteria, suggesting that teachers differ with respect to how assessment is handled and communicated about (also see Hay & Macdonald, 2008). Yet, our analyses also showed that between-student differences (82% of the variance) outweighed between-teacher differences (18% of the variance), implying that albeit being taught by the same teacher, students still largely differ in the degree to which they indicate that they know the criteria for the upcoming test. Somewhat in line with these findings, Redelius and Hay (2012) showed that when students are asked about their perceptions of the criteria in PE, they seemed to describe diverse criteria that were often inconsistent with the goals, or criteria, set by the official curriculum. This diversity may be caused by differences in



students' personal familiarity with the sport at hand, their cultural or social background, or their cognitive capabilities to process the information provided by the teacher (Hay & Penney, 2009). Yet, it would also be possible that teachers communicate the criteria in a more indirect or implicit way. This would leave more room for students' personal interpretations to be of influence. This would be different when teachers would explicitly communicate about the assessment criteria, for instance, by using video-examples, rubrics or self- or peer-assessment.

In the current study, we also investigated relations between knowledge about the criteria for an upcoming test and students' motivational and emotional outcomes (Research Question 1). In line with prior SDT-based research that focused on rule clarity (Kunter et al., 2007; Vansteenkiste et al., 2012) and our hypotheses, results showed that students and classes who are more knowledgeable about the assessment criteria, enjoy and value the PE lesson more (i.e., autonomous motivation). This is important as students (and classes) who are higher on autonomous motivation tend to be more physically active and engaged during the lesson (Aelterman et al., 2012), report less boredom during PE (Ntoumanis, 2001), and are also more inclined to be physically active outside PE (Hagger et al., 2009).

In addition to these positive associations with autonomous motivation, an important question was whether there were no side effects on controlled motivation, such that students, when being highly aware of the assessment criteria, started to pressure themselves to live up to the criteria (i.e., introjected regulation) or to obtain good grades (i.e., external regulation). Such reasoning was not supported by our data, as being more knowledgeable about the criteria did not relate to controlled motivation. Instead, students and classes who reported that they were more knowledgeable about the criteria, indicated lower levels of amotivation. Amotivation is related to a host of negative outcomes in PE (Van den Berghe et al., 2014) and arises when students do not see how their efforts will help them to reach their goals, or when they do not understand why an activity is useful. Our results propose that when students are better informed on the criteria for the upcoming test constitutes, rises in amotivation may be prevented. We also investigated whether knowledge about the criteria can prevent students from experiencing fear during the PE lessons, as fear is a frequently reported problem among secondary school students, particularly in relation to assessment (McDonald, 2001; Stiggins, 2002). Yet, our findings did not provide support for this assumption, as both were unrelated. Perhaps this is the case because we did not measure fear of tests at the contextual level but situational, that is regarding a specific lesson in which students were not graded. In a previous study (Krijgsman et al., 2017) we showed that fear is particularly high in lessons in which students are graded.

Another question was whether need-based experiences served as the underlying mechanism in the relationship between knowledge of the assessment criteria and student outcomes (Research Question 2). In line with our expectations, we found that greater knowledge of the criteria for the upcoming test related to more need satisfaction, which in turn related positively to autonomous motivation and negatively to amotivation. When students have better knowledge about the criteria for the upcoming test, they have a goal towards which they can work. Apparently, students then perceive that they are more in charge of their learning trajectory (i.e., autonomy satisfaction), they feel more effective in reaching their goals (i.e., competence satisfaction), and they experience better relationships with their teacher (i.e., relatedness satisfaction), which in turn leads them to enjoy and value the lesson more (i.e., autonomous motivation), and to feel less aloof (i.e., amotivation).

While some may argue that gaining more insight into the assessment criteria may well lead students to feel more pressured to reach up to the criteria (i.e., autonomy frustration), to feel incapable of meeting the criteria (i.e., competence frustration) or to feel disrespected by the teacher (i.e., relatedness frustration), such assumptions were not confirmed.

This brings us to the final research question (Research Question 3), that is, whether the motivational consequences of knowing the assessment criteria for the upcoming test, depended on teachers' general motivating style. Although we hypothesised, based on previous research (Aelterman et al., 2019; Vansteenkiste et al., 2012), that the positive relations between knowledge about the assessment criteria and students' motivation, could be amplified when teachers hold a more autonomy-supportive style overall, this assumption was not entirely confirmed (but see the findings for need frustration). Overall, both knowledge about the assessment criteria and an autonomy-supportive style showed independent relationships with the motivational outcomes (also see Jang et al., 2010).

Yet, the presence of autonomy support seemed most crucial to foster need satisfaction and autonomous motivation, while knowledge about the assessment criteria appeared most important to dampen amotivation. This is an interesting finding. When students get to know the assessment criteria for a test, this seems to mobilise and energise them, that is, quantitatively speaking they become motivated, as indexed by lower levels of amotivation. This might be the case because knowledge about the assessment criteria helps them to identify how the lessons offered will help them to reach the criteria. However, for students to become in charge of their learning trajectory, feel effective, and connected to the teacher (i.e., need satisfaction) so that they can truly value and enjoy the lesson (i.e., autonomous motivation), obviously more is needed than just knowing the criteria. Indeed, this seemed to more strongly depend on whether the PE teacher held an overall autonomy-supportive approach. We even found that under the condition that students experience their teachers as being highly autonomy-supportive, more knowledge about the assessment criteria dampens need frustration. Apparently, an additional and unexpected benefit can be created when students know the assessment criteria and concurrently experience their teacher as very autonomy-supportive.

Together, these findings have some important theoretical implications. Speculating that increased knowledge about the assessment criteria follows from the teachers' instructions, students' knowledge about the criteria would be an indirect measure of the teachers' provision of structure (Belmont et al., 1988). If this holds true, our results add to the discussion on the potential tension between the provision of structure and autonomy support (e.g., Jang et al., 2010; Vansteenkiste et al., 2012) and show that "more of both is better".

We were also open to the possibility that knowledge about the assessment criteria could go hand in hand with a controlling approach. This is because previous studies showed that, while setting goals and clarifying expectations, teachers can become rigid and overly script students' behaviour (Aelterman et al., 2019), resulting in negative motivational outcomes. However, such reasoning was not supported by our findings, as both were unrelated. While this is promising, it is noteworthy to mention that in the current study we mainly measured teachers' reliance on internally controlling strategies such as referring to feelings of shame or guilt or expressing disappointment towards students. In the study by Aelterman et al. (2019), it was shown that the clarification of goals and expectations particularly aligns with externally controlling strategies, such as referring to rewards or



tests (e.g., grades) and threatening with sanctions, yelling, and commanding. One unanticipated finding deserves further attention in relation to the synergy with a controlling approach. Specifically, we found that knowledge about the assessment criteria displayed positive relationships with autonomous motivation, if teachers were moderate-to-highly controlling, while no significant relationship was found if teachers were perceived as relatively low on control. This unexpected finding is hard to explain, as it is hard to understand how students, who had better knowledge about the criteria for the upcoming test, would value and enjoy the lesson more if a teacher is relying on internally pressuring tactics such as shaming or guilt induction. Yet, supplementary analyses revealed that this interaction effect appeared very unstable and constituted a statistical artefact caused by the strong relationship between need satisfaction and autonomous motivation. Overall, the findings confirm previous work (e.g., De Meyer et al., 2014; Koestner et al., 1984), in that a controlling approach clearly does more harm than good (i.e., less need satisfaction, more need frustration, more controlled motivation, more amotivation).

Limitations and Future Directions

In the current study, we only investigated one aspect of assessment quality (i.e., knowledge about criteria for the upcoming test), while many others (e.g., sound design, student involvement, validity, socially just, authentic and integrated) are equally important (Hay & Penney, 2009; Stiggins et al., 2007). Second, we investigated it in isolation, while quality assessment is characterised by an integrative approach that connects assessment with curriculum and pedagogy. In future studies, it would be interesting to investigate in detail (e.g., through inspection of field documents) which criteria are communicated, how they align with the learning goals and curriculum offered (e.g., fitness, skills, games, attitudes, persistence), and which are the pedagogical approaches used (e.g., type of feedback, inclusion of peer-assessment; Redelius & Hay, 2012). Third, the cross-sectional nature of the study precludes any inferences of causality. In future studies, longitudinal or experimental designs can be used. Fourth, we exclusively relied on self-reported measures of teachers' strategies; in future research these can be complemented with measures of teacher perceptions and direct observations (e.g., Aelterman et al., 2014). Fifth, our measures of students' motivation were situational in nature (i.e., in relation to one specific PE lesson). In future studies, it would be interesting to measure students' motivation both at the situational (i.e., with respect to the specific lesson) as well as at the contextual level (i.e., regarding PE more generally). Indeed, while students may display a specific motivational pattern in one specific lesson, they also bring their general motivation towards the subject at hand to the lesson. By controlling for students' contextual motivation towards PE, the situational impact of teaching strategies can be more precisely investigated.

Finally, it would also be informative to examine in more detail whether teachers communicated about the assessment criteria in an autonomy-supportive or more controlling way, rather than measuring teachers' overall engagement in autonomy-supportive and controlling teaching.

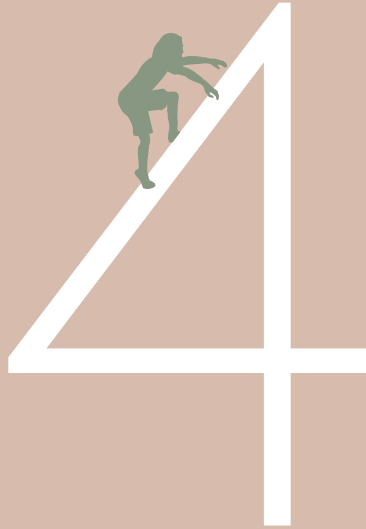
Conclusion and Implications

Results of the current study showed that most students in PE indicated that they know the criteria for an upcoming test. This is important, as when students in PE indicated they knew the criteria for an upcoming test, they not only valued and enjoyed the lesson more, they were also less likely to feel aloof or disconnected. The reason why students feel this way is that they perceived that they were more in charge of their learning trajectory (i.e., autonomy satisfaction), felt more effective in reaching their goals (i.e., competence satisfaction), and experienced better relationships with their teacher (i.e., relatedness satisfaction). In addition, more knowledge about the criteria for an upcoming test did not necessarily relate to feelings of pressure to live up to the criteria (i.e., introjected regulation) or to obtain good grades (i.e., external regulation). If students experience their teachers as being highly autonomy-supportive, more knowledge about the assessment criteria for an upcoming test even negatively related to feelings of need frustration. The findings of the current study thus emphasise the need to search for effective approaches to develop students' knowledge about the criteria for an upcoming test, while at the same time relying on an autonomy-supportive approach. To do so, teachers will do well if they offer choices whenever possible (e.g., the level of difficulty of the assessment task), provide meaningful rationales for the chosen criteria (e.g., in relation to the goals they want to attain with their students), actively solicit students' opinion (e.g., "do you think you are sufficiently prepared for the assessment?"), and accept rather than suppress the irritation or negative emotions that the assigned assessment tasks might elicit (e.g., if students feel stressed or look anxious). By giving voice to students' wishes, concerns, and problems, students might feel respected and hence, be more volitional in their learning. Finally, when explaining assessment criteria for an upcoming test, PE teachers can try to refrain from relying on internally controlling practices such as referring to feelings of shame and guilt, given that such strategies relate to negative motivational and emotional outcomes.



Supplementary data

Supplemental data for this article can be accessed via
<https://journals.sagepub.com/doi/suppl/10.1177/1356336X18783983>



Where to Go and How to Get There: Goal Clarification, Process Feedback, and Students' Need Satisfaction and Frustration from Lesson to Lesson

This chapter is based on:

Krijgsman, C., Mainhard, T., van Tartwijk, J., Borghouts, L., Vansteenkiste, M., Aelterman, N., & Haerens, L. (2019). Where to go and how to get there: Goal clarification, process feedback and students' need satisfaction and frustration from lesson to lesson. *Learning and Instruction*, 61, 1-11.
<https://doi.org/10.1016/j.learninstruc.2018.12.005>

Acknowledgement of author contributions:

CK, JvT, LB, LH designed the study; CK collected the data; CK, TM and LH planned the data analyses; CK analysed the data; CK drafted the manuscript; all authors contributed to critical revision of the manuscript; TM and LH supervised the study.

Abstract

This study investigated to what degree lesson-to-lesson variability in teachers' goal clarification and process feedback explains variability in secondary students' motivational correlates. Students ($n = 570$, 24 classes) completed questionnaires at six occasions. Multilevel regression analyses showed that relations between perceived process feedback and experienced need satisfaction (i.e., competence, autonomy and relatedness) were conditional on perceived goal clarification. No such interaction effects between process feedback and goal clarification were found for need frustration (i.e., experiencing failure, feeling pushed to achieve goals, feeling rejected). In general, when students perceived more process feedback or goal clarification, students experienced more competence, autonomy and relatedness satisfaction. Yet, when perceiving very high levels of process feedback, additional benefits of goal clarification were no longer present (and vice versa). In lessons in which students perceived goals to be less clear, they experienced more need frustration. No associations were found between process feedback and need frustration.

Introduction

Goal clarification and process feedback are strategies that teachers can use to structure students' learning activities (Hattie & Timperley, 2007; Jang et al., 2010; Locke & Latham, 1990; Sadler, 1989; Vansteenkiste et al., 2012). From a motivational perspective (Deci & Ryan, 2000; Ryan & Deci, 2017), it is suggested that motivational (Haerens et al., 2019) and learning gains (Van den Berghe et al., 2014) will be obtained because in well-structured learning environments, when goals and process feedback are provided, students' basic psychological need for competence (i.e., feelings of effectiveness) gets satisfied (Mouratidis et al., 2013). Also, students might feel more in charge of their learning process (i.e., autonomy satisfaction) and they might experience a more positive classroom atmosphere (i.e., relatedness satisfaction).

According to the assessment literature (Hattie & Timperley, 2007; Sadler, 1989; Wiliam, 2011) not only motivational gains, but also learning gains will be obtained when teachers structure the learning environment through goal clarification and process feedback (Hattie & Timperley, 2007). Sadler (1989) argues that goal clarification and process feedback are necessary conditions which must be satisfied simultaneously (in one and the same lesson) so that students experience them as one "greater whole" as to establish optimal conditions for ongoing learning (Hattie & Timperley, 2007; Locke & Latham, 1990). While studies have empirically investigated how goal clarification and process feedback jointly relate to students' learning and performance (e.g., Hall et al., 1987; Schunk & Swartz, 1993), no such studies are available in relation to students' motivation (but see Schunk & Swartz, 1993). To understand the way goal clarification and process feedback work together, the current study investigated their joint association with motivational correlates.

Existing investigations of motivational correlates of goal clarification and process feedback have predominantly relied on cross-sectional data (e.g., Levesque et al., 2004; Pat-El et al., 2012), only allowing for an investigation of inter-individual differences between students. However, during the past decade, scholars have increasingly shown that the strategies teachers rely on (Mainhard et al., 2011; Shute, 2008), students' motivation (Martin et al., 2015), and accordingly students' need-based experiences (Krijgsman et al., 2017; Van der Kaap-Deeder et al., 2017) can vary substantially from one moment to another (Bartholomew et al., 2018; Ketonen et al., 2018) and from lesson to lesson (Tsai et al., 2008). To be able to investigate this *intra*-individual variability, we used a repeated measures design encompassing six lessons.

Goal Clarification and Process Feedback from an Assessment for Learning Perspective

The importance of clarifying goals and providing process feedback for student learning has been widely acknowledged (Hattie & Timperley, 2007; Locke & Latham, 1990; Moeller et al., 2012; Sadler, 1989; Shute, 2008). Both teaching strategies are proposed as essential in the framework of assessment for learning (AFL; Leahy et al., 2005; Wiliam, 2011; Wiliam & Thompson, 2008). AFL is defined as "the process of seeking and interpreting evidence for use by learners and their teachers to decide where they are in their learning, where they need to go and how best to get there" (Broadfoot et al., 2002, p. 2-3). By communicating clear, specific and transparent goals (i.e., goal clarification or also more in general referred to as goal specificity; Hattie & Timperley, 2007; Sadler, 1989; Wirth et al., 2009), teachers



provide the necessary information for students to decide where to direct their learning to. If students understand the goals of the lesson, they can become more self-regulated, because they are able to evaluate their current performance in relation to the desired goal (Andrade & Du, 2005; Moeller et al., 2012; Winstone et al., 2017). Process feedback (or more in general, formative feedback; for an overview see Shute, 2008) provides students with concrete suggestions on how to improve (Butler & Winne, 1995; Harks et al., 2014; Hattie & Timperley, 2007; Peterson & Irving, 2008). Past research has indicated that the most motivating and effective types of process feedback should include elements of both verification (i.e., the judgment of whether an answer is correct) and elaboration (i.e., the informational aspect of the message, providing relevant cues to guide the learner towards improvement) (for overviews see Kulhavy & Stock, 1989; Shute, 2008). Furthermore, regarding timing and specificity of feedback, findings are mixed and a more differentiated view is recommended (e.g., Mathan & Koedinger, 2005; Shute, 2008).

In practice, goals are often clarified at the beginning of a lesson and presented to the whole group at once (Haerens et al., 2013; Reeve, 2015), whereas process feedback is usually presented as information to an individual learner during the exercises (Haerens et al., 2013; Reeve, 2015; Shute, 2008). Moreover, some practices, such as the use of rubrics (Andrade et al., 2010), inherently involve both goal clarification and process feedback, as they include concrete indications for students on *where to go* and *how to take the next step* (Panadero & Jonsson, 2013).

Goal Clarification and Process Feedback From a Motivational Perspective

Congruent with the existing literature on AFL, studies starting from Self-Determination Theory (SDT; Deci & Ryan, 2000) consider goal clarification (i.e., clarifying) and process feedback (i.e., guiding) as components of teacher structure (Aelterman et al., 2019; Jang et al., 2010), which is crucial to foster students' motivation and learning (Vansteenkiste et al., 2012). Goal clarification and process feedback are thought to positively relate to the satisfaction of students' need for competence (Aelterman et al., 2019; Mouratidis et al., 2013). When students experience that their teachers set clear goals (Kunter et al., 2007) and provide process feedback (Levesque et al., 2004; Pat-El et al., 2012), teachers help students to expand their capabilities hereby fostering their feelings of competence (Mouratidis et al., 2013). Because students' understanding of the goals of a lesson may also enable them to evaluate where they are in their learning trajectory and process feedback provides them with concrete information on how to improve, students may also be more likely to take ownership of their learning process (i.e., autonomy satisfaction; Butler & Winne, 1995; Carpentier & Mageau, 2016). Also, in a classroom atmosphere in which students feel effective and have ownership over their learning, a more positive and caring atmosphere may be created which satisfies students' need for relatedness (i.e., relatedness satisfaction; Pat-El et al., 2012).

Relatively few studies have linked the specific strategies of goal clarification and process feedback to students' need-based experiences. In the studies that are available, setting clear goals has been found to relate positively to students' need satisfaction (Haerens et al., 2019; Kunter et al., 2007; Mouratidis et al., 2013; Pat-El et al., 2012). Similar associations have been reported for the provision of process feedback (Carpentier & Mageau, 2016; Levesque et al., 2004; Pat-El et al., 2012). To our knowledge, no studies so far (but

see Haerens et al., 2019) have included measures of the frustration of the need for competence (i.e., feelings of inferiority or failure), autonomy (i.e., feelings of pressure) and relatedness (i.e., feelings of alienation; Vansteenkiste & Ryan, 2013). Insight in goals might potentially be negatively associated to feelings of incapability of reaching those goals (i.e., competence frustration) and to feelings of pressure to reach up to the goals (i.e., autonomy frustration). Haerens et al. (2019) explored the role of goals in relation to need frustration. Yet, in their research, no such assumptions were confirmed. Further, although researchers have alluded to an interplay between goal clarification and process feedback (Sadler, 1989), it has not been empirically studied whether the association between process feedback and students' need-based experiences may, for example, be conditional on the level to which goals have been clarified.

On the one hand, the combination of high levels of goal clarification and process feedback may be related to large positive effects on students' competence. On the other hand, it is also possible that when the goals of a lesson are unclear, students depend more on the process feedback, such that its presence becomes of greater value for students feelings of competence (e.g., Butler & Winne, 1995; Narciss, 2013; Zimmerman, 2008).

Equally and in relation to the need for autonomy, it is possible that the process feedback provided by the teacher may become more meaningful when the goals of the lessons are clearer, such that the presence of both in one lesson would be most beneficial. On the other hand, if no information is provided about the lesson goals, the process feedback provided by the teacher may become more important for students' initiative taking (i.e., autonomy).

As for students' need frustration, it may be possible that when receiving a lot of process feedback without having a clear understanding of the goal that needs to be achieved, process feedback may be linked to feelings of failure (i.e., competence frustration).

Along similar lines, students may feel pushed to live up to the feedback provided by the teacher (i.e., autonomy frustration), if they do not understand the goals of the lessons (Vansteenkiste & Ryan, 2013). Since SDT proposes that the three basic needs are interdependent (Ryan & Deci, 2017), relatedness frustration will probably fluctuate in a similar fashion as competence and autonomy frustration. Investigating need frustration is important, as they have shown to yield unique relations with maladaptive educational outcomes such as amotivation and ill-being (Haerens et al., 2015; Vansteenkiste & Ryan, 2013).

Research Goal

The aim of the present study was to understand how student-perceived goal clarification and process feedback is associated with students' experiences of need satisfaction and frustration. We chose physical education (PE) as a context for our study, because in PE, teachers have the opportunity to provide specific process feedback (Haerens et al., 2013) since students' performance is directly visible for them. In the current study, we focused on the within rather than between student-level associations, because we expected teaching strategies and students' needs to vary between lessons (Krijgsman et al., 2017; Mainhard et al., 2011). Consequently, we chose a longitudinal design with six repeated measures. The study was guided by the following research question:



To what degree can lesson-to-lesson variability in students' perceptions of teachers' goal clarification and process feedback explain students' lesson-specific experiences of competence, autonomy and relatedness satisfaction and frustration?

Based on previous research among adolescents, we expected substantial percentages (approximately between 40% and 60%) of intra-individual variance for perceived goal clarification, process feedback, need satisfaction and frustration (Krijgsman et al., 2017; Mainhard et al., 2011; Van der Kaap-Deeder et al., 2017).

We further expected that variability in perceived goal clarification and process feedback would explain variability in students' experiences of need satisfaction and frustration on a lesson to lesson basis. Overall, we expected positive associations with need satisfaction (e.g., Pat-El et al., 2012) and no relations (Haerens et al., 2019) or negative relations with need frustration. More specifically, because perceived goal clarification and process feedback may both independently and in combination be related to student learning (Hattie & Timperley, 2007; Sadler, 1989) and need-based experiences (Mouratidis et al., 2013), we explored in what way both strategies interact with one another in relation to students' experiences of need satisfaction and frustration. Given the lack of previous work in this area, we considered this a more exploratory part in the analyses.

While addressing the research question at the intra-individual level (i.e., within students from lesson-to-lesson), we took stable processes at the inter-individual (i.e., between students) and group or teacher level into account (Tsai et al., 2008). Particularly, some students might generally receive more goal clarification or process feedback than others or some students may more easily pick up explanations about goals or process feedback due to their familiarity with the subject of the lesson or their social background (Hay & Penney, 2009). Similarly, there may be stable differences between teachers regarding how clear they are in their communication of goals and process feedback (Hay & Macdonald, 2008). Note that, although interesting, such issues were not considered as central to our aim (i.e., to investigate intra-individual variability in perceived goal clarification, process feedback and students' needs).

Methods

Participants

Our convenience sample consisted of 570 students ($n = 284$ boys; 49.8%, $M_{\text{age}} = 13.76$; $SD_{\text{age}} = 1.32$; range 11–18 years in wave 1) clustered in 24 PE classes and teachers from eleven secondary education schools in The Netherlands. The number of participants ranged from twelve to 32 students per class ($M = 23.75$). Students were enrolled in the seventh ($n = 168$; 29.5%; $M_{\text{age}} = 12.32$; $SD_{\text{age}} = 0.61$ in wave 1), eighth ($n = 149$; 26.1%; $M_{\text{age}} = 13.53$; $SD_{\text{age}} = 0.59$ in wave 1), ninth ($n = 182$; 31.9%; $M_{\text{age}} = 14.64$; $SD_{\text{age}} = 0.66$ in wave 1) or tenth grade ($n = 71$; 12.5%; $M_{\text{age}} = 15.65$; $SD_{\text{age}} = 0.80$ in wave 1) of secondary educa-

tion. It was communicated that participation was voluntary. Out of 623 students in the selected participating classes, 53 (8.51%) students did not agree to participate. The Ethical Committee of Utrecht University approved the study protocol.

Procedure

Participants were recruited by inviting PE teachers from the network of the research team to participate in the study with one of their PE classes. Teachers were asked to plan and deliver their lessons as they would normally do. Students were asked to complete a paper-and-pencil questionnaire on six different occasions directly after the lesson. The six measurement occasions took place directly after the second last and last PE lesson of three series of lessons on three different topics. The lesson topics were categorised in five domains (i.e., gymnastics, ball-games, track and field, dancing, and self-defence), which are all customary domain categories in Dutch PE curricula. Data were collected in lessons with different lesson-topics, because PE teachers typically deliver a series of three to five lessons on one and the same topic (e.g., five gymnastics lessons) and we aimed for six measures per student. Topics were divided as followed over the measured lessons: 20.3% gymnastics, 37% ball-games, 26.2% track and field, 8.2% dancing, 8.2% self-defence.

Students completed the questionnaires both for non-grading (i.e., at measurement occasion one, three and five) and grading lessons (i.e., at measurement occasion two, four and six), to ensure that goal clarification and process feedback could be examined in both types of lessons. The non-grading and grading lesson were one week apart, and students were aware that they were graded. Overall, our approach resulted in six repeated measurements per student, and a total of 2637 ratings (see section “Missing Data” for the treatment of missing values). A researcher administered the questionnaires. It was communicated that there were no wrong answers and that students' responses would be treated confidentially. It took students 5-10 min to complete the questionnaires. Data were collected between January and June 2015.



Measures

All measures were assessed on a 5-point Likert scale anchored by 1 (*Strongly disagree*) and 5 (*Strongly agree*). The stem for all items was “*During the last PE class...*”. A complete list of items and detailed information on the internal consistency and factorial validity is presented as supplementary online data.

Goal Clarification and Process Feedback

Students' perceptions of their teacher's goal clarification and process feedback were measured with items of the Students Assessment for Learning Questionnaire (SAFL-Q; Pat-El et al., 2013). Both variables were measured with three items that most closely aligned with the definitions in our study. Items for goal clarification were “The teacher told us what the criteria are by which my assignment will be evaluated”, “The teacher told us what we could learn from the assignments” and “I knew the areas I needed to work on to improve my results”. Items for process feedback were “My teacher encouraged me to reflect on how I could improve my assignments”, “My teacher discussed with me how to exploit my strengths to improve my assignments” and “My teacher talked to me about the progress I made”. Internal consistency was calculated with coefficient omega (Dunn et al., 2014), which can be interpreted analogously to coefficient alpha (Reise, 2012), yet has less risk of overestimating or underestimating reliability (Dunn et al., 2014). Over six measurements, per time point, both scales were internally consistent with coefficient omega varying somewhat per time point $0.66 \leq \omega_{\text{goalclarification}} \leq 0.81$ and $0.85 \leq \omega_{\text{processfeedback}} \leq 0.93$. Next, we tested for measurement invariance (see Table 1 for the fit indices) to ensure that students interpreted the items similarly across occasions (i.e., metric invariance; van

de Schoot et al., 2012) and that the intra-individual variability in our main variables was not due to a different interpretation of the items over time. Comparisons of the CFI (Cheung & Rensvold, 2009) for the configural versus metric invariance models yielded $\Delta\text{CFI} = 0.00$, which indicated no meaningful decrement in fit among these models (Cheung & Rensvold, 2009), suggesting evidence for metric invariance.

Need Satisfaction and Frustration

Students' experiences of competence, autonomy and relatedness satisfaction and frustration during the past PE lesson were assessed with an adjusted version of the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015), which was previously modified to the PE context (Haerens et al., 2015). Each need was measured with four items. An exemplary item for competence satisfaction was "I felt capable at what I did", for autonomy satisfaction "I felt a sense of choice and freedom in the tasks I was participating in", for relatedness satisfaction "I felt close and connected with other people who are important to me", for competence frustration "I felt like a failure because of the mistakes I made", for autonomy frustration "I felt pressured to do certain tasks" and for relatedness frustration "I felt excluded from the group I wanted to belong to". Over six measurements, per time point, all scales were internally consistent with coefficient omega varying somewhat per time point: $0.83 \leq \omega_{\text{competence satisfaction}} \leq 0.89$, $0.77 \leq \omega_{\text{autonomy satisfaction}} \leq 0.84$, $0.84 \leq \omega_{\text{relatedness satisfaction}} \leq 0.88$, $0.82 \leq \omega_{\text{competence frustration}} \leq 0.89$, $0.83 \leq \omega_{\text{autonomy frustration}} \leq 0.88$ and $0.81 \leq \omega_{\text{relatedness frustration}} \leq 0.88$. Metric measurement invariance was confirmed, $\Delta\text{CFI} = 0.00$.

Analyses

Missing Data

Not all participating students completed all six measurements (i.e., unit non-response; van Buuren, 2012; $n = 508$ in wave 1, $n = 464$ in wave 2, $n = 433$ in wave 3, $n = 421$ in wave 4, $n = 402$ in wave 5 and $n = 409$ in wave 6) and on average, 22.89% of missing data existed per measurement occasion. Multilevel analysis accounted for this unit non-response. There were several reasons for drop-out resulting in missing data. A first reason was that three classes ($n = 78$; on average 8.19% of the missing data) only participated at the start of the study. One teacher ($n = 32$ students) terminated participation after the third measurement without further notification (i.e., wave 1, 2 and 3 were retained for analyses). Further, students of two classes ($n = 26$ and $n = 20$) erroneously completed two questionnaires simultaneously and they did so on two occasions, which were removed from further analyses. Another reason for missing data was that we emphasised that participation was voluntary and that students could withdraw from the study at any point. As a result, a number of students did not repeatedly fill out the same questionnaires. Finally, some students dropped out because they did not participate in class for reasons such as minor sports and leisure injuries or illness. Together, this accounted on average for 14.71% of the missing data per occasion. In addition to unit non-response, there also was item-non response (van Buuren, 2012) which was relatively small (i.e., 0.38%), and was therefore treated with pairwise deletion.

Analyses

We used multilevel regression analyses (MLwiN version 2.31; Rasbash et al., 2014) with three-levels (occasions nested in students and classes) and one model per dependent variable. First, variance components models (M0) were fitted. Next (M1), goal clarification and process feedback were entered student mean centred at the occasion-level, class mean centred at the student-level, and grand mean centred at the class-level (Enders & Tofighi, 2007; Lüdtke et al., 2009), considering the student and teacher/group levels as a relatively stable contexts that we wanted to partial out. In this model, we also included the interaction term between student centred goal clarification and process feedback. We chose to include only the student-centred interaction term, since this was the level our research question targeted and including more interaction terms (e.g., at the student or teacher level) would stress the model unnecessarily. To check the psychometric quality of aggregated constructs, interclass correlations (ICC2) of goal clarification and process feedback were calculated. With values of 0.74 for goal clarification and 0.80 for process feedback at the student-level, and 0.76 for goal clarification and 0.81 for process feedback at the class-level, the ICC2's indicated acceptable to good levels of reliability (LeBreton & Senter, 2008; Lüdtke et al., 2009). Finally, the main model (M2) also included the covariates gender (0/1), lesson topic (dummy coded), and grading (0/1). We focused on the models including the covariates gender, lesson topic and grading (M2) for two reasons. First, our own findings pointed to significant associations between the covariates and need satisfaction and frustration. Second, previous research indicated that when examining motivational functioning, girls significantly differed from boys (e.g., girls' perceived competence was lower than that of boys during PE; Slingerland et al., 2014; Vansteenkiste et al., 2012). Also, students reported differences according to lesson-topic (De Meyer et al., 2014) and according to whether their performance was graded or not (Krijgsman et al., 2017).

Table 1

Goodness of Fit Indices for Measurement Invariance Models

	Chi-Square Test	SRMR	RMSEA 90% CI	CFI	TLI	AIC	BIC
Goal clarification and process feedback							
Configural invariance	$\chi^2 (48) = 160.42^{***}$	.03	.07 [.06, .09]	.98	.97	43,067	43,736
Metric invariance	$\chi^2 (68) = 191.99^{***}$	.04	.06 [.05, .08]	.98	.97	43,058	43,610
Need satisfaction and frustration							
Configural invariance	$\chi^2 (1,422) = 3,677.47^{***}$	.05	.06 [.06, .06]	.92	.90	153,994	157,062
Metric invariance	$\chi^2 (1,512) = 3,821.81^{***}$	.06	.06 [.06, .06]	.92	.91	153,958	156,497

Note. SRMR = Standardised Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

*** $p < 0.001$.



Table 2
Descriptive Statistics and Pearson Correlations between Measured Variables Averaged over All Time Points

Variable	1	2	3	4	5	6	7	8
1. Goal clarification		.60*** .53, .67	.34*** .22, .42	.44*** .40, .48	.20*** .11, -.25	-.15*** -.25, -.07	-.25*** -.31, -.19	-.13*** -.21, -.07
2. Process feedback			.26*** .20, .37	.39*** .31, .47	.18*** .13, .23	-.07*** -.11, -.03	-.15*** -.10, .22	-.00 -.09, .04
3. Competence satisfaction				.58*** .50, .65	.35*** .26, .42	-.57*** -.63, -.51	-.39*** -.51, -.30	-.31*** -.42, -.24
4. Autonomy satisfaction					.37*** .28, .43	-.33*** -.37, -.31	-.46*** -.52, -.40	-.22*** -.29, -.14
5. Relatedness satisfaction						-.16*** -.21, -.07	-.16*** -.22, -.04	-.32*** -.36, -.28
6. Competence frustration							.60*** .49, .69	.57*** .49, .63
7. Autonomy frustration								.48*** .37, .60
8. Relatedness frustration								
M	0.00 ^a , 3.48 ^b	0.00 ^a , 2.90 ^b	3.63	3.36	3.66	2.02	2.22	1.67
SD	0.57 ^a , 0.87 ^b	0.62 ^a , 1.05 ^b	0.77	0.82	0.82	0.82	0.87	0.70
Range	-.2, 5.8-2.22 ^a , 1-5 ^b	-.2, 6.1-2.33 ^a , 1-5 ^b	1-5	1-5	1-5	1-5	1-5	1-5
% variance class-level	.12**	.15**	.02	.05*	.04*	.00	.05*	.04*
% variance student-level	.33***	.40***	.36***	.32***	.53***	.50***	.42***	.45***
% variance occasion-level	.56***	.45***	.61***	.63***	.43***	.50***	.54***	.51***

Note. Descriptive statistics calculated with measurements averaged over time points not controlled for nesting in classrooms; 0.40, 0.48 is the range of correlations per time point not controlled for nesting within students. The percentage of total variance that can be attributed to differences in levels, with 0.30 regarded as high (Lüdtke et al., 2009).
^a Descriptive statistics of goal clarification and process feedback were calculated with both student-centred variables, since these predictors were used in our main analyses.
^b Descriptive statistics of goal clarification and process feedback calculated with raw scores.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 3

Students' Need Satisfaction: Variance Component Model (M0) and Conditional Models including Goal Clarification and Process Feedback (M1) and Covariates (M2)

Parameter	Competence satisfaction				Autonomy satisfaction				Relatedness satisfaction				
	M0a	M1a	M2a	M0b	M1b	M2b	M0c	M1c	M2c				
	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)				
Intercept	3.63(.03)	3.64(.03)	3.85(.05)	3.36(.04)	3.37(.03)	3.55(.05)	3.66(.04)	3.67(.04)	3.60(.06)				
Occasion level													
Goal clarification		.19(.02)***	.19(.02)***		.20(.02)***	.20(.02)***		.09(.02)***	.09(.02)***				
Process feedback		.08(.02)***	.09(.02)***		.16(.02)***	.16(.02)***		.08(.02)***	.09(.02)***				
GC X PF		-.05(.03)	-.06(.03)*		-.05(.03)	-.06(.03)*		-.07(.03)**	-.07(.03)**				
Student level													
Students' gender ^a			-.32(.04)***			-.03(.04)			.19(.05)***				
Goal clarification		.34(.05)***	.34(.05)***		.43(.05)***	.44(.05)***		.21(.06)**	.21(.06)***				
Process feedback		.07(.04)	.06(.04)		.12(.04)***	.12(.04)**		.09(.05)	.10(.05)*				
Teacher/ Class level													
Lesson topic ^b													
Ball games			-.08(.04)*			-.12(.04)**			-.06(.04)				
Track & field			-.18(.04)***			-.29(.04)***			-.08(.04)*				
Dance			.12(.06)*			-.12(.06)			-.04(.06)				
Self-defence			-.08(.06)			-.21(.06)***			.01(.05)				
Performance grading lesson ^c													
Goal clarification		.36(.17)*	.37(.16)*		.41(.18)*	.37(.17)*		.15(.24)	.13(.24)				
Process feedback		-.10(.12)	-.09(.11)		.06(.13)	.07(.12)		-.02(.17)	-.01(.18)				



Table 3 (continued)

Parameter	Competence satisfaction				Autonomy satisfaction				Relatedness satisfaction			
	M0a	M1a	M2a	M0b	M1b	M2b	M0c	M1c	M2c			
	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)			
Random part												
σ^2_e (Occasion)	.36(.01)***	.34(.01)***	.33(.01)***	.42(.01)***	.38(.01)***	.36(.01)***	.28(.01)***	.27(.01)***	.27(.01)***			.27(.01)***
$\sigma^2_{\nu 0}$ (Student)	.21(.02)***	.16(.02)***	.14(.01)***	.22(.02)***	.12(.01)***	.12(.01)***	.36(.03)***	.33(.02)***	.32(.02)***			.32(.02)***
$\sigma^2_{\nu 0}$ (Teacher/class)	.01(.01)	.01(.01)	.01(.01)	.03(.01)*	.02(.01)*	.01(.01)*	.03(.01)*	.03(.01)*	.03(.01)*			.03(.01)*
Explained variance												
R^2 occasion-level		6%	8%		10%	14%		4%	4%			
R^2 student-level		24%	33%		45%	45%		8%	11%			
R^2 class-level		0%	0%		33%	67%		0%	0%			
Total R^2		12%	17%		22%	27%		6%	8%			
-2*log likelihood (df)		272.84(7)***	109.79(6)***		466.31(7)***	67.17(6)***		125.63(7)***	23.80(6)***			

Note. Reference category = 0.

^a 0 = boy, 1 = girl.

^b 0 = gymnastics, 1 = ball games, 2 = track and field, 3 = dance, 4 = self-defence.

^c 0 = absence of performance grading, 1 = presence of performance grading.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Results

Descriptive statistics and Pearson correlations are presented in Table 2. Perceived goal clarification and process feedback correlated positively ($r = 0.60$). Percentages of variance for experienced need satisfaction and frustration were low at the class-level and most variance resided at the student and occasion levels (the latter level including measurement error; see Table 2).

Goal Clarification, Process Feedback and Need Satisfaction

Adding the goal clarification and process feedback variables (M1; Table 3) improved the model-fit significantly for all need satisfaction variables (i.e., $\Delta\chi^2(7) = 272.84, p \leq 0.001$ for competence satisfaction, $\Delta\chi^2(7) = 466.31, p \leq 0.001$ for autonomy satisfaction and $\Delta\chi^2(7) = 125.63, p \leq 0.001$ for relatedness satisfaction). Both perceived goal clarification and process feedback were positively associated with experienced competence, autonomy and relatedness satisfaction at the occasion level. Goal clarification and process feedback explained high percentages of total variance for autonomy satisfaction (22%, a large effect) and smaller percentages were explained in competence satisfaction (12%) and relatedness satisfaction (6%).

The interaction term between goal clarification and process feedback on relatedness satisfaction was significant, while the interaction terms in the competence and autonomy satisfaction models were insignificant.

Adding the covariates (M2) further improved the model-fit in all cases (i.e., $\Delta\chi^2(6) = 109.79, p \leq 0.001$ for competence satisfaction, $\Delta\chi^2(6) = 67.17, p \leq 0.001$ for autonomy satisfaction and $\Delta\chi^2(6) = 23.80, p \leq 0.001$ for relatedness satisfaction).

Both perceived goal clarification and process feedback remained positively associated with all three needs to a similar degree. After adding the covariates to the model, the interaction terms between goal clarification and process feedback became significant for all three need satisfaction variables. Interactions in models of the form $Y = i_1 + b_1X + b_2M + b_3XM$ (Hayes, 2013) were probed with the online tool of Preacher et al. (2006). To probe the interactions, conditional (b_1 and b_2 estimates) and interaction terms (b_3 estimates) were calculated with three values of goal clarification; the lowest occurring score, the mean, and highest score in the dataset (see Table 2 for the range). The nature of all interactions was similar for all three needs (see Figure 1). Areas of significance indicated that the relation between perceived process feedback and need satisfaction was not significant when perceived goal clarification (i.e., the moderator) was very high. Up to values of perceived goal clarification of 1.60, 1.32 and 0.58 for respectively competence, autonomy and relatedness satisfaction (more than one to two and a half standard deviation above their means), the relationships between perceived process feedback and the need satisfaction variables were significantly positive. In the presented graphs (see Figure 1), the solid (—) and dashed (---) lines represent very low and average perceived goal clarification. At very high levels of goal clarification, the dotted line (.....), there was no significant relation between perceived process feedback and experiences of students' needs.



From the perspective of teaching, it is also relevant to examine how the relation between perceived goal clarification on need-based experiences depended on perceived process feedback (i.e., process feedback instead of goal clarification as moderator). Results showed that the relation between goal clarification and competence, autonomy and relatedness satisfaction were significantly positive up to values of perceived process feedback of 1.52, 1.59 and 0.55 for respectively competence, autonomy and relatedness satisfaction. At very high levels of process feedback, the dotted line (---), there was no significant relation between perceived goal clarification and students' needs (see Figure 2).

When adding the covariates in M2, we found that girls reported more relatedness, yet less competence satisfaction than boys. Moreover, students perceived track and field lessons to be less need satisfying compared to gymnastics. No associations were found for the presence or absence of performance grading³. In total, respectively for autonomy, relatedness and competence satisfaction, only 5%, 2% and 5% of additional variance was explained by the covariates.

Goal Clarification, Process Feedback and Need Frustration

Adding the goal clarification and process feedback variables (M1; Table 4) improved the model-fit significantly for all need frustration variables (i.e., $\Delta\chi^2(7) = 58.38, p \leq 0.001$ for competence frustration, $\Delta\chi^2(7) = 106.84, p \leq 0.001$ for autonomy frustration and $\Delta\chi^2(7) = 47.18, p \leq 0.001$ for relatedness frustration). Perceived goal clarification was negatively associated with experienced competence, autonomy, and relatedness frustration at the occasion level, whereas no associations were found between perceived process feedback and students' experiences of competence, autonomy and relatedness frustration. Also, the regression coefficients of the interactions between goal clarification and process feedback on competence, autonomy and relatedness frustration were insignificant. Goal clarification and process feedback explained rather small amounts of variance for competence frustration (5%), autonomy frustration (7%) and relatedness frustration (6%).

Adding the covariates (M2) further improved the model-fit in all cases (i.e., $\Delta\chi^2(6) = 43.33, p \leq 0.001$ for competence frustration, $\Delta\chi^2(6) = 60.63, p \leq 0.001$ for autonomy frustration and $\Delta\chi^2(6) = 44.46, p \leq 0.001$ for relatedness frustration).

In line with the unadjusted model (M1), none of the examined interaction terms were statistically significant.

Adding the covariates in M2 showed that girls experienced less relatedness frustration but more competence frustration than boys. Students experienced more autonomy and relatedness frustration during track and field when compared to gymnastics. Furthermore, students experienced less autonomy and relatedness frustration in the presence (versus the absence) of performance grading⁴. In total, respectively for competence, autonomy and relatedness frustration, only 1%, 2% and 0% of additional variance was explained by the covariates.

3 Additional analyses including three-way interactions between goal clarification, process feedback and grading showed that the interplay between perceived goal clarification and process feedback was not dependent on the presence or absence of grading for experiences of competence, autonomy and relatedness satisfaction (all $\chi^2 < 2.50, df = 1, \text{all } p > 0.11$). The two-way interaction between goal clarification and grading was significant for competence and autonomy satisfaction (respectively $b = 0.10, SE = 0.04, \chi^2 = 5.56, df = 1, p < 0.05$; $b = 0.10, SE = 0.05, \chi^2 = 5.17, df = 1, p < 0.05$) and between process feedback and grading for autonomy satisfaction ($b = -0.09, SE = 0.04, \chi^2 = 4.58, df = 1, p < 0.05$). Yet, follow-up analyses revealed positive relations between goal clarification and competence and autonomy satisfaction, and between process feedback and autonomy satisfaction in both the grading and non-grading lessons.

Table 4

Students' Need Frustration: Variance Component Model (M0) and Conditional Models including Goal Clarification and Process Feedback (M1) and Covariates (M2)

Parameter	Competence frustration				Autonomy frustration				Relatedness frustration				
	M0d	M1d	M2d	M0e	M1e	M2e	M0f	M1f	M2f				
	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)				
Intercept	2.04(.03)	2.04(.03)	1.94(.05)	2.24(.05)	2.24(.04)	2.28(.06)	1.69(.04)	1.69(.03)	1.69(.05)				
Occasion level													
Goal clarification		-.11(.02)***	-.11(.02)***		-.13(.02)***	-.13(.02)***		-.07(.02)***	-.08(.02)***				
Process feedback		.01(.02)	.00(.02)		-.02(.02)	-.03(.02)		.02(.02)	.02(.02)				
GC X PF		-.01(.03)	-.00(.03)		-.05(.03)	-.04(.03)		-.02(.03)	-.02(.02)				
Student level													
Students' gender ^a			.23(.05)***			-.01(.05)			-.14(.04)**				
Goal clarification		-.21(.06)***	-.21(.06)***		-.38(.06)***	-.38(.06)***		-.24(.05)***	-.24(.05)***				
Process feedback		.00(.05)	.02(.05)		.07(.05)	.06(.05)		.09(.04)*	.09(.04)*				
Teacher/ Class level													
Lesson topic ^b													
Ball games			-.04(.04)			.02(.04)			.15(.03)***				
Track & field			.07(.04)			.12(.04)**			.11(.03)**				
Dance			-.16(.06)**			.13(.06)*			.06(.05)				
Self-defence			-.02(.06)			.10(.06)			.07(.05)				
Performance grading lesson ^c													
Goal clarification		-.36(.15)*	-.39(.15)**		-.58(.22)**	-.55(.21)**		-.48(.18)**	-.45(.17)**				
Process feedback		.29(.11)**	.27(.11)*		.18(.16)	.17(.15)		.33(.13)*	.34(.13)**				



Table 4 (continued)

Parameter	Competence frustration				Autonomy frustration				Relatedness frustration				
	M0d <i>b</i> (SE)	M1d <i>b</i> (SE)	M2d <i>b</i> (SE)	M0e <i>b</i> (SE)	M1e <i>b</i> (SE)	M2e <i>b</i> (SE)	M0f <i>b</i> (SE)	M1f <i>b</i> (SE)	M2f <i>b</i> (SE)				
Random part													
σ^2_{ϵ} (Occasion)	.34(.01)***	.33(.01)***	.33(.01)***	.40(.01)***	.40(.01)***	.39(.01)***	.25(.01)***	.25(.01)***	.25(.01)***	.25(.01)***	.25(.01)***		
$\sigma^2_{\nu 0}$ (Student)	.34(.03)***	.32(.02)***	.31(.02)***	.32(.03)***	.28(.02)***	.28(.02)***	.23(.02)***	.21(.02)***	.21(.02)***	.21(.02)***	.21(.02)***		
σ^2_{u0} (Teacher/class)	.00(.01)	.00(.00)	.00(.01)	.03(.02)*	.02(.01)	.02(.01)	.02(.01)*	.01(.01)	.01(.01)	.01(.01)	.01(.01)		
Explained variance													
R^2 occasion-level		3%	3%		0%	3%		0%	0%	0%	0%		
R^2 student-level		6%	9%		13%	13%		9%	9%	9%	9%		
R^2 class-level		0%	0%		33%	33%		50%	50%	50%	50%		
Total R^2		5%	6%		7%	9%		6%	6%	6%	6%		
-2*log likelihood (df)		58.38(7)***	43.33(6)***		106.84(7)***	60.63(6)***		47.18(7)***	44.46(6)***	44.46(6)***	44.46(6)***		

Note. Reference category = 0.
a 0 = boy, 1 = girl.
b 0 = gymnastics, 1 = ball games, 2 = track and field, 3 = dance, 4 = self-defence.
c 0 = absence of performance grading, 1 = presence of performance grading.
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

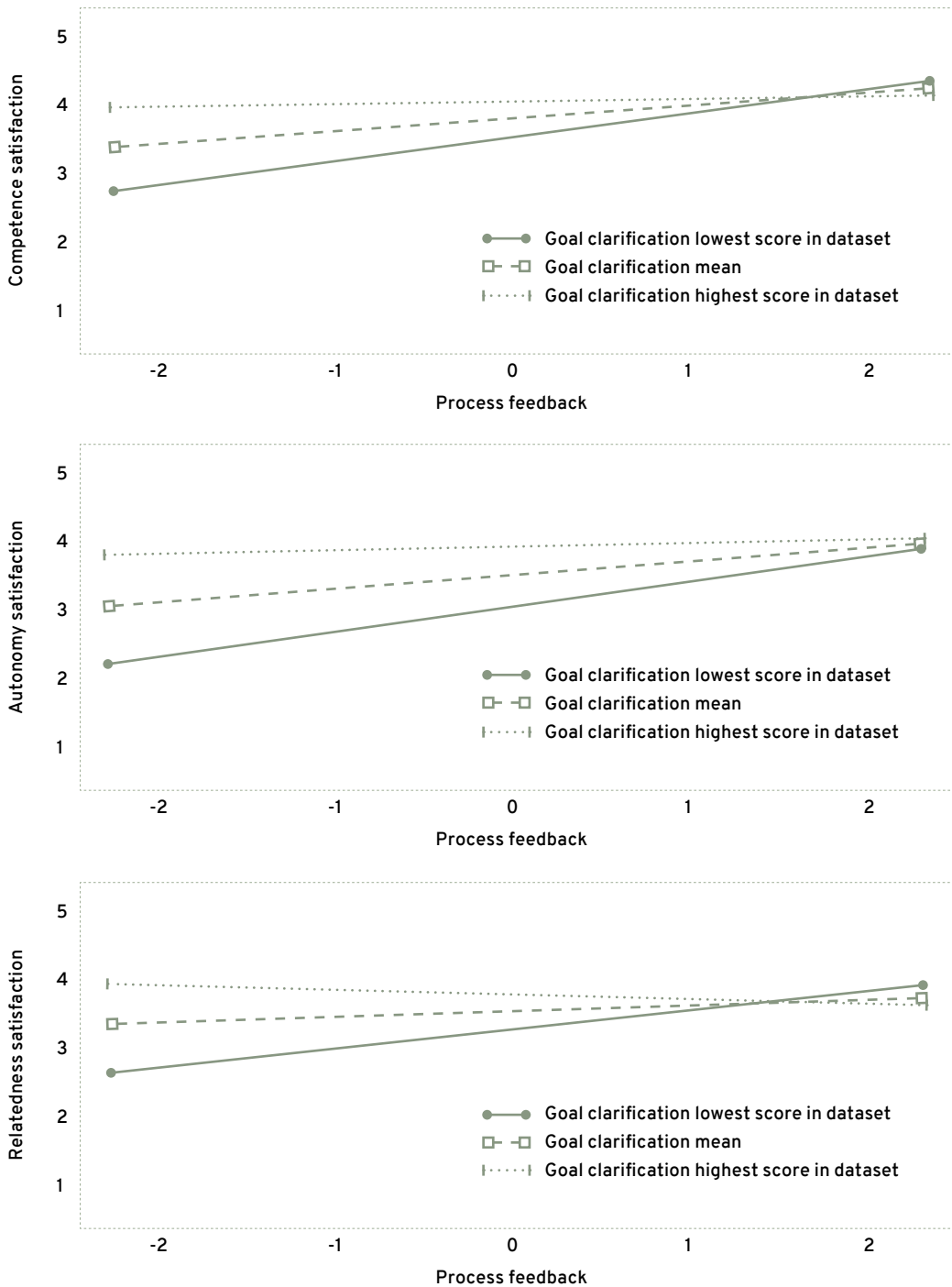


Figure 1

The relation between students' experiences of competence, autonomy and relatedness satisfaction and perceived process feedback depending on the level of students' perceived goal clarification from lesson to lesson.



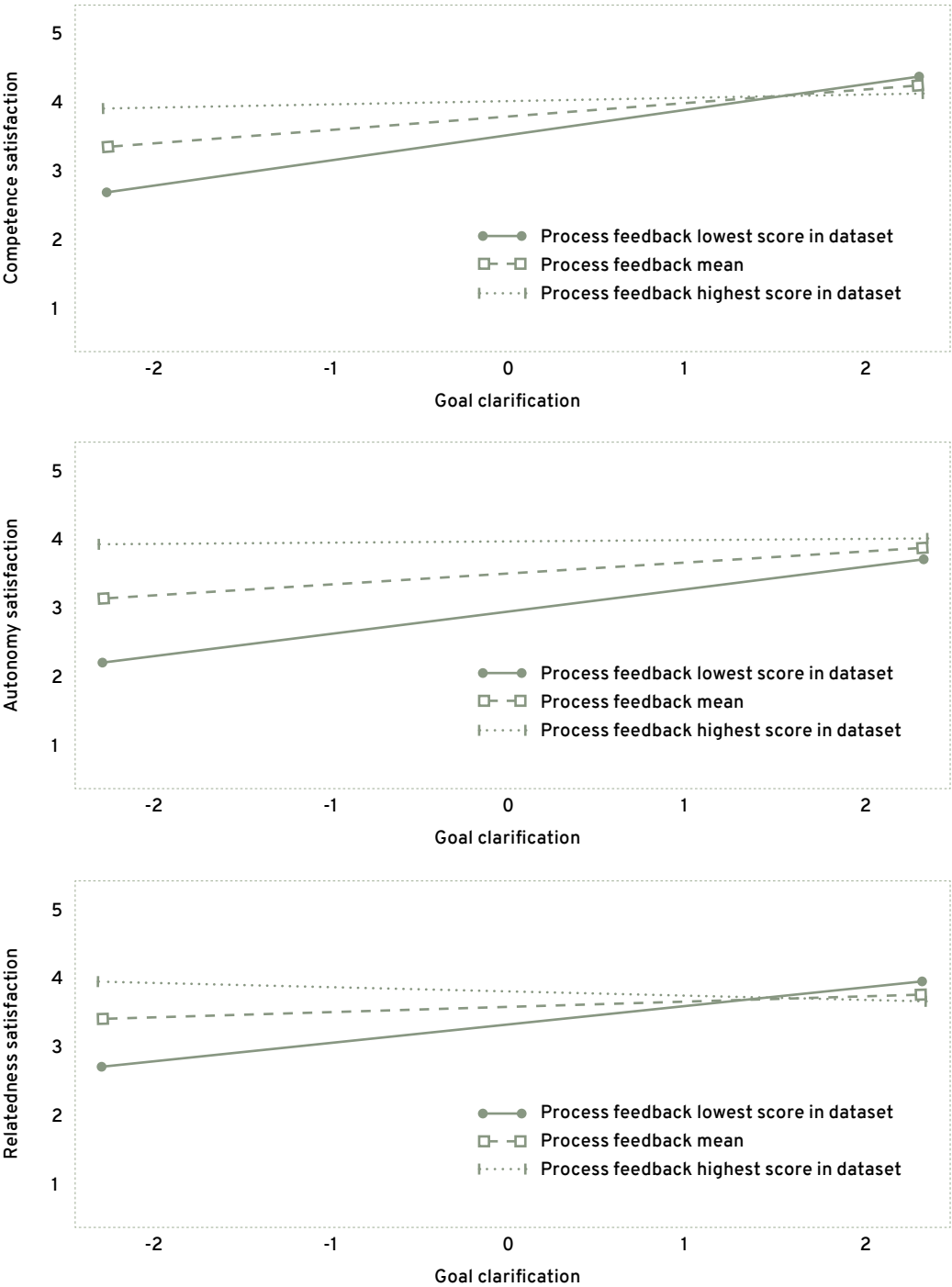


Figure 2
The relation between students' experiences of competence, autonomy and relatedness satisfaction and perceived goal clarification depending on the level of students' perceived process feedback from lesson to lesson.

Discussion

The importance of clarifying goals and providing process feedback for student learning and performance has been widely acknowledged in the assessment literature (Hattie & Timperley, 2007; Locke & Latham, 1990; Moeller et al., 2012; Sadler, 1989; Shute, 2008). Along similar lines, SDT research suggests that the use of goal clarification and process feedback is positively related to students' motivation and learning because of their critical role in fulfilling students' basic psychological needs (Haerens et al., 2019; Mouratidis et al., 2013). When students perceive that their teachers set clear goals and provide process feedback, students can not only expand their capabilities so that they feel capable in reaching the goals (i.e., competence satisfaction; Haerens et al., 2019; Mouratidis et al., 2013), they can also take more ownership over their learning trajectory (i.e., autonomy satisfaction; Butler & Winne, 1995; Carpentier & Mageau, 2016). Also, a more positive classroom atmosphere may be created such that also students' need for relatedness gets satisfied (i.e., relatedness satisfaction; Pat-El et al., 2012). We also explored the possibility that when students think they receive a lot of process feedback without having a good notion about what is expected, they may experience more feelings of failure (i.e., competence frustration) or pressure (i.e., autonomy frustration). This may point towards the importance of providing both goal clarification and process feedback in one and the same lesson, as suggested by Sadler (1989) and Schunk and Swartz (1993).

Thus, the present study adds to the existing literature in at least three ways. First, rather than examining the independent associations between either perceived goal clarification or process feedback and students' overall experiences of need satisfaction, we considered also their combined associations with student needs. Second, rather than focusing solely on need satisfaction, we also considered the frustration of students' needs, as need frustration is uniquely related to important maladaptive outcomes such as amotivation and ill-being (e.g., Haerens et al., 2015; Krijgsman et al., 2017; Vansteenkiste & Ryan, 2013). Third, whereas most previous studies examined the proposed associations at the between-student level (i.e., inter-individual variability; Levesque et al., 2004; Pat-El et al., 2012), we examined these relationships as processes at the within-student level (i.e., intra-individual variability).

The intra-individual approach proved to be very valuable as confirmed by high percentages of variance at the within-student level. From lesson to lesson, teachers' goal clarification as perceived by students showed stronger associations with students' reported need-based functioning than perceived process feedback. Overall, goal clarification and process feedback were positively associated with experiences of need satisfaction and negatively associated with need frustration. Conditional effects of perceived goals and process feedback on need satisfaction were confirmed.

4 Additional analyses including three-way interactions between goal clarification, process feedback and grading showed that the interplay between perceived goal clarification and process feedback was not dependent on the presence or absence of grading for experiences of competence, autonomy and relatedness frustration (all $\chi^2 < 2.34$, $df = 1$, $p > 0.17$). From the six additional analyses including two-way interactions, only the two way interaction between goal clarification and grading on competence frustration was significant ($b = -0.11$, $SE = 0.04$, $\chi^2 = 6.08$, $df = 1$, $p < 0.05$). Results showed that the relation between goal clarification and competence frustration was significantly negative in both the grading on non-grading lessons.



Variability in Goal Clarification, Process Feedback and Need-Based Outcomes

We found substantial lesson-to-lesson variability in the degree to which students reported that the teacher had clarified the goals (56% of variance including error) or had provided process feedback (45% of variance including error), as well as in the degree to which students experienced competence, autonomy and relatedness satisfaction and frustration (respectively 61%, 63%, 43%, and 50%, 54% and 51% including error). These findings are in line with fairly recent work on teacher behaviour and students' needs (Krijgsman et al., 2017; Mainhard et al., 2011; Van der Kaap-Deeder et al., 2017), where similar levels of occasion-level variance were found. The findings imply that, although this lesson is taught by the same teacher, the degree to which students perceive the goals of the lesson to be clear, varies from one lesson to another. This applies to all of our study's variables.

Goal Clarification and Process Feedback

In line with the AFL literature (Pat-El et al., 2013) and the SDT literature on structure (Aelterman et al., 2019), we found that goal clarification and process feedback are distinguishable (i.e., see Table 1) yet related constructs ($r = 0.60$). This suggests that levels of goal clarification and process feedback are shifting together. Thus, as is recommended, teachers who were perceived to communicate goals or expectations were perceived to provide process feedback as well, which has been shown to maximise student learning (e.g., Schunk & Swartz, 1993; Wiliam, 2011; Wiliam & Thompson, 2008). It is, however, also possible that when students perceive the goals to be clearer and they know in which direction they need to work, they may self-generate ideas on how to improve (i.e., internal feedback; Butler & Winne, 1995). This may have led students to report having received a greater amount of process feedback. Similarly, when students perceive to have received high levels of process feedback (i.e., external feedback given by a teacher; Narciss, 2013), students' may infer the lesson goals themselves and therefore in retrospect rate teacher goal clarification higher accordingly.

Goal Clarification, Process Feedback and Need-Based Outcomes

Our main goal was to investigate the degree to which lesson-to-lesson variability in student perceptions of teacher goal clarification and process feedback was related to variability in student need satisfaction and frustration. We found that in lessons where students said to be informed on the key goals of the lesson and to have perceived information on how to improve, they also reported to feel more in charge of their learning process (i.e., need for autonomy; Carpentier & Mageau, 2016; Levesque et al., 2004). Such findings are in line with the literature on self-regulated learning, where it has been recognised that when students understand in which direction they need to move, they will experience a heightened sense of volition and ownership over their learning (Butler & Winne, 1995). Furthermore, in line with SDT's theoretical premises (Ryan & Deci, 2017) and empirical work (Mouratidis et al., 2013), we also found positive relations between goal clarification, process feedback and students' feelings of effectiveness (i.e., competence). Similarly, when students perceived more goal clarification and process feedback, they also felt more connected and cared for (i.e., need for relatedness; Pat-El et al., 2012). These findings are in line with previous work that separately studied correlates of goals (Haerens et al., 2019; Kunter et al., 2007) and process feedback (Levesque et al., 2004; Pat-El et al., 2012). Also,

our results showed that in lessons where students knew the goals of the lessons better, they felt less inefficient (i.e., competence frustration), pressured (i.e., autonomy frustration), or rejected (i.e., relatedness frustration). The presence of process feedback did not relate to students' experiences of need frustration. Together, these are important findings, as we may speculate that a more motivating and stimulating learning environment will be created when teachers manage to clarify the goals and to provide sufficient process feedback to the benefit of students' need-based experiences. Indeed, need satisfaction has been related to important positive outcomes such as students' engagement (Jang et al., 2016) and learning (Mouratidis et al., 2013). Need frustration, on the other hand, is related to negative outcomes such as students' disengagement (Jang et al., 2016) and oppositional defiance (De Meyer et al., 2016). As such, our findings align with other empirical studies showing that the combination of goal clarification and process feedback benefits students' self-efficacy, learning and performance (Hall et al., 1987).

Are Goal Clarification and Process Feedback Conditional on Each Other?

It has been argued that the combination of both goal clarification and process feedback will help students to feel most effective (i.e., competence satisfaction; Mouratidis et al., 2013) and to make the greatest learning progress (e.g., Sadler, 1989). However, the extent to which both should be provided and whether the presence of one of the two complements or compensates the outcomes of the other remained unclear (Butler & Winne, 1995; Zimmerman, 2008). Our study provides evidence for earlier claims (Hattie & Timperley, 2007; Sadler, 1989) that perceived goal clarification and process feedback depend on each other, at least to a certain degree. When students perceived that teachers provided both goal clarification and process feedback to a moderate degree, they experienced that their needs were relatively highly satisfied. Goal clarification and process feedback seem to build on each other's positive effects. Only at very high levels of process feedback, goal clarification did not add anything to students' needs and only at very high levels of goal clarification, process feedback did not add anything to students' needs. These findings fit our expectation that if either one is very salient (e.g., high levels of goal clarification), this may provide students with the opportunity to self-generate the other (e.g., self-generated process feedback or internal feedback) or infer the other (e.g., detect which goals were critical based on the given feedback; Butler & Winne, 1995; Narciss, 2013).

However, keep in mind that the interaction term became only statistically significant after including the covariates and that we did not find empirical evidence for an interplay between perceived goal clarification and process feedback on students' need frustration. Further research should clarify how robust these findings actually are.

Goal Clarification and Process Feedback at Student and Teacher Level

Although not of our main interest, some results were found at the between student and teacher levels that are worth mentioning. Classes that perceived relatively more process feedback, experienced more ineffectiveness (i.e., competence frustration). Perhaps when teachers, across all lessons, give a lot (or perhaps too much) process feedback, students in those classes may feel that specifically their incapacities are highlighted (i.e., competence frustration). Also, students and classes perceiving more process feedback across all lessons, experienced more relatedness frustration, indicating that being heavily informed on how to improve has the potential to alienate students from others in their classroom, maybe because students perceive this as reiteration of their weaknesses and they find this difficult in front of others. On the other hand, in line with our expectations, classes



that perceived relatively more goal clarification, experienced less competence, autonomy and relatedness frustration. This might indicate that when teachers clarify lesson goals and consequently students know what is expected, students may feel less incapable of reaching those goals (i.e., competence frustration), feel less pressure to reach up to the goals (i.e., autonomy frustration) and which might give them less feelings of alienation from others in the classroom (i.e., relatedness frustration).

Results further showed that students experienced less autonomy and relatedness frustration in lessons in which students' performance was graded. These findings differ from previous findings (cf. Krijgsman et al., 2017). Thus, performance grading seems to have complex associations with motivational functioning that deserve further investigation.

Limitations and Future Directions

Although the present study contributed to the recent body of knowledge, by addressing lesson-to-lesson variation (Bartholomew et al., 2018) in need-based experiences (Van der Kaap-Deeder et al., 2017), we were able to explain only small parts of the variance situated at the occasion level (ranging between 0% and 14%). Potentially, other key teaching strategies of AFL (e.g., engineering effective classroom discussions and activating students as instructional resources for one another; Wiliam & Thompson, 2008), which are less clearly related to providing classroom structure (Reeve, 2015), might be important here.

Further, the wording in the relatedness satisfaction and frustration items ("I felt excluded from *the group...*" and "I felt close and connected *with other people...*" may account for the low percentages of explained variance in need for relatedness (at the occasion level 4% for relatedness satisfaction and 0% for relatedness frustration), compared to the other needs (at the occasion level respectively 14% and 8% for autonomy and competence satisfaction and 3% and 3% for autonomy and competence frustration). Focussing the items on the relatedness to the teacher instead would have connected relatedness experiences more directly to students' perceptions of teacher goal clarification and process feedback.

Moreover, the present study exclusively relied on self-reports. Therefore, the associations with perceived goal clarification and process feedback at the occasion level might potentially be biased. Nonetheless, the internal quality of the measure was good as was indicated by tests of reliability and measurement invariance. Moreover, associations between variables at the student and class level might be considered less biased, since these variables were aggregated constructs and thus less dependent on a participant's perspective at one moment in time.

In the current study we favoured an ecologically valid and large-scale approach above a more focused and experimentally controlled study. Therefore, causation cannot be claimed. Experimental studies are needed to provide evidence regarding the need-satisfying effect of providing goals and process feedback. This is an interesting issue for future research to explore.

The design of the present study could be strengthened by taking the timing of goal clarification and process feedback into account. Communicating expectations and goals could be an activity that predominantly takes place at the beginning of a lesson (i.e., before engaging in the activity), while providing suggestions for improvement could primarily

take place during the lesson (Haerens et al., 2013; Jang et al., 2010; Reeve, 2015). Taking the timing of the lesson into account might further enlighten our understanding of how perceived goal clarification and process feedback work together.

Finally, the findings presented in the current study were gathered in a PE context, a context in which teachers can perhaps more easily provide process feedback, because they can actually see how a student is performing. Although similar positive effects are to be expected in theoretical courses (Levesque et al., 2004; Pat-El et al., 2012) putting it into practice may be more challenging. This issue of generalisability is interesting for future research to explore.

Implications for Education

The present results suggest that teachers may do well by clarifying the goals of the lesson and providing process feedback as suggested by Sadler (1989) to fully optimise students' need-based experiences (Mouratidis et al., 2013; Pat-El et al., 2012). Even if teachers provide very high levels of goal clarification, the additional provision of process feedback (or vice versa) does not seem to get in the way of students' need-based experiences. Yet, too much process feedback directed to the whole class on a structural basis is not recommended as this might be experienced as ineffectiveness (i.e., competence frustration) and as a reiteration of their weaknesses which they find difficult in front of others (i.e., relatedness frustration).

This study also showed that students' need-based functioning is malleable from lesson to lesson. Considering needs as a malleable within-student-trait is promising for teachers as it indicates the possibility to intervene in students' need-based functioning. Exploring which instructional features can be used to create the most interesting and motivating learning environment is a time-consuming but potentially inspiring and satisfying task for teachers to undertake.

Conclusion

Our results showed that goal clarification and process feedback seem to build on each other's positive effects. Yet, when perceiving very high levels of process feedback, additional benefits of goal clarification were no longer present. Similarly, when perceiving very high levels of goal clarification, additional benefits of process feedback were no longer evident. No such dependencies were found for experienced need frustration. In general, in lessons where students knew better what was expected and perceived to have received more information on how to improve, they also reported more need satisfaction and less need frustration. Because need satisfaction and need frustration are related to adaptive (i.e., autonomous motivation, learning and engagement) and maladaptive (i.e., amotivation, ill-being, disengagement and oppositional defiance) educational outcomes, it is recommended for teachers to clarify the goals of the lesson and to provide process feedback.

Supplementary data

Supplemental data for this article can be accessed via
<https://doi.org/10.1016/j.learninstruc.2018.12.005>





Do Goal Clarification and Process Feedback Positively Affect Students' Need-Based Experiences? A Quasi-Experimental Study Grounded in Self-Determination Theory

This chapter is based on:

Krijgsman, C., Mainhard, T., Borghouts, L., van Tartwijk, J., & Haerens, L. (2020). Do goal clarification and process feedback positively affect students' need-based experiences? A quasi-experimental study grounded in Self-Determination Theory. *Physical Education and Sport Pedagogy*. Advance online publication. <https://doi.org/10.1080/17408989.2020.1823956>

Acknowledgement of author contributions:

CK, TM, LB, JvT and LH designed the study; CK collected the data; CK, TM and LH planned the data analyses; CK and LB analysed the data; CK drafted the manuscript; all authors contributed to critical revision of the manuscript; TM and LH supervised the study.

Abstract

The importance of clarifying goals and providing process feedback for student learning has been widely acknowledged. From a Self-Determination Theory perspective, it is suggested that motivational and learning gains will be obtained because in well-structured learning environments, when goals and process feedback are provided, students will feel more effective (need for competence), more in charge over their own learning (need for autonomy) and experience a more positive classroom atmosphere (need for relatedness). Yet, in spite of the growing theoretical interest in goal clarification and process feedback in the context of physical education (PE), little experimental research is available about this topic. The present study quasi-experimentally investigated whether the presence of goal clarification and process feedback positively affects students' need satisfaction and frustration. Twenty classes from five schools with 492 seventh grade PE students participated in this quasi-experimental study. Within each school, four classes were randomly assigned to one of the four experimental conditions ($n = 121$, $n = 117$, $n = 126$ and $n = 128$) in a 2x2 factorial design, in which goal clarification (absence vs. presence) and process feedback (absence vs. presence) were experimentally manipulated. The experimental lesson consisted of a PE lesson on handstand (a relatively new skill for seventh grade students), taught by one and the same teacher who went to the school of the students to teach the lesson. Depending on the experimental condition, the teacher either started the lesson explaining the goals, or refrained from explaining the goals. Throughout the lesson the teacher either provided process feedback or refrained from providing process feedback. All other instructions were similar across conditions, with videos of exercises of differential levels of difficulty provided to the students. All experimental lessons were observed by a research-assistant to discern whether manipulations were provided according to a condition-specific script. One week prior to participating in the experimental lesson, data on students' need-based experiences (i.e., quantitatively) was gathered. Directly after students' participation in the experimental lesson, data on students' perceptions of goal clarification and process feedback, need-based experiences (i.e., quantitatively) and experiences in general (i.e., qualitatively) was gathered. The questionnaire data and observations revealed that manipulations were provided according to the lesson-scripts. Rejecting our hypothesis, quantitative analyses indicated no differences in need satisfaction across conditions, as students were equally satisfied in their need for competence, autonomy and relatedness regardless of whether the teacher provided goal clarification and process feedback, only goal clarification, only process feedback or none. Similar results were found for need frustration. Qualitative analyses indicated that, in all four conditions, aspects of the experimental lesson made students feel more effective, more in charge over their own learning and experience a more positive classroom atmosphere. Our results suggest that under certain conditions, lessons can be perceived as highly need-satisfying by students, even if the teacher does not verbally and explicitly clarify the goals and/ or provides process feedback. Perhaps, students were able to self-generate goals and feedback based on the instructional videos.

Introduction

The importance of clarifying goals and providing process feedback for student learning has been widely acknowledged, both in the broader educational (Hattie & Timperley, 2007; Sadler, 1989; Shute, 2008) as in the physical education (PE) literature (Borghouts et al., 2017; Hay & Penney, 2009, 2013; Leirhaug & MacPhail, 2015; MacPhail & Halbert, 2010). Yet, in spite of the growing theoretical interest in clarifying goals and providing process feedback in the context of PE (e.g., Hay & Penney, 2009, 2013), it has been noted that very little empirical research (Lorente-Catalán & Kirk, 2014) is available about this topic. As such, literature calls for a shift from theoretical work towards empirical studies (Leirhaug & Annerstedt, 2016; Lorente-Catalán & Kirk, 2014).

From a motivational perspective (Ryan & Deci, 2017), clarifying goals and providing process feedback are argued to contribute to a structured learning environment (Aelterman et al., 2019). Such structure is positively related to students' most volitional forms of motivation, as students get the opportunity to feel effective (i.e., need for competence), feel more in charge over their own learning (i.e., need for autonomy) and experience a more positive classroom atmosphere (i.e., need for relatedness; Cheon et al., 2019; Mouratidis et al., 2013; Pat-El et al., 2012).

Observations of PE lessons have demonstrated that the implementation of goal clarification and process feedback shows room for improvement (e.g., Leirhaug & Annerstedt, 2016; Leirhaug & MacPhail, 2015; López-Pastor et al., 2013). This may be because teachers might not possess the essential competence to successfully integrate goal clarification and process feedback into their regular teaching repertoire (Leirhaug & Annerstedt, 2016). As such, concrete evidence-based practices are warranted (Georgakis & Wilson, 2012; Ní Chóinín & Cosgrave, 2013). Experimental studies that examine the impact of goal clarification and process feedback in PE lessons, rather than in a lab setting (De Meyer et al., 2016), can provide such evidence-based pedagogical practices. Therefore, the present quasi-experimental study investigated whether the presence of goal clarification and process feedback positively affects students' need-based experiences during a PE lesson on handstand.



Goal Clarification and Process Feedback

Both goal clarification and process feedback are proposed as essential in the framework of assessment for learning (MacPhail & Halbert, 2010; Wiliam, 2011; Wiliam & Thompson, 2008). Assessment for learning is defined as “the process of seeking and interpreting evidence for use by learners and their teachers to decide where they are in their learning, where they need to go and how best to get there” (Broadfoot et al. 2002, p. 2-3). Within this process it is emphasised that assessment should be part of the pedagogical process (Hay, 2006; Hay & Penney, 2009) and integrated in the teaching and learning process (Desrosiers et al., 1997; Lund & Kirk, 2010).

By communicating clear and transparent expectations, goals and success criteria (i.e., goal clarification or more in general, goal specificity; Hattie & Timperley, 2007; Hay & Macdonald, 2008; Redelius & Hay, 2012; Wirth et al., 2009), teachers communicate in which direction students need to go and what aspects of the assignment deserve attention such that students know how to complete it successfully. Goal clarification can constitute of explicit verbal instructions, but can also take the form of a criteria sheet or video

excerpts in which the goals are clarified (Hay & Penney, 2009). Moreover, if students understand the goal of the lesson, they can become more self-regulated, because they are able to evaluate their current performance in relation to the desired goal (Butler & Winne, 1995; MacPhail & Halbert, 2010; Sadler, 1989).

Students' current performance can be improved by receiving concrete strategies and hints, improving their task execution and increase their competence (i.e., process feedback, or more in general, formative feedback; Shute, 2008). Process feedback focuses on improvement and provides students with the necessary step-by-step support to achieve the learning goal (Reeve, 2015). For process feedback to be effective, it should deliver high quality information to students about their learning and provide opportunities to close the gap between current and desired performance (Nicol & MacFarlane-Dick, 2006; Sadler, 1989). The provision of spoken success feedback, i.e., emphasising strong elements in the exercise so far, and stimulating to do the same in future exercises, serves as an example of such effective process feedback. Also spoken intervention feedback, i.e., giving students corrective advice, can be provided, as it focusses on a specific suggestion for improvement (Kluger & DeNisi, 1996). As such, effective feedback will set students into action (Nicol & MacFarlane-Dick, 2006).

Goal Clarification and Process Feedback: A Motivational Perspective

Starting from a Self-Determination Theory perspective (SDT; Deci & Ryan, 2000; Ryan & Deci, 2017), a growing body of empirical research in the domain of PE has shown that goal clarification and process feedback positively relate to students' motivational functioning (Cheon et al., 2019; Krijgsman et al., 2019). According to SDT, when teachers adopt a structuring teaching style (Aelterman et al. 2019), which is the case when teachers set clear goals (Kunter et al., 2007) and provide process feedback (Levesque et al., 2004; Pat-El et al., 2012), the most volitional forms of motivation are elicited. This is because students' basic psychological needs for competence (i.e., feelings of effectiveness), autonomy (i.e., feelings of volition) and relatedness (i.e., feelings of mutual care) are supported, rather than thwarted. Clarifying the goals and providing process feedback helps students to direct their learning efforts and thereby expand their capabilities, satisfying their need for competence (Kunter et al., 2007; Mouratidis et al., 2013). Because their understanding of the lesson goals enables them to evaluate where they are in their learning trajectory and process feedback provides them with concrete information on how to improve, students take more ownership over their learning process, satisfying their need for autonomy (Butler & Winne, 1995; Carpentier & Mageau, 2016; Potdevin et al., 2018). Also, in a classroom atmosphere in which students perceive support, a more positive and caring atmosphere is created, satisfying their need for relatedness (Pat-El et al., 2012).

In addition, according to SDT, when structure is lacking, students may experience need frustration. The absence of insight in goals and process feedback might cause feelings of inferiority and failure, frustrating their need for competence, as students do not know when a performance is "good enough". Also, a lack of insight in "where to go" might give students pressure, frustrating their need for autonomy, while searching how to improve learning. Since SDT proposes that the three basic needs are interdependent (Ryan & Deci, 2017), feelings of alienation, frustrating the need for relatedness (Vansteenkiste & Ryan, 2013), will probably correlate with goals and feedback in a similar fashion as competence and autonomy frustration.

Only two (non-experimental) studies so far explored how goal clarification and process feedback related to students' need frustration. Haerens et al. (2019) did not find any relations between knowledge of expectations (i.e., goal clarification) and students' need frustration, while Krijgsman et al. (2019) found negative relations between the clarification of goals and students' need frustration. As for process feedback, only one study is available and no relations with students' need frustration were found (Krijgsman et al., 2019).

The Present Study

This quasi-experimental study examines whether the presence of goal clarification and process feedback can positively affect students' need-based experiences, in an ecologically valid setting. By relying on a quasi-experimental design and on quantitative methods enriched with qualitative methods, this study methodologically complements the available empirical research on the motivational correlates of goal clarification and process feedback which predominantly (with the exception of Cheon et al., 2019; Potdevin et al., 2018) relied on cross-sectional or longitudinal designs and quantitative methods only (e.g., Krijgsman et al., 2019; Levesque et al., 2004; Mouratidis et al., 2013; Pat-El et al., 2012).

The following research question guided our study:

Does the presence of goal clarification and process feedback positively affect PE students' feelings of competence, autonomy and relatedness satisfaction and frustration, and vice versa for the absence?

We hypothesised that in the experimental condition in which the teacher clarified goals *and/or* provided process feedback, students would report high levels of need satisfaction. Moreover, we explored in what way both teaching strategies, or the absence of both, affected students' experiences of need frustration.



Methods

Participants

The participants for the current study were recruited through the network of the first author. PE teachers were contacted and asked whether four of their seventh grade PE classes could participate in the current study. Participating classes were required to follow a general secondary education track, preparing for higher education. This invitation led to a convenience sample consisting of five different schools that each participated with four different seventh grade PE classes. In total, across all 20 participating classes, 513 students were eligible to participate. Of these students, seventeen students (or 3.31%) did not participate because either their parents or students themselves did not consent. Another four students (or 0.78%) were absent or indisposed otherwise at the measurement occasions. The final sample consisted of 492 students ($n = 236$ boys; 48.0%, $M_{\text{age}} = 12.51$; $SD = 0.51$; range 10.53 – 14.68 years at baseline). The number of students per class ranged from 15 to 28 students ($M = 24.6$).

Procedure and Measures

In a 2 by 2 factorial design, the four classes within each school were randomly assigned to one of the four quasi-experimental conditions: (1) absence of both goal clarification and process feedback ($n = 121$), (2) presence of goal clarification, absence of process feedback ($n = 117$), (3) absence of goal clarification, presence of process feedback ($n = 126$), (4) presence of both goal clarification and process feedback ($n = 128$).

Prior to participating in the experiment, all students first completed a questionnaire as a baseline measure considering students' experiences in PE in general. One week after completing the baseline measure, students from all conditions participated in one experimentally manipulated lesson on handstand, which were all taught by the same guest-teacher. Directly after the experimental lesson, students completed a second questionnaire, focusing on their experiences during the experimental lesson. This resulted in a total of 943 completed questionnaires (see "analyses" section for the treatment of missing values). Before students completed the questionnaires, it was clearly communicated that there were no wrong answers, and that students' responses would be treated confidentially. Students were told that by completing the questionnaires, they would get the opportunity to inform the university and PE teachers about their experiences in PE lessons in general, and specifically during this lesson given by the guest-teacher. Completing questionnaires took about 10-15 min each. Data were collected between October and November 2017. The Ethical Committee of Utrecht University approved the study protocol.

The experiment was set-up as a lesson on handstand, for most students of this age a relatively new motor skill. The lesson was given by a guest-teacher, who is the first author and a licensed and experienced PE teacher, and was taught during regular school hours according to the normal schedule of the participating class. The guest-teacher followed a detailed and condition specific lesson-script, to provide lessons within each of the four conditions in a standardised manner.

Prior to the start of the study, the experimental lesson with presence of goals and feedback was piloted twice. Both pilots were run with seventh grade PE classes who did not participate in the final sample and were observed by a fellow PE teacher who was aware of the research objectives. Subsequently, directly after each pilot, feedback was provided in order to adapt the lesson accordingly. This way, the experimental lesson was fine-tuned, and the guest-teacher had two rehearsals of the lesson-script with presence of both goals and feedback, which was the most challenging script.

All experimental lessons took on average 41 min. A research confederate, introduced as a university researcher, observed the guest-teacher to allow for a manipulation check. Only the guest-teacher and the research confederate, and not the usual PE teacher, were present during the lessons. Only the research confederate was present when students completed the questionnaires. At the end of the study, PE teachers, students and parents were fully informed about the differences between experimental conditions.

Baseline Measure

All questionnaire items were assessed on a 5-point Likert scale bounded by 1 (*Strongly disagree*) and 5 (*Strongly agree*). The stem for the baseline measure was "*In general during PE class...*".

Need satisfaction and frustration. Students' experiences of competence, autonomy and relatedness satisfaction and frustration were assessed with the for PE modified Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Haerens et al. 2015). Each need was measured with four items, e.g., for competence satisfaction "I feel capable at what I do", autonomy satisfaction "I feel a sense of choice and freedom when participating in tasks", relatedness satisfaction "I feel at ease with my teacher", competence frustration "I feel like a failure because of the mistakes I make", autonomy frustration "I feel pressure to do certain tasks" and relatedness frustration "I feel that the teacher dislikes me". Internal consistency was calculated with coefficient omega (Dunn et al., 2014), which can be interpreted analogously to coefficient alpha, yet has less risk of overestimating or underestimating reliability. All scales were internally consistent, varying per variable between $.68 \leq \omega \leq .92$. The lowest omega was found for relatedness frustration ($\omega = .68$), with two items loading very poorly "I felt excluded from the group I wanted to belong to" ($\beta = .24$) and "I felt that I did not really know the teacher" ($\beta = .37$). This poor internal consistency on these specific items could be explained by the fact that students had just started a new schoolyear at a new school, transitioning from primary to secondary school, with a new PE teacher and new classmates. For comparability reasons with previous studies, given removal of the items would lead to a two-item scale, and in light of the acceptable omega-values, these specific items were retained for analyses.

Moreover, students' anticipated experiences of competence satisfaction for handstand specifically were measured at baseline. This measure was similar to the competence satisfaction measure as described above yet used the stem "*Imagine you would participate in a handstand lesson. How do you feel about these statements?*". The scale was internally consistent with $\omega = .92$. Since this scale was adapted from the original scale, factorial validity was tested. The model fitted the data very well, $\chi^2(2) = 1.88$, $p = 0.39$, RMSEA = 0.00, CFI = 1.00 and SRMR = 0.01. All indicator loadings ranged between 0.65 and 0.93, $p < 0.001$.

Experimental Manipulation

For the purpose of standardisation, each lesson consisted of a general and firmly scripted introduction, followed by a practice phase including scripted teacher contact and instruction of the exercises through videos on an iPad, and a scripted lesson closure. The standardised lesson, which constitutes the basis for all four conditions, is presented in Table 1. The videos and standardised feedback are presented as supplemental online material. The additional steps that were taken in the conditions in which goal clarification and process feedback were provided, are presented in Appendix A. Lesson-scripts are available upon request from the first author.

In all four conditions, students watched exercises displayed on the iPad, which were arranged by four levels of difficulty, named the green, blue, red and black slope, analogous with ski slopes coding, with the green slope being the easiest level and the black slope being the most difficult level. This way, students in all four conditions, including those who would not get goals and feedback, could work independently and safe from injuries for the planned 40 min-lesson. To avoid students being distracted because of other iPad applications, indicated as a pitfall for novice iPad learning (Bodsworth & Goodyear, 2017) and congruent with students' behaviour in our pilot lessons, students could only use the video-app, as all other functionalities of the iPad were password protected.



Goal clarification conditions. Additional to the standardised condition, the goal clarification conditions comprised seven extra steps (see Appendix A). To provide students with insights in the guest-teacher's expectations for the upcoming lesson, students watched a one-min video displaying the expected beginning and end level for all levels of difficulty. Based on this video, they were asked to make an informed choice about the level they would like to attain. In step 2-7, awareness was created about the general lesson goal by explicitly writing the goal at the beginning of the video: "do a straight handstand on your own level of difficulty", and by explicitly writing the main focus per level of difficulty in the video, for instance for the green slope: "keep shoulders above hands or elbows".

Process feedback conditions. Additional to the standardised condition, the process feedback conditions comprised five extra steps (see Appendix A). The teacher informed the students that, while practising, they would receive feedback that would help them improve. In step 2-5, the focus was on informing students about one strong element, providing them with success feedback, and one suggestion for improvement, providing them with intervention feedback. Both types of feedback (see supplemental online materials) were standardised per level of difficulty. The guest-teacher, who remembered the feedback by heart, provided the process feedback congruent with the level of difficulty of the exercises students were working on. These remarks were alternated directed towards individual students, groups or the whole class.

Goal clarification and process feedback condition. Additional to the standardised condition, the manipulations were a combination of both goal clarification and process feedback. Moreover, goals and process feedback were aligned (MacPhail et al., 2013). To deliver the scripted instruction aligned, the teacher used more instruction time compared to the other conditions.

Manipulation Check and Effect Measures

All questionnaire items were assessed on a 5-point Likert scale anchored by 1 (*Strongly disagree*) and 5 (*Strongly agree*). The stem for the effect measure was lesson focussed, i.e., "While we were practising during the previous PE class...", or "During the previous PE class...".

Manipulation check. Students' perceptions of the provided goal clarification and process feedback by the teacher were measured with four items each that were developed specifically for the current study, for instance for goal clarification "During the beginning of the previous PE class, the teacher explained the goal she wanted to reach", and for process feedback "While we were practising during the previous PE class, the teacher explained to our group how we could improve". Both scales were internally consistent with $\omega_{\text{goalclarification}} = 0.82$ and $\omega_{\text{processfeedback}} = 0.91$. Since this scale was developed for this study, factorial validity was tested. The model fitted the data very well, $\chi^2(19) = 52.16, p < 0.001$, RMSEA = 0.06, CFI = 0.98 and SRMR = 0.04. All indicator loadings ranged between 0.48 and 0.88, $p < 0.001$.

Moreover, the research assistant observed the teacher to see whether results from the quantitative manipulation check could be confirmed. During observation, the specific lesson script and an accompanied coding scheme were filled-out, in order to describe as exact as possible, what happened during the lesson.

Table 1
Design of the Standardised Experimental Condition: Absence of Goal Clarification and Process Feedback

Lesson phase		Lesson closure
Introduction	Practise	10. The teacher thanked the students and informed them that the university researcher would now take over to conduct the questionnaires.
1. The teacher informed the students that the lesson was about handstand.	8. The teacher interrupted each group on a minimum of two occasions and said (1) "come on, get back to your exercises" or "well done" depending on the actual situation in that group and requested to look at the video-example once again.	
2. Students were asked "Are you a novice in handstand? Please sit on the bench with the green sticker. Are you a bit familiar with the handstand? Please sit on the blue bench. Can you already perform the handstand? Go to the red bench. Are you an expert in the handstand? Go to the black bench".	9. Teachers' verbal instruction towards the class: a. Switching between levels is possible. b. Practise two or three new exercises during the last five min of the lesson.	
3. Students did a warm-up.		
4. Homogeneous groups of approximately four students were made. There were four levels of difficulty: green – blue – red – black.		
5. The teacher told the students that they were expected to work self-sufficiently.		
6. The teacher explained how they would work during the lesson: a. Each group receives one iPad with instructional videos on it. b. Watch the first exercise of your level of difficulty; c. Practise this specific exercise exactly as shown in the video; d. Successfully performed? Watch and practise the next exercise; e. Not successfully? Practise again.		
7. The teacher indicated that the gym was divided in four quarters: one quarter per level of difficulty.		

Note. See Appendix A for more information on the three manipulated conditions.



Need satisfaction and frustration. Students' experiences of competence, autonomy and relatedness satisfaction and frustration were assessed analogously to the baseline measure. All scales were internally consistent, varying per variable between $0.63 \leq \omega \leq 0.89$. The lowest omega was found for relatedness frustration ($\omega = 0.63$), with again the same two items loading very poorly "I felt excluded from the group I wanted to belong to" ($\beta = 0.26$) and "I felt that I did not really know the teacher" ($\beta = 0.25$). Next, we tested for measurement invariance (see Table 2 for fit indices) to ensure that students interpreted the items similarly in the baseline and effect measure (i.e., metric invariance; van de Schoot et al., 2012) and to make sure that the intra-individual variability in our main variables was not due to a different interpretation of the items during the two measurements. Comparisons of the CFI (Cheung & Rensvold, 2009) for the configural versus metric invariance models yielded $\Delta\text{CFI} = 0.00$, which indicated no meaningful decrement in fit among these models, suggesting evidence for metric invariance.

Open questions about general liking of the lessons. Additionally, students answered two open questions to get a better impression of their experiences: "Did you or didn't you like working in groups, organised by level of difficulty? Explain please." and "Mention one thing that you liked and one thing that you didn't like about this lesson. Explain please.".

Table 2

Goodness of Fit Indices for Measurement Invariance Model

	Chi-Square Test	SRMR	RMSEA 90% CI	CFI	TLI	AIC	BIC
Need satisfaction and frustration							
Configural invariance	$\chi^2 (474) = 1146.54^{***}$	0.06	.06 [.05, .06]	0.92	0.91	52,687	53,531
Metric invariance	$\chi^2 (492) = 1218.86^{***}$	0.07	.06 [.05, .06]	0.92	0.90	52,723	53,480

Note. SRMR = Standardised Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CI = confidence interval; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

*** $p < 0.001$.

Analyses

Missing Data

Unit non-response (van Buuren, 2012) existed as not all participants completed both measurements; $n = 475$ completed the baseline-measurement, $n = 468$ completed the effect-measurement. On average, 4.17% of missing data existed per measurement occasion, with a range between conditions of 3.13% - 5.13% due to no class participation for reasons such as minor sports and leisure injuries or illness. This was accounted for by multilevel analyses. Item non-response (van Buuren, 2012) was on average relatively small: 0.82%, with a range between conditions of 0.62% - 1.22% and was treated with pairwise deletion.

Analytic Strategy

We first inspected descriptive statistics in SPSS version 23. To examine the comparability of the experimental conditions, we tested for significant differences in gender and all outcome variables at baseline through two-level multilevel regression analyses, with students nested within classes, in MLwiN version 2.31.

To address our main research question on the effects of goal clarification and process feedback, we used three-level multilevel regression analyses, with occasions nested within students and classes, and separate models per dependent variable. First, variance components models (M0) were fitted. Next (M1), Occasion, Condition and the cross-level interaction between Occasion and Condition were entered into the model. Finally, the main model (M2) also included the covariate Gender (0/1). Gender was deemed important because, in line with earlier studies (De Meyer et al., 2016; Nicaise et al., 2007), our own findings pointed to significant differences in need satisfaction and frustration according to Gender.

Answers to open-ended questions were processed with NVivo 12 Mac. Similar to the Framework Analysis Method (Gale et al., 2013), two independent researchers manually reviewed and inductively coded answers of one class, seeking similarities, differences and items of particular interest. Then, coding of this particular class was discussed until a consensus was reached on a codebook, facilitating a systematic procedure. Subsequently, all data were coded by the two researchers. Afterwards, both researchers allocated themes and interpreted the data individually before discussing their findings. Data from both open questions were merged and will be reported jointly.

Results

Preliminary Analyses

Descriptive statistics per condition among all study variables and Pearson correlations between measured variables at post-test are reported in respectively Table 3 and 4. At baseline, no significant differences between conditions for the variables gender, need satisfaction and frustration (for means, see Table 3) were shown. At post-test, student means in reported need satisfaction were $M = 3.58$ and for need frustration $M = 1.99$. Correlations between goal clarification and process feedback per condition (see Table 3) were stronger in conditions in which goals were clarified when compared to the conditions in which no goals were clarified.

Manipulation Check

Multilevel regression analyses showed that students in conditions where goal clarification was present, also perceived that the teacher clarified more goals when compared to conditions where goal clarification was absent (see Table 3 and Figure 1). Students in conditions where process feedback was present also perceived that the teacher gave more process feedback when compared to conditions where process feedback was absent (see Table 3 and Figure 1), suggesting that the manipulations were provided according to the lesson-scripts.

These findings were confirmed by logs on a filled-out lesson script and coding scheme noted by the observing research confederate. Observations indicated that, overall, the guest-teacher delivered the lessons as prepared in the lesson-scripts.



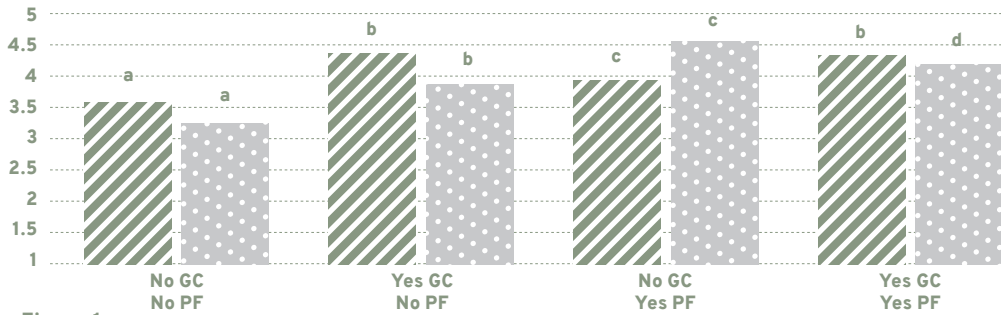


Figure 1

Comparability of conditions. Conditions with dissimilar superscripts are significantly different.

Primary Analyses

Quantitative Student Data

The Intraclass Correlation Coefficient (ICC; Lüdtke et al. 2009) (M0; Table 5) for competence, autonomy and relatedness satisfaction and frustration revealed that most variance could be attributed to differences between occasions. These differences between baseline and post-test ranged between 94% for relatedness frustration and 66% for competence frustration (see Table 3). Adding the predictors Occasion, Condition and the cross-level interaction Occasion \times Condition (M1; Table 5) and, subsequently, adding the covariate Gender (M2; Table 5) improved the model fit in both models (M1 and M2) significantly for respectively five and four out of six need variables (see $-2 \times \log$ likelihood in Table 5). None out of eighteen potential Occasion \times Condition effects were significant (all $\chi^2 < 3.00$, $df = 1$, all $p \geq 0.083$; see Table 5). Also, the main effects of Condition were insignificant (all $\chi^2 < 1.45$, $df = 1$, all $p \geq 0.29$; see Table 5). There were five main effects for Occasion. Students experienced more competence satisfaction ($\chi^2 = 10.79$, $df = 1$, $p \leq 0.01$), autonomy satisfaction ($\chi^2 = 5.82$, $df = 1$, $p \leq 0.05$), relatedness satisfaction ($\chi^2 = 6.20$, $df = 1$, $p \leq 0.05$) and autonomy frustration ($\chi^2 = 4.20$, $df = 1$, $p \leq 0.05$), yet less relatedness frustration ($\chi^2 = 9.56$, $df = 1$, $p \leq 0.01$) during PE in general when compared to the experimental lesson on handstand. Supplementary analyses showed that regardless of the experimental manipulation, students experienced more competence satisfaction in the experimental handstand lesson when compared to their anticipated feelings of competence regarding a lesson on handstand at baseline ($\chi^2 = 39.19$, $df = 1$, $p \leq 0.001$).

Qualitative Student Data

The majority of students, regardless of the experimental manipulation they were in, indicated that several aspects of the experimental lesson were much appreciated. See Table 6 for an overview of examples of students' answers. First, students indicated to have experienced competence satisfaction during the experimental lesson. They liked working on their own level of difficulty, felt growth in their capabilities, enjoyed the challenge, reported that it gave them a learning opportunity and that it provoked positive emotions when mastering an exercise. Also, a lot of students mentioned that they appreciated working in homogeneously skilled groups. Second, students reported to experience autonomy satisfaction during the experimental lesson. A lot of students reported enjoying giving and receiving feedback – even in conditions in which no feedback was provided – and as such, liked to learn from each other. Students appreciated working at their own pace and experiencing a sense of independency. Third, students experienced relatedness satisfaction during the experimental lesson. They frequently commented on the nice atmosphere in the class, their relationship with others, and on the teacher's teaching style.

Table 3
Descriptive Statistics of All Study Variables at Baseline and Post-Experimental, Check of Comparability of Conditions and Manipulation Check.

	No GC, No PF; <i>n</i> = 121		Yes GC, No PF; <i>n</i> = 117		No GC, Yes PF; <i>n</i> = 126		Yes GC, Yes PF; <i>n</i> = 128	
	Baseline <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)	Baseline <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)	Baseline <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)	Baseline <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)
1. Goal clarification		3.22 (0.90) ^a		4.20 (0.64) ^b		3.67 (0.83) ^c		4.17 (0.63) ^b
2. Process feedback		2.82 (1.03) ^a		3.61 (0.89) ^b		4.45 (0.61) ^c		3.99 (0.90) ^d
3. Competence satisfaction	3.85 (0.70) ^a	3.57 (0.84) ^a	3.89 (0.64) ^a	3.50 (0.91) ^a	3.84 (0.64) ^a	3.54 (0.88) ^a	3.81 (0.59) ^a	3.60 (0.84) ^a
4. Autonomy satisfaction	3.52 (0.61) ^a	3.28 (0.97) ^a	3.73 (0.56) ^a	3.29 (0.95) ^a	3.52 (0.65) ^a	3.35 (0.93) ^a	3.53 (0.58) ^a	3.30 (0.97) ^a
5. Relatedness satisfaction	4.13 (0.55) ^a	3.91 (0.78) ^a	4.03 (0.67) ^a	3.90 (0.79) ^a	3.94 (0.73) ^a	3.84 (0.78) ^a	4.00 (0.57) ^a	3.85 (0.83) ^a
6. Competence frustration	1.80 (0.85) ^a	1.93 (0.76) ^a	1.89 (0.66) ^a	2.08 (0.85) ^a	1.85 (0.72) ^a	2.04 (0.78) ^a	1.85 (0.71) ^a	1.92 (0.71) ^a
7. Autonomy frustration	2.36 (0.83) ^a	2.16 (0.90) ^a	2.15 (0.73) ^a	2.19 (1.00) ^a	2.29 (0.74) ^a	2.16 (0.90) ^a	2.33 (0.71) ^a	2.22 (0.77) ^a
8. Relatedness frustration	1.58 (0.51) ^a	1.77 (0.47) ^a	1.63 (0.42) ^a	1.79 (0.57) ^a	1.70 (0.50) ^a	1.75 (0.50) ^a	1.66 (0.42) ^a	1.85 (0.49) ^a
9. Anticipated competence satisfaction handstand	2.99 (1.09) ^a		2.81 (1.11) ^a		2.97 (1.05) ^a		2.93 (1.13) ^a	
10. Gender	% boys 51.20 ^a		% boys 45.30 ^a		% boys 50.80 ^a		% boys 44.50 ^a	
<i>r</i> GC - PF	.36***		.54***		.37***		.51***	
% variance class-level	.26**	.36**	.00	.03	.05*	.00	.04	.03
% variance student-level	.74***	.64***	.20***	.09	.10*	.34***	.19***	.03
% variance occasion-level			.80***	.88***	.85***	.66***	.78***	.94***

Note. *M* and *SD* calculated with measurements not controlled for nesting in classrooms and students. To calculate comparability of conditions: Regression equations, controlled for nesting in classrooms and students, were repeated several times by changing the reference category to obtain coefficients for all combinations of conditions. Conditions with dissimilar superscripts are significantly different. Differences in the extent to which students experienced that goal clarification was provided by the teacher were significant at least at the $p < .01$ level, for process feedback at least at the $p < .05$ level.

No GC, No PF: absence of goal clarification, absence of process feedback.
 Yes GC, No PF: presence of goal clarification, absence of process feedback.
 No GC, Yes PF: absence of goal clarification, presence of process feedback.
 Yes GC, Yes PF: presence of both goal clarification and process feedback.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.



Table 4
Pearson Correlations between Measured Variables at Post-Test

Variable	1	2	3	4	5	6	7	8
1. Goal clarification		.44***	.30***	.35***	.35***	-.10*	-.22***	-.19***
2. Process feedback			.29***	.36***	.33***	-.13**	-.21***	-.21***
3. Competence satisfaction				.56***	.49***	-.55***	-.44***	-.27***
4. Autonomy satisfaction					.66***	-.29***	-.54***	-.40***
5. Relatedness satisfaction						-.25***	-.47***	-.46***
6. Competence frustration							.45***	.35***
7. Autonomy frustration								.45***
8. Relatedness frustration								

Note. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.



Table 5

Effect of Teaching Behaviour Regarding Goal Clarification and Process Feedback on Students' Feelings of Competence, Autonomy and Relatedness Satisfaction and Frustration

Parameter	Competence satisfaction			Autonomy satisfaction			Relatedness satisfaction		
	M0a <i>b</i> (SE)	M1a <i>b</i> (SE)	M2a <i>b</i> (SE)	M0b <i>b</i> (SE)	M1b <i>b</i> (SE)	M2b <i>b</i> (SE)	M0c <i>b</i> (SE)	M1c <i>b</i> (SE)	M2c <i>b</i> (SE)
Fixed part									
Intercept	3.70(.03)	3.57(.07)	3.59(.08)	3.44(.04)	3.29(.08)	3.15(.10)	3.96(.04)	3.92(.09)	3.82(.10)
Occasion level									
Time: baseline ^a		.28(.09)**	.28(.09)**		.24(.10)*	.23(.10)*		.22(.09)*	.21(.09)*
Student level									
Students' gender ^b			-.05(.06)			.30(.05)***			.20(.05)***
Class level									
Condition ^c									
Yes goal clarification, no process feedback		-.06(.10)	-.06(.10)		.00(.13)	-.02(.13)		-.01(.13)	-.03(.13)
No goal clarification, yes process feedback		-.03(.10)	-.03(.10)		.06(.13)	.05(.13)		-.08(.13)	-.09(.13)
Yes goal clarification, yes process feedback		.04(.10)	.05(.10)		.01(.13)	-.01(.13)		-.06(.13)	-.08(.13)
Cross-level interaction									
YesGC noPF X baseline	.11(.12)	.11(.12)	.11(.12)		.21(.14)	.22(.14)		-.08(.12)	-.08(.12)
NoGC yesPF X baseline	.03(.12)	.03(.12)	.03(.12)		-.06(.14)	-.05(.14)		-.12(.12)	-.11(.12)
YesGC yesPF X baseline	-.08(.12)	-.08(.12)	-.08(.12)		.01(.13)	.01(.13)		-.06(.12)	-.06(.12)
Random part									
σ^2_e (Occasion)	.48(.03)***	.43(.03)***	.43(.03)***	.58(.04)***	.53(.04)***	.53(.04)***	.44(.03)***	.43(.03)***	.43(.03)***
$\sigma^2_{\nu_0}$ (Student)	.12(.03)***	.15(.03)***	.15(.03)***	.06(.03)	.08(.03)**	.06(.03)*	.05(.02)*	.06(.02)*	.05(.02)*
$\sigma^2_{\nu_0}$ (Class)	.00(.00)	.00(.00)	.00(.00)	.02(.01)	.02(.01)	.02(.01)	.03(.01)*	.02(.01)*	.02(.01)*
-2*log likelihood (df)		47.09(7)***	0.87(1)		36.37(7)***	30.1(1)***		14.78(7)*	17.70(1)***

Table 5 (Continued)

Parameter	Competence frustration				Autonomy frustration			Relatedness frustration			
	M0d	M1d	M2fd	M0e	M1e	M2e	M0f	M1f	M2f		
	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)	<i>b</i> (SE)		
Intercept	1.92(.03)	1.94(.07)	1.90(.08)	2.23(.05)	2.16(.10)	2.26(.10)	1.72(.03)	1.77(.06)	1.83(.06)		
Occasion level	Fixed part										
Time: baseline ^a		-.15(.08)	-.15(.08)		.19(.10)*	.20(.10)*		-.19(.06)**	-.19(.06)**		
Student level											
Students' gender ^b			.08(.06)			-.21(.06)***			-.12(.03)***		
Class level											
Condition ^c											
Yes goal clarification, no process feedback		.13(.10)	.12(.10)		.03(.14)	.05(.14)		.02(.08)	.03(.08)		
No goal clarification, yes process feedback		.10(.10)	.09(.10)		.00(.14)	.01(.14)		-.02(.08)	-.01(.08)		
Yes goal clarification, yes process feedback		-.03(.10)	-.04(.10)		.06(.14)	.08(.14)		.08(.08)	.09(.08)		
Cross-level interaction											
YesGC noPF X baseline		-.03(.12)	-.03(.12)		-.23(.14)	-.24(.14)		.02(.09)	.02(.09)		
NoGC yesPF X baseline		-.04(.11)	-.04(.11)		-.07(.13)	-.07(.13)		.13(.09)	.13(.09)		
YesGC yesPF X baseline		.08(.11)	.08(.11)		-.08(.13)	-.08(.13)		-.01(.09)	.01(.09)		
Random part											
σ ² _e (Occasion)	.38(.03)***	.37(.02)***	.37(.02)***	.53(.04)***	.52(.04)***	.52(.04)***	.23(.02)***	.21(.01)***	.21(.01)***		
σ ² _{v0} (Student)	.20(.03)***	.20(.03)***	.20(.03)***	.13(.03)***	.13(.03)***	.12(.03)***	.01(.01)	.02(.01)	.01(.01)		
σ ² _{u0} (Class)	.00(.00)	.00(.00)	.00(.00)	.02(.01)	.02(.01)	.02(.01)	.01(.00)	.01(.00)	.01(.00)		
-2*log likelihood (df)		16.85(7)*	2.20(1)		8.4(7)	12.61(1)***		28.08(7)***	13.85(1)***		

Note. Values in parentheses are standard errors. Reference category = 0.

^a0 = posttest, 1 = baseline.

^b0 = boy, 1 = girl.

^c0 = No goal clarification, no process feedback, 1 = Yes goal clarification, no process feedback, 2 = No goal clarification, yes process feedback,

3 = Yes goal clarification, yes process feedback.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 6

Examples of Students' Reactions to the Open Questions about the Experimental Lesson

Student number	Slope	Key concept	Comment
31007	red	Competence satisfaction	"I liked it, because I could participate on a level that is not too easy and not too difficult."
51801	green		"I liked the exercises. It feels like I've improved my handstand."
31009	green		"A handstand with support from the box, this was exciting."
51706	green		"When I performed the handstand against the wall. It made me feel really good."
10407	red		"We learned more. I really liked that."
10307	blue	Autonomy satisfaction	"It is nice when others in your group can do the same as you can."
51908	blue		"I really liked it, because I could ask for feedback and I could give feedback to my classmates."
51911	blue		"This way, we did not need to wait for students that were not so good at it."
31121	red		"Working on your own with the group. It gives a feeling of independency."
20614	red		"I liked working in groups. We had a nice atmosphere in our group and we could help each other."
31104	green	Relatedness satisfaction	"I felt free and the teacher's instructions and help were very clear. The teacher was friendly."
20707	blue		"I don't like the handstand. I can't do it."
31106	blue		"I totally suck at it. I was afraid of falling."
51722	blue		"I enjoyed everything! It's just so much more fun than soccer or something like that."
41609	blue		"I don't like handstand. It's boring."
31124	blue	Didactical approach	"I liked it. It's something else. We never do this."
20714	blue		"I didn't like it. It was too much of the same thing. It became rather boring."
30922	blue	iPad	"Working with videos was nice. We could replay the example."
41608	black		"The exercises and the videos on the iPad were nice. The videos gave clear instructions and an iPad is fun."

In contrast, there was also a group of students who commented negatively on their capabilities in the experimental lesson. These students indicated that they were not good at performing a handstand, experienced fear of failure and indicated that certain exercises were too difficult, or in other words, indicating feelings of competence frustration.

Besides need-based related aspects of the experimental lesson, a large number of students commented on three other aspects. First, there were comments on the lesson's subject of handstand. Approximately half of these were positive, and the other half were negative. Second, a lot of students commented positively on the didactical approach of the lesson, either in general or because it was either "new" or "something else". A minority of students preferred more variation, reporting that they found the lesson boring. Third, students enjoyed working with instruction videos on an iPad because they experienced it as novel, clear, well-arranged, fun, or supportive.



Discussion

The importance of both goal clarification and process feedback (Hay & Penney, 2009, 2013; Leirhaug & Annerstedt, 2016; MacPhail & Halbert, 2010) for students' motivation (Cheon et al., 2019; Krijgsman et al., 2019) towards PE has recently received more and more attention. Observations of PE lessons have demonstrated that the implementation of goal clarification and process feedback shows room for improvement (Leirhaug & Annerstedt, 2016; Leirhaug & MacPhail, 2015; López-Pastor et al., 2013) and concrete evidence-based practices of how this can be done are warranted (Georgakis & Wilson, 2012; Ní Chóinín & Cosgrave, 2013). Prior studies in the PE context reported mostly on students' perceptions of their teachers' naturally occurring and non-manipulated teaching style regarding goal clarification and process feedback (with the exception of Cheon et al., 2019; Potdevin et al., 2018), and available evidence predominantly relied on cross-sectional or longitudinal designs and quantitative methods only (e.g., Koka & Hein, 2003; Krijgsman et al., 2019). The present study aimed to contribute to the literature by experimentally manipulating the teachers' teaching style regarding goal clarification and process feedback in an ecologically valid context and examining its impact on students' need-based experiences using both quantitative and qualitative methods. Advancing our understanding regarding how teachers can affect students' experiences of need satisfaction and frustration is important, as need satisfaction has been shown to relate to positive educational outcomes such as engagement (Jang et al., 2016) and learning (Mouratidis et al., 2013), while need frustration has shown to yield unique relations with maladaptive educational outcomes such as amotivation, fear (Krijgsman et al., 2017) and ill-being (Haerens et al., 2015; Vansteenkiste & Ryan, 2013).

Goal Clarification, Process Feedback and Need-Based Outcomes

Our main aim was to examine the extent to which goal clarification and process feedback affected PE students' perceived competence, autonomy and relatedness satisfaction and frustration. The experimental manipulations were effective with students reporting more goal clarification and/or process feedback when this was implemented by the guest-teacher in line with the script. Surprisingly, these differences in goal clarification and process feedback did not translate into differences in students' need-based experiences across the four conditions. Indeed, rejecting our hypothesis, we found that, regardless of whether students received additional verbal goal clarification and/or process feedback, students felt equally effective (i.e., competence satisfaction; Mouratidis et al. 2013), in charge of their learning process (i.e., autonomy satisfaction; Carpentier & Mageau, 2016) and connected and cared for (i.e., relatedness satisfaction; Pat-El et al., 2012). In line with results found for need satisfaction, the experimentally manipulated verbal goal clarification and process feedback did not affect students' need frustration, as students felt equally frustrated in their need for competence, autonomy and relatedness in all four conditions. Said differently, the way in which the teacher implemented goal clarification and process feedback in the manipulated conditions did not decrease students' need frustration.

Yet, correlations between perceived goal clarification, process feedback and students' need satisfaction and frustration (see Table 4) were in line with theoretical (Butler & Winne, 1995; Hattie & Timperley, 2007; Sadler, 1989) and empirical literature in which it is argued that students who are more knowledgeable about goals (Kunter et al., 2007;

Mouratidis et al., 2013) and who perceive to receive more process feedback (Pat-El et al., 2012) or both (Krijgsman et al., 2019), will feel more effective and self-regulated in their learning, experiencing higher need satisfaction, and lower need frustration.

Altogether, these findings suggest that the experimentally implemented goal clarification and process feedback were noted by the students (see Table 3 and Figure 1), yet these differences did not yield the expected benefits for students' need satisfaction and frustration, suggesting that the effects of the manipulation were too small.

Explaining the Lack of Effects on Need-Based Experiences

The lack of effect of the manipulated conditions is noteworthy as previous experimental studies provided evidence that short experimental manipulations, as the ones provided in the current study, can positively affect students' motivational functioning. Such evidence, that short (single-lesson) experimental manipulations work, was already provided by Edward Deci in 1971 when he showed that verbal reinforcement and positive feedback as external awards seemed to increase psychology students' intrinsic motivation relative to the non-rewarded students. Other more recent experimental studies confirm that motivational functioning can be influenced in one-single lesson manipulations. For instance Gonzalez and Chiviawowsky (2018) showed that when instructions for a swimming task were provided in a more relatedness supporting versus relatedness thwarting way, positive effects on youngsters' motivational functioning were noted. De Mynck et al. (2017) showed that positive feedback versus negative feedback during a tennis task positively influenced youngsters' competence satisfaction, enjoyment and perseverance. In both fairly recent experiments, in the lesson-instructions, only three sentences were different between the experimental conditions. Together, this evidence shows that short manipulations do have the potential to affect students' need-based experiences on a momentary basis. Yet, why was this not the case in the present study?

We hypothesise that the use of instructional videos in the standardised condition (see Table 1) contaminated our results in several ways. First, the presence of the instructional videos may have allowed students to self-generate the goal of the lesson (Hay & Penney, 2009), and to provide each other with process feedback (Potdevin et al. 2018). This may have been equally motivating than to receive this information from the teacher. In line with this explanation, qualitative data analyses indeed revealed that students in all conditions, also the standardised condition, perceived the videos as clarifying (e.g., "*The videos gave clear instructions*"). Also, students had enjoyed giving and receiving peer feedback (e.g., "*I really liked it, because I could ask for feedback and I could give feedback to my classmates*"). Only two students from the standardised condition commented negatively about a lack of instruction or solely receiving instruction via videos.

Second, when compared to prior research (e.g., De Meyer et al. 2016; Haerens et al. 2015), students in all four conditions appeared to experience high levels of need satisfaction, which may also be due to the instructional videos on the iPads. In line with this reasoning, qualitative data revealed that students experienced the use of iPads as well-arranged, novel and fun, contributing to feelings of autonomy. The use of instructional videos on the iPads also allowed students to choose the level of difficulty they wanted to practise on and the pace by which they moved from one exercise to another, contributing to feelings of autonomy and



competence. Moreover, the instructional videos allowed students to collaborate intensively with classmates, contributing to feelings of relatedness. We also hypothesise that the experienced high levels of need satisfaction in all conditions might be due to the novelty effect that might have been enlarged because a new guest-teacher taught the lesson.

Relationship between Goal Clarification and Process Feedback

Results revealed that a relationship between goal clarification and process feedback existed, as in the presence of goal clarification, students indicated to have received more process feedback, even when no additional process feedback was provided by the teacher (see Table 3 and Figure 1; also see for instance Aelterman et al., 2019; Krijgsman et al., 2019; Pat-El et al., 2012 for the relationship between goals and feedback). Said differently, also students in the goal clarification condition without any additional process feedback experienced to have received more process feedback than students in the standardised condition who also did not receive any additional feedback. This suggests that when the goals of lessons are clarified and students therefore know the direction they need to work towards, they might be able to self-generate internal feedback (Butler & Winne, 1995).

Similarly, students in the process feedback conditions (i.e., the students who received both goals and feedback, but also the students who were only provided with process feedback, no goal clarification) experienced to have received more goal clarification than students in the standardised condition (see Table 3 and Figure 1). This suggests that students are able to filter which goal is pursued from the process feedback they receive, even when the goals are not explicitly clarified.

Students' Need Satisfaction in a Physical Education Lesson on Handstand

Interestingly, students' need satisfaction decreased from baseline to post-test. Apparently, students experienced more need satisfaction during PE in general, as compared to a specific lesson on handstand. Qualitative data indeed revealed that a large number of students indicated to dislike the subject handstand, as is in line with previous research reporting that the subject of the lesson is related to students' motivational functioning (Aelterman et al., 2012). It was therefore encouraging to find that students experienced more competence satisfaction during the experimental lesson than they expected to feel in a handstand lesson.

Limitations and Future Directions

In order to standardise the experimental lesson as much as possible, a high level of structure was provided to all students. IPads were used to standardise instructions, and to make sure that all students could work independently and safely for the planned 40 min-lesson, even without verbal instructions provided by the teacher. Qualitative data suggests that this "iPad-approach" and its videos may have interfered with our manipulations as students may have been able to self-generate the goals and to provide process feedback to themselves and others. These qualitative findings could not be tested through the quantitative data as in the present study, students from all conditions used an iPad, making it, in retrospect unfortunately, impossible to test the actual interference of the iPad. Therefore, it would be interesting to replicate this experiment with an additional condition:

a standardised lesson that uses a more conventional approach, in which students would get instruction from the teacher without having the advantages of iPad-usage and videos. The videos allowed to view the demonstration of the exercise as many times as desired, choices and challenges were provided, and students were allowed to work in homogeneous groups, which appeared to be highly motivating. The iPad-usage and its videos were thus a contaminating factor in the current study.

In addition, the results of the present study indicated a certain spill-over in goal clarification and process feedback, with students who received goal clarification, being able to self-generate internal feedback. To provide a more refined insight in the perception of goal clarification and process feedback by students in a school-based setting, future research could further investigate this issue.

Implications for Education

Students in the present study experienced the instructional videos on the iPad (see supplemental online material), explaining exercises with various difficulty levels, as highly motivating. This is because students could work in small and homogeneous groups, on their own level of difficulty, and gave them the opportunity to self-discover the goals of the lesson and provide each other with feedback. Although additional verbal goal clarification and process feedback by the teacher did not get in the way of students' need-based experiences, our results show that even when the teacher does not provide goals and feedback, under these lesson-conditions, students are equally motivated to participate in the lesson. Therefore, we recommend teachers to use the present videos and to develop such instructional videos for various curriculum domains.

Conclusion

Results showed differences in goal clarification and process feedback when comparing all four experimental conditions, suggesting that the manipulations were provided according to the condition specific lesson-scripts. Nevertheless, these differences did not translate into differences in need-based experiences, as students were equally satisfied in their need for competence, autonomy and relatedness regardless of whether they were provided with both goals and feedback, only goals or feedback or none. Similar results were found for students' perceived need frustration. In general, additional quantitative and qualitative analyses indicated that aspects of the experimental lesson made students feel effective, in charge over their own learning and experiencing a positive classroom atmosphere.

Acknowledgements

We want to thank Astrid Luijten-Audenaerde for her help with the development of the handstand-videos and observing and fine-tuning both pilot-lessons.

Supplementary data

Supplemental data for this article can be accessed via

<https://doi.org/10.1080/17408989.2020.1823956>

The instructional videos can be accessed via

<https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41g-LPpk4S-5W6eybWa>



Appendix A

Goal Clarification and Process Feedback Manipulations: Additional Steps

Conditions with goal clarification: additional steps	Conditions with process feedback: additional steps
<p>Step 1: Students watched a one-min video displaying the expected beginning and end level for all levels of difficulty (i.e., creating insight in expectations). Based on this video, they were asked to make an informed choice.</p> <p>Step 2: The teacher informed the students about the general lesson goal (i.e., “do a straight handstand on your own level of difficulty”).</p> <p>Step 3: The teacher emphasised that there was one specific main focus per level of difficulty (e.g., main focus of the easiest level: “keep shoulders above your hands and/ or elbows”), which was written above every video.</p> <p>Step 4: During the practise phase, the teacher asked each group of students which main focus was written in the video that they were practising. When students could not recall the main focus, they were asked to look at the video again. When they could recall the main focus, they were instructed to pay attention to that specific aspect and then immediately, the teacher left that group to avoid questions about “how am I doing”.</p> <p>Step 5: When pausing the class’ exercising, the teacher emphasised a main focus that was important for a lot of students (i.e., “belly tucked in, bottom tight”) and asked them to pay attention to this aspect.</p> <p>Step 6: When pausing the class’ exercising for a second time, the teacher asked the students to recall the main focus for their level of difficulty and allowed responses from two students.</p> <p>Step 7: During the lesson closure, the teacher asked two students to recall their main focus and encouraged the students to remember this when practising the handstand in future PE lessons.</p>	<p>Step 1: At the start of the lesson, the teacher informed the students that, while practising, they would receive feedback that would help them improve.</p> <p>Step 2: During the practise phase, the teacher informed students (in person or in a group of students when applicable) about one strong element and one suggestion for improvement (see supplemental online material for the standardised feedback).</p> <p>Step 3: When pausing the class’ exercising, the teacher provided the students with a strong element and a suggestion for improvement that was applicable for almost the whole group.</p> <p>Step 4: When pausing the class’ exercising for a second time, the teacher asked the students to recall one personal strong element and suggestion for improvement.</p> <p>Step 5: During the lesson closure, the teacher asked two students to recall their suggestion for improvement and encouraged the students to remember this when practising the handstand in future PE lessons.</p>





General Discussion

Introduction

One of the main aims of PE is to provide students with competencies that enable and encourage them to participate in sports and physical activities in and outside of the school setting (Brouwer et al., 2011; European Commission/EACEA/Eurydice, 2013). In order for students to develop a wide range of competencies in the psychomotor, cognitive and affective domain, they are ideally volitionally motivated to actively participate in PE lessons. With students' volitional forms of motivation decreasing as students move from primary school to secondary school (Lepper et al., 2005; van Rooijen et al., 2016), further insights are needed into which pedagogies can foster students' volitional forms of motivation.

It appears from the literature that teachers' assessment practices in PE might impact students' motivation negatively (Butler, 1987; Butler & Nisan, 1986). Particularly, when being graded, students experience more fear of failure and display greater feelings of incompetence (McDonald, 2001; Ryan & Weinstein, 2009). Moreover, with students often being ill-informed about PE goals and being unaware about what PE assessment is based on, there seems to be room for improvement (Redelius & Hay, 2012; Zhu, 2015). In light of these findings, it has been strongly debated amongst PE researchers, PE teacher educators (AIESEP, 2020) and PE teachers (Lucassen, 2014; Lucassen & Komen, 2020) how PE assessment can become more meaningful, relevant and motivating instead of demotivating, stressful and fear-inducing (Hay & Penney, 2009; López-Pastor et al., 2013; Lorente-Catalán & Kirk, 2014) and calls have been launched to create an evidence base that can support PE teachers' motivating assessment practices (AIESEP, 2020). As such, this dissertation is centred around the motivating role of assessment in PE.

The identified gaps in the literature as well as PE teachers' concerns have led to the main question addressed in this dissertation *“How are performance grading, as well as goal clarification and process feedback, related to students' motivational functioning and fear during PE?”*.

In this general discussion, the main findings are first summarised per Chapter. Then, a thematic discussion of the findings across Chapters in light of the scientific contributions is provided, which is followed by an integrated view on the findings. Thereafter, the overarching limitations and future directions of the studies described in this dissertation are pointed out. Finally, recommendations for the educational practice are provided.

Summary of the Findings per Chapter

The short-term longitudinal study in **Chapter 2** addressed the following research questions: (1) Do students' display different need-based experiences, motivational functioning, and fear in a PE lesson in which performance grading is applied compared with a lesson in which no performance grading is applied and (2) can differences in motivational functioning and fear be accounted for by differences in experienced need satisfaction and frustration across both lessons? Results of multilevel regression analyses ($N = 409$ students) showed that after lessons including performance grading, students reported less intrinsic motivation and identified regulation, and more external regulation, amotivation and fear. Need satisfaction predominantly accounted (i.e., mediated) for the link between performance grading and more self-determined forms of motivation, while need frustration largely accounted for less self-determined motivational outcomes and experienced fear.

That is, when students were exposed to performance grading, they experienced a sense of ineffectiveness, being less in charge of their learning process and a sense of disconnection to others, which then made students find the lesson less enjoyable and valuable. Also, when students were exposed to performance grading, they experienced feelings of failure, pressure to perform well and rejection which partially explained why students experienced less joy, more external pressure, more aloof, and experienced more fear in a lesson in which performance grading took place.

The cross-sectional study in **Chapter 3** addressed the following research questions: (1) Does goal clarification relate to students' motivation and fear, (2) can feelings of need satisfaction and need frustration account for these associations, and (3) does the teachers' autonomy supportive and controlling teaching style reinforce or attenuate the relation between goal clarification and students' motivation and fear? This study thus moved away from performance grading and targeted the role of goal clarification. Results of the multilevel structural equation modelling ($N = 659$ students) showed that the more students felt that goals were clarified, the more they enjoyed and valued the lesson, and the less they felt aloof. No relations were found between goal clarification and internal and external pressure and fear. Relations between goal clarification and students' motivation were accounted for by perceived need satisfaction and not by perceived need frustration. Specifically, the more students felt that goals were clarified, the more they felt effective, in charge of their learning process and connected to others, which then made students find the lesson more enjoyable and valuable, and made students feel less aloof. No relations were found between goal clarification and feelings of failure, pressure and rejection. The relations between goal clarification and students' motivation were not dependent (i.e., moderated by) on the teachers' autonomy supportive or controlling teaching style, which had independent relations with students' motivation. In this study, goal clarification was measured at one occasion with one item: "During the last PE class I got to know the criteria by which my test will be evaluated". Therefore, the present investigation of the motivational correlates of goal clarification were considered an exploration.

The longitudinal study in **Chapter 4** addressed the following research question: To what degree can lesson-to-lesson variability in students' perceptions of teachers' goal clarification and process feedback explain students' lesson specific experiences of competence, autonomy and relatedness satisfaction and frustration? By adding process feedback, collecting data in both grading and non-grading lessons, using more refined measurements and using a more advanced design, this study builds on Chapters 2 and 3. Results of multilevel regression analyses ($N = 570$ students) showed that, in lessons in which students experienced that their teacher clarified goals to a greater extent and provided more process feedback, students felt more effective, more in charge of their learning process and more connected. In lessons in which students experienced that their teacher clarified goals to a lesser extent, students felt more like a failure, experienced more pressure and felt more rejected by others. No relations were found between process feedback and need frustration. Effects of perceived process feedback on experienced competence, autonomy and relatedness satisfaction were conditional of perceived goal clarification (and vice versa). No such interaction effects between process feedback and goal clarification for competence, autonomy and relatedness frustration were found. In general, when students perceived more process feedback or goal clarification, students experienced more competence, autonomy and relatedness satisfaction. Yet, when perceiving very high levels of process feedback, additional benefits of goal clarification were no longer



present (and vice versa). Whether students received a grade in a particular lesson or not was controlled for in the analyses. Students were surprisingly less pressured to perform well and less likely to be feeling rejected by others when exposed to performance grading compared to not being exposed to performance grading. No differences were found for need satisfaction and competence frustration.

The quasi-experimental study described in **Chapter 5** addressed the research question: Does the delivery of goal clarification and process feedback positively affect PE students' feelings of competence, autonomy and relatedness satisfaction and frustration? In this study, I delivered experimentally manipulated lessons. By moving away from students' perceptions and targeting teaching behaviour directly, this study builds on Chapter 4. Results of multilevel regression analyses ($N = 492$ students) and observations showed that manipulations in goal clarification and process feedback were generally noticed by the students. Rejecting our hypothesis however, multilevel regression analyses indicated no differences in need satisfaction between conditions, as students were equally highly satisfied in their need for competence, autonomy and relatedness regardless of whether the teacher provided additional goal clarification and process feedback. Similar results were found for need frustration. A qualitative check of students' responses to open-ended questions pointed towards the possibility that, in all four conditions, aspects present in each of the lessons (e.g., the use of performance grouping and of iPads with instructional videos) made students feel effective, in charge over their own learning and experiencing a positive classroom atmosphere, regardless of the manipulated level of goal clarification and process feedback.

Scientific Contributions

The studies presented in this dissertation contribute to our knowledge by gaining a more refined understanding of the existing mechanisms regarding assessment and students' motivational functioning and fear. *In this section*, the identified gaps are translated into four overarching themes that need further research and are discussed in light of the scientific contributions. The four overarching themes were:

- 1 Are performance grades really detrimental for students' motivational functioning and do they elicit elevated levels of fear?
- 2 Can the motivating potential of assessment in PE be augmented by goal clarification and process feedback?
- 3 Can experiences of need satisfaction and frustration explain why assessment impacts motivation and fear?
- 4 Can variability in goal clarification and process feedback explain variability in students' need-based experiences?

Are Performance Grades Really Detrimental for Students' Motivational Functioning and Do They Elicit Elevated Levels of Fear?

Previous studies examining the impact of performance grading were predominantly situated in general education and mainly focused on intrinsic motivation, revealing that students in graded conditions experienced lowered levels of intrinsic motivation (Butler,

1987; Grolnick & Ryan, 1987; Pulfrey et al., 2013). Only one study was available in the PE context and formed an exception to the previous focus on intrinsic motivation, investigating a broad range of motivational regulations, (Johnson et al., 2011). The study revealed that performance grades, when compared to an assessment with an informational or formative function, affected girls negatively in their intrinsic motivation, identified regulation and external regulation and amotivation to participate in PE lessons, yet did not affect boys. Building on this latter study, as advocated for by some scholars in the field to investigate a broader spectrum of motivational functioning (Gagné et al., 2015; Taylor et al., 2014), the studies in this dissertation complemented the existing PE literature by empirically examining whether need satisfaction and frustration, and the individual motivational regulations (i.e., intrinsic motivation, identified regulation, introjected regulation, external regulation and amotivation) vary as a function of being exposed to a grading and non-grading PE class. The impact of performance grading on experienced fear was also examined.

The findings of Chapters 2 and 4 regarding the motivating impact of performance grading were inconclusive. While in Chapter 2, negative motivational outcomes as a function of performance grading were found, such results were not confirmed in Chapter 4.

The empirical examination of the wide spectrum of motivational regulations beyond the exclusive examination of intrinsic motivation is important because, for example, the findings in Chapter 2 showed that grading not only undermined joy and interest (i.e., intrinsic motivation), which is in line with studies examining the broader educational context (Butler, 1987, 1988; Butler & Nisan, 1986; Grolnick & Ryan, 1987; Pulfrey et al., 2013), but students also experienced the activity as less valuable (i.e., identified regulation). When being graded, students also experienced more pressure to gain a positive reward (i.e., external regulation), diminished intention to participate (i.e., amotivation) and more fear. No results were found for pressure that students can impose to themselves (i.e., introjected regulation). The present results were in line with the only study available that, with the exception of introjected regulation, examined all separate motivational regulations *and* was conducted in the PE context (Johnson et al., 2011). This dissertation complemented the existing research, in which introjected regulation indeed was not examined, by showing that no differences in introjected regulation emerged as a function of grading, thereby supporting the necessity to look at subtypes, as advocated by some scholars in the field (Gagné et al., 2015; Taylor et al., 2014). Thus, whereas in lessons where performance grading took place, students put effort in a lesson out of experiences of more pressure imposed by someone else, no evidence was found showing that students imposed such pressure to themselves. This is an interesting and somewhat unexpected finding by itself, because one could speculate that under grading circumstances, students become increasingly concerned with their self-worth and would feel guilty if they did not perform well. Perhaps this process of internalising external pressure is a longer-term process. The study in Chapter 2 also complemented existing research by showing that when students were exposed to performance grading, they experienced a sense of ineffectiveness, a lack of ownership over their learning and a sense of disconnection to others. Students not only reported less need satisfaction, they also reported more need frustration as a function of performance grading, as they felt more strongly like a failure, more pressured to perform well and more likely to be rejected by others. The results of Chapter 2 are in line with the only investigation available on the need-based correlates of performance grading, situated in general education (Pulfrey et al., 2013), revealing that when students were graded, they experienced a lack of ownership over their learning.



The findings of Chapter 2 were not confirmed in Chapter 4. This study revealed that when students were exposed to performance grading when compared to not being exposed to performance grading, they were surprisingly less pressured to perform well and less likely to be rejected by others. These findings showed rather small effect sizes. No differences were found for need satisfaction and competence frustration. When interpreting these results, it is important to note that, although results in Chapter 2 indicated that performance grading has drawbacks for students' motivation, the effect sizes were rather small. Moreover, many factors, such as the teachers' style during the specific lesson were not considered. Chapter 4 showed no drawbacks of grading.

The variation in the findings presented in Chapters 2 and 4 could potentially be explained from a SDT account. SDT-based research indicates and argues that feedback (in this case grades) about performance can have varied functional significance, or meaning, to the recipient (Grolnick & Ryan, 1987; Ryan & Deci, 2020; Ryan & Weinstein, 2009). Feedback can have informational significance if it provides input that helps the student improve or highlight areas of competence. Informational inputs tend to enhance more self-determined forms of motivation. In contrast, feedback can have a controlling significance when experienced as pressure toward specific behaviours or outcomes. The fact that students in the sample described in Chapter 2 experienced more feelings of failure, pressure to perform well and rejection during performance grading may indicate that the performance grading had a more controlling significance. In future studies, it would be interesting to question students about the functional significance of the performance grading to measure whether it is experienced as more informational versus controlling. Perhaps the informational significance is enlarged when students are better informed of what is expected in their assignment or are more strongly provided with information about their strengths and aspects they could improve.

In sum, the results of this dissertation provide a more differentiated image of how performance grading is associated with students' motivational functioning and fear. No unequivocal evidence was provided that performance grading by itself is detrimental for students' motivational functioning and students' feelings of fear in PE.

Can the Motivating Potential of Assessment in PE be Augmented by Goal Clarification and Process Feedback?

Moving forward from performance grading as one form of assessment, the studies in this dissertation examined the motivating potential of goal clarification and process feedback. Previous studies examining the impact of goal clarification and process feedback were predominantly situated in general education and mainly focused on need satisfaction (Carpentier & Mageau, 2016; Kunter et al., 2007; Levesque et al., 2004; Pat-El et al., 2012), intrinsic motivation (Kunter et al., 2007; Pat-El et al., 2012) and autonomous motivation (Carpentier & Mageau, 2016). These authors revealed that goal clarification and process feedback positively associated to need satisfaction, intrinsic motivation and autonomous motivation. Regarding goal clarification, no studies were available in the context of PE. While literature on the impact of positive normative feedback (i.e., comparing performance in relation to others or to a particular norm-table) is available, also in PE (e.g., Mouratidis et al., 2008), to our knowledge only two studies (i.e., of which one was published recently) focused on process feedback, which considers positive information-based feedback that provides students with information on how to improve (De Meester et al., 2020; Koka & Hein, 2003). Koka and Hein (2003) revealed that positive information-based feedback,

and competence satisfaction and intrinsic motivation were unrelated (Koka & Hein, 2003). De Meester et al., (2020) revealed that overall, the presence of positive information-based feedback especially decreased students' negative motivational functioning such as feelings of failure, pressure and rejection, yet was unrelated to students' positive motivational functioning such as feelings of effectiveness, feelings of being in charge of their learning and experiences of a positive classroom atmosphere. The studies in this dissertation complemented the existing PE literature by empirically examining how goal clarification and process feedback were related to need satisfaction and frustration, the composite scores autonomous and controlled motivation, and amotivation and fear.

In general, the findings of Chapters 3, 4 and 5 regarding the relations between goal clarification and process feedback, and students' motivational functioning, were consistent. Chapters 3, 4 and 5 pointed towards positive motivational correlates of students' perceptions of goal clarification and process feedback.

Goal clarification and students' motivational functioning and fear. The empirical examination of the wide spectrum of motivational functioning beyond the exclusive examination of need satisfaction, intrinsic motivation and autonomous motivation was important. When students perceived that goals were clarified, they not only enjoyed the lesson more (i.e., intrinsic motivation), they also valued the lesson more (i.e., identified regulation) and felt less aloof (i.e., amotivation Chapter 3). Findings in Chapters 3 and 4 further showed that when students have a goal towards which they can work, they felt a sense of effectiveness, in charge of their learning and a more positive classroom atmosphere (i.e., more need satisfaction, Chapters 3 and 4). Although the experimental study in Chapter 5 showed no differences in students' need satisfaction when students did or did not receive verbal goal clarification, correlations between perceived goal clarification and students' need satisfaction were also positive. The results of Chapters 3 and 4 regarding *need satisfaction* are in line with SDT's theoretical premises (Ryan & Deci, 2017) and previous research conducted in the broader academic context (Kunter et al., 2007; Mouratidis et al., 2013; Pat-El et al., 2012), in which it was shown that goal clarification was positively related to competence, autonomy and relatedness satisfaction. These findings are also in line with the literature on self-regulated learning, where it is recognised that when students understand in which direction they need to move, they will experience a heightened sense of volition and ownership over their learning (Butler & Winne, 1995). Results from the experimental manipulation in Chapter 5 were not in line with this body of knowledge. However, additional quantitative and qualitative analyses indicated that aspects of the standardised experimental lesson, such as using instructional videos on an iPad and exercising in small and heterogeneous groups, gave students the opportunity to self-discover the goals of the lesson and provide each other with feedback, making all students feel more need-satisfied.

Results from Chapters 3, 4 and 5 regarding goal clarification and need frustration were conflicting. Indeed, whereas the results of Chapter 3 and the comparison of the experimental conditions in Chapter 5 suggest no impact of goal clarification on need frustration, the results from Chapter 4 and the correlational analyses in Chapter 5 showed that in lessons where students knew the goals of the lessons better, they felt less like a failure, less pressured, or less rejected. The reason for these inconsistent findings is unclear at this stage. The study in Chapter 4 had a more robust research design compared to the study in Chapter 3, with a more extensive measurement of goal clarification and a longitudinal repeated measures design, versus a cross-sectional design in Chapter 3. The study



in Chapter 4 also differed from the study in Chapter 3 in that goal clarification was measured in both non-grading and grading lessons, whereas in Chapter 3 this was measured during the first or second lesson of a series of lessons and not during grading lessons. One could assume that the pressuring effect of goal clarification would be more prevalent when performance assessment is approaching when compared to an early stage in a series of lessons. Yet, findings pointed in a different direction. When students were better informed on the goals of the lesson, students felt less like a failure, less pressured to perform well and less likely to be rejected by others. Apparently, when knowing what the teacher finds important, feelings of failure and pressure were reduced rather than augmented. Moreover, while it might be argued that gaining more insight in goals and as such, knowing where to work towards, may also lead to students starting to pressure themselves to obtain those goals or to obtain good grades (i.e., introjected regulation; Aelterman et al., 2019; Vansteenkiste et al., 2012), such assumptions were not confirmed in Chapter 3. Also, although fear is a frequently reported problem among secondary school students, particularly in relation to assessment (McDonald, 2001; Stiggins, 2002), no relations were found in Chapter 3 between goal clarification and experienced fear. Most importantly thus, in none of the studies in the current dissertation positive relationships between goal clarification and need frustration or controlled motivation were found, which is important as some may assume that students may feel pressured to reach up to the goals or feel incapable of meeting the goals when goals are made transparent, which clearly was not the case.

Process feedback and students' motivational functioning. The present findings are in line with previous research investigating the need-based correlates of process feedback in the general education context (Levesque et al., 2004; Mouratidis et al., 2013; Pat-El et al., 2012), revealing that process feedback is positively related to students' perceived need satisfaction. The findings of the experimental manipulation in Chapter 5 were not in line with the findings of Chapter 4 regarding need satisfaction. However, the correlational findings in Chapter 5 were different compared to the experimental findings in Chapter 5, indicating that students' perceptions of process feedback positively correlated to need satisfaction. Moreover, in contrast to correlational findings of Chapter 4 and the experimental manipulation findings in Chapter 5, yet in line with recent findings by De Meester et al. (2020), the correlational findings in Chapter 5 showed that students reported that in lessons where students perceived to receive more process feedback, they felt less strongly like a failure, less pressured to perform well and less likely to be rejected by others. Given these conflicting findings, the studies in this dissertation did not provide sufficient basis to conclude that process feedback could lower students' feelings of need frustration.

The interplay between goal clarification and process feedback. Furthermore, by showing that perceived goal clarification and process feedback depend on each other, at least to a certain degree, empirical evidence for earlier claims (Hattie & Timperley, 2007; Sadler, 1989) was provided (Chapter 4). When students perceived that teachers provided both goal clarification and process feedback to a moderate degree, they experienced that their needs were relatively highly satisfied. Goal clarification and process feedback seem to build on each other's positive effects. Only at very high levels of process feedback, goal clarification did not add anything to students' needs and only at very high levels of goal clarification, process feedback did not add anything to students' needs. These findings fit our expectation that if either one is very salient (e.g., high levels of goal clarification), this may provide students with the opportunity to self-generate the other (e.g., self-generated process feedback or internal feedback) or infer the other (e.g., detect which goals were

critical based on the given feedback; Butler & Winne, 1995; Narciss, 2013). Such need-satisfying effects of goal clarification and process feedback were not confirmed in the experimental study in Chapter 5.

In sum, the results of this dissertation provide evidence that students' perceptions of the teachers' goal clarification and process feedback are positively related to students' need satisfaction in PE. Moreover, the presence of goal clarification also seems to positively impact students' need frustration, yet more research is needed to clarify how robust these findings are. Evidence was conflicting regarding the relationship between process feedback and students' experiences of need frustration with either negative or insignificant relations being found. Said differently, none of the studies revealed that process feedback increased feelings of failure, pressure and rejection. Together, the findings thus suggest that the motivating potential of assessment in PE can indeed be augmented by clarifying goals and providing process feedback.

Can Experiences of Need Satisfaction and Frustration Explain Why Assessment Impacts Motivation and Fear?

To increase our understanding why assessment impacts students' motivation and fear, the studies in this dissertation examined the potential explaining role of need satisfaction and frustration. Only two previous studies in the general education context and no studies in the PE context were available, examining the explaining role of need satisfaction in the relation between performance grades (Pulfrey et al., 2013), goal clarification (Pat-El et al., 2012), and intrinsic motivation. These authors revealed that lowered levels of autonomy satisfaction explained why students experienced less interest when being graded (Pulfrey et al., 2013) and higher levels of competence and relatedness satisfaction explained why students experienced more interest when they perceived that goals were clarified (Pat-El et al., 2012). The studies in this dissertation complemented the existing PE literature by empirically examining the specific explaining (i.e., mediating) role of need satisfaction and frustration in the relationship between either performance grading or goal clarification on the one hand, and students' motivational functioning and fear on the other hand.

The study in Chapter 2 showed that in lessons with presence of performance grading, students enjoyed and valued the lesson less, and reported to put effort into the lesson out of pressured reasons, felt more aloof and experienced more fear. Students felt this way because they experienced a sense of ineffectiveness, a lack of choice or freedom and a sense of disconnection to others (i.e., the mediating role of need satisfaction), and because they experienced fear of failure, pressure and rejection (i.e., the mediating role of need frustration). More specifically, decreased need satisfaction explained why performance grading diminished intrinsic motivation and identified regulation. These results are in line with previous research, in which it was shown that autonomy satisfaction explained the relation between performance grading and intrinsic motivation (Pulfrey et al., 2013) and complemented the literature by indicating that grades may decrease students' feelings of need satisfaction, which may then lead to a more controlled form of motivation, lack of motivation and fear. Need frustration explained the relation between performance grading and intrinsic motivation, external regulation, amotivation and fear. As no previous research is available to compare such results with, it is perhaps useful to use these results as a starting point in our understanding how to make PE assessment more motivating. Indeed, it seems vital for teachers to support students' need based-experiences, because when students experience more feelings of effectiveness, feelings of being in charge of their



learning and a sense of connection and mutual care, yet less feelings of failure, pressure and rejection during performance grading, this may positively affect students' motivation during PE assessment. To obtain such need-based experiences, it might be interesting for teachers to pursue (graded) assessments that are experienced by the students as more informational rather than controlling (Grolnick & Ryan, 1987; Ryan & Deci, 2020; Ryan & Weinstein, 2009). As shown in Chapter 3, one way to do so is by providing students with a clear idea of the lesson's goals.

Moving forward from performance grading, the study in Chapter 3 indeed complemented the study in Chapter 2 by examining whether need-based experiences explained the relations between goal clarification and students' motivation and fear. The study in Chapter 3 showed that when students have a goal towards which they can work, they enjoy and value the lesson more, and they feel less aloof. This is the case, because when having a goal towards they can work, students perceive more effectiveness in reaching their goals, they perceive to be more in charge of their learning trajectory, and they experience a more positive atmosphere in the classroom. In other words, need satisfaction explained the relation between goal clarification and autonomous motivation and amotivation. These findings are in line with previous research in the academic context, in which it was shown that competence, autonomy and relatedness satisfaction explained the association between goal clarification and intrinsic motivation (Pat-El et al., 2012). Moreover, given that goal clarification did not relate to need frustration in Chapter 3, no such explanatory mechanisms were found for need frustration.

In sum, this dissertation provides initial evidence that decreased need satisfaction and increased need frustration indeed can explain why, at least in some situations, performance grading negatively impacts students' motivation and fear in PE. Moreover, initial evidence is provided showing that when goals are clarified, students experience more need satisfaction, which in turn fosters positive motivational functioning in PE. Yet, more research is needed to clarify how robust these findings are. Overall, experiences of need satisfaction and frustration can indeed explain why assessment impacts students' motivation and fear in PE.

Can Variability in Goal Clarification and Process Feedback Explain Variability in Students' Need-Based Experiences?

Moving forward from empirical research that examined predominantly between-student differences in goal clarification and process feedback and students' motivational functioning, the studies in this dissertation examined within-student differences or lesson-to-lesson differences in goal clarification and process feedback and students' motivational functioning. During the past decade, scholars examining both the academic context (Mainhard et al., 2011; Tanaka & Murayama, 2014; Tsai et al., 2008) and the PE context (Bartholomew et al., 2018) showed that teaching behaviour (Bartholomew et al., 2018; Mainhard et al., 2011; Tsai et al., 2008) and motivational functioning (Bartholomew et al., 2018; Tanaka & Murayama, 2014; Tsai et al., 2008) can vary substantially from moment to moment or lesson to lesson. Whereas existing research has often relied on cross-sectional designs (e.g., Levesque et al., 2004; Pat-El et al., 2012), repeated measures designs are needed to recognise the existence of this variability over time (Murayama et al., 2017). The studies in this dissertation complemented the existing PE literature by empirically examining how variability in lesson-to-lesson goal clarification and process feedback covary with variability in lesson-to-lesson need satisfaction and frustration.

Findings in the present dissertation showed substantial differences from lesson to lesson in goal clarification, process feedback (Chapters 4 and 5), and need-based experiences (Chapters 2, 4 and 5), with variance ranging between 43% and 94%, which is in line with existing literature examining lesson to lesson differences in teaching strategies and motivational functioning (Bartholomew et al., 2018; Tanaka & Murayama, 2014; Tsai et al., 2008). This implies that, although the same teacher teaches the lessons, the degree to which students perceive goals and feedback to be clear, varies from lesson to lesson. In parallel, the degree to which students not only experience effectiveness, being in charge of their learning, and a positive classroom atmosphere, but also experience failure, pressure, and rejection, varies substantially from lesson to lesson. It may thus be possible that students experience that their teacher clarifies goals to a large extent in for instance the first lesson in a series of lessons, while in the following lessons, the students experience that their teacher does not communicate the goals that much, while at the end of a series of lessons, the teacher again emphasises the goals again in anticipation of a graded assessment. Similar reasoning can be applied to students' motivational functioning. It may thus be possible that a student feels very effective in one lesson, but in the next lesson, the student feels more ineffective or even incapable and like a failure. These findings suggest that it is possible and needed for teachers to influence students' motivational functioning every single lesson again.

Although not of our main interest, besides differences between lessons, some differences between students and between classes were found that are worth mentioning. Substantial differences between students and, to a smaller extent, differences between classes emerged in all four studies in this dissertation (Chapters 2, 3, 4 and 5), which is in line with previous research investigating differences between students (Bartholomew et al., 2018; Tanaka & Murayama, 2014; Tsai et al., 2008) and between classes or teachers (Cheon & Reeve, 2015; Cheon et al., 2016; Hay & Macdonald, 2008). The differences between students suggest that there might be student-level factors, such as students' prior experiences with PE or their motor competence levels that may determine their overall need satisfaction and frustration and motivation for PE. The smaller differences between classes suggest that there might be class-level factors, such as the way students were graded, the objectives of the lesson and the way lessons were aligned with the grading lesson, that can explain motivational differences.

In sum, the results of this dissertation provide evidence that perceived goal clarification and process feedback, and students' motivational functioning differ from lesson to lesson, but also between students and between classes. Student-level factors such as students' prior experiences with PE, and class-level factors such as the way the lesson is taught, are examples of factors that can explain motivational differences in PE. Specifically, variability in perceived goal clarification and process feedback indeed explained variability in students' need-based experiences.



Conclusion

Assessment and Motivation in Physical Education: An Integrated View on the Findings

The studies presented in this dissertation add to *the PE literature* by empirically exploring assessment and students' motivational functioning and fear, therewith contributing to *the development of an evidence base that can support PE teachers' motivational assessment practices*. Goal clarification and process feedback are deemed to be important elements of PE teachers' teaching and assessment practices (Georgakis & Wilson, 2012; Hay & Penney, 2009, 2013; López-Pastor et al., 2013; Ní Chóinín & Cosgrave, 2013), since they are viewed as fundamental to enhance students' learning. Although in the last decade goal clarification and process feedback have gained considerable interest in research and development on assessment in PE (e.g., Hay, 2006; Hay & Penney, 2009, 2013; Leirhaug & MacPhail, 2015; López-Pastor et al., 2013; Lorente-Catalán & Kirk, 2016; MacPhail & Halbert, 2010; Redelius & Hay, 2012; Svennberg et al., 2014), only three empirical studies were conducted examining the associations between assessment and students' motivation, showing that positive information-based feedback was unrelated to perceived competence satisfaction (Koka & Hein, 2003), positive information-based feedback especially decreased students' need frustration, yet was unrelated to students' need satisfaction (De Meester et al., 2020) and that an assessment with a formative purpose was positively related to more self-determined forms of motivation (Johnson et al., 2011).

Results presented in Chapter 2 add to this small body of research on assessment and motivation in PE by showing that, in line with existing literature from the academic educational context, more “traditional” forms of assessment in PE such as grading students' performance, may *potentially* cause feelings of failure and pressure (Chapter 2; see also Butler, 1987; Butler & Nisan, 1986; Grolnick & Ryan, 1987). Yet, effect sizes of these findings were small, and these findings were not replicated in Chapter 4. Therefore, further research should clarify how robust these findings (Chapters 2 and 4) actually are. Instead, assessment with a focus on growth, including communicating goals and providing process feedback, stimulate feelings of interest, relevance, effectiveness, feeling in charge of their learning, and experiences a positive classroom atmosphere during PE (Chapters 3 and 4; see also Levesque et al., 2004; Pat-El et al., 2012). Unique contributions of the current dissertation to the assessment and motivation field were provided by showing that need satisfaction and frustration are potential mediators in the relation between performance grading and students' motivation (Chapter 2), that need satisfaction mediates the relation between goal clarification and autonomous motivation and amotivation (Chapter 3), and that PE teachers' assessment strategies can influence students' need satisfaction and frustration every lesson again (Chapter 4). These are promising results in our search for assessment practices that allow to foster more positive motivational functioning during PE. Previous research, in which PE lessons were observed, indicated that the implementation of goal clarification and process feedback shows room for improvement (e.g., Leirhaug & Annerstedt, 2016; Leirhaug & MacPhail, 2015; López-Pastor et al., 2013) and that concrete evidence-based examples on how to provide goal clarification and process feedback are warranted (Georgakis & Wilson, 2012; Ní Chóinín & Cosgrave, 2013). Therefore, Chapter 5 added to the PE literature by quasi-experimentally examining goal clarification, process feedback and students' feelings of need satisfaction and frustration, using an experimental design that was based upon a concrete evidence-based motivating assessment example. That is, the experimental lesson in which goal clarification and process feedback

were manipulated. This PE lesson on handstand was highly motivating, as indicated by students, regardless of the experimental condition. The use of instructional videos with an innovative pedagogical content (see link⁵) was indicated to provoke this highly motivating atmosphere, as it provided students with structure, choice in level of difficulty and pace of practice (i.e., contributing to competence and autonomy satisfaction) as well as allowing classmates to collaborate intensively (i.e., contributing to relatedness satisfaction).

In sum, this dissertation provided unique contributions to the PE assessment and motivation field. First, goal clarification and process feedback can indeed augment the motivating potential of assessment in PE, whereas the performance grading was not indicated to be detrimental for students' motivational functioning and fear yet needs further investigation. Second, need satisfaction and need frustration have the potential to explain why students experience less self-determined forms of motivation and more controlled forms of motivation and amotivation as a function of performance grading. Third, feeling more need satisfaction is the reason why students experience more autonomous motivation and less amotivation when goals are clarified to a greater extent. Fourth, variability in PE teachers' clarification of goals and provision of process feedback can explain why students' need satisfaction and frustration varies from lesson to lesson. Fifth and final, a concrete evidence-based motivating assessment lesson example was provided.

Limitations and Future Directions

The studies presented in this dissertation have some limitations and also provide interesting directions for future research. The focus here is on overarching issues as study specific limitations and future directions have been addressed in the respective Chapters. Limitations that will be addressed here are related to (1) the complexity of the framework of assessment for learning, (2) the need for refined measures of goal clarification and process feedback, (3) the need to assess students' perceptions of assessment as being more judgmental or informational, (4) the need to examine actual teaching behaviour in goal clarification and process feedback and (5) the generalisability of the findings to other educational contexts.



The Complexity of the Framework of Assessment for Learning

Assessing students is a complex process and its impact may depend on many factors. The instructional processes “where is the learning going”, “where is the learner right now” and “how to get there” (Hattie & Timperley, 2007; Wiliam & Thompson, 2008) guide teachers *and* students during learning. The framework of assessment for learning (Leahy et al., 2005; Wiliam, 2011; Wiliam & Thompson, 2008) identifies clarifying goals and providing feedback that moves learners forward as key strategies. Moreover, the framework recognises the comprehensiveness of the concept (Wiliam & Thompson, 2008), with the complex role of different players in the classroom (i.e., teachers and students) that can be actively involved in assessment and the nature of the numerous activities it encompasses. Although it is important to acknowledge the interdependency of the key strategies (Wylie & Lyon, 2015) and to consider the active involvement in assessment of both the teacher and students, in the present dissertation, the focus was on the role of the teacher.

Chapters 3, 4 and 5 focussed on students' perceptions of the teachers' provision of goal clarification and process feedback as two specific strategies of this wide-ranging concept. The teacher as the assessor was chosen because in contemporary PE assessments,

assessment is largely driven by the teacher (Borghouts et al., 2017) and therefore, when aiming to examine existing ecologically valid PE contexts, choosing the teacher perspective would be most realistic and aligned with contemporary PE assessment contexts. Although in this dissertation, the focus was on the assessment-related behaviour of the teacher (i.e., items focussing on the *teacher* such as “my *teacher* talked to me about the progress I made”), this does not imply that students could not have played an active role in assessment as well (Wiliam & Thompson, 2008). Indeed, qualitative data in Chapter 5 suggests that students may have been able to self-generate the goals and provide feedback to themselves and others. Therefore, future research could address the active involvement of students in the assessment process in relation to their motivational functioning. The key strategy “activating students as instructional resources for one another” (Wiliam & Thompson, 2008) might directly activate students’ feelings of autonomy, competence and relatedness as they receive ownership over their own learning when providing each other feedback and constructing the way forward with students together. The potential influence of students as assessors in the classroom seems to be underlined by the previously discussed results regarding variability at the class- and student-level. Indeed, possible other factors, such as the extent to which students are involved in self- and peer-assessment could potentially explain such variability, impacting students’ motivational functioning. Taken together, this is an interesting issue for future research to explore.

The Measures of Goal Clarification and Process Feedback

The studies presented in Chapters 3 and 4 started from a relative recently developed and validated questionnaire that measured assessment for learning with a relatively large number (i.e., 28) of items: the ‘Student Assessment for Learning Questionnaire’ (SAFL-Q; Pat-El et al., 2013). Intending to stay as close as possible to goal clarification and process feedback as two key aspects of assessment for learning, the items that aligned best with these concepts were selected for measurement while reducing the number of items per construct. This reduction in the number of items was necessary to increase the feasibility of the repeated measures design in Chapter 4. However, several measurement issues were encountered. First, especially the construct validity of the variable goal clarification in Chapter 4 (three items: “the teacher told us what the criteria are by which my assignment will be evaluated”, “the teacher told us what we could learn from the assignments” and “I knew the areas I needed to work on to improve my results”) could be improved. This was confirmed by acceptable but rather low internal consistency values (i.e., $\omega = 0.66$ at time point 2 and 4). Moreover, a better differentiation between the constructs goal clarification and process feedback could be strived for ($r = 0.60$ in Chapter 4). While developing the research presented in Chapter 5, both the goal clarification and process feedback scales were improved according to the above insights. Both newly developed scales showed good internal consistency and were validated successfully. Yet note that in the research presented in Chapter 5, these concepts were operationalised close to the actual PE context, as these items were designed to function as a manipulation check in a quasi-experimental study with an experimental lesson on handstand. One example of a goal clarification item was “During the beginning of the last PE class, the teacher explained what goal she wanted to achieve” and an example of a process feedback item was “While we were practising during the last PE class, the teacher told me how to improve my handstand”. It would be interesting for future research to explore whether the validity of the in the current dissertation developed goal clarification and process feedback questionnaire (Chapter 5) would be confirmed in different samples and contexts. In such a case, small adaptations will be required to fit new contexts. Moreover, it would be interesting to develop

new scales fitting other key-strategies of the assessment for learning framework, thereby for instance taking the student perspective (Leahy et al., 2005; Wiliam & Thompson, 2008).

Students' Perceptions of Performance Grading Being More Judgmental or Informational

The present dissertation did not measure whether students perceived performance grades as predominantly a judgment of their performance, or predominantly informational. Such data could help to understand why students from the sample described in Chapter 2 experienced pressure to perform well during performance grading (i.e., controlling significance; Ryan & Deci, 2020) while students in the sample described in Chapter 4 gave a different meaning to their grade (i.e., informational significance; Ryan & Deci, 2020), perhaps because during the course of several lessons, students were informed of what was expected in their assignment and perhaps they were provided with information about their strengths and aspects they could improve. Such insights would help to deepen our understanding about PE assessments, an interesting issue for future research to explore.

Goal Clarification and Process Feedback: Students' Perceptions Versus Actual Teaching Behaviour

The present dissertation highlighted goal clarification and process as motivating teaching strategies. More specifically, results showed that when students *perceived* that their teachers clarified goals and provided process feedback to a greater extent, students felt positively stimulated in their need-based experiences and motivational functioning (Chapters 3 and 4). As such, no evidence was provided yet to conclude that when teachers clarify goals and process feedback to a greater extent, students experience more need satisfaction. Especially since the experimental study in Chapter 5 did not demonstrate any differences according to the changed teaching behaviours. It is thus unclear at this stage which factors influence students' perceptions of goal clarification and process feedback the most. Next to the actual teaching behaviour, other factors can also potentially influence students' perceptions such as for instance their prior knowledge. Results from this dissertation underline such assumptions, showing that, although students were taught by the same teacher, they experienced differences in the way that their teacher clarified goals and provided process feedback. To investigate whether students' perceptions differ compared to actual teaching behaviour and whether other factors influence students' motivational functioning, future research is needed.

Generalisability to Other Educational Contexts

Assessment practices that are examined in this dissertation, such as performance grading, clarifying goals and providing process feedback, are relevant to academic contexts as well (Barenberg & Dutke, 2013; Butler, 1987; Butler & Nisan, 1986; Pulfrey et al., 2013). However, the results found in this dissertation may be more difficult to generalise to more academic settings as there are some clear differences between PE and academic courses. First, judgments of performances in academic courses such as mathematics are communicated on the school report and will be considered when determining whether students may enter the next schoolyear. This is not entirely the same for PE. Judgments of performances in PE are communicated on the report card in most schools (Borghouts et al., 2017; reporting on data from $n = 260$ Dutch PE departments). Although a relatively large group of schools (i.e., 77%) indicates to take these reported PE grades into account when determining whether students may enter the next year (Borghouts et al., 2017), in general, students do not repeat a schoolyear when failing PE. Therefore, it is questionable whether



PE grades in such a context are perceived as “high stakes”. Second, in many countries, accountability regarding learning outcomes in academic courses is higher due to centralised (national, state-wide, etc.) exams compared to accountability in PE, where centralised exams are often absent. Often, PE departments have a relatively high autonomy in designing their assessments (e.g., Dauenhauer et al., 2019; Md-Ali & Veloo, 2017; Svennberg et al., 2018). The result of this might be that if teachers notice that pre-defined objectives are too demanding for students, goals and expectations are adjusted downwards. Such differences between academic subjects and PE may clarify why the studies in the present dissertation did not find sufficient basis to conclude that the presence of performance grading in itself negatively impacts students’ motivational functioning in PE, while studies in the academic context did find grading to negatively impact motivation (Butler, 1987, 1988; Butler & Nisan, 1986; Pulfrey et al., 2011). In the present dissertation, information about performance grading was mapped out in a more generic way. No information was gathered to indicate whether PE grades were reported on report cards, whether such PE grades affected the transition to the next school year, whether teachers perhaps adjusted the difficulty of their goals and whether grades were accompanied with oral qualitative feedback. To further unravel such assessment practices and examine relations with students’ motivational functioning, future research is needed.

Recommendations for Practice

How can teachers assess students in a more motivating way while teaching in contemporary – performance grade driven – physical education? Changing this performance grade driven educational system or even, as suggested by some, to abolish grades altogether, is not per se supported by the evidence provided in this dissertation (Chapters 2 and 4). Results do not provide sufficient basis to conclude that the presence of performance grading in itself negatively impacts students’ motivational functioning and fear in PE. Yet, the findings of this dissertation do suggest that from a motivational perspective, it is important to inform students, next to performance grades, about goals and to provide step-by-step guidance in their learning progress (Chapters 3, 4 and 5; either as students’ perceptions of the teachers’ teaching behaviour or as students’ perceptions of a specific pedagogical approach using instructional videos). This is important because when students are well-informed about their progress in learning and aware of their effectiveness in the task at hand, judgments of the quality of their learning such as performance grades are potentially no surprise to these students, and therefore may not affect students’ motivational functioning negatively. Working with a mix of assessments that have either predominantly a summative or a formative function, is in line with the wider educational assessment literature (Black, 2015; Laveault & Allal, 2016) and recent PE assessment literature (AIESEP, 2020). If the function of summative assessment is to evaluate student learning at the end of an instructional unit by comparing it against the learning goals, and the function of formative assessment is to monitor student learning to provide ongoing feedback towards those goals, then their combined use seems to inform students on their learning. Both an informed judgment of performance and information on how to improve to achieve the targeted goal is provided. Thus, demands for accountability, the need to improve learning and the need to stimulate students’ motivational functioning are met. Indeed, Black (2015, p. 162) argues that “an approach using marriage guidance rather than divorce must be chosen”.

The question how to assess in a more motivating way while teaching in contemporary physical education and the need for more knowledge on this topic has also been addressed by an international group of PE scholars and PE teacher educators (AIESEP, 2020). In that respect, this dissertation responds to their recently communicated need (AIESEP, 2020). This need has in recent years also been frequently expressed by PE teachers that are members of the Dutch PE union (Lucassen, 2014; Lucassen & Komen, 2020). This is because, most of these PE teachers are familiar with students that do not want to participate in, for example, an endurance run because they know beforehand that they will fail the test (which is measured using a time-table).

Although assessment and students' motivational functioning are debated quite intensively in the Dutch PE teaching community via for instance professional publications (e.g., Borghouts, 2019; Krijgsman et al., 2018; Weeldenburg et al., 2018), continuing professional development at PE conferences and on-site training sessions, the need for more knowledge and practical tools remains (Lucassen & Komen, 2020). This need is perhaps a logical consequence of the current PE assessment system in the Netherlands, in which physical educators on average teach only three to four lessons on one topic (e.g., a series of lessons on endurance running) and subsequently assess all students by means of a performance grade in the final lesson. These performance grades are mostly judgments of quality that are based on teachers' observations, or outcome measurements (time, height, number of scores; Borghouts et al., 2017). If there is little time for actual learning in PE, then opportunities for (acting on) process feedback will also be limited for students.

Taking into account this contemporary PE assessment system, based on the results of this dissertation, my personal experience as a PE teacher and my experience as a facilitator of a teacher learning community on this topic (Wiliam, 2006; Wiliam & Thompson, 2008), I hereafter aim to provide motivating assessment strategies that can help teachers and teacher educators who want to assess in a more motivating way. Therefore, in this section, I will describe which opportunities I see for the implementation of motivating assessment, focussing on four recommendations for educational practice. Then, I will conclude with the challenges ahead of us in the implementation process.

Opportunities for the Implementation of Motivating Assessment

Results of the present dissertation showed that when teachers clarify goals and provide process feedback, students' motivational functioning is positively influenced. Should we then stop grading students as a judgment of their performance? No. Results presented in this dissertation provide no sufficient basis to conclude that the presence of performance grading in itself negatively impacts students' motivational functioning and fear in PE. Yet, how can we assess in a more motivating way? In this section, I provide four practical recommendations to PE teachers, rooted in the key educational message from this dissertation:



The key message for educational practice:

*The results in this dissertation imply that it is important for educational practitioners, teacher educators and researchers to focus on **goal clarification, process feedback, competence satisfaction, autonomy satisfaction and relatedness satisfaction** and to translate and implement these theoretical concepts into practically applicable teaching-strategies.*

Recommendation 1: Apply a well-considered mix between assessments with a summative purpose such as performance grading, and assessments with a formative purpose such as goal clarification and process feedback and emphasise its informational value in both situations.

By intelligently mixing both purposes of assessment (AIESEP, 2020; Laveault & Allal, 2016), students receive grades, yet not too many. It is noted that currently a disbalance exists in assessments with a summative purpose such as performance grading, and assessments with a formative purpose such as goal clarification and process feedback (Onderwijsraad, 2018). The emphasis is on the summative function of assessment in current educational systems, while there is a need for more goal clarification and process feedback during the learning trajectory, so that students know where to go and what can be improved. Applying a well-considered mix is supported by the data of this dissertation and will stimulate that (1) students, parents, teachers and school leaders, who are used to working with grades, instantly have “an understanding” of the meaning of the grades and students’ performance in PE, (2) students can improve their learning and (3) students feel more effective, perceive to be in charge of their learning and experience a positive classroom atmosphere.

As a teacher, you could discuss with your PE department what balance exists in your PE curriculum between assessments with a summative purpose and assessments with a formative purpose. How many times are students assessed with a summative purpose? What do such assessments yield? What do students learn in the amount of time before receiving an assessment with a summative purpose? Do you and your colleagues sufficiently explain learning goals and provide students with process feedback, and as a consequence, are students informed about the reason why they for instance receive 7 out of 10 points?

Recommendation 2: Mix intelligently – Try to align goals, process feedback and the graded assessment of students’ performance.

When teachers want to intelligently mix both purposes of assessment (i.e., summative and formative) and stimulate students’ feelings of effectiveness (i.e., competence satisfaction), being in charge of their learning (i.e., autonomy satisfaction) and create a positive classroom atmosphere (i.e., relatedness satisfaction), it is important that goals, expectations and success criteria, learning activities, feedback on how to improve and the graded assessment are aligned (Biggs, 1996; Borghouts et al., 2015; MacPhail et al., 2013; Penney et al., 2009).

As a teacher, you could discuss with your PE department how the current PE curriculum is structured. Does this match the overarching competencies (i.e., motor competencies, social behaviour, game tactics, organisational skills or other aspects) that the PE department considers important in students' learning? When (re)designing the curriculum, do not start out with planning activities. The national core objectives and learning outcomes of PE should be used as a starting point in building the curriculum. From these, derive learning outcomes for specific learning units and subsequently choose or develop appropriate (graded) assessment tasks. Finally, design learning activities and process feedback to optimally support student learning, in line with the learning outcomes and assessment. The articles "Toetsing als kans voor leren" (Sluijsmans, 2020) and "Doelen, lessen en beoordelen: één geheel" (Borghouts et al., 2015) might serve as inspiration.

Recommendation 3: Choose one strategy of preference to start with, look for various ways of implementation and try to follow through in every lesson.

How can teachers implement goal clarification and process feedback? By focusing on one strategy, adjustments to regular teaching are kept small. This is important, because in order to "make it work" in educational practice, it is essential to take small steps when integrating a new strategy in existing teaching-routines (Leahy & Wiliam, 2012). Moreover, focussing on one strategy is supported by the data of this dissertation, as results imply that by focussing on for instance goals, students may self-generate their own process feedback, providing them with feelings of being in charge of their learning process (i.e., autonomy satisfaction). Results from this dissertation also imply that, although students are taught by the same teacher, (1) not all students understand the goals and feedback to the same extent as other students and (2) students experience differences in the extent to which the teacher explains goals and feedback. Therefore, it would be valuable if (1) teachers could clarify goals and provide process feedback in various ways, trying to reach as many students as possible and if (2) teachers focus every lesson again on goal clarification and process feedback (referred to as the "short-cycle" type of formative assessment; Wiliam, 2006).



As a teacher, you could explicitly include strategies for goal clarification and process feedback in your lesson preparations. Experiment with these teaching strategies, every lesson again. Do not worry if anything does not work out according to plan, because every lesson is a new opportunity to clarify goals and to provide process feedback. The books "Embedded Formative Assessment" (Wiliam, 2018) and "Wijze Lessen" (Surma et al., 2019) provide practical examples how to implement goal clarification or process feedback in the classroom. These books might serve as inspiration.

Recommendation 4: Implement goals and process feedback in a motivating way.

Both goal clarification and process feedback can be translated into practically applicable motivating assessment strategies. For each assessment strategy, three examples are given below: one motivating assessment strategy for each basic psychological need.

If goal clarification is chosen as the preferential strategy:

- Competence satisfaction. Communicate clear and feasible yet challenging goals, that leave room for differentiation for students of various proficiency levels. Insight in when a task is completed successfully and working on tasks that are not too easy and not too difficult (thus challenging), will foster students' feelings of effectiveness.

- **Autonomy satisfaction.** By communicating clear and feasible yet challenging goals, it is possible to provide students with choices. For instance, choice in task level of difficulty, in pace and in timing of feedback requests. This will nurture students' feelings of volition and feelings of being in charge of one's own learning process. For example by using the instruction videos⁶ that were developed for the study that is presented in Chapter 5, students could (1) choose on which level of difficulty they wanted to participate by choosing the green, blue, red or black slope, and they could (2) choose in which pace they wanted to work.
- **Relatedness satisfaction.** By communicating clear and feasible yet challenging goals, it is possible to organise the class in small groups that work cooperatively. By communicating with others in the group about the learning goals, where they stand towards these goals and helping each other to achieve them, students' feelings of a positive classroom atmosphere will be nurtured, provided that students are well-supported in this process.

If providing process feedback is chosen as the preferential strategy:

- **Competence satisfaction.** Start with explaining what aspects of the task are executed successfully. Then, explain what the student could try to improve while keeping in mind that the proposed steps to be taken should be feasible yet challenging for the student. Insight in (small) successes and how to improve with feasible yet challenging steps will foster students' feelings of effectiveness.
- **Autonomy satisfaction.** You can offer process feedback with an internal focus (i.e., "If you want to improve your practice, you could try to squeeze your bottom together.") and with an external focus (i.e., "If you want to improve your practice, you could try to position your back on the landing mat and your feet on the floor. Can you make a plank?"). While communicating this, try to use inviting language such as "you could try to..." instead of pressuring language such as "you must...". By providing choice and applying inviting language, you will nurture students' feelings of volition and feelings of being in charge of one's own learning process.
- **Relatedness satisfaction.** When explaining what aspects of the task are executed successfully and what can be improved, try to express positive support regardless of success or failure. Encourage the student to pose questions regarding their progress. By demonstrating unconditional respect, care and support and by encouraging to pose questions, an open and collaborative relation will be created that promotes a warm and positive classroom environment.

The videos in this link⁷ show a practical example of how goal clarification, competence satisfaction, autonomy satisfaction and relatedness satisfaction can be implemented in PE. The document that can be downloaded in this link⁸ show a practical example of how process feedback, competence satisfaction and autonomy satisfaction can be implemented in PE. See Chapter 5 for more information. Furthermore, the book "Motiverend Coachen in de Sport" (Aelterman et al., 2017) provides practical examples how to support students' feelings of competence, autonomy and relatedness in the classroom. These might serve as inspiration.

6 <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>

7 <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>

8 <https://www.tandfonline.com/doi/suppl/10.1080/17408989.2020.1823956?scroll=top>

Finally, professional development for teachers is essential when aiming to implement motivating assessment strategies into daily practice (Aelterman et al., 2013, 2012; Cheon et al., 2016, 2019, 2020; Slingerland et al., 2017; van Tartwijk et al., 2017). One way to achieve such professional development is by providing teachers with a training that includes a theoretical part, a translation part, and an exploration part. During the theoretical part, teachers might learn about the theoretical background of the motivating assessment strategies provided. During the translation part, theory is translated into daily practice by for instance discussing and experiencing lesson examples (for example as used in Chapter 5) or applying a “toolbox” with motivating assessment strategies. During the exploration part, lessons are co-created in teacher learning communities and these co-created lessons are then taught, evaluated and revised within these communities. For this process to be successful, several challenges can be identified.

Challenges in Implementing Motivating Assessment

From literature that describes the implementation or improvement of the practice of assessment for learning (Black, 2015), which is in line with my personal experience as a teacher and as a facilitator of a teacher learning community (Wiliam, 2006; Wiliam & Thompson, 2008), I know that implementing goal clarification and process feedback is by no means an easy project to undertake.

Paul Black (2015, p.171) provides an explanation why educators struggle with the implementation of goal clarification and process feedback: “For many teachers, adopting formative assessment [assessment for learning] practices is difficult because it involves a radical change in the way in which they relate to their students and the ways they behave in the classroom. What is called for is nothing less than a change in the ways they perceive, and strive to implement, their role as teachers.” And as Paul Black and Dylan Wiliam (1998, p.146) pointed out already more than 20 years ago: “The improvement of formative assessment [assessment for learning] cannot be a simple matter. There is no “quick fix” that can be added to existing practice with promise of rapid rewards”. The strong wording used by these authors such as “radical change in classroom behaviour” and “no quick fix”, was confirmed by implementation issues when teachers tried to implement key strategies of assessment for learning such as goal clarification and process feedback in practice (Black, 2015). To raise awareness of current difficulties in implementation, several of those issues are highlighted here.

First, teachers experience tension between the investment in assessment for learning teaching strategies and the pressures of the testing instruments used to satisfy demands for accountability (Birenbaum et al., 2015; Flórez Petour, 2015), a tension that also operates as an obstacle for students (Jonsson et al., 2015). For example, when at the end of a learning process the final grades were about to be received, students wanted an opportunity to “fix things” in order to “get” a certain mark (Jonsson et al., 2015).

Second, the difference between top-down models of innovation and bottom-up initiatives is indicated as a problem. When aiming for a large-scale implementation in a whole district or school, a top-down approach might be appropriate. Although top-down approaches may vary across a spectrum ranging from supported exploration to imposed work, it is not surprising that not all teachers are willing to cooperate (Hopfenbeck et al., 2015).



Third, the lack of understanding of the concept assessment for learning (i.e., lack of assessment literacy; AIESEP, 2020; Starck et al., 2018) and the slow pace of teacher change is another issue that needs to be acknowledged and accepted. Indeed, because “normal” work moves forward at a fast pace, there is little time for reflective thought for teachers and as a result, assessment behaviours are driven by habit (Leahy & Wiliam, 2012; Wiliam, 2018). Therefore, time to learn in collaboration with colleagues (i.e., teacher learning communities; for recommendations how best to organise such communities, see Leahy & Wiliam, 2012), time to experiment in the classroom and resources and guidance are essential in this process (DeLuca et al., 2015; Leahy & Wiliam, 2012).

While the core responsibility of these issues lies with policymakers (national level), school leaders (school level) and teachers (class level), the research presented in this dissertation predominantly targeted *students’* experiences of their teachers’ provision of goal clarification and process feedback at the classroom level. Yet, by showing in this dissertation that students’ perceptions of teachers’ provision of goal clarification and process feedback can augment students’ motivational functioning, I believe that it is essential to start with addressing this third issue of teachers’ assessment literacy. Indeed, in order to master the proposed motivating assessment strategies, school leaders need to acknowledge this issue and facilitate teachers with time, resources and guidance (Sluijsmans, 2020).

I started this dissertation with the following quote and I would like to end with it as well:

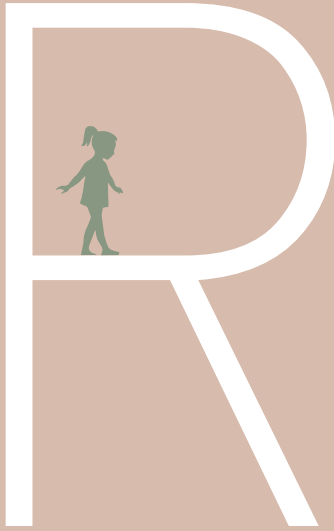
“...some educators and policymakers mistakenly assume that grades are an effective motivational strategy. They believe that by grading students they are “incentivising” effort as well as providing “feedback”. Yet as research by Butler (1987) and our own work has shown, grades by themselves typically provide little competence relevant feedback; they merely let students know where they stand relative to others”.

Ryan and Deci (2020, p. 6)

Richard Ryan and Edward Deci point towards a common and often heard assumption among educators, namely that students are more motivated to participate in their lessons when they know that they will be graded in the near future. I believe that this quote provides interesting food for thought for educators.

Based on the findings of this dissertation, I can agree with Ryan and Deci's argument. The present dissertation provided sufficient evidence to conclude that it is mistakenly assumed that grades positively affect students' motivation. Yet, it remains unclear whether grades *by themselves* indeed have a negative impact on students' motivation, and thus should be avoided. Foremost the following message should be remembered: goal clarification and process feedback are effective assessment strategies when it comes to fostering students' motivation.





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Nederlandse samenvatting
(summary in Dutch)

Nederlandse samenvatting

In hedendaagse onderwijssystemen over de gehele wereld is evaluatie door middel van cijfers volledig geaccepteerd (Ames, 1992; Lingard, 2010; Strain, 2009). In dergelijke onderwijssystemen weerspiegelen cijfers een oordeel van de leerprestatie, leeruitkomsten of leerproducten aan het einde van het onderwijsleerproces (Dochy & Struyven, 2011). Tegelijk vindt evaluatie ook plaats om het leren van leerlingen te stimuleren. Bijvoorbeeld wanneer een docent doelen stelt en op groei gerichte feedback geeft om leeractiviteiten van leerlingen te structureren (Wiliam, 2011; Wiliam & Thompson, 2008). Deze vorm van evaluatie, bekend als “assessment for learning” in de Angelsaksische literatuur en “evalueren om te leren” in de Nederlandstalige literatuur (Dochy & Struyven, 2011), is wereldwijd bezig aan een opmars, maar heeft nog lang geen structurele plek in het onderwijs verworven. Dit geldt voor zowel de cognitieve vakken (Black, 2015; Hopfenbeck & Stobart, 2015; Leahy & Wiliam, 2012), als voor de lichamelijke opvoeding (LO) (Borghouts et al., 2017; López-Pastor et al., 2013). Uit de bredere onderwijs-literatuur is het bekend dat wanneer leerlingen cijfers voornamelijk ervaren als een oordeel van hun prestaties, dat dit de motivatie van leerlingen negatief kan beïnvloeden (Butler, 1987; Butler & Nisan, 1986; Grolnick & Ryan, 1987). Ze willen wellicht voorkomen dat ze als mislukkeling en als onbekwaam gezien worden door klasgenoten (McDonald, 2001; Ryan & Weinstein, 2009). Dit zou temeer kunnen gelden voor de les LO waar iedereen kan zien hoe vaardig leerlingen zijn. Wanneer evaluatie ingezet wordt om het leren te verbeteren, verwachten we, wederom gebaseerd op de bredere onderwijsliteratuur, positieve motivationele uitkomsten (Levesque et al., 2004; Pat-El et al., 2012).

Tot dusver is de wetenschappelijke kennisbasis over de samenhang tussen prestatiecijfers, doelen stellen en op groei gerichte feedback, motivatie en angst in de context van de les LO gering (voor uitzonderingen zie Johnson et al., 2011; Koka & Hein, 2003). Resultaten uit deze studies tonen aan dat wanneer leerlingen ervaren dat evaluatie gericht is op leren en vooruitgang, ze meer plezier hebben, interesse tonen en belang zien van de les. Er is echter nog weinig bekend over prestatiecijfers, doelen en op groei gerichte feedback, en de samenhang met motivatie en angst van leerlingen in de les LO. Ook is er weinig bekend over de redenen die een eventuele samenhang kunnen verklaren.

De onderzoeksvraag die in dit proefschrift centraal staat is: “Op welke manier zijn prestatiecijfers, het inzichtelijk maken van doelen en het geven van op groei gerichte feedback gerelateerd aan de motivatie en gevoelens van angst van leerlingen in de les LO?”. In deze Nederlandse samenvatting wordt eerst de achtergrond van deze vraag beschreven. Vervolgens worden de individuele studies van dit proefschrift gepresenteerd. Deze Nederlandse samenvatting wordt afgesloten met een discussie van de onderzoeksresultaten inclusief aanbevelingen voor de lespraktijk.

Achtergrond van de onderzoeksvraag

Prestatiecijfers als kwaliteitsoordeel aan het einde van een leertraject

Leerlingen worden bij LO gedurende het schooljaar regelmatig beoordeeld door middel van een cijfer dat gericht is op hun motorische prestaties (Borghouts et al., 2017; European Commission/EACEA/Eurydice, 2013). Door het geven van een cijfer leggen docenten

individuele prestaties van leerlingen op een bepaald moment in de tijd vast. Zodanig heeft evaluatie een summatieve functie. Docenten rapporteren op deze manier naar belanghebbenden zoals ouders, mentoren, schoolleiders en onderwijsinspectie. Cijfers kunnen gegeven worden aan de hand van criteria (Redelius & Hay, 2012) of in vergelijking tot anderen (Chan et al., 2011; Elliot & Moller, 2003; Johnson et al., 2011). Welke manier ook gekozen wordt, door middel van cijfers kunnen leerlingen zichzelf met anderen vergelijken. In de onderwijspraktijk blijkt dat dit ook veel gebeurt. Onderzoekers beargumenen daarom dat het geven van cijfers tot sociale vergelijking aanmoedigt (Ames, 1992; Elliot & Moller, 2003), een fenomeen dat verder gestimuleerd zou kunnen worden door de “zichtbaarheid” van leerlingprestaties in de les LO (Annerstedt & Larsson, 2010; Johnson et al., 2011; Redelius & Hay, 2012).

Doelen en op groei gerichte feedback bekeken vanuit een “evalueren om te leren” perspectief

Leerlingen kunnen ook geëvalueerd worden met een meer informerende functie. Men spreekt dan van “evalueren om te leren” en deze term wordt gedefinieerd als “het proces van informatie verzamelen en interpreteren, zodat leerlingen en docenten kunnen bepalen welk niveau de leerlingen nu hebben, waar ze naartoe willen werken en hoe ze daar het beste kunnen komen” (Broadfoot et al., 2002). Een essentieel kenmerk van deze evaluatiebenadering is het informatie verzamelen om het leren van leerlingen bij te sturen en te bevorderen (Dochy & Struyven, 2011; Sadler, 1989; Wiliam, 2011).

Het stellen van doelen en het geven van op groei gerichte feedback zijn twee belangrijke lesgeef-strategieën binnen het theoretisch kader van evalueren om te leren (Wiliam, 2011; Wiliam & Thompson, 2008). Door transparante en specifieke doelen te stellen (Hattie & Timperley, 2007; Sadler, 1989; Wirth et al., 2009), geven docenten aan leerlingen de benodigde informatie zodat zij zelf kunnen bepalen hoe ze het beste hun leren voort kunnen zetten. Als leerlingen begrijpen wat het doel van de les is, kunnen ze meer zelfregulerend werken, aangezien ze kunnen bekijken wat hun huidige niveau is in vergelijking met het beoogde doel (Andrade & Du, 2005; Moeller et al., 2012; Winstone et al., 2017). Op groei gerichte feedback geeft leerlingen concrete suggesties hoe ze zichzelf kunnen verbeteren (Butler & Winne, 1995; Harks et al., 2014; Hattie & Timperley, 2007; Peterson & Irving, 2008).

Prestatiecijfers, evenals doelen en op groei gerichte feedback, bekeken vanuit een motivatie perspectief

Hoe prestatiecijfers, evenals het stellen van doelen en het geven van op groei gerichte feedback, leerlingen kan (de)motiveren in hun leerproces, kan verklaard worden vanuit de Zelf-Determinatie Theorie (ZDT; Deci & Ryan, 2000; Ryan & Deci, 2017; Ryan & Deci, 2020). Het *doel van de evaluatie* (het waarom) dat door de leerlingen ervaren wordt als ze cijfers krijgen, doelen gesteld worden of als op groei gerichte feedback gegeven wordt, zal variëren (Nolen, 2020). Dit zal variëren door bijvoorbeeld hoe evaluatie toegepast wordt en hoe erop gereageerd wordt door docenten en ouders. Volgens ZDT beïnvloedt het doel van de evaluatie de motivatie van de leerling. Zo kan een evaluatie meer beoordelelend zijn, ZDT spreekt dan van een “controlerend doel van de evaluatie”. Of een evaluatie kan meer informierend en behulpzaam zijn, ZDT spreekt dan van een “informierend doel van de evaluatie” (Ryan & Deci, 2020). Afhankelijk van het doel van de evaluatie zullen leerlingen deelnemen aan de les om verschillende motieven. Redenerend vanuit de ZDT kunnen leerlingen meedoen omdat ze de activiteit heel erg leuk, interessant of uitdagend vinden (intrinsieke motivatie). Anderen doen mee omdat ze sport en bewegen belangrijk



vinden, bijvoorbeeld voor hun gezondheid (geïdentificeerde regulatie). Weer anderen zetten zich in omdat ze druk voelen om dit te doen. Druk die een leerling zichzelf oplegt, bijvoorbeeld door jezelf schuldig te voelen als je niet zou deelnemen (geïntrojecteerde regulatie). Of druk die door iemand anders wordt opgelegd, bijvoorbeeld het gevoel 'het goed te moeten doen' omdat een ouder dat verwacht (externe regulatie). Ook kan een leerling helemaal geen initiatief tonen om deel te nemen (amotivatie). Intrinsieke motivatie en geïdentificeerde regulatie zijn de meest optimale vormen van motivatie (autonome motivatie), omdat ze in de grootste mate bepaald zijn door de persoon zelf en dus meer vrijwillig zijn. Geïntrojecteerde regulatie en externe regulatie zijn minder optimale vormen van motivatie (gecontroleerde motivatie), omdat ze in minder grote mate bepaald zijn door de persoon zelf en meer ontstaan vanuit een gevoel van druk.

De belangrijkste vraag is *waardoor* het komt dat leerlingen intrinsieke motivatie of geïdentificeerde regulatie ervaren. De Zelf-Determinatie Theorie legt uit dat de drie “psychologische basisbehoeften” hierin een rol spelen: competentie, autonomie en verbondenheid. Het is belangrijk dat leerlingen het gevoel hebben bekwaam te zijn (competentie bevrediging), het gevoel hebben zelf invloed te hebben op het eigen leerproces (autonomie bevrediging) en het gevoel hebben dat anderen hen mogen en er een fijne sfeer in de klas gecreëerd kan worden (verbondenheid bevrediging). Wanneer alle drie de behoeften worden vervuld, zal de autonome motivatie gunstig worden beïnvloed (Niemiec & Ryan, 2009). De basisbehoeften kunnen ook op een negatieve wijze beïnvloed worden. Er wordt dan gesproken van behoeftefrustratie (Vansteenkiste & Ryan, 2013). Zo kunnen leerlingen het gevoel krijgen “er niks van te kunnen” (competentie frustratie), het gevoel hebben dat er dwang wordt uitgeoefend (autonomie frustratie) of dat ze niet gewaardeerd worden (verbondenheid frustratie). Wanneer de basisbehoeften worden gefrustreerd, hangt dit samen met gecontroleerde motivatie en amotivatie (Haerens et al., 2015).

Studies die gebaseerd zijn op de Zelf-Determinatie Theorie, beschouwen het stellen van doelen en op groei gerichte feedback als componenten van een structurerende lesgeefstijl (Aelterman et al., 2019; Jang et al., 2010; Skinner & Belmont, 1993). Structuur in de les draagt bij aan autonome motivatie en leren (Vansteenkiste et al., 2012). Doelen en feedback worden geacht bij te dragen aan de gevoelens van bekwaamheid (competentie) van de leerlingen, doordat het stellen van doelen en op groei gerichte feedback de vaardigheden van leerlingen mogelijk zullen verbeteren (Mouratidis et al., 2013). Als leerlingen de doelen van de les begrijpen, kunnen ze zelf beter bepalen hoe hun leren verbeterd kan worden en zullen ze daarmee meer eigenaarschap (autonomie) in hun leerproces ervaren (Butler & Winne, 1995). Bovendien, in een klas waar een sfeer heerst waar leerlingen consequent werken om de eigen bekwaamheid te verbeteren en daarbij eigenaarschap ervaren, kan een positief en behulpzaam klimaat gecreëerd worden (verbondenheid; Pat-El et al., 2012). Aan de andere kant, inzicht in doelen zou ook negatief kunnen samenhangen met gevoelens van “die doelen nooit te kunnen halen” (competentie frustratie) en gevoelens van dwang “om die doelen te moeten halen” (autonomie frustratie).

Overzicht van de studies in dit proefschrift

De relatie tussen cijfers, motivatie en angst

Literatuur die gebaseerd is op onderwijs in de cognitieve vakken (met uitzondering van Johnson et al., 2011) toont aan dat als gevolg van prestatiecijfers, vooral als leerlingen

ze ervaren als een eindoordeel van de leerprestatie aan het einde van het onderwijsleerproces, leerlingen minder plezier en interesse beleven (intrinsieke motivatie; Butler, 1987, 1988; Butler & Nisan, 1986; Grolnick & Ryan, 1987; Pulfrey et al., 2011), meer druk ervaren (externe regulatie) en geen initiatief tonen om deel te nemen aan de les (amotivatie; Johnson et al., 2011). Om beter te begrijpen hoe cijfers precies samenhangen met motivatie, is het belangrijk om de samenhang tussen cijfers en alle individuele regulaties (intrinsieke motivatie, geïdentificeerde, geïntrojecteerde en externe regulatie) te onderzoeken (Gagné et al., 2015; Taylor et al., 2014). Daarnaast is het onbekend op welke manier cijfers samenhangen met behoeftebevrediging en -frustratie en of deze psychologische basisbehoeften de relatie tussen cijfers en motivatie en angst kunnen verklaren. In **Hoofdstuk 2** wordt daarom een cross-sectionele studie gepresenteerd. Hierin wordt onderzocht of (1) tijdens een les waarin leerlingen wel of geen cijfer krijgen of leerlingen verschillende motieven hebben om deel te nemen aan de les LO en of er verschillen zijn in de mate van ervaren angst (2) of deze motieven en angst verklaard kunnen worden door behoeftebevrediging en behoeftefrustratie.

Een groep van 409 leerlingen uit 31 klassen uit het voortgezet onderwijs werd door middel van vragenlijsten bevraagd. Dit gebeurde tijdens twee lessen LO die gegeven werden door hun eigen docent. De eerste keer werden leerlingen bevraagd tijdens een reguliere les, de tweede keer tijdens een les waarin een cijfer werd gegeven. Docenten beoordeelden de leerlingen zoals ze gewend waren. Bij alle klassen was dit een cijfer voor motorische vaardigheid, of een cijfer voor motorische vaardigheid, verweven met inzet. De cijfers die gegeven werden, waren allemaal een eindoordeel ter afsluiting van een lessenreeks.

De onderzoeksresultaten toonden aan dat leerlingen minder plezier en persoonlijk belang, en meer externe druk en angst ervaarden tijdens een les waarin een cijfer werd gegeven. Ook wilden ze in zo'n les vaker *niet* deelnemen. De relatie tussen cijfers en motivatie en angst werd verklaard door behoeftebevrediging en behoeftefrustratie. Bijvoorbeeld, op momenten dat de prestaties van leerlingen beoordeeld werden voor een cijfer, wilden leerlingen vaker niet deelnemen aan de les (amotivatie). De reden waarom leerlingen niet wilden deelnemen was omdat ze ervaarden "er niks van te kunnen" (competentief frustratie).

De relatie tussen doelen stellen, behoeftebevrediging en behoeftefrustratie, motivatie en angst

Voortbouwend op het onderzoek naar prestatiecijfers en motivatie (Hoofdstuk 2), werd er in Hoofdstuk 3 onderzocht hoe het stellen van doelen samenhangt met de motivatie van leerlingen om deel te nemen aan de les LO. Transparantie over doelen in de les heeft in het onderwijs de laatste jaren in toenemende mate aan belang gewonnen, ook in de context van de les LO (Hay & Penney, 2013). Het stellen van doelen helpt docenten namelijk inzicht te krijgen in het *leren* van leerlingen (Hattie & Timperley, 2007; Sadler, 1989). Waar staan de leerlingen al ten opzichte van het vooropgestelde doel? En wat zijn de volgende stappen in hun leerproces om dit vooropgestelde doel te bereiken? Deze inzichten kunnen docenten concrete handvatten bieden om hun lessen optimaal op het leerproces van de leerlingen af te stemmen (Sadler, 1989). Echter, ondanks deze voordelen is het maar de vraag in hoeverre leerlingen werkelijk op de hoogte zijn van de doelen die bij de lesstof horen (Redelius & Hay, 2012).

Vanuit motivationeel oogpunt rijst bovendien de vraag of inzicht in doelen samenhangt met de motivatie om deel te nemen aan de les. Wanneer leerlingen weten welke lesdoelen er zijn, zijn ze dan enthousiaster voor de les? Of zou het inzicht in de lesdoelen juist een



gevoel van druk geven om goed te presteren? En kunnen behoeftebevrediging en of -frustratie verklaren waarom leerlingen wellicht meer interesse of druk ervaren wanneer ze de lesdoelen kennen? De wetenschappelijke kennisbasis van studies die het stellen van doelen in relatie tot dit brede scala aan motivationele mechanismen hebben onderzocht is zeer gering, zowel in de onderwijsbrede context (voor een uitzondering zie Pat-El et al., 2012) als in de LO context (voor een uitzondering zie Johnson et al., 2011). Bovendien is het nog onbekend of en in welke mate de psychologische basisbehoeften optreden als verklaarend mechanisme in de relatie tussen doelen en motivatie. In **Hoofdstuk 3** wordt daarom een cross-sectionele studie gepresenteerd. Hierin wordt onderzocht in welke mate leerlingen de lesdoelen kennen, of en hoe ze samenhangen met de motivatie en angst van leerlingen en of behoeftebevrediging en -frustratie deze samenhang kan verklaren.

Een groep van 659 leerlingen uit 40 klassen uit het voortgezet onderwijs werd door middel van vragenlijsten bevraagd. Dit gebeurde tijdens één les LO die gegeven werd door hun eigen docent. Docenten werd gevraagd om hun les te geven zoals gewoonlijk en geen bijzondere aanpassingen te doen.

De onderzoeksresultaten toonden aan dat het grootste deel van de leerlingen wist wat de lesdoelen waren. Er werden verschillen tussen docenten gevonden in de mate waarin ze, volgens leerlingen, de doelen duidelijk communiceerden. Opvallend was dat er ook verschillen waren tussen leerlingen van dezelfde klas, in de mate waarin ze de doelen duidelijk vonden. Dus, leerlingen, die les krijgen van dezelfde docent, begrepen de instructie op een verschillende manier. Daarnaast werd aangetoond dat leerlingen die meer inzicht hadden in de doelen, meer deelnamen omwille van plezier of persoonlijk belang (autonome motivatie) en minder vaak het gevoel hadden dat ze niet wilden deelnemen (amotivatie). Er werd geen relatie gevonden tussen doelen en interne en externe druk (gecontroleerde motivatie) en angst. Tot slot kon de samenhang tussen doelen en motivatie verklaard worden door behoeftebevrediging en *niet* door behoeftefrustratie. Bijvoorbeeld, leerlingen die meer inzicht in de doelen hadden, hadden vaker het gevoel zelf aan het roer van hun eigen leerproces te zitten (autonomiebevrediging) en dit zorgde ervoor dat leerlingen meer plezier en interesse ervoeren en minder vaak niet wilden deelnemen aan de les.

Doelen, feedback en behoeftebevrediging en -frustratie van les tot les

Terwijl Hoofdstuk 3 de motiverende rol van het stellen van doelen onderzocht, bouwt Hoofdstuk 4 voort op dit werk door de rol van het stellen van doelen en op groei gerichte feedback te onderzoeken. Hier is voor gekozen omdat vooraanstaande onderzoekers (o.a., Sadler, 1989) hebben aangestuurd op het belang van een samenspel tussen doelen en op groei gerichte feedback. Het is echter nog niet eerder empirisch onderzocht of de samenhang tussen op groei gerichte feedback en behoeftebevrediging en -frustratie bijvoorbeeld afhankelijk is van de mate waarin doelen duidelijk zijn gesteld. Daarnaast onderzocht bestaande literatuur met een focus op doelen, op groei gerichte feedback en behoeftebevrediging en -frustratie voornamelijk verschillen tussen leerlingen (Levesque et al., 2004; Pat-El et al., 2012). Daarmee werd motivatie beschouwd als een vaststaande eigenschap. Bijvoorbeeld, Alex voelt zich altijd als een mislukkeling in de les LO. Er bestaan echter aanwijzingen dat docentgedrag (Mainhard et al., 2011) en motivatie (Van der Kaap-Deeder et al., 2017) aanzienlijk kunnen verschillen van moment tot moment. Daarmee zouden docentgedrag, zoals het stellen van doelen en het geven van op groei gerichte feedback, en motivatie beschouwd kunnen worden als veranderlijke eigenschappen. Bijvoorbeeld, tijdens de vorige les voelde Alex dat hij succesvol kon deelnemen aan een opdracht, maar

tijdens de les van vandaag voelt Alex zich als een mislukkeling. In **Hoofdstuk 4** wordt daarom een longitudinale studie met zes herhaalde metingen gepresenteerd. Hierin wordt de samenhang tussen het stellen van doelen en op groei gerichte feedback, en de behoeftebevrediging en -frustratie van les tot les onderzocht.

Een groep van 570 leerlingen uit 24 klassen uit het voortgezet onderwijs werd door middel van vragenlijsten bevraagd. Dit gebeurde tijdens zes lessen LO die gegeven werden door hun eigen docent, tijdens drie verschillende lessenreeksen. De eerste keer werden leerlingen bevraagd tijdens een reguliere les (de voorlaatste les voordat er een beoordeling zou plaatsvinden), de tweede keer tijdens een les waarin een beoordeling door middel van een cijfer werd gegeven. Op eenzelfde wijze werden daarna de vier volgende vragenlijsten afgenomen, bij de twee opvolgende lessenreeksen. Docenten beoordeelden de leerlingen zoals ze gewend waren. Bij alle klassen was dit een cijfer voor motorische vaardigheid, of een cijfer voor motorische vaardigheid verweven met inzet. De cijfers die gegeven werden, waren allemaal een eindoordeel ter afsluiting van een lessenreeks.

De onderzoeksresultaten toonden aan dat docentgedrag, volgens de leerling, met betrekking tot het stellen van doelen en het geven van op groei gerichte feedback, aanzienlijk fluctueerde van les tot les. Ditzelfde gold ook voor gevoelens van competentie-, autonomie- en verbondenheidbevrediging en de frustratie van deze basisbehoeften. Bijvoorbeeld, een leerling kon zich in de ene les heel bekwaam en efficiënt voelen en in de volgende les het gevoel hebben een mislukkeling te zijn. Ook werd aangetoond dat tijdens lessen waarin leerlingen ervaaarden dat hun docent de doelen duidelijk stelde, leerlingen meer behoeftebevrediging en minder behoeftefrustratie ervaaarden. Tijdens lessen waarin leerlingen ervaaarden dat hun docent meer op groei gerichte feedback gaf, ervaaarden zij meer behoeftebevrediging. Er werd geen samenhang gevonden tussen op groei gerichte feedback en behoeftefrustratie. Daarnaast werd aangetoond dat leerlingen een relatief sterke bevrediging van de basisbehoeften ervaaarden in lessen waarin zowel doelen als op groei gerichte feedback in gemiddelde mate werden gecommuniceerd. Er lijkt dus inderdaad een positief samenspel tussen doelen en feedback te zijn. Pas wanneer op groei gerichte feedback in zeer sterke mate werd gegeven in bepaalde lessen, was er geen toegevoegde waarde meer op de behoeftebevrediging door het stellen van doelen (en vice versa). Een dergelijk samenspel werd niet gevonden voor behoeftefrustratie. Extra analyses toonden aan dat leerlingen geen verschil ervaaarden in hun psychologische basisbehoeften tijdens een les waarin een cijfer werd gegeven, in vergelijking tot een les waarin geen cijfer werd gegeven.

Effecten van doelen, feedback op de behoeftebevrediging en -frustratie

Gebaseerd op de inzichten die zijn gevonden in **Hoofdstuk 2, 3 en 4**, onderzocht de studie in **Hoofdstuk 5** de effecten van doelen en op groei gerichte feedback op de behoeftebevrediging en -frustratie. Waar in eerdere studies van dit proefschrift de perspectieven van studenten op docentgedragingen onderzocht werden, werd het onderzoek nu voortgebouwd door een quasi-experimenteel ontwerp te gebruiken en daarmee expliciet docent-gedragingen te onderzoeken. Door een zeer concreet uitgewerkte les te presenteren waarbij het stellen van doelen en het geven van op groei gerichte feedback experimenteel gemanipuleerd werd, vult Hoofdstuk 5 een hiaat in de literatuur in de context van de LO (Georgakis & Wilson, 2012; Ní Chóinín & Cosgrave, 2013).

Een groep van 492 leerlingen uit 20 brugklassen uit het voortgezet onderwijs werd willekeurig toegewezen aan een van de vier condities van een studie met een



quasi-experimenteel ontwerp. Doelen (wel of niet gecommuniceerd) en op groei gerichte feedback (wel of niet gegeven) werden gemanipuleerd. Alle leerlingen namen deel aan een eerste les van een voor hen relatief nieuwe motorische vaardigheid (handstand), welke gegeven werd door één en dezelfde gastdocent in alle klassen. Instructie werd gegeven via videovoorbeelden op een iPad, waarbij leerlingen uitgedaagd werden op het eigen niveau. Leerlingen werden door middel van vragenlijsten bevraagd. Dit gebeurde in totaal twee keer: één keer tijdens de reguliere les LO (een week voor de experimentele les), en één keer direct aansluitend aan de experimentele les. Alle klassen werden geobserveerd door een onderzoeksassistent om te bepalen of lessen werden gegeven zoals stond vastgelegd in de les-scripts behorende bij de betreffende manipulatie (manipulatie-check).

De onderzoeksresultaten toonden aan dat de experimentele lessen gegeven waren zoals dit voorbereid was in de vier verschillende les-scripts. Met andere woorden, in experimentele lessen waarin het de bedoeling was dat de docent doelen en feedback zou communiceren aan de leerlingen, ervoeren de leerlingen dat ze meer doelen en feedback kregen in vergelijking met leerlingen die deelgenomen hadden aan een experimentele les waarin ze dit niet kregen. Vervolgens kon bekeken worden of het gedrag van de docent (wel of geen doelen en feedback communiceren) invloed had op de basisbehoeften van leerlingen. Tegengesteld aan de hypothese werd er aangetoond dat er geen verschillen waren voor behoeftebevrediging en -frustratie tussen de verschillende condities (experimentele lessen). Echter, overeenkomstig aan de hypothese werd aangetoond dat correlaties wel in de verwachte richting waren. Oftewel, correlatieve bevindingen lieten zien dat wanneer de docent de doelen had gecommuniceerd en op groei gerichte feedback had gegeven, leerlingen meer behoeftebevrediging en minder behoeftefrustratie ervoeren.

De gebruikte methode werd in alle lessen als zeer motiverend ervaren (zie [deze link](#)⁹ voor de instructie video's van de experimentele handstand-les). Extra analyses wezen uit dat aspecten van de experimentele les, zoals het gebruik van een iPad, hier mogelijk een rol in hebben gespeeld. Bijvoorbeeld, het gebruik van de iPad kan een versturende factor zijn geweest, doordat leerlingen in een conditie waarin geen doelen en feedback werd gegeven, de doelen wellicht zelf hebben begrepen via de videobeelden. En wellicht konden leerlingen op eenzelfde manier ook feedback geven aan zichzelf en elkaar.

Discussie

Zijn prestatiecijfers echt schadelijk voor de behoeftebevrediging, behoeftefrustratie en motivatie van leerlingen en roepen ze meer angst op?

Overkoepelende resultaten laten niet eenduidig zien dat prestatiecijfers een negatieve impact hebben op de behoeftebevrediging, behoeftefrustratie, motivatie en angst van leerlingen in de les LO (Hoofdstuk 2 en 4). Enerzijds werden negatieve relaties gevonden tussen prestatiecijfers en de basisbehoeften en motivatie, waarbij de effecten weliswaar klein waren (Hoofdstuk 2), anderzijds werd geen samenhang gevonden tussen prestatiecijfers en de basisbehoeften (Hoofdstuk 4). Een mogelijke verklaring lijkt gevonden te kunnen worden in het *doel* dat bijvoorbeeld leerlingen, docenten, ouders en scholen toekennen aan cijfers (Nolen, 2020; Ryan & Deci, 2020). Heeft het prestatiecijfer meer een oordelend of juist meer een informatief doel? Afhankelijk daarvan zouden de gevoelens van competentie, autonomie, verbondenheid en motivatie kunnen variëren. Om dit beter te begrijpen, is het van belang om meer onderzoek te doen naar deze samenhang. Samenvattend laten

de resultaten van dit proefschrift dus zien dat prestatiecijfers op zichzelf niet schadelijk zijn voor de behoeftebevrediging, behoeftefrustratie, motivatie en angst.

Kan de evaluatie in de les LO meer motiverend worden door doelen te verduidelijken en door op groei gerichte feedback te geven?

Overkoepelend laten de resultaten van dit proefschrift zien dat wanneer leerlingen na een les LO aangeven dat de doelen duidelijk waren en ze op groei gerichte feedback ontvangen hebben, dat dit positief inwerkt op hun basisbehoeften en motivatie (Hoofdstuk 3, 4 en 5). Bovendien is er enig bewijs gevonden dat aantoonde dat wanneer leerlingen ervaren dat doelen gesteld zijn, ze minder behoeftefrustratie ervaren (Hoofdstuk 4). Er is echter meer onderzoek nodig om aan te geven hoe robuust deze bevindingen zijn. Tegenstrijdige resultaten werden gevonden met betrekking tot de samenhang tussen op groei gerichte feedback en behoeftefrustratie, waarbij een studie negatieve relaties vond (Hoofdstuk 5) en een andere studie geen relaties vond (Hoofdstuk 4). Met andere woorden, geen enkele studie toonde aan dat op groei gerichte feedback de gevoelens van "er niks van kunnen", dwang en afwijzing verhoogde. Samenvattend suggereren de bevindingen dus dat de evaluatie in de les LO inderdaad meer motiverend kan worden als doelen en op groei gerichte feedback gegeven wordt.

Kunnen behoeftebevrediging en -frustratie verklaren waarom cijfers en het stellen van doelen invloed heeft op de motivatie en angst van leerlingen in de les LO?

De resultaten van dit proefschrift leveren een eerste bewijs dat verminderde behoeftebevrediging en toegenomen behoeftefrustratie kunnen verklaren waarom, althans in sommige situaties, prestatiecijfers een negatieve invloed hebben op de motivatie en angst van leerlingen in de les LO (Hoofdstuk 2). Daarnaast werd voor het eerst aangetoond dat wanneer de leerling ervaart dat de docent doelen stelt, leerlingen meer behoeftebevrediging ervaren wat vervolgens leidt tot een betere kwaliteit van motivatie (Hoofdstuk 3). Er is meer onderzoek nodig om aan te tonen hoe robuust deze bevindingen zijn. Samenvattend suggereren de bevindingen dat gevoelens van behoeftebevrediging en -frustratie inderdaad kunnen verklaren waarom prestatiecijfers en het stellen van doelen invloed heeft op de motivatie en angst van leerlingen in de les LO.

Kan les-tot-les variabiliteit in het stellen van doelen en op groei gerichte feedback les-tot-les variabiliteit in de basisbehoeften van leerlingen verklaren?

Overkoepelend laten de resultaten van dit proefschrift zien dat de door de leerling ervaren mate waarin een docent doelen stelt en op groei gerichte feedback geeft, verschilt van les tot les. Ook gevoelens van competentie-, autonomie- en verbondenheidbevrediging en competentie-, autonomie- en verbondenheidfrustratie verschillen van les tot les. Deze verschillen werden niet alleen van les tot les gevonden, maar ook tussen leerlingen en tussen klassen (Hoofdstuk 2, 3, 4 en 5). Deze verschillen van les tot les, verschillen tussen leerlingen en verschillen tussen klassen toonden aan dat er andere factoren waren die een invloed hadden op de motivatie van leerlingen. Op les-tot-les niveau zouden dit bijvoorbeeld de gevoelens van bekwaamheid van leerlingen in een specifieke les kunnen zijn. Op leerlingniveau zouden dit bijvoorbeeld de algemene behoeftebevrediging en algemene motivatie voor de les LO van leerlingen kunnen zijn. Op klasniveau zou dit de manier waarop cijfers gegeven werden kunnen zijn. Samenvattend suggereren de bevindingen dat les-tot-les variabiliteit in het stellen van doelen en het geven van op groei gerichte feedback inderdaad de variabiliteit in de basisbehoeften van leerlingen in de les LO kan verklaren.



Beperking van dit proefschrift

In dit proefschrift werd voornamelijk gekeken naar twee lesgeef-strategieën (het stellen van doelen en het geven van op groei gerichte feedback) uit het theoretisch kader van evalueren om te leren (Wiliam, 2011; Wiliam & Thompson, 2008). Bij het bekijken van deze lesgeef-strategieën werd gefocust op de actieve rol van de docent, en niet zo zeer op de actieve rol van leerlingen bij evaluaties. In **Hoofdstuk 6** werd deze limitatie verder beschreven, samen met verschillende mogelijkheden die het bestuderen van evalueren om te leren biedt voor vervolgonderzoek.

De toekomst van evaluatie en de motivatie van leerlingen in de les LO: praktische aanbevelingen

Tot slot wordt aan het einde van dit proefschrift gereflecteerd op de meerwaarde van dit onderzoek voor de onderwijspraktijk. Resultaten suggereren dat het voor docenten interessant kan zijn om zich te bezinnen op hun huidige curriculum en de manier van beoordelen. Anders dan bij de meeste andere schoolvakken zijn tijdens de les LO de vaardigheden van leerlingen vaak goed zichtbaar voor medeleerlingen, ook tijdens de beoordeling. Tegelijkertijd is het doel van de les LO dat leerlingen *(meer) bekwaam raken en bewegen vanuit plezier en interesse* om daarmee een *blijvende deelname in bewegen* te stimuleren (Brouwer et al., 2011). De resultaten van dit proefschrift toonden aan dat wanneer docenten doelen stellen en op groei gerichte feedback geven, de behoeftebevrediging en de motivatie van leerlingen positief wordt beïnvloed. Moeten we dan stoppen met cijfers geven? Nee. De resultaten van dit proefschrift bieden onvoldoende basis om te concluderen dat cijfers op zichzelf een negatief effect hebben op de basisbehoeften, motivatie en de angst van leerlingen in de les LO. Maar hoe kunnen we op een meer motiverende manier beoordelen? Op basis van resultaten uit de studies die gepresenteerd zijn in dit proefschrift, mijn eigen ervaringen als docent LO, mijn ervaringen als procesbegeleider van een docent-ontwikkelteam dat zich verdiept in motiverend evalueren, en in overeenstemming met bestaande literatuur (zie bijvoorbeeld Leahy & Wiliam, 2012), doe ik hieronder drie aanbevelingen voor de onderwijspraktijk. De aanbevelingen zijn geworteld in de belangrijkste boodschap van dit proefschrift:

De kernboodschap voor de onderwijspraktijk:

*De resultaten van dit proefschrift suggereren dat het belangrijk is voor docenten, lerarenopleiders en onderzoekers om zich te concentreren op **het stellen van doelen, op groei gerichte feedback, competentiebevrediging, autonomiebevrediging en verbondenheidsbevrediging** en om deze theoretische concepten te vertalen en te implementeren in praktisch toepasbare onderwijs strategieën.*

Aanbeveling 1: Kies een weloverwogen mix tussen evaluaties met een summatieve functie, zoals prestatiecijfers, en evaluaties met een formatieve functie, zoals het stellen van doelen en het geven van op groei gerichte feedback, en benadruk de informatieve waarde van beide evaluaties.

Als de evaluatie een summatieve functie heeft, is deze gericht op een beoordeling van de leerprestaties, leeruitkomsten of leerproducten aan het einde van het onderwijsleerproces. De evaluatie gaat na of, en in welke mate de leerling de gestelde leerdoelen heeft bereikt

en legt dat vast, bijvoorbeeld in de vorm van een cijfer. Als de evaluatie een formatieve functie heeft, gaat het om een tussentijdse vorm van evaluatie, die de basis vormt voor de optimalisering van het onderwijsleerproces in de toekomst. Leerlingen worden gevolgd in hun leerproces om doorlopend op groei gerichte feedback te geven op de gestelde doelen om zo de doelen te behalen (Dochy & Struyven, 2011). Door evaluaties met een overwegend summatieve of formatieve functie intelligent te mixen (AIESEP, 2020; Black, 2015; Laveault & Allal, 2016), ontvangen leerlingen cijfers, maar niet teveel. In het huidige onderwijs is er namelijk een disbalans tussen evaluaties met een summatieve functie, zoals prestatiecijfers, en evaluaties met een formatieve functie, zoals het stellen van doelen en het geven van op groei gerichte feedback (Onderwijsraad, 2018). De nadruk ligt op de summatieve functie van evalueren in het onderwijs, terwijl er een behoefte is aan het stellen van doelen en het geven van op groei gerichte feedback gedurende het leertraject, zodat leerlingen weten wat van hen verwacht wordt en wat verbeterd kan worden. Het toepassen van een weloverwogen mix wordt ondersteund door de data uit dit proefschrift. Zo'n mix stimuleert dat (1) leerlingen, ouders, docenten en schoolleiders, die gewend zijn te werken met cijfers, direct "een begrip" hebben van de betekenis van het cijfer en de prestatie van de leerling, (2) leerlingen hun leren kunnen verbeteren en (3) leerlingen zich meer bekwaam voelen, meer eigenaarschap over hun eigen leren ervaren en een positieve sfeer in de klas ervaren.

Als docent kun je met de vakgroep LO bespreken welke balans er is tussen evaluaties met een summatieve functie en evaluaties met een formatieve functie. Hoe vaak worden leerlingen summatief geëvalueerd? Wat leveren zulke evaluaties op? Wat leren leerlingen in de gegeven lessen voordat ze een evaluatie krijgen met een summatieve functie? Worden doelen en op groei gerichte feedback zodanig uitgelegd zodat leerlingen begrijpen waarom ze bijvoorbeeld een zeven krijgen?

Aanbeveling 2: Mix intelligent – Probeer doelen, op groei gerichte feedback en prestatiecijfers op elkaar af te stemmen.

Wanneer docenten beide functies van evalueren (summatief en formatief) intelligent willen mixen en de basisbehoeften van leerlingen willen stimuleren, is het belangrijk dat doelen, verwachtingen en succescriteria, leeractiviteiten, op groei gerichte feedback en prestatiecijfers op elkaar afgestemd zijn (Borghouts et al., 2015; Penney et al., 2009).

Als docent kun je met de vakgroep LO bespreken hoe het huidige LO curriculum is opgebouwd. Komt dit overeen met de meervoudige bekwaamheden (bv. motorische vaardigheden, sociale vaardigheden, speltactiek, organisatorische vaardigheden of andere aspecten) die de vakgroep belangrijk vindt bij het leerproces van leerlingen? Begin niet met het plannen van activiteiten als je het curriculum gaat (her)ontwerpen. De kerndoelen, eindtermen en meervoudige bekwaamheden zijn een voor de hand liggend startpunt, die verder uitgeschreven moet worden naar concretere periode- en lesdoelen, toets vormen en, als laatste, lesinhouden (Borghouts et al., 2015). De artikelen "Toetsing als kans voor leren" (Sluijsmans, 2020) en "Doelen, lessen en beoordelen: één geheel" (Borghouts et al., 2015) kunnen als inspiratie dienen.

Aanbeveling 3: Kies één voorkeursstrategie om mee te beginnen, probeer deze op verschillende manieren aan te bieden en probeer dit iedere les opnieuw.

Hoe kunnen docenten het stellen van doelen en op groei gerichte feedback implementeren in de les? Door te focussen op één strategie worden aanpassingen aan het reguliere onderwijs



beperkt gehouden. Dit is belangrijk, want om het in de onderwijspraktijk “te laten werken” is het essentieel om kleine stappen te zetten bij het integreren van een nieuwe strategie in bestaande onderwijsroutines (Leahy & Wiliam, 2012). Bovendien wordt het focussen op één strategie ondersteund door de resultaten van de studies in dit proefschrift, aangezien de resultaten suggereren dat door te focussen op bijvoorbeeld doelen, leerlingen zelf hun eigen op groei gerichte feedback kunnen genereren, waardoor ze het gevoel krijgen de leiding te hebben over hun eigen leerproces (autonomiebevrediging). Resultaten uit dit proefschrift suggereren ook dat, ook al krijgen leerlingen les van dezelfde docent, (1) niet alle leerlingen begrijpen de doelen en feedback in dezelfde mate en (2) leerlingen ervaren verschillen van les tot les in hoeverre de docent de doelen heeft uitgelegd en feedback heeft gegeven. Daarom is het waardevol als (1) docenten doelen en feedback op verschillende manieren kunnen uitleggen om zodanig zoveel mogelijk leerlingen te bereiken en (2) docenten iedere les opnieuw doelen stellen en op groei gerichte feedback geven.

Als docent kun je expliciet één strategie opnemen in je lesvoorbereiding, bijvoorbeeld het stellen van doelen of het geven van op groei gerichte feedback. Experimenteer met deze lesgeef-strategie en doe dit op verschillende manieren, elke les opnieuw. Maak je geen zorgen als iets niet volgens plan verloopt, want elke les is een nieuwe kans om doelen te stellen en op groei gerichte feedback te geven. De boeken “Embedded Formative Assessment” (Wiliam, 2018) en “Wijze Lessen” (Surma et al., 2019) geven praktische voorbeelden van het implementeren van doelen stellen of op groei gerichte feedback geven. Deze boeken kunnen als inspiratie dienen.

Aanbeveling 4: Implementeer doelen en op groei gerichte feedback op een motiverende manier.

Hieronder worden zowel het stellen van doelen als het geven van op groei gerichte feedback vertaald naar praktisch toepasbare motiverende lesgeef-strategieën. Voor elke lesgeef-strategie worden drie voorbeelden gegeven: één motiverende lesgeef-strategie voor elke psychologische basisbehoefte.

Wanneer het stellen van doelen wordt gekozen als voorkeursstrategie:

- Competentiebevrediging. Communiceer duidelijke en haalbare maar uitdagende doelen. Geef leerlingen inzicht in hoe een taak met succes kan worden voltooid. Werken aan taken die niet te gemakkelijk en niet te moeilijk zijn (dus uitdagend), zal het gevoel van bekwaamheid van leerlingen bevorderen.
- Autonomiebevrediging. Door duidelijke en haalbare maar uitdagende doelen te communiceren, is het mogelijk om leerlingen keuzes te bieden. Bijvoorbeeld keuzes in moeilijkheidsgraad van de taak, in tempo, en qua timing van feedback vragen. Dit zal het gevoel van invloed hebben op het eigen leerproces bevorderen. In dit voorbeeld¹⁰ (instructievideo's gebruikt in Hoofdstuk 5) kunnen leerlingen zelf de moeilijkheidsgraad kiezen door een groene, blauwe, rode of zwarte piste te volgen en ze kunnen zelf het eigen werk tempo bepalen.
- Verbondenheidsbevrediging. Door duidelijke en haalbare maar uitdagende doelen te communiceren, is het mogelijk om de klas te organiseren in kleine groepen die samenwerken. Door met anderen in de groep te communiceren over de leerdoelen, bijvoorbeeld over waar ze staan ten opzichte van deze doelen en hoe ze die doelen kunnen bereiken,

¹⁰ <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>

wordt er een positieve sfeer in de klas gecreëerd. Gevoelens van “elkaar mogen” zullen op deze manier gekoesterd worden, mits dit goed begeleid wordt.

Wanneer het geven van op groei gerichte feedback wordt gekozen als voorkeursstrategie:

- **Competentiebevrediging.** Start je instructie met uit te leggen welke aspecten van de taak al met succes uitgevoerd worden. Leg vervolgens uit wat leerlingen zouden kunnen verbeteren en benoem dit ook concreet als verbeterpunten. Hierbij houd je in gedachten dat de voorgestelde stappen haalbaar maar toch uitdagend zijn. Inzicht in (kleine) successen en hoe te verbeteren met haalbare maar uitdagende stappen, zal het gevoel van bekwaamheid van leerlingen bevorderen.
- **Autonomiebevrediging.** Je kunt op groei gerichte feedback geven met een interne focus (“Om een plank van jezelf te maken, zou je kunnen proberen je billen samen te knijpen”) en met een externe focus (“Wil je eens met je rug op de landingsmat gaan liggen terwijl je je voeten op de grond plaatst? Kun je eens proberen een plank te maken waarbij je lichaam dus helemaal recht is?”). Probeer tijdens het communiceren hiervan uitnodigende taal te gebruiken zoals “je zou kunnen proberen om ...” in plaats van druk uit te oefenen, zoals “je moet ...”. Door keuzemogelijkheden te bieden en uitnodigende taal toe te passen, bevordert je het gevoel zelf invloed te hebben op het eigen leerproces.
- **Verbondenheidbevrediging.** Probeer bij de uitleg positieve steun te betuigen, ongeacht het niveau van leerlingen. Moedig de leerling aan om vragen te stellen over hun voorvragen. Door onvoorwaardelijk respect, zorg en ondersteuning te tonen en door aan te moedigen om vragen te stellen, zal een open sfeer ontstaan die uitnodigt tot samenwerking. Dit creëert een positieve sfeer in de klas.

De video's in [deze link](#)¹¹ tonen praktische voorbeelden hoe doelen, competentie-, autonomie- en verbondenheidbevrediging geïmplementeerd kunnen worden in de les LO. Het document dat gedownload kan worden in [deze link](#)¹² toont een praktisch voorbeeld hoe op groei gerichte feedback en competentie- en autonomiebevrediging geïmplementeerd kan worden in de les LO. Het artikel “Evalueren om te leren: Motiverend beoordelen in de les LO” (Slingerland et al., 2015) kan meer inspiratie bieden rondom motiverende lesgeef-strategieën in de LO lespraktijk. Tot slot geeft het boek “Motiverend Coachen in de Sport” (Aelterman et al., al., 2017) praktische voorbeelden om gevoelens van competentie, autonomie en verbondenheid van leerlingen in de klas te ondersteunen.

Voor een diepgaande reflectie op de implementatie in de lespraktijk verwijs ik de geïnteresseerde lezer graag naar [Hoofdstuk 6, Recommendations for Practice](#), p. 126.

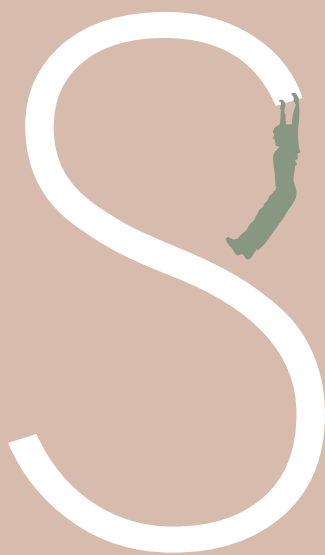
Conclusie

De studies in dit proefschrift hebben het inzicht in de samenhang tussen prestatiecijfers, doelen, op groei gerichte feedback, motivatie en angst van leerlingen in de les LO vergroot. Ze laten zien dat het stellen van doelen en het geven van op groei gerichte feedback effectieve lesgeef-strategieën zijn om gevoelens van competentie, autonomie en verbondenheid te ondersteunen en vervolgens ook autonome vormen van motivatie te stimuleren. Dit proefschrift biedt daarmee handvatten voor implementatietrajecten in de onderwijspraktijk. Er is meer onderzoek nodig om prestatiecijfers en evalueren om te leren, in relatie tot motivatie beter te begrijpen. Toekomstig onderzoek kan voortbouwen op de suggesties die beschreven zijn in dit proefschrift.

11 <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>

12 <https://www.tandfonline.com/doi/suppl/10.1080/17408989.2020.1823956?scroll=top>





Summary

Summary

Grading students' performance is fully integrated in most educational systems around the globe (Ames, 1992; Lingard, 2010; Strain, 2009). In such educational systems, performance grades reflect a judgment of learning achievement, learning outcomes or learning products at the end of the learning process (Dochy & Struyven, 2011). Simultaneously, assessment also takes place to stimulate students' learning. For example, when a teacher clarifies goals and provides process feedback (i.e., growth-oriented feedback) to structure students' learning activities (Wiliam, 2011; Wiliam & Thompson, 2008). This form of assessment, known as "assessment for learning" (Wiliam, 2011), is on the rise worldwide, but has not yet acquired a structural place in education. This applies to both general education (Black, 2015; Hopfenbeck & Stobart, 2015; Leahy & Wiliam, 2012), and physical education (PE) (Borghouts et al., 2017; López-Pastor et al., 2013). The broader educational literature showed that when students perceive grades primarily as a judgment of their performance, it can negatively affect students' motivation (Butler, 1987; Butler & Nisan, 1986; Grolnick & Ryan, 1987). Students may want to avoid being perceived as failures and incapable by classmates (McDonald, 2001; Ryan & Weinstein, 2009). This could be all the more true for PE lessons where everyone can see how skilled students are. When assessment is used to improve learning, positive motivational outcomes are expected, again based on the broader educational literature (Levesque et al., 2004; Pat-El et al., 2012).

So far, the available literature on the associations between performance grades, as well as goal clarification and process feedback, and motivation and fear in the context of PE is scarce (for exceptions see Johnson et al., 2011; Koka & Hein, 2003). Results from these studies show that when students experience that assessment is focused on learning and progress, they experience more fun, interest and experience the lesson as more relevant. To deepen our understanding about performance grades, goal clarification and process feedback, and their associations with PE students' motivational functioning and fear, more research is needed.

The main research question that is addressed in this dissertation is: "How are performance grading, as well as goal clarification and process feedback, related to students' motivational functioning and fear during PE?". This summary first describes the background of this question. Next, the individual studies of this dissertation are presented. This summary is concluded with a discussion of the research results including recommendations for practice.

Background of the research question

Performance grades as a quality judgment at the end of a learning trajectory
Physical education students are regularly assessed during the school year by means of a grade that aim to map their motor competencies (Borghouts et al., 2017; European Commission/EACEA/Eurydice, 2013). By grading students, teachers provide a judgment of the quality of students' performance, serving a summative purpose, and respond to demands of accountability which includes documenting students' individual achievements at a point in time. Grades can be given on the basis of criteria (Redelius & Hay, 2012) or in comparison to others (Chan et al., 2011; Elliot & Moller, 2003; Johnson et al., 2011). In both cases, students can compare themselves with others by means of performance grades. In

educational practice it appears that this occurs frequently. Researchers therefore argue that performance grades encourage social comparison (Ames, 1992; Elliot & Moller, 2003), a phenomenon that could be further stimulated by the “visibility” of students’ performance in PE (Annerstedt & Larsson, 2010; Johnson et al., 2011; Redelius & Hay, 2012).

Goal clarification and process feedback from an assessment for learning perspective

Besides assessing students through grading for accountability, students’ learning could also be assessed with a more informational or formative purpose. Assessment for learning (Wiliam, 2011) serves such a purpose and is defined as “the process of seeking and interpreting evidence for use by learners and their teachers to decide where they are in their learning, where they need to go and how best to get there” (Broadfoot et al., 2002). For assessment for learning to be successful in the classroom, teachers need to use all relevant information, generated from assessment that identifies gaps in students’ learning, to adapt future instructions and learning activities (Dochy & Struyven, 2011; Sadler, 1989; Wiliam, 2011).

Goal clarification and process feedback are two essential teaching strategies in the framework of assessment for learning (Wiliam, 2011; Wiliam & Thompson, 2008). By communicating clear, specific and transparent goals (Hattie & Timperley, 2007; Sadler, 1989; Wirth et al., 2009), teachers provide the necessary information for students to decide where to direct their learning to. If students understand the goals of the lesson, they can become more self-regulated, because they are able to evaluate their current performance in relation to the desired goal (Andrade & Du, 2005; Moeller et al., 2012; Winstone et al., 2017). Process feedback provides students with concrete suggestions on how to improve (Butler & Winne, 1995; Harks et al., 2014; Hattie & Timperley, 2007; Peterson & Irving, 2008).

Performance grades, as well as goal clarification and process feedback, from a motivational perspective

How performance grading, as well as goal clarification and process feedback, can (de)motivate students’ learning can be explained from the perspective of Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2017; Ryan & Deci, 2020). The purpose of the assessment (the why), experienced by students when they receive grades, when goals are clarified, or when process feedback is provided, will vary (Nolen, 2020). This will vary by, for example, how assessment is applied and reacted to by teachers and parents. According to SDT, depending on whether different forms of assessment are perceived to be more informational and helpful (i.e., informational significance) or evaluative and judgmental (i.e., controlling significance; Ryan & Deci, 2020), students will have different motives to participate in PE.

From a SDT perspective, students display autonomous motivation when they find their class enjoyable and interesting, for instance because they just love making handstands. In such a case, SDT refers to intrinsic motivation. Students can also experience personal relevance, for instance because they find it important to improve their handstand, as they want to be able to show a good example in an effort to enrol for Physical Education Teacher Education. In such a case SDT refers to identified regulation. In contrast, students display controlled motivation when they put effort in their PE class because they experience feelings of guilt or shame and contingent self-worth when receiving a bad grade and may thus want to avoid such feelings. In these cases, SDT refers to introjected regulation. Students



may not only pressure themselves to do well, but sometimes also feel externally pressured to obtain good grades. For instance, to please their teacher or parents, or to avoid criticism. In such a case, SDT refers to external regulation. While students are – quantitatively speaking – motivated when they display either autonomous or controlled motivation, amotivation within SDT reflects a lack of motivation. Amotivated students typically invest minimum effort in PE classes because they experience incapability to perform activities, or because they do not experience any personal value.

An important question then is why students experience intrinsic motivation or identified regulation. SDT explains that the three basic psychological needs, that is, the need for competence, autonomy and relatedness, are highly relevant (Deci & Ryan, 2000; Ryan & Deci, 2017). Competence satisfaction refers to students' experiences of effectiveness, autonomy satisfaction refers to students' experiences of volition and self-endorsement and relatedness satisfaction refers to students' experiences of connection and mutual care. The satisfaction of all three needs will positively impact students' autonomous motivation (Niemic & Ryan, 2009). The needs can also be actively thwarted. This is referred to as need frustration (Vansteenkiste & Ryan, 2013). When students feel like a failure, they experience competence frustration. If students feel pressured, for instance to perform well, they experience autonomy frustration. Relatedness frustration refers to feelings of rejection or disrespect. The frustration of all three needs will positively impact students' controlled motivation and amotivation (Haerens et al., 2015).

Studies starting from SDT (Deci & Ryan, 2000; Ryan & Deci, 2017) consider goal clarification and process feedback as components of a motivating teaching style, that is teacher structure (Aelterman et al., 2019; Jang et al., 2010; Skinner & Belmont, 1993). A structured lesson contributes to students' experiences of autonomous motivation and learning (Vansteenkiste et al., 2012). When teachers set clear goals and provide process feedback, they help students to expand their capabilities thereby fostering competence satisfaction (Mouratidis et al., 2013). Because students' understanding of the goals of a lesson may also enable them to evaluate where they are in their learning trajectory and process feedback provides them with concrete information on how to improve, students may also be more in charge of their learning process thereby fostering autonomy satisfaction (Butler & Winne, 1995). By providing goals and feedback, teachers help and support students' learning which might create a caring environment between students and teacher and therefore satisfies experiences of relatedness (Pat-El et al., 2012). Instead, it is possible, yet not empirically proven, that when grading is experienced as evaluative and judgmental, students might feel like a failure, particularly if they receive bad grades despite their efforts. In a similar vein, grading might pressure students to perform well, entailing autonomy frustration (Ryan & Deci, 2020). Or students might feel rejected by their teachers or classmates when receiving (reactions to) a low grade.

Overview of this dissertation

Associations between performance grades, students' motivational functioning and fear

Studies situated in general education (for an exception see Johnson et al., 2011) showed that grading, particularly when students experience it as a judgment of their performance, results in lower levels of joy and interest (i.e., intrinsic motivation; Butler, 1987, 1988; Butler

& Nisan, 1986; Grolnick & Ryan, 1987; Pulfrey et al., 2011), more pressure (i.e., external regulation) and more lack of motivation (i.e., amotivation; Johnson et al., 2011). To gain a better insight in how performance grades relate to students' motivational functioning, it is important to study the associations between performance grades and all individual regulations (intrinsic motivation, identified regulation, introjected regulation and external regulation; Gagné et al., 2015; Taylor et al., 2014). In addition, it is unknown how performance grades relate to students' need satisfaction and frustration and whether need satisfaction and frustration can account for relationships between performance grades and students' experiences of motivation and fear.

Therefore, using a short-term longitudinal design, the study in **Chapter 2** investigated (1) in grading lessons compared to non-grading lessons whether secondary school students reported differing motives to participate in PE and whether they experienced differences in levels of fear and (2) whether experienced need satisfaction and frustration could be the reason why these motives and experienced fear differ.

A sample of 409 Belgian 12-18 year-old secondary school PE students participated in this study. Questionnaires were completed directly after two PE lessons. The first questionnaire was completed directly after a lesson in which no grading took place, the second questionnaire was completed directly after a lesson in which grading took place. The lessons were taught by their own teacher and the teachers assessed the students as usual. In all classes, grades represented performance judgments of students' motor competence, or judgments of students' motor competence intertwined with effort. All assigned grades represented quality judgments of students' performance at the end of a series of lessons.

Results showed that students experienced less fun and interest, valued the lessons less, yet experienced more external pressure and more fear during a lesson in which grading took place. Students also experienced diminished intention to participate. Associations between performance grading and students' motivation and fear were explained by need satisfaction and frustration. For example, when being graded for their performance, students experienced more pressure imposed by someone else. Students felt this way because they experienced fear of failure, pressure and rejection (i.e., need frustration).

Associations between goal clarification, need satisfaction and frustration, motivation and fear

Building on the examination of the motivational correlates of performance grading (Chapter 2), Chapter 3 investigated associations between goal clarification and students' motivation to participate in PE. Providing insight in goals has become increasingly important in education in recent years, also in the context of PE (Hay & Penney, 2013). This is because clarifying goals provides teachers with insight in students' learning (Hattie & Timperley, 2007; Sadler, 1989). Where is the student related to the targeted goal? What are the next steps in students' learning process to achieve the targeted goal? These insight can provide teachers with information to tailor the lessons according to students' learning needs (Sadler, 1989). Yet, despite these advantages, the question is to what extent students are really aware of the lessons' goals (Redelius & Hay, 2012).

From a motivational perspective, the question also arises whether insight in goals is related to students' motivation to participate in PE. When students are aware of the goals, are they then more enthusiastic about the lesson? Or does insight in the lessons' goals



augment feelings of pressure to perform well? And can need satisfaction and frustration explain why students experience more interest or pressure when they are aware of the lessons' goals? Available literature investigating goal clarification in relation to this wide range of motivational mechanisms is scarce, both in general education (for an exception see Pat-El et al., 2012) as in PE (for an exception see Johnson et al., 2011). Moreover, it is unknown whether need satisfaction and frustration act as explanatory mechanisms in the relationship between goals and motivation. Using a cross-sectional design, in **Chapter 3** we therefore investigated (1) to what extent students are aware of the lesson's goals, (2) whether and how the lesson's goals are related to students' motivation and fear and (3) whether need satisfaction and frustration can explain these relationships.

A sample of 659 Belgian 12-18 year-old secondary school PE students participated in this study. Questionnaires were completed directly after a non-grading lesson which was taught by their own teacher. Teachers were asked to teach as usual and not make any special adjustments.

Results showed that most students were aware of the lesson's goals. Differences were found between teachers in the extent to which they, according to students' perceptions, clarified goals. Interestingly there were differences between students of the same class, in the extent to which they perceived that goals were clarified. In other words, students, who are taught by the same teacher, understood the teachers' instruction differently. In addition, results showed that students who were more knowledgeable about the goals, participated because they experienced joy and interest, and valued the lesson more (i.e., autonomous motivation) and felt less aloof (i.e., amotivation). No associations were found between internal and external pressure (i.e., controlled motivation) and fear. Finally, the relationship between goals and motivation could be explained by need satisfaction and not by need frustration. For example, students who had more insight in the lesson's goals were more likely to feel in charge of their learning (i.e., autonomy satisfaction). This resulted in students experiencing more joy and interest and feeling less aloof.

Goal clarification, process feedback and students' need satisfaction and frustration from lesson to lesson

While Chapter 3 investigated the motivating role of goal clarification, Chapter 4 builds on this work by examining the role of goal clarification *and* process feedback. Although prominent scholars (o.a., Sadler, 1989) underlined the importance of the interplay between goal clarification and process feedback, no empirical evidence exists investigating this interplay in relation to students' needs. For instance, it is unknown whether the association between process feedback and need satisfaction is dependent on the extent to which goals are clarified. In addition, existing literature investigating relations between goal clarification, process feedback and students' need satisfaction and frustration predominantly focused on differences between students (Levesque et al., 2004; Pat-El et al., 2012). Motivation was therefore regarded as a stable characteristic. For example, students always feel like a failure during PE. However, there are indications that teacher behaviour (Mainhard et al., 2011) and motivation (Bartholomew et al., 2018) can vary substantially from lesson to lesson. As such, it is likely that students vary from lesson to lesson in their feelings of effectiveness, feeling in charge of their learning and feeling connected and mutually cared for. For example, in some lessons, students may feel capable of performing a task, while in other lessons they may feel like a failure and feel pressured to do what the teachers tells them to do. The associations between goal clarification, process feedback and students'

need satisfaction and frustration, viewed as differences within students from lesson to lesson, have not been investigated so far. Therefore, using a longitudinal design, the study in **Chapter 4** investigated associations between goal clarification and process feedback, and students' need satisfaction and frustration from lesson to lesson.

A sample of 570 Dutch 11-18 year-old secondary school PE students participated in this study. Questionnaires were completed directly after the second last and last PE lesson of three series of lessons on three different topics (i.e., six measurements in total). Students completed questionnaires both for non-grading (i.e., at measurement occasion one, three and five) and grading lessons (i.e., at measurement occasion two, four and six). The lessons were taught by their own teacher and the teachers assessed the students as usual. In all classes, grades represented performance judgments of students' motor competence, or judgments of students' motor competence intertwined with effort. All assigned grades represented quality judgments of students' performance at the end of a series of lessons.

Results showed that the teachers' teaching behaviour regarding goal clarification and process feedback, as was perceived by the student, substantially varied from lesson to lesson. Similar results were found for students' feelings of competence, autonomy and relatedness satisfaction and frustration. For example, a student might feel very effective in one lesson and feel like a failure in the next. In addition, it was shown that during lessons in which students experienced that their teacher clarified goals to a greater extent, students experienced more need satisfaction and less need frustration. During classes in which students experienced that their teacher provided more process feedback, they experienced more competence, autonomy and relatedness satisfaction. No associations were found between process feedback and competence, autonomy and relatedness frustration. In addition, it was shown that students experienced need satisfaction to a relatively high extent in lessons in which both goals and process feedback were communicated to an average degree. So there does indeed seem to be a positive interplay between goals and feedback. It was only when process feedback was provided to a large extent in certain lessons, that there was no added value of goal clarification in the effect on need satisfaction (and vice versa). No such interplay was found for need frustration. Additional analyses showed that students did not experience differences in their perceived need satisfaction and frustration in graded lessons when compared to non-graded lessons.

Effects of goal clarification, process feedback and students' need satisfaction and frustration

Based on the insights found in Chapters 2, 3 and 4, the study in **Chapter 5** examined the effects of goal clarification and process feedback on students' perceived need satisfaction and frustration using a quasi-experimental design. Moving away from students' perspectives (Chapters 2, 3 and 4), Chapter 5 thus targeted teachers' goal clarification and process feedback directly by explicitly examining teaching behaviour. Moreover, by presenting a lesson in which goal clarification and process feedback were experimentally manipulated, Chapter 5 fills a gap in literature in the context of the LO (Georgakis & Wilson, 2012; Ní Chóinín & Cosgrave, 2013).

A sample of 492 Dutch 10-14 year-old PE students participated in this study. Classes were randomly assigned to one of the four experimental conditions. Goals (clarified or not) and process feedback (provided or not) were manipulated. All students participated in a first lesson of a for them relatively new motor skill (handstand), which was taught in all classes



by one and the same guest teacher. Instructions were given via video examples on an iPad, with each student being challenged at their own level. Students were questioned by means of two questionnaires: the first questionnaire was completed directly after a regular PE lesson (one week before the experimental lesson), and the second questionnaire was completed directly after the experimental lesson. All classes were observed by a research assistant to determine whether classes were taught as specified in the lesson-scripts associated with the manipulation in question (manipulation check).

Results showed that the experimental lessons were delivered as prepared in the four different lesson scripts. In other words, in experimental lessons where the teacher was meant to communicate goals and provide feedback to the students, students experienced more goals and feedback compared to students who participated in an experimental lesson where they did not receive goals and feedback. Subsequently, it could be examined whether the behaviour of the teacher (whether or not communicating goals and feedback) influenced students' need satisfaction and frustration. Contrary to the hypothesis, it was shown that there were no differences in need satisfaction and frustration between the four conditions (experimental lessons). However, consistent with the hypothesis, correlations were in the expected direction. In other words, correlational findings showed that when the teacher communicated goals and provided process feedback, students experienced more need satisfaction and less need frustration. The pedagogical approach that was used, was found to be very motivating in all lessons (see this link¹³ for the instructional videos of the experimental handstand lesson). Additional analyses indicated that aspects of the experimental lesson, such as the "iPad-approach", may have played a role in this. For example, the use of the iPad and its videos may have interfered with our manipulations as students may have been able to self-generate the goals and to provide process feedback to themselves and others.

Discussion

Are performance grades really detrimental for students' motivational functioning and do they elicit elevated levels of fear?

Overarching results do not unequivocally show that performance grading has a negative impact on students' need satisfaction, need frustration, motivation and experiences of fear in PE (Chapters 2 and 4). On the one hand, negative associations were found between performance grading and students' need-based experiences and motivation, although the effect sizes were small (Chapter 2), and on the other hand, no relationships were found between performance grading and students' need-based experiences (Chapter 4). A possible explanation seems to be found in the *purpose* that, for example, students, teachers, parents and schools assign to performance grades (Nolen, 2020; Ryan & Deci, 2020). Does the performance grade serve more of a judgmental or more of an informative purpose? Depending on this, feelings of competence, autonomy, relatedness and motivation could vary. More research is needed in order to gain a better understanding on this topic. In sum, the results of this dissertation provide a more differentiated image of how performance grading is associated with students' motivational functioning and fear. No unequivocal evidence was provided that performance grading by itself is detrimental for students' motivational functioning and students' feelings of fear in PE.

¹³ <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>

Can the motivating potential of assessment in PE be augmented by goal clarification and process feedback?

Overarching results of this dissertation provide evidence that students' perceptions of the teachers' goal clarification and process feedback are positively related to students' need satisfaction in PE (Chapters 3, 4 and 5). Moreover, the presence of goal clarification also seems to positively impact students' need frustration, yet more research is needed to clarify how robust these findings are (Chapter 4). Evidence was conflicting regarding the relationship between process feedback and students' experiences of need frustration with either negative (Chapter 5) or insignificant relations being found (Chapter 4). Said differently, none of the studies revealed that process feedback increased feelings of failure, pressure and rejection. Together, the findings thus suggest that the motivating potential of assessment in PE can indeed be augmented by clarifying goals and providing process feedback.

Can experiences of need satisfaction and frustration explain why assessment impacts motivation and fear?

Results from this dissertation provide initial evidence that decreased need satisfaction and increased need frustration indeed can explain why, at least in some situations, performance grading negatively impacts students' motivation and fear in PE (Chapter 2). Moreover, initial evidence is provided showing that when goals are clarified, students experience more need satisfaction, which in turn fosters positive motivational functioning in PE (Chapter 3). Yet, more research is needed to clarify how robust these findings are. Overall, experiences of need satisfaction and frustration can indeed explain why assessment impacts students' motivation and fear in PE.

Can variability in goal clarification and process feedback explain variability in students' need-based experiences?

Overarching results of this dissertation provide evidence that perceived goal clarification and process feedback, and students' motivational functioning differ from lesson to lesson. They also differ between students and between classes. Student-level factors such as students' prior experiences with PE, and class-level factors such as the way the lesson is taught, are examples of factors that can explain motivational differences in PE. Specifically, variability in perceived goal clarification and process feedback indeed explained variability in students' need satisfaction and frustration.

Limitation

This dissertation focused on two teaching strategies (i.e., goal clarification and process feedback) from the framework of assessment for learning (Wiliam, 2011; Wiliam & Thompson, 2008). Although it is important to consider the active involvement in assessment of both the teacher and students, in the present dissertation the focus was on the role of the teacher. In **Chapter 6**, this limitation is further described, along with several possibilities to investigate assessment for learning in future research.

Opportunities for the implementation of motivating assessment in PE: Practical recommendations

Finally, the contribution of this research for educational practice is reflected upon at the end of this dissertation. The results of this dissertation showed that when teachers clarify goals and provide process feedback, students' need satisfaction and motivation are positively influenced. Should we stop assigning performance grades? No. The results



presented in this dissertation do not provide sufficient basis to conclude that grading in itself has a negative impact on students' need-based experiences, motivation and fear in PE. But how can teachers assess in a more motivational way? Based on the results from the studies presented in this dissertation, my personal experience as a PE teacher, my experience as a facilitator of a teacher learning community on this topic, and in accordance with existing literature (see for example Leahy & Wiliam, 2012), I provide four recommendations for educational practice. The recommendations are rooted in the key educational message from this dissertation:

The key message for educational practice:

*The results in this dissertation imply that it is important for educational practitioners, teacher educators and researchers to focus on **goal clarification, process feedback, competence satisfaction, autonomy satisfaction and relatedness satisfaction** and to translate and implement these theoretical concepts into practically applicable teaching-strategies.*

Recommendation 1: Apply a well-considered mix between assessments with a summative purpose such as performance grading, and assessments with a formative purpose such as goal clarification and process feedback and emphasise its informational value in both situations.

As a teacher, you could discuss with your PE department what balance exists in your PE curriculum between assessments with a summative purpose and assessments with a formative purpose. How many times are students assessed with a summative purpose? What do such assessments yield? What do students learn in the amount of time before receiving an assessment with a summative purpose? Do you and your colleagues sufficiently explain learning goals and provide students with process feedback, and as a consequence, are students informed about the reason why they for instance receive 7 out of 10 points?

Recommendation 2: Mix intelligently – Try to align goals, process feedback and the graded assessment of students' performance.

As a teacher, you could discuss with your PE department how the current PE curriculum is structured. Does this match the overarching competencies (i.e., motor competencies, social behaviour, game tactics, organisational skills or other aspects) that the PE department considers important in students' learning? When (re)designing the curriculum, do not start out with planning activities. The national core objectives and learning outcomes of PE should be used as a starting point in building the curriculum. From these, derive learning outcomes for specific learning units and subsequently choose or develop appropriate (graded) assessment tasks. Finally, design learning activities and process feedback to optimally support student learning, in line with the learning outcomes and assessment.

Recommendation 3: Choose one strategy of preference to start with, look for various ways of implementation and try to follow through in every lesson.

As a teacher, you could explicitly include strategies for goal clarification and process feedback in your lesson preparations. Experiment with these teaching strategies, every lesson again. Do not worry if anything does not work out according to plan, because every lesson is a new opportunity to clarify goals and to provide process feedback. The book “Embedded Formative Assessment” (William, 2018) provides practical examples how to implement goal clarification or process feedback in the classroom. This book might serve as inspiration.

Recommendation 4: Implement goals and process feedback in a motivating way.

Both goal clarification and process feedback can be translated into practically applicable motivating assessment strategies. For each assessment strategy, three examples are given below: one motivating assessment strategy for each basic psychological need.

If goal clarification is chosen as the preferential strategy:

- Competence satisfaction. Communicate clear and feasible yet challenging goals, that leave room for differentiation for students of various proficiency levels. Insight in when a task is completed successfully and working on tasks that are not too easy and not too difficult (thus challenging), will foster students' feelings of effectiveness.
- Autonomy satisfaction. By communicating clear and feasible yet challenging goals, it is possible to provide students with choices. For instance, choice in task level of difficulty, in pace and in timing of feedback requests. This will nurture students' feelings of volition and feelings of being in charge of one's own learning process. For example by using the [instruction videos](#)¹⁴ that were developed for the study that is presented in Chapter 5, students could (1) choose on which level of difficulty they wanted to participate by choosing the green, blue, red or black slope, and they could (2) choose in which pace they wanted to work.
- Relatedness satisfaction. By communicating clear and feasible yet challenging goals, it is possible to organise the class in small groups that work cooperatively. By communicating with others in the group about the learning goals, where they stand towards these goals and helping each other to achieve them, students' feelings of a positive classroom atmosphere will be nurtured, provided that students are well-supported in this process.

If providing process feedback is chosen as the preferential strategy:

- Competence satisfaction. Start with explaining what aspects of the task are executed successfully. Then, explain what the student could try to improve while keeping in mind that the proposed steps to be taken should be feasible yet challenging for the student. Insight in (small) successes and how to improve with feasible yet challenging steps will foster students' feelings of effectiveness.
- Autonomy satisfaction. You can offer process feedback with an internal focus (i.e., “If you want to improve your practice, you could try to squeeze your bottom together.”) and with an external focus (i.e., “If you want to improve your practice, you could try to position your back on the landing mat and your feet on the floor. Can you make a plank?”). While communicating this, try to use inviting language such as “you could try to...”

¹⁴ <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>



instead of pressuring language such as “you must...”. By providing choice and applying inviting language, you will nurture students’ feelings of volition and feelings of being in charge of one’s own learning process.

- Relatedness satisfaction. When explaining what aspects of the task are executed successfully and what can be improved, try to express positive support regardless of success or failure. Encourage the student to pose questions regarding their progress. By demonstrating unconditional respect, care and support and by encouraging to pose questions, an open and collaborative relation will be created that promotes a warm and positive classroom environment.

The videos in [this link¹⁵](#) show a practical example of how goal clarification, competence satisfaction, autonomy satisfaction and relatedness satisfaction can be implemented in PE. The document that can be downloaded in [this link¹⁶](#) show a practical example of how process feedback, competence satisfaction and autonomy satisfaction can be implemented in PE.

The section “Recommendations for practice”, Chapter 6, p. 126, provides more information on these four recommendations.

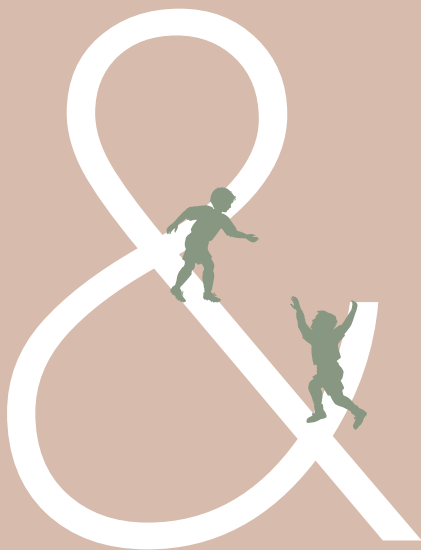
Conclusion

The studies in this dissertation improved our understanding about how performance grades, as well as goal clarification and process feedback, relate to students’ motivational functioning and fear during PE. Results showed that goal clarification and process feedback are effective teaching strategies to support students’ feelings of competence, autonomy and relatedness, and subsequently also stimulate students’ autonomous motivation. As such, this dissertation offers tools for implementation processes in educational practice. More research is needed to better understand performance grades and assessment for learning in relation to motivation. Future research can build on the suggestions that are described in this dissertation.

¹⁵ <https://www.youtube.com/playlist?list=PLLGtTEF0pmuOMz41q-LPpk4S-5W6eybWa>

¹⁶ <https://www.tandfonline.com/doi/suppl/10.1080/17408989.2020.1823956?scroll=top>





About the author

List of publications

Dankwoord



About the author

Christa Krijgsman (1981) is currently a PhD researcher in the final phase of her doctoral studies, appointed in a joint-doctorate at Utrecht University and Ghent University. Besides being a PhD researcher, she is a Physical Education (PE) teacher at a secondary school in the Netherlands.

Christa started her carrier as a secondary school PE teacher at Sint-Janslyceum, 's-Hertogenbosch, after completing her bachelor's degree in PE at Fontys University of Applied Sciences in Tilburg, the Netherlands (2003). While teaching, in 2009, Christa obtained a teacher grant (OCW) and started with the part-time Master of Sports & Education program at Fontys University of Applied Sciences in Tilburg, which she successfully completed in 2012. From 2012 – 2014, she was involved in a research project (in collaboration with, amongst others, all Dutch schools for Physical Education Teacher Education and Ghent University) aiming to gain more insight in current PE assessment practices at secondary schools in the Netherlands. Due to her involvement in this project, in combination with her experiences in PE assessment which she obtained in her work as a PE teacher, she developed an interest in educational assessment and students' motivation in PE. To pursue this interest further, in 2014, Christa applied and obtained a doctoral grant for teachers from the Netherlands Organisation for Scientific Research (NWO). In 2015, Christa started her PhD research investigating the overall research question "How are performance grading, as well as goal clarification and process feedback, related to students' motivational functioning and fear during PE?" in a joint-doctorate at Utrecht University and Ghent University. By the time of her dissertation completion, she published her four doctoral studies in peer-reviewed journals in the educational – psychology research field. She presented her work at various national (Toetsrevolutie, Toetsen & Examineren in het VO, KVLO) and international (JURE, EARLI, AIESEP) conferences. Next to her work as a PhD researcher and a PE teacher, Christa worked with several groups of Dutch teachers from various schools and domains (i.e., education-wide and PE specific), implementing theory on motivating assessment into everyday practice. Moreover, she issued several professional publications on the topic of assessment and motivation, to inform a wider educational audience (teachers, parents and school leaders) about her research findings. After completing her PhD research, Christa will be teaching PE at Sint-Janslyceum, 's-Hertogenbosch, and will be involved in a project investigating the current role of research in secondary education in the Southern part of the Netherlands on behalf of Ons Middelbaar Onderwijs, aiming to identify opportunities to connect research with education and to strengthen its interplay.

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- Krijgsman, C., Mainhard, T., Tartwijk, J., Borghouts, L., & Haerens, L. (2016, July). *Assessment practices: within-student fluctuations in perceived motivational experiences across lessons*. Presentation awarded with the Best-of-JURE-Poster-Award 2016. Poster presented at the meeting of the Junior Researchers (JURE) of the European Association for Research on Learning and Instruction (EARLI), Helsinki, Finland.



- Krijgsman, C., Mainhard, T., Tartwijk, J., Borghouts, L., & Haerens, L. (2016, August). *Assessment practices: within-student fluctuations in perceived motivational experiences across lessons*. Paper presented at the meeting of the Assessment and Evaluation Special Interest Group (SIG 1) of the European Association for Research on Learning and Instruction (EARLI), Munich, Germany.
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- Krijgsman, C., Mainhard, T., van Tartwijk, J., Borghouts, L., Haerens, L. (2018, August). *Do goal clarification and process feedback foster students' motivational functioning? An experiment grounded in Self-Determination Theory*. Paper presented at a symposium on "the interplay between autonomy support and structure" at the meeting of the International Conference on Motivation Special Interest Group (SIG 8) of the European Association for Research on Learning and Instruction (EARLI), Aarhus, Denmark.
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- Krijgsman, C., Mainhard, T., van Tartwijk, J., Borghouts, L., & Haerens, L. (2018, October). *Do goal clarification and process feedback foster students' need-based functioning? An experiment grounded in Self-Determination Theory*. Paper presented at the meeting of the Association Internationale des Écoles Supérieures d'Éducation Physique (AIESEP), Assessment in Physical Education specialist seminar, Eindhoven, the Netherlands.

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- Krijgsman, C., Mainhard, T., van Tartwijk, J., Borghouts, L., Haerens, L. (2017, maart). *Het promoten van optimale motivatie voor Lichamelijke Opvoeding door het communiceren van doelen, criteria en op groei gerichte feedback*. Paper gepresenteerd in een symposium op de Dag voor Lichamelijke Opvoeding, Apeldoorn, Nederland.
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Dankwoord

Dit proefschrift is het resultaat van een vijf en een half jaar durend avontuur aan Universiteit Utrecht en Universiteit Gent. Een avontuur dat op ook de voet werd gevolgd door het Sint-Janslyceum, Ons Middelbaar Onderwijs en Fontys Sporthogeschool. Een avontuur waarin ik drie dagen per week promotie-onderzoek combineerde met twee dagen per week lesgeven als docent LO. En wat voor een avontuur is het geweest. Deze periode heeft een bijzondere indruk op mij achtergelaten en heeft mij zoveel meer gebracht dan alleen de totstandkoming van dit proefschrift. Het was een verrijking op persoonlijk vlak, waarbij grenzen omgezet werden in uitdagingen en doorzettingsvermogen een nieuwe betekenis kreeg. Ik prijs me gelukkig met het leertraject dat ik heb mogen doormaken en ik ben eenieder die me daarbij geholpen heeft oprecht heel dankbaar. In chronologische volgorde van het moment waarop jullie betrokken raakten bij mijn promotie-traject wil ik jullie graag bedanken.

Lars, mijn avontuur begon in gesprek met jou, toen ik mijn idee offerde over een aanvraag voor een promotiebeurs voor leraren. Jij gaf me vertrouwen om het avontuur aan te gaan en alles stap voor stap aan te gaan pakken. Literatuur lezen, onderzoeksidee uitwerken, een begeleidingsteam samenstellen. Jij was erbij en je hielp bij iedere stap. Tijdens mijn onderzoekstraject heeft jouw perspectief op evaluatie in de les LO mijn blik altijd verruimd. Je was altijd bereid om tijd vrij te maken om stukken na te lezen of om overleg in te plannen. De manier zoals jij theorie weet te vertalen naar de praktijk, in artikelen, maar bijvoorbeeld ook in trainingen, en de passie die je hierbij laat zien, is een rijke bron van inspiratie voor mij. Ook de persoonlijke berichtjes die je af en toe stuurde heb ik altijd enorm gewaardeerd.

Leen, jij bent een van de belangrijkste personen geweest in de totstandkoming van dit proefschrift. Ook jij gaf me vertrouwen door aan te geven dat je me wilde begeleiden in een dubbeldoctoraat als ik een promotiebeurs zou kunnen bemachtigen. Wat begon bij vertrouwen uitspreken mondde uit in een begeleiding die enorm rijk is gebleken. Op onderzoeksgebied heb je me altijd van stevige, kritische en opbouwende feedback voorzien. Jouw eigen lat ligt hoog en je legt de lat van jouw promovendi ook hoog. Uitdaging met hoofdletter U en Doorzettingsvermogen met hoofdletter D. De uitdagingen en de daarbij behorende feedback en hulp hebben mijn niveau keer op keer doen groeien. Je vroeg veel van mijn doorzettingsvermogen, maar ik heb iedere uitdaging steeds graag aangepakt, juist omdat ik zag dat mijn werk er beter van werd. Daarbij begeleidde je niet alleen de onderzoeker, maar ook de persoon achter de onderzoeker. Op deze wijze ondersteunde je me altijd, zowel in tijden van "ieder succesje moet je vieren" als in tijden waarin ik het even niet meer zag zitten. Er is nog zoveel meer waarvoor ik je dankbaar ben. Rosmalen – Gent is niet om de hoek. Om zo efficiënt mogelijk de reistijd te gebruiken nodigde je me uit om bij jullie thuis te overnachten; twee nachtjes per maand. Jij en Koen hebben me gastvrij opgenomen in jullie gezin, waar ik mee mocht eten, met de kindjes op de trampoline speelde en in slaap mocht vallen onder een hemel van sterrenstickers. Op dinsdagavond draaiden we de rollen van coach/ trainee even om en mocht ik jou en je tennisvriendinnen van een tennislesje voorzien. Aan al deze momenten, maar ook aan onze talloze autoritjes Gent-Brugge en



Brugge-Gent, waarin we vele gesprekken over werk en privé hadden en waarin we elkaar heel goed hebben leren kennen, denk ik met veel weemoed terug. Herinneringen die ik voor altijd zal koesteren. Leen, uit de grond van mijn hart ben ik je heel erg dankbaar voor alles wat je voor me hebt gedaan, zowel op professioneel als op persoonlijk gebied.

Jan, vanaf ons eerste gesprek heb ik altijd een gevoel van vertrouwen van je gekregen. Jij stond open voor een samenwerking met Universiteit Gent in een dubbeldoctoraat en voor de begeleiding van een docent LO met een onderzoeksidee. Want meer was het op dat moment nog niet. Hetzelfde soort 'blinde vertrouwen' heb ik altijd van je gekregen, iets waarvan ik besef dat het heel bijzonder is. Het heeft me de ruimte gegeven die ik nodig had om een traject met drie werkplekken (UU, UGent en Sint-Janslyceum) te kunnen combineren en succesvol tot een einde te brengen. Ook jij was een begeleider die, wanneer ik bij aanvang van een overleg direct over de inhoud begon, mij onderbrak en vroeg 'Hoe gaat het eigenlijk met je?'. Dat ook de persoonlijke kant achter de inhoudelijke kant door jou gezien werd, heb ik altijd heel erg gewaardeerd. Ook heb ik het altijd enorm gewaardeerd hoe je tijd voor me vrijmaakte. In een overvol schema toch nog een twee-uur durend overleg inplannen of ergens in het weekend nog een stuk voorzien van feedback. Bij dringende zaken vroeg je me altijd een appje te sturen. Je reageerde dan altijd heel snel en zocht overal een oplossing voor.

Tim, wat heb ik veel van jou mogen leren. Ook jouw lat ligt erg hoog en voorzichtig bekeek je in welke mate die lat bij mij ook steeds hoger kon. In het begin van mijn traject kwam er stoom uit mijn oren als ons overleg ten einde was. Soms ging ik dan een wandelingetje maken om alles te verwerken wat er gezegd was. Voornamelijk op statistisch vlak, maar zeker ook op allerlei andere vlakken zoals het ontwerp van onderzoek en schrijfvaardigheden, heb je mijn vaardigheden naar een hoger niveau getild. Daar ben ik echt heel blij mee. In jouw begeleiding was je ook heel reëel en eerlijk. Aan het einde van de rit was jij bijvoorbeeld diegene die voorzichtig ter sprake bracht of het niet beter was om de vijfde paper niet op te nemen in dit proefschrift. Om daar meer tijd voor te nemen op een later moment met betere omstandigheden. Je gaf daarmee een goede voorzet, waarvoor ik je heel dankbaar ben. De manier waarop je deze sterke inhoudelijke begeleiding gaf, op een serieuze maar ook ontspannen manier, waar af en toe een goede grap zeker welkom was, heb ik heel fijn gevonden. Ook bij jou was er altijd tijd om even te informeren hoe het met mij persoonlijk ging, zeker in tijden van zwangerschap, maar ook daarna toen er wat meer druk op de ketel kwam. Tim, dankjewel voor alles en ik kijk ernaar uit om van paper 5 een dikke kers op de taart te maken!

Vier individueel goede begeleiders bleken ook nog eens fantastisch samen te werken in een begeleidingsteam. Iedereen had zijn eigen expertise en gaf altijd feedback vanuit zijn eigen perspectief. Deze feedback lag niet altijd op één lijn. Jullie hebben altijd aangegeven dat ik mijn eigen weloverwogen keuzes mocht maken. Iets waarin ik heb moeten groeien, maar waarvan ik veel geleerd heb en jullie zeer dankbaar voor ben. Ik hoop dat we in de toekomst nog veel mogen samenwerken.

Maarten, jij was co-auteur op twee van de vier manuscripten en toevoorder of discussant van mijn werk tijdens verschillende symposia in Gent en op EARLI congressen. Vanuit die rollen heb jij een grote bijdrage geleverd aan mijn perspectief op de Zelf-Determinatie Theorie en specifiek inhoudelijk aan de studies in dit proefschrift. Je feedback was altijd zeer opbouwend kritisch en zodanig grondig van aard, dat vaak analyses opnieuw werden

uitgevoerd en tekst daarna opnieuw moest worden uitgeschreven. Ik ging dergelijke pittige feedback zien als een sport. Een uitdaging die de kwaliteit van het werk zou verhogen. Maarten, mede door jouw inzichten ben ik als onderzoeker enorm gegroeid en hebben de studies in dit proefschrift het huidige niveau kunnen behalen. Dank dat ik zoveel van je mocht leren.

Nathalie, lief, zacht, behulpzaam... Je was voor mij een voorbeeld onderzoeker en een soort mentor. Als ik weer op het kantoor in Gent aankwam gaf je me altijd een warm onthaal en vroeg je altijd hoe het ging. Ik mocht altijd met inhoudelijke vragen aan je bureau verschijnen en je was altijd bereid iets nog een keer uit te leggen als ik het niet begreep. Je luisterde als dingen even wat minder goed gingen en gaf een knuffel als dat nodig was. Talloze fijne momenten zijn fantastische herinneringen geworden: bijvoorbeeld in Limassol (einde EARLI congres) een drankje op het strand om het verloop van een goede week te vieren of lunchen in de PPW om even bij te kletsen. Aan het bijna-einde van mijn traject mocht ik ook bij jou, Kevin en de kindjes slapen. Handstandjes maken met de meisjes tegen de muur of tegen de bank. Een aperitiefje. Tijdens een van deze avondjes heb ik zelfs een keer met heel veel plezier deelgenomen aan jouw les ritmische gymnastiek bij de vereniging waar je les gaf. Nathalie, al met al herinneringen die ik nooit zal vergeten. Dankjewel voor alles en dankjewel dat je er voor me wil zijn als paranimf.

Mijn hele promotie-traject had nooit kunnen plaatsvinden als de school waar ik werk, het Sint-Janslyceum, niet achter mijn keuze had gestaan. Toine, Paulien, Roel, Jean en Ramona, door de tijd heen hebben er wat wisselingen van rectoren en leidinggevendens plaatsgevonden. Hetgeen jullie allemaal gemeen hebben is dat jullie mij altijd volledig ondersteund hebben in mijn ambitie om dit promotie-traject succesvol te doorlopen, iets wat ik altijd bijzonder gewaardeerd heb. Jullie waren altijd geïnteresseerd in mijn voorstellen, dachten met me mee waar mogelijk om op beide werkplekken (onderwijs en onderzoek) alles goed te laten verlopen, en stonden/ staan altijd open voor de vertaling van de theorie naar de dagelijkse onderwijspraktijk op het Sint-Janslyceum om de kwaliteit van ons onderwijs nog beter te maken. Bedankt daarvoor.

Collega's van het Sint-Janslyceum, bedankt voor jullie interesse in mijn onderzoekswerk. In het bijzonder een bedankje aan de vakoverstijgende groep collega's waarmee ik samenwerk om de theorie van mijn proefschrift te vertalen naar de onderwijspraktijk: het is inspirerend om elkaars ervaringen van implementatie te horen en samen te bekijken hoe we leerlingen meer kunnen laten groeien in hun leerproces. Astrid en Sven, ook met jullie mag ik altijd samenwerken om de theorie van mijn proefschrift te vertalen naar de LO onderwijspraktijk. Samen ontwikkelden we materialen voor de LO les (zo ook de filmpjes die gebruikt zijn in de studie die gepresenteerd is in Hoofdstuk 5), probeerden we dingen uit en pasten we aan waar dat nodig bleek. Dank voor onze open samenwerking. Maar nog meer bedankt voor de vriendschap die er is. Bij een lach, maar ook bij een traan. Even onaangekondigd thuis aanwaaien, of even een informerend appje sturen. Super fijn dat dit kan en dat dit er is.

Ook ons Middelbaar Onderwijs (OMO) heeft mij ondersteund op een belangrijke manier. Eugène, Jos, Jos en Karin, jullie gaven me vertrouwen door in eerste instantie te geloven in mijn onderzoeksvoorstel. Jullie gaven me vrijstelling van mijn werkzaamheden op het Sint-Janslyceum voor één dag in de week om te werken aan mijn onderzoek – iets wat in zeer grote mate heeft bijgedragen aan de haalbaarheid van mijn ambitieuze onderzoeksplan.



Ook gaven jullie mij vrijheid om mijn werk te doen, omdat jullie wisten hoe veelomvattend de opdracht (promoveren en lesgeven combineren) was die ik mijzelf gesteld had. Nu mijn promotietraject bijna succesvol doorlopen is, krijg ik van jullie een kans om samen na te denken over de versteviging en verbinding tussen onderzoek en onderwijs in de toekomst van OMO-scholen. Dank voor het vertrouwen en de kansen die ik van jullie gekregen heb.

Zonder deelnemende docenten en leerlingen had ik mijn onderzoek nooit kunnen uitvoeren. Aan alle deelnemende docenten en leerlingen: bedankt dat er in jouw les vragenlijsten afgenomen mochten worden en bedankt dat je een of meerdere vragenlijsten hebt willen invullen. En wat betreft de experimentele studie (Hoofdstuk 5): bedankt dat je mij je leerlingen toevertrouwde zodat ik hen een gastles kon geven en bedankt dat ik jullie gastdocent mocht zijn.

Lieve collega's, kamergenootjes en medepromovendi in Utrecht en Gent: Katrijn, Mare, Marloes, Sophie, Anne, David, Xiaojing, Mei, Jonne, Eva, Bas, Renée, Monika, Anouk en Sophia/ Jolien, An, Sofie, Femke, Julie, Tom en Kris (en in zowel Utrecht als Gent nog veel meer kanjers waar ik wat minder contact mee heb gehad), wat was het fijn om te weten dat velen van ons hetzelfde proces aan het doorlopen waren of het proces heel goed kenden. Wat was het fijn om altijd vragen te mogen stellen. Wat was het fijn dat iedereen elkaar altijd wilde helpen. Wat was het fijn om samen ook ontspanning op te zoeken. Of het nu buikspierkwartier was, een lunch aan de statafel op het LV3 plein, een rondje hardlopen langs de Watersportbaan, tennis op het dak van het HILO, een wandeling door de Botanische Tuinen, of een congres met inspirerende sessies en gezellige drankjes; het zijn allemaal mooie herinneringen die ik nooit meer vergeet. Jolien en An, voor jullie een speciale dankjewel. Jullie hebben mij met open armen ontvangen toen ik in Gent begon. Aan jullie mocht ik altijd vragen stellen of zochten we ontspanning op zoals voor dag en dauw een rondje rennen door Londen of een avondje bowling ergens in Gent. Ik zal de vele mooie herinneringen altijd koesteren. Katrijn, ook voor jou een speciale dankjewel. Ik heb onze LO-achtergrond altijd gezien als de reden dat we het zo goed met elkaar konden vinden. Samen in de Zumba en Bodypump les, op weg naar Gent of gewoon even bijkletsen aan tafel. Ik ben blij dat je mijn paranimf wil zijn.

Lieve Yvette, jij was degene die mij tipte op de promotiebeurs. Jij was erbij (ergens in het hoge Noorden van Lapland) toen ik de verlossende mail kreeg dat mijn promotiebeurs-aanvraag toegekend was. Je hebt me altijd aangemoedigd zoals alleen Yvette dat kan. Lief en leed heb ik altijd met je mogen delen, iets waarvoor ik je heel dankbaar ben. Yv, je hebt een speciaal plekje in mijn hart. Ik kijk ernaar uit om onze meisjes samen te zien opgroeien.

Lieve papa en mama, jullie hebben mij geleerd dat als je ergens voor kiest, je daarvoor je best moet doen. Een gezonde portie doorzettingsvermogen en eigen verantwoordelijkheid nemen werd me al vroeg bijgebracht, of dit nu via muziek, sport of school was. Jullie gaven me daarbij altijd de ruimte om mijn eigen keuzes te maken. Nu, zoveel jaren later, besef ik dat ik toen al karaktereigenschappen heb ontwikkeld die me zeker hebben geholpen om dit proefschrift tot stand te laten komen. Jullie hebben altijd veel interesse getoond in mijn werk en met me meegeleefd bij ieder klein succesje of hobbeltje. Ik prijs me gelukkig dat jullie er altijd voor me zijn.

Lieve Josta, Joep, Els, Suzanne en Pim, dank jullie wel dat jullie, meer dan eens, begrip toonden als ik weer eens moest werken in weekenden of vakanties. Bedankt dat jullie gezorgd hebben voor de broodnodige afleiding en dat jullie zo lief zijn voor Luna.

Lieve Victor, waar zal ik beginnen. Het begon met jouw tomeloze vertrouwen in mijn kunnen, je hielp mij met structuur te krijgen in mijn gedachten en de grote lijnen te blijven zien. Daarna kwamen jouw managementvaardigheden mij te hulp, waarbij je mij leerde prioriteiten te stellen: je kunt nu eenmaal niet alles. Ook kon ik altijd vertrouwen op jouw ICT help-desk vaardigheden. We hebben samen mijn successen gevierd, en je was er ook om mij een knuffel te geven als ik het even niet meer zag zitten. Aan het einde van mijn promotie-traject was jij altijd degene die me onvoorwaardelijk de ruimte gaf mijn eigen keuzes te maken en me stimuleerde om weer achter de computer te kruipen om dit werk af te maken. Ik hou van je energie en je hulpvaardigheid en het is fantastisch om te zien met hoeveel humor en liefde je speelt met Luna.

Lieve Luna, waar mijn avontuur op het gebied van promoveren nu succesvol ten einde gaat komen, staat er een nieuw avontuur met jou te wachten. Iedere ochtend lig je te wachten in je bedje totdat ik je kom halen. Als ik binnenkom heb je een grote glimlach op je gezicht en gaan we samen snel kijken waar de eendjes zwemmen. Op deze manier verdwijnt mijn vermoeidheid als sneeuw voor de zon, iedere dag opnieuw. Stappend en met een heleboel woordjes weet jij precies aan te geven wat je graag wil doen, bijvoorbeeld – *buien of binne spele* – . De lieve en enthousiaste glimlach die jij daarbij laat zien is zo betekenisvol en puur. Blijf maar altijd zo lief en puur. Ik geniet van iedere dag die we samen beleven en ik kijk uit naar alles wat komen gaat.





Assessment with a focus on setting clear goals and providing process feedback have the potential to contribute to secondary school students' motivational functioning. In contrast, traditional assessments such as performance grading often negatively affects students' interest and love of learning (i.e., autonomous motivation). Yet, the potential of setting clear goals and providing process feedback is not fully realised in physical education (PE) lessons, as students are often ill-informed about

PE goals and unaware about what PE assessment is based on. Therefore, this dissertation addressed the main question "How are performance grading, as well as goal clarification and process feedback, related to students' motivational functioning and fear during PE?".

The research presented in this dissertation provides a more differentiated image of how performance grading is associated with students' motivational functioning and fear. There was no unequivocal evidence that performance grading by itself is detrimental for students' need satisfaction and frustration, quality of motivation and students' feelings of fear in PE. Further, the motivating potential of assessment in PE can indeed be augmented by clarifying goals and providing process feedback. Goals impacted students' motivation positively through students' need satisfaction, whereas performance grading impacted students' motivation and fear negatively through increased need frustration and decreased need satisfaction. Notably, the presented research indicates that perceived goal clarification and process feedback, as well as students' motivational functioning, vary from lesson to lesson. This variability in perceived goal clarification and process feedback explained variability in students' need satisfaction and frustration, suggesting that teachers can affect students' need satisfaction and frustration every lesson again.

Results from this dissertation are translated into four practical recommendations, by which I hope to inspire educators and teacher-educators to engage in more motivating assessment of student performance in PE.

