Differences in regulation and efficiency of learning between traditional and non-traditional students

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Abstract

The aim of this study was to research in which aspects of regulation of learning the traditional and non-traditional students enrolled in the Bachelor of Health study program of Physiotherapy at Avans University of Applied Sciences differ, and if non-traditional students learn more efficiently than traditional students.

Significant differences between traditional students (defined as having entered higher education for the first time and under the age of 24) and non-traditional students (defined as those 24 and over who are searching for meaning and relevance connected to their working life and job experience and therefore pursuing higher education), were identified on 13 of the 16 combined MSLQ and ILS scales. On the Rehearsal scale, the traditional students score significant higher than non-traditional students. Non-traditional students performed better on 12 of the 16 scales. Non-traditional students were also found to be more able to regulate their learning than traditional students in the areas of cognition, motivation, behavior and context.

Non-traditional students scored significantly higher on a multiple-choice Physiotherapy test. It can be concluded that non-traditional students learned material more efficiently than traditional students on the measures studied.

Keywords: Regulation of Learning; Efficiency of Learning; Higher Education; (Non-) Traditional Students; MSLQ

Introduction

Lecturers at the Academy of Health of Avans University of Applied Sciences assume that traditional and non-traditional students differ in regulation and efficiency of learning. The aim of this research is to discover if, and in which aspects of regulation and efficiency of learning, traditional and non-traditional students differ.

Traditional and non-traditional

According to Jinkens (2009) traditional students (less than 24 years of age) are more focused on getting high grades, while non-traditional students (24 years of age and older) are more focused on what they can do with the knowledge obtained. Jinkens (2009) describes the characteristics for a traditional and non-traditional student besides age: non-traditional students are more serious and more motivated. Traditional students have the opposite characteristics: less serious,

less motivated and need more encouragement (Jinkens, 2009).

Ronning (2009) states that this growing group of non-traditional students faces several challenges. These challenges (studying off campus, having work and family obligations) cause an increased total workload and therefore these students necessarily have to acquire highly self-regulated behavior.

Non-traditional students are searching for meaning and relevance connected to their working life situation and experience (Ronning, 2009). First-time non-traditional students are significantly more reproducing orientated and take in knowledge by memorizing (Vermunt & Vermetten, 2004) than students with prior experience in higher education. These non-traditional students with prior knowledge of higher education are familiar with the study culture in academia and were able to apply a more effective approach to studying.

According to Ronning (2009), non-traditional students have an impressive ability to reorganize their lives and fit their studies into the total context of their other obligations and thus regulate their learning and learning activities. Good time management is associated with a meaning orientation, and poor management with a reproducing orientation. Ronning (2009) states that this distinction confirms that there is a close connection among self regulated behavior, metacognition, and the quality of learning also among non-traditional students. Self-efficacy is the dimension most strongly related to study strategies (Ronning, 2009). It is negatively related to the reproducing approach, thus indicating that a more uncertain, inexperienced approach to study is connected with doubts about one's own mastery (Ronning, 2009).

Regulation of learning

Within the learning process, Pintrich (2004) distinguishes four phases and areas in regulation of learning (Table 1). From the self-regulated learning (SRL) perspective (Pintrich, 2004), students are actively involved in their learning process. They can monitor, control and regulate aspects of their cognition, motivation, behavior, and some features of their surroundings.

Based on these areas and phases, Pintrich (2004) designed a conceptual framework for research on the motivation and learning of college students. Pintrich (2004) suggests that the framework is a blueprint for development of instruments that measure the motivation and learning of college students.

Cognition. Cognitive control and regulation includes different types of cognitive and metacognitive activities (Pintrich, 2004). Metacognition is important in monitoring cognition (Phase 2 of the conceptual framework; Pintrich, 2004). Vermunt (1996) states that metacognitive regulation activities are directed at regulating cognitive and affective learning activities. Cognitive processing activities are those that people use to process the content to be learned. These activities lead to learning outcomes in terms of knowledge, skills and attitudes.

There is an individual difference in cognitive development which leads to differences in how well and how quickly people learn (Woolfolk et al., 2008). Non-traditional students generally are older compared to traditional students. Based on the development of the frontal cortex of the brain (Jolles, 2007), non-traditional students should be able to monitor their learning process more efficiently, as compared to traditional students.

Motivation. Students in higher education use several strategies to keep themselves motivated; they use external-oriented goals like achieving good grades, they give themselves incentives, and they make tasks more interesting and practical (Pintrich, 2004). A useful distinction can be drawn here between intrinsic and extrinsic motivation. Intrinsic motivation

sustains personal factors, personal needs and interests. Extrinsic motivation concerns external factors

Table 1. *Phases and Areas for Self-Regulated Learning (Pintrich, 2004)*

	Areas for regulation			
	Cognition	Motivation/Affect	Behavior	Context
Phase 1 Forethought, planning, and activation	Target goal setting	Goal orientation adoption	Time and effort planning	Perceptions of task
	Prior content knowledge activation	Efficacy judgments	Planning for self observations of behavior	Perceptions of context
	Metacognitive knowledge activation	Perceptions of task difficulty	Task value activation	Interest activation
Phase 2 Monitoring	Metacognitive awareness and monitoring of cognition	Awareness and monitoring of motivation and affect	Awareness and monitoring of effort, time use, need for help	Monitoring changing task and context conditions
			Self-observation of behavior	
Phase 3 Control	Selection and adaptation of cognitive strategies for learning, thinking	Selection and adaptation of strategies for managing, motivation, and affect	Increase/decrease effort	Change or renegotiate task
			Persist, give up	Change or leave context
			Help-Seeking behavior	
Phase 4 Reaction and reflection	Cognitive judgments Attributions	Affective reactions Attributions	Choice behavior	Evaluation of task Evaluation of context
Relevant MSLQ Scales	Rehearsal	Intrinsic Goals	Effort Regulation	Peer Learning
	Elaboration	Extrinsic Goals	Help-Seeking	Time/Study Environment
	Organization	Task Value	Time/Study Environment	
	Critical Thinking	Control Beliefs		
	Metacognition	Self-Efficacy		
		Test Anxiety		

which influence a person, like incentives, punishments and social pressure (Woolfolk et al., 2008). According to Jinkens (2009) non-traditional do not need much extrinsic encouragement, because they have relatively strong intrinsic motivation.

Behavior. Planning and prioritizing is part of behavioral control. Students attempt to channel their efforts in order to achieve good grades. Students who are able to regulate their behavior and effectively invest their effort in difficult and boring tasks are able to use effective study strategies. Students who are able to self regulate their behavior know when, why and from whom to seek help (Pintrich, 2004). The need for planning and controlling effort is higher for non-traditional students, as compared to traditional students. These behavioral regulatory strategies could lead to a more efficient approach to learning (Pintrich, 2004).

Context. Time planning and time management within an academic context involve making schedules and setting priorities. The Academy of Health uses the student-centered approach in which students have influence on the context and environment of learning (e.g., projects, experiments and collaborative learning groups). Students who are able to control and regulate their study environment are able to resist distractions and have an organized environment conducive to study (Pintrich, 2004).

Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire (Pintrich & De Groot, 1990) is a validated and practical instrument that measures all four areas of regulation in the framework (Pintrich, 2004). Pintrich and De Groot (1990) conducted one of the first empirical studies using the MSLQ. Further development of the instrument led to an 81-item self-reported questionnaire for assessing college students' motivational orientations and their use of different learning strategies (Pintrich, Smith, Garcia & McKeachie, 1991).

Jacobsen and Harris (2008) investigated the differences between traditional and non-traditional students measured with the MSLQ. Differences between traditional and non-traditional students were found for 10 out of 15 scales. Jacobsen and Harris (2008) found that non-traditional students differed significantly on four motivation scales: Internal and External Goal Orientation, Task Value and Test Anxiety. The higher scores of non-traditional students on Internal Goal Orientation and Task Value can be explained by their higher intrinsic motivation (i.e., in terms of improved vocational opportunities, personal interest, employment requirements and striving for a better standard of living. The lower scores of traditional students with respect to External Goal Orientation can be explained by the fact that traditional students do not have the life experience necessary to set clear career and educational goals (Jacobsen & Harris, 2008).

Results of the two groups with respect to the learning strategy scales Elaboration, Organization, Critical Thinking, Metacognitive Self-Regulation, Effort Regulation and Help-Seeking also differed significantly. The non-traditional students scored significantly higher than the traditional students on all of these scales except Help-Seeking, where traditional students scored significantly higher. These results support the theory that self-regulated behavior is a combination of a variety of strategies. These six learning strategy scales are described in the literature as the critical elements of a self-regulated learning model (Jacobsen & Harris, 2008).

The MSLQ does not cover all self-regulatory strategies. Nevertheless the MSLQ can be used to research the areas of

regulation (Pintrich, 2004). Entwistle and McCune (2004) reviewed seven study inventories in order to find differences and overlaps. They compared the constructs of the Inventory Learning Styles (ILS) and the MSLQ to each other and to other inventories. They found that the MSLQ is distinctive in measuring metacognition and self-regulation.

Inventory Learning Styles (ILS)

Vermunt (1996) conducted a questionnaire, the ILS, which includes items measuring self-regulation. The ILS contains items at different levels of learning; deep learning (critical processing, relating ideas and structuring) and surface learning (memorization and rehearsal). The MSLQ, in contrast, focuses on deep learning and contains only two items referring to surface learning.

Vermunt and Vermetten (2004) state that regulatory activities involve, for example, focusing on a learning task, monitoring the learning process, diagnosing the cause of difficulties and changing learning activities during the process. These activities are similar to Pintrich's phases of regulation of learning. Vermunt and Vermetten (2004) have reviewed several articles about learning strategies. They distinguish three main regulation strategies: (1) self-regulated strategy (students perform regulation activities by themselves) (2) externally regulated strategy (students let their learning process be regulated by teachers or books) and (3) lack of regulation (students are unable to regulate their learning and experience insufficient support from their surroundings. The aim of Vermunt's and Vermetten's research (2004) was to integrate existing constructs of student learning and to connect metacognition of student learning to motivation and cognitive processing.

One of the conclusions of their review was that older or more experienced students show greater ability to differentiate various learning strategies, conceptions, and orientations and also reflect stronger interrelationships between those concepts than younger or less experienced learners. Furthermore Vermunt and Vermetten (2004) conclude that older students regulate both internally and externally. Older students adjust their learning activities when they face difficulties, and they monitor their learning process in order to imagine the subject more specifically in terms of its real-life applications. Older students find they master the subject when they are able to understand the relationship between theory and practice (Vermunt, 1996). When combining the MSLQ and the ILS, both levels of learning (deep and surface) can be taken into account.

Efficiency of learning

The areas of cognition and behavior (Pintrich, 2004) are related to brain development and efficiency of learning. Based on the cognitive load theory, Paas and Van Merriënboer (1994) developed a research method for measuring students' learning efficiency.

The cognitive load theory is based on the very limited capacity of short-term memory. Learning takes place when information is transferred from short-term memory to the relatively unlimited long-term memory (Paas, Tuovinen, Tabbers & Van Gerven, 2003). Cognitive load represents the load that performing a particular task imposes on the cognitive system of the learner (Paas & Van Merriënboer, 1994).

In the view of Paas and Van Merriënboer (1994) the model has a causal and an assessment dimension. The causal dimension suggests interaction between task and student characteristics. The assessment dimension reflects the measurable construct of mental effort and performance. Mental effort is estimated during work on a task. Performance can be estimated during working, in terms of time

on task, and in terms of correct number of items and number of errors. Paas and Van Merriënboer (1994) suggest that gauging the intensity of mental effort is essential for an appropriate way to measure cognitive load.

In their first study involving the estimating of cognitive load and efficiency of learning, Paas and Van Merriënboer (1993) let participants score mental effort on a Likert scale from 1 (very very low mental effort) to 9 (very very high mental effort) while performing a particular task. Its reliability, sensitivity and user-friendliness make the scale the most frequently used instrument for measuring Cognitive Load (Paas et al., 2003).

Van Gog, Kirschner, Kester and Paas (n.d.) recommend that mental effort be estimated on a frequent and ongoing basis. Their experiments reveal that the entire experienced mental effort is greater than the sum of its parts. When mental effort was measured right after performing a task, learners experienced less mental effort than when it as measured following a sequence of tasks.

Research on differences in regulation and learning efficiency

Literature indicates differences between traditional and non-traditional students with respect to regulation of learning and efficiency of learning. There is no clear evidence that these differences can be applied to traditional and non-traditional students in the Physiotherapy Program of the Academy of Health of Avans University of Applied Sciences. This study focuses on the differences in learning and how these differences can influence outcomes on the MSLQ. The study focused on two critically important questions in addressing whether there are differences in regulation of learning and in efficiency of learning between traditional and non-traditional students in the Physiotherapy Program of the Academy of Health of Avans University of Applied Sciences? (1) What differences in regulation of learning can be determined between traditional and non-traditional students? (2) What differences in efficiency of learning (combining mental effort and performance) can be determined between traditional and non-traditional students?

Method

Setting

The Physiotherapy program at Avans (located in Breda, The Netherlands) is a four-year course of study leading to a bachelor's degree. Avans University of Applied Sciences is located in Breda, the Netherlands. The educational program of Physiotherapy is designed for traditional and non-traditional students. The student population consists of 175 traditional freshman students and 75 non-traditional freshman students.

The preparatory education of traditional students is secondary education (HAVO or VWO) or senior secondary vocational education and training (MBO). The entry requirement of the part-time bachelor program is a bachelor's degree of any kind. All participants take part in the same educational program and take the same courses and classes, except that non-traditional students have a class schedule different from that of traditional students, and one that involves fewer tutorial hours (i.e., 22 as opposed to 40).

Participants

Participants comprised 250 freshman students enrolled in the bachelor degree program in Physiotherapy at Avans University of Applied Sciences. For the Efficiency of Learning instrument, all participants were surveyed, and 175 (70%) were identified as traditional students and 75 as non-traditional students (30%). For the Regulation of Learning instrument, 181 students (72%) of the total population were surveyed, with 137 (76%) identified as traditional students and 42 (23%) as non-traditional students. Two cases were

removed from the data set due to incomplete data, leaving 179 cases available for analysis with descriptive statistics. Table 2 shows a comparison of the total student percentage with the total sample percentage and frequencies.

Table 2. *Comparison of sub-samples of Traditional (T) and Non-Traditional (NT) students*

		Total Student Percent		Total Sample Percent (n=179)		Frequency	
		T (n=137)	NT (n=42)	T	NT	T	NT
Gender	Male	42	48	32	11	57	20
	Female	58	52	45	12	80	22
Age	Younger than 24 yrs	99	7	75	2	135	3
	Older than 24 yrs	1	93	1	22	2	39
Education	MBO, HAVO & VWO	100	17	76	4	136	7
	HBO & WO	0	83	0	20	0	35
Children	Yes	0	24	0	6	0	10
	No	100	76	76	18	137	32
Job	No job	19	2	14	1	26	1
	Less than 16 hrs*	72	5	55	1	98	2
	More than 16 hrs*	9	93	7	22	13	39
Study hrs	Less than 75%**	48	38	38	8	60	13
	More than 75%**	52	62	41	13	64	21

Note. * Working hours per week; ** Study hours per week, Traditional program consists of 40 hours per week of classroom instruction and tutorial hours, non-traditional program consists of 22 hours per week of classroom instruction and tutorial hours.

Instruments

The survey instrument used to collect the data for the regulation of learning was a self-questionnaire based on the MSLQ (Pintrich et al., 1991) and a part of the ILS (Vermunt, 1996): resulting in a combined MSLQ-ILS questionnaire. The MSLQ consists of 81 self-report items. Pintrich et al. (1991) divided the MSLQ into two broad categories: (1) a motivation section and (2) a learning strategies section.

According to the Manual for the use of the MSLQ (Pintrich et al., 1991) the motivation section consists of 31 items that assess students' goals and value beliefs for a course, their beliefs about their ability to succeed, and their anxiety about tests. The learning strategy section includes 31 items regarding students' use of different cognitive and metacognitive strategies. In addition, the learning strategies section includes 19 items concerning student management of different resources (Pintrich et al., 1991).

According to Pintrich (2004), the MSLQ (Pintrich et al., 1991) is limited in measuring regulation of learning, because the development of the MSLQ started in the early 1980s and was finalized in 1991. New insights about brain development and learning strategies discovered during the past two decades have thus not been integrated into the instrument. Based on this information, a new instrument was

developed and the MSLQ (Pintrich et al., 1991) was complemented with of the section of the ILS (Vermunt, 1996) that assesses self-regulation. This section of the ILS comprises a 16th scale called "Self-regulation" (Vermunt, 1996).

Table 3. *Components of the MSLQ (Pintrich et al., 1991) and the ILS (Vermunt, 1997) divided in the areas of regulation (Pintrich, 2004)*

Area	Scale	e.g. Item	Code	N_{items}
Cognition	Rehearsal	When I study for this class, I practice saying the material to myself over and over.	(Reh)	4
	Elaboration	I try to relate ideas in this subject to those in other courses whenever possible.	(Elab)	6
	Organization	I make simple charts, diagrams, or tables to help me organize course material.	(Org)	4
	Critical thinking	I try to play around with ideas of my own related to what I am learning in this course.	(Crit)	5
	Metacognitive Self-Regulation	When reading for this course, I make up questions to help focus my reading.	(Mcg)	12
Motivation/ Affect	Intrinsic Goal Orientation	In a class like this, I prefer course material that really challenges me so I can learn new things.	(Intr)	4
	Extrinsic Goal Orientation	Getting a good grade in class is the most satisfying thing for me right now.	(Extr)	4
	Task Value	I think the course material in this class is useful for me to learn.	(Tskv)	6
	Control of Learning Beliefs	If I try hard enough, then I will understand the course material.	(Cont)	4
	Self-efficacy for Learning and Performance	I'm confident I can do an excellent job on the assignments and test in this course.	(Slfef)	8
	Test Anxiety	When I take a test, I think about how poorly I am doing compared to other students.	(Tanx)	5
Behavior	Effort Regulation	Even when course materials are dull and uninteresting, I manage to keep working until I finish.	(Eff)	4
	Help-Seeking	I try to identify students in this class whom I can ask for help if necessary.	(Hsk)	4
	Self-Regulation (ILS)	I try to create examples when studying course material.	(Selfreg)	18
Context	Time & Study Environmental Management	I have a regular place set aside for studying.	(Tsdy)	8
	Peer Learning	I try to work with other students from this class in order to complete the course assignments.	(Prlrn)	3
	N items total			99

Validity data for the MSLQ can be found in Pintrich et al. (1991). A detailed results section of the original analyses of data is provided in the MSLQ manual (Pintrich et al., 1991). Validity data for the ILS items used in the current study can be found in Vermunt (1987). Some of the same analyses were completed with the current sample in order to assure that the combined MSLQ-ILS questionnaire was valid with respect to the subjects used in this study.

In this study, the 16 scales of the MSLQ-ILS questionnaire are not divided into the two sections (i.e., motivation and learning strategies) of Pintrich et al. (1991) but instead into four areas of regulation; cognition, motivation, behavior and context (Pintrich, 2004) (Table 3).

The Self-regulation scale is assigned to the area of Behavior, and the scale of Time & Study Environmental Management is assigned to the area of Context.

The survey instrument used to collect data with respect to the efficiency of learning was an instrument devised by Paas and Van Merriënboer (1994). Efficiency of learning was measured by combining performance results and mental effort (Paas et al., 2003). Paas and Van Merriënboer (1993) created a formula to estimate the efficiency of instructional conditions:

$$E = \frac{z_{\text{Performance}} - z_{\text{Mental Effort}}}{\sqrt{2}}$$

The survey instrument used to collect performance results was a theoretical multiple choice physiotherapy test (Cronbach's Alpha = .84). The instrument to collect data regarding mental effort was the 9-point Likert scale for determining cognitive load during the multiple choice physiotherapy test (Figure 1).

"How much effort did you put into this learning assignment?"

1	2	3	4	5	6	7	8	9
O	O	O	O	O	O	O	O	O
Very very low mental effort	Very low mental effort	Low mental effort	Quite low mental effort	Not low, not high mental effort	Quite high mental effort	High mental effort	Very high mental effort	Very very high mental effort

Figure 1. *Mental effort – 9-point Likert scale question (Paas & Van Merriënboer, 1994).*

Design and procedure

This quasi-experimental research is designed to investigate the differences between traditional and non-traditional physiotherapy students with respect to the regulation of learning. The sample of the population was selected; the groups of traditional and non-traditional already existed. There was no control group.

After receiving permission from the board of the Academy of Health of Avans University of Applied Sciences to conduct the present study, time was scheduled with lecturers in classes to survey the students. Information accompanied the MSLQ-ILS questionnaire requesting students' cooperation with the study. Surveys were completed by the students using an online survey program called Lime Survey (http://www.limesurvey.org/nl). It took respondents an average of about 25 minutes to complete the MSLQ.

Following the recommendation of Van Gog et al. (n.d.) mental effort was measured repeatedly. The 9-point Likert's scale of Paas and Van Merriënboer (1994) was incorporated into the theoretical multiple-choice physiotherapy test. After every cluster of questions about a particular subject area, the students were asked to mark a score utilizing the 9-point Likert scale.

Results

From the total of 250 freshman students, 181 MSLQ-ILS questionnaires were collected (72%). From these 181 questionnaires, 14 cases with missing data were excluded, leaving 167 surveys eligible for further analysis. The differences between traditional and non-traditional students were then examined with respect to the four areas of learning regulation (i.e., cognition, motivation, behavior and context) measured by the MSLQ-ILS questionnaire.

Reliability

A reliability analysis was performed for all 16 scales within the four areas represented in the combined MSLQ-ILS questionnaire in order to determine the reliability of each scale of the questionnaire. Cronbach's alpha and item-rest correlations were analyzed for each individual scale. Measurements were obtained at the group level, and scales were determined to be reliable, with Cronbach's alpha higher than .60. Furthermore, an independent sample *t*-test was conducted for all 99 items of the questionnaire, to determine the difference ($\alpha < .05$) between traditional and non-traditional students per item. Results of the reliability analysis per scale employing Cronbach's alpha, and the analysis per item, using an independent sample *t*-test, were compared.

Table 4. *Reliability Analysis of Individual Subscales of the MSLQ-ILS using total sample*

Area	Scale	N_{items}	N	Mean	SD	Min	Max	Alpha
Cognition	Rehearsal	4	158	18.61	4.10	7.00	27.00	.71
	Elaboration	6	158	24.98	4.18	11.00	34.00	.75
	Organization	4	159	13.91	3.39	4.00	21.00	.62
	Critical Thinking	5	158	21.60	4.44	11.00	31.00	.67
	Metacognitive Self-Regulation	12	158	52.37	8.62	26.00	75.00	.76
Motivation	Intrinsic Goal Orientation	4	167	16.86	2.42	8.00	21.00	.61
	Extrinsic Goal Orientation	4	166	22.23	3.40	9.00	28.00	.67
	Task Value	6	166	32.81	3.87	20.00	42.00	.73
	Control of Learning Beliefs	4	167	21.38	3.23	8.00	28.00	.58
	Self-Efficacy	8	165	33.96	5.32	12.00	46.00	.82
	Test Anxiety	5	166	19.12	6.43	5.00	34.00	.80
Behavior	Time & Study Environment	3	158	28.85	5.27	12.00	40.00	.71
	Effort Regulation	4	158	13.42	3.19	3.00	21.00	.61
	Help-Seeking	4	158	10.83	2.22	2.00	14.00	.78
	Self-Regulation	18	158	70.58	11.66	42.00	106.00	.79
Context	Time & Study Environment	8	158	28.85	5.27	12.00	40.00	.71
	Peer Learning	3	160	15.58	3.05	3.00	21.00	.61

Of the 99 items, 45 were found to significantly ($p < .05$) measure the differences between traditional and non-traditional students. Of these 45 items, seven previously deleted items, based on reliability analysis by Cronbach's alpha, were included again based on the *t*-test analysis ($\alpha < .05$) of the individual items. After the reliability and *t*-test analyses, 11 items were deleted (r_{ir} □ .3 and an increasing Alpha if item deleted) from the 99 items on the original MSLQ-ILS questionnaire. Fifteen of the scales were found to be reliable (Cronbach's alpha > .60), as shown in table 4. Although the scale 'Control of Learning Beliefs' was found to be less reliable (alpha = .58, indicating moderate reliability), it was still taken into account in further analyses in order to find significant differences for our students.

Regulation of Learning

An independent sample *t*-test ($\alpha < .05$) performed in the area of cognition of the MSLQ-ILS indicated significant differences (Table 5) between traditional and non-traditional Physiotherapy students in the scales Rehearsal ($t(156) = 2.48$, $p = .014$), Elaboration ($t(156) = -2.82$, $p = .005$), Critical Thinking ($t(156) = -3.36$, $p = .001$) and Metacognitive Self-Regulation ($t(156) = -3.10$, $p = .002$).

Table 5. *Independent sample t-test of the MSLQ-ILS results for traditional and non-traditional physiotherapy students*

		Traditional students		Non-traditional students			
Area	Scale	Mean	SD	Mean	SD	t	Sig.
Cognition	Rehearsal	19.02	3.85	17.09	4.67	2.48	.014*
	Elaboration	24.50	4.20	26.74	3.69	-2.82	.005**
	Organization	13.79	3.30	14.35	3.72	-.86	n.s.
	Critical Thinking	21.00	4.10	23.79	4.97	-3.36	.001**
	Metacognitive Self Regulation	51.28	8.07	56.32	9.52	-3.10	.002**
Motivation	Intrinsic Goal Orientation	16.55	2.42	17.89	2.12	-3.09	.002**
	Extrinsic Goal Orientation	22.27	3.42	22.11	3.39	.26	n.s.
	Task Value	32.33	3.84	34.46	3.56	-3.02	.003**
	Control of Learning Beliefs	21.53	3.22	20.87	3.26	1.11	n.s.
	Self-Efficacy	33.32	5.25	36.22	5.00	-2.99	.003**
	Test Anxiety	18.39	6.17	21.68	6.72	-2.80	.006**
Behavior	Effort Regulation	12.90	3.17	15.29	2.52	-4.06	<.001***
	Help-Seeking	10.62	2.27	11.59	1.86	-2.29	.024*
	Self-Regulation	69.30	11.35	75.26	11.74	-2.70	.008**
Context	Time & Study Environment	28.23	5.29	31.15	4.57	-2.93	.004**
	Peer Learning	15.31	3.08	16.59	2.74	-2.20	.030*

Note. *p < .05, **p < .01, ***p < .001, n.s. = non significant.

On the Rehearsal scale, traditional students scored significantly higher. On the Elaboration, Critical Thinking and Metacognitive Self-Regulation scales, non-traditional students scored higher. Non-traditional students also scored higher

on the Organization scale ($t(157) = -.86$, $p = .39$), but the difference was not statistically significant.

The independent sample *t*-test ($\alpha < .05$) performed in the area of motivation indicated significant differences (Table 5) between traditional and non-traditional Physiotherapy students with respect to the following scales: Intrinsic Goal Orientation ($t(165) = -3.09$, $p = .002$), Task Value ($t(164) = -3.02$, $p = .003$), Self-efficacy ($t(164) = -2.99$, $p = .003$) and Test Anxiety ($t(164) = -2.80$, $p = .006$). Non-traditional students scored significantly higher on these scales. On the other hand, traditional students scored higher on the motivation scales Extrinsic Goal Orientation ($t(164) = .26$, $p = .80$) and Control of Learning Beliefs ($t(165) = 1.11$, $p = .27$). However, the differences were not significant. In addition, the Control of Learning Beliefs scale was found not to be reliable.

The independent sample *t*-test ($\alpha < .05$) performed in the area of behavior indicated significant differences (Table 5) between traditional and non-traditional students in the following scales: Effort Regulation ($t(156) = -4.06$, $p < .001$), Help-Seeking ($t(156) = -2.29$, $p = .024$) and Self-Regulation ($t(156) = -2.70$, $p = .008$). Non-traditional students scored significantly higher on those scales.

The independent sample *t*-test ($\alpha < .05$) performed in the area of context indicated significant differences (Table 5) in the Time and Study Environment ($t(156) = -2.93$, $p = .004$) and Peer Learning ($t(158) = -2.20$, $p = .030$) scales, in favor of the non-traditional students.

Learning efficiency

An independent sample *t*-test ($\alpha < .05$) was performed with respect to the areas of Performance, Mean Mental Effort, and Efficiency.

Non-traditional students obtained a higher score (Table 6) on the multiple choice physiotherapy test ($N = 75$, $M = 5.81$, $SD = 0.83$) than traditional students ($N = 172$, $M = 4.99$, $SD = 0.65$). This difference in score is significant ($t(115) = -7.63$, $p < 0.01$). Education (traditional/non-traditional) can explain 34% of the variance in the outcome of the multiple choice test; however, it did represent a substantial effect ($r = .58$).

Table 6. *Learning Efficiency*

		N	Mean	Std. Dev.	Std. Error Mean	t	Sig. 2-tailed
Performance	Traditional	172	4.99	0.65	0.05	-7.63	<0.01
	Non -traditional	75	5.81	0.83	0.10		
Mean Mental Effort	Traditional	153	6.20	1.07	0.09	1.56	0.12
	Non -traditional	66	5.96	0.98	0.12		
Efficiency	Traditional	151	-0.28	0.97	0.08	-5.88	<0.01
	Non -traditional	66	0.58	1.05	0.13		

Note. Performance theoretical minimum = 0, theoretical maximum = 10. Mental Effort theoretical minimum = 1, theoretical maximum = 9; Efficiency theoretical minimum = -1, theoretical maximum = 1.

There is a non-significant difference ($t(217) = 1.56$, $p = 0.12$) between traditional (N = 153, M = 6.20, SD = 1.07) and non-traditional (N = 66, M = 5.96, SD = 0.98) students on the subjectively experienced mental effort during the multiple choice test (see Table 6). Education (traditional/non-traditional) can explain 1% of the variance in the mean mental effort, and a generally small effect (r = .11).

The learning efficiency of traditional and non-traditional students was measured with Paas and Van Merriënboer's formula (1993). There is a significant difference ($t(215) = -5.88$, $p < 0.01$) between traditional (N = 151, M = -0.28, SD = 0.97) and non- traditional (N = 66, M = 0.58, SD = 1.05) students regarding learning efficiency (see Table 6). Education (traditional/non-traditional) can explain 14% of the variance, and represented a medium-sized effect (r = .37).

Discussion

Regulation of learning

The traditional and non-traditional Physiotherapy students have the same differentiating characteristics identified by Jinkens (2009). Most of the non-traditional students were 24 years or older (93%) and most of the traditional students were under the age of 24 (99%). Non-traditional students should be able to regulate learning better than traditional students because of their emotional maturity, their former academic experience and their comparatively enhanced brain development. The development of metacognitive skills, which are responsible for regulating cognitive and affective learning activities (Vermunt, 1996), takes place in the frontal cortex, which develops in late adolescence (Jolles, 2007).

The first research question addressed possible differences between traditional and non-traditional students in the regulation of learning. Non-traditional students proved to be better able to regulate their learning than traditional students in the areas of cognition, motivation, behavior and context.

Cognition

In the area of cognition, non-traditional students scored significantly higher on the scales of Elaboration, Critical Thinking and Metacognitive Self-Regulation. These results are consistent with those obtained by Jacobsen and Harris (2008), who found significant differences on the same scales. Non-traditional students are better at transferring information to long-term memory; integrating new information with prior knowledge (Elaboration); applying previous knowledge to new situations (Critical Thinking); and planning, monitoring and regulating their activities (Metacognitive Self-Regulation) (Pintrich et al., 1991).

On the Rehearsal scale, the traditional students scored significantly higher. Although this finding was exactly the opposite of the result obtained by Jacobsen and Harris (2008), it really would seem to be the expected outcome. This is because the rehearsal scale involves basic rehearsal strategies like reciting or naming items from a list. These strategies are best used for simple tasks (Pintrich et al., 1991). Thus the Rehearsal scale is oriented toward reproducing. Based on the findings of Ronning (2009), it is to be expected that traditional students score higher on the Rehearsal scale because they are more oriented toward reproducing.

Non-traditional students scored higher on the Organization scale, but the difference was not statistically significant. The findings of Jacobsen and Harris (2008) in this regard were similar, but the differences were significant in their study. Organization strategies help the learner select appropriate information and construct connections with respect to the

information to be learned (Pintrich et al., 1991). It seems that the traditional Physiotherapy students are able to use such strategies more or less as effectively as the non-traditional students.

Motivation

In the area of motivation, the non-traditional students scored significantly higher on the scales of Intrinsic Goal Orientation, Task Value, Self-Efficacy and Test Anxiety. These findings were consistent with those obtained by Jacobsen and Harris (2008), except that the difference with respect to self-efficacy was not found to be significant. Jinkens hypothesized that non-traditional students are more motivated because they have a specific reason to attend college, whereas traditional students are less serious, less motivated and need more encouragement (Jinkens, 2009). The non-traditional Physiotherapy students scored significantly higher on four of the six motivation scales.

On the scales Extrinsic Goal Orientation and Control of Learning Beliefs, the traditional students scored higher, but the difference was not statistically significant. A higher score on Extrinsic Goal Orientation was to be expected among traditional students, who are more focused on getting high grades and need more encouragement (Jinkens, 2009). The non-significant difference suggests the possibility that the motivation of non-traditional Physiotherapy student might be grades and rewards, just as is the case with traditional students.

"Control of Learning Beliefs" refers to the efforts of a student to learn, and his or her believe that doing so will result in positive outcomes. If students believe that their efforts to study make a difference in their learning, then they study more effectively (Pintrich et al., 1991). It was expected that non-traditional students would study more effectively.

The Control of Learning Beliefs scale scored a moderate reliability (alpha = .58) for our sample. Pintrich et al. (1991) and Duncan & McKeachie (2005) found a reliability of .68 on the Control of Learning Beliefs scale in their studies, which also utilized the MSLQ. The difference in reliability can be explained by the differences in context, tasks and participants of the different studies. The measured constructs are context dependent (Duncan & McKeachie, 2005). Be that as it may, the Control of Learning Beliefs scale was not found to reliable in discriminating between the traditional and non-traditional students in the present study.

Behavior

In the area of behavior, non-traditional students scored significantly higher on all three scales; Effort Regulation, Help-Seeking and Self-Regulation. The result for Effort Regulation is once again consistent with the findings of Jacobsen and Harris (2008), who also reported significantly higher scores for non-traditional students on this scale. Effort regulation reflects how students try to regulate their effort and attention in the face of difficult and boring tasks (Pintrich et al., 1991; Pintrich, 2004). Self-regulation reflects how students try to regulate their behavior in terms of their effort. The result on Help-Seeking is the opposite of that reported by Jacobsen and Harris (2008). It seems that the non-traditional Physiotherapy students in our sample were more willing to ask other students or lecturers for help. A factor that may explain this difference could be that the non-traditional students are seeking help for more information because they have fewer study hours at university. It is thus not altogether surprising that non-traditional students scored higher on Help-Seeking. The non-traditional students scored significantly higher on performance, and it is common for good students to seek help when necessary (Pintrich et al., 1991).

Non-traditional students typically have several activities in their lives in addition to their education. In order to

meet all of their responsibilities, they have to acquire highly self-regulated behavior (Ronning, 2009). The results reported here show that non-traditional students are better at regulating their behavior than traditional students.

Context

In the area of context, non-traditional students scored significant higher on both scales: Time and Study Environment and Peer Learning. At the institution where the students participating in this study are enrolled, a student-centered approach is used. Students thus have an influence on the context of their learning. Pintrich (2004) stated that students who are able to regulate and influence their study environment are better able to resist distractions. In a student-centered environment, students need to be able to regulate their context. Despite their several activities and spending less time on campus, the non-traditional students are more able to regulate their context of learning. This might lead to more efficient management of time, study environment and the help of fellow students.

Differences between traditional and non-traditional students were found to be significant on 13 of the 16 scales. These statistical results should be interpreted with caution, as social desirability is a factor that influences results based on self-reported questionnaires like the MSLQ-ILS. The motivation and strategies of even the most self-regulated learner are dependent on task and content (Duncan & McKeachie, 2005).

In his review of the MSLQ, Artino (2005) recommends maintaining the constructs and keeping the subscales as short as possible. The original MSLQ-ILS questionnaire existed of 99 items, with a Cronbach's alpha = .94. By deleting 11 items, the reliability of the individual scales increased. However the reliability of the whole questionnaire remained the same. For collecting data it can be recommended to use the MSLQ-ILS questionnaire with 88 items (Cronbach's alpha = .94).

Efficiency of learning

The second research question addressed the differences between traditional and non-traditional students in efficiency of learning. As expected, the non-traditional students scored significantly higher on efficiency of learning. As noted above, Van Gog et al. (n.d.) recommended that mental effort be measured frequently, and on an ongoing basis. The whole experienced mental effort is more than the sum of its parts.

Further research

This research was performed with freshman Physiotherapy students. One could hypothesize that the differences found among the two groups during the freshman year will decrease in subsequent years. This expected decrease in differences could be observed in longitudinal research. Conducting ongoing measurement of mental effort, in accordance with the recommendation of Van Gog and his colleagues, thus appears a sound course of action.

The differences found between traditional and non-traditional students are recommended for further qualitative research. Observations of students and in-depth interviews with students who are using different learning strategies while performing certain tasks are recommended.

Conclusion

The aim of this research was to discover if and in which aspects of regulation and learning efficiency traditional and non-traditional students differ. The MSLQ-ILS questionnaire was found to be a reliable instrument for the sample of students participating in the present study. Differences between traditional and non-traditional students were identified on 13

of the 16 MSLQ-ILS scales. Reliability analyses as well as independent sample *t*-tests were performed to determine if the MSLQ-ILS questionnaire was appropriate for this sample population, and to determine if differences between traditional and non-traditional students existed. The independent sample *t*-test confirmed the differences between traditional and non-traditional Physiotherapy students.

The first research question addressed the differences between traditional and non-traditional students in regulation of learning. Of the 16 scales of the MSLQ-ILS questionnaire, 12 scales were found significantly different in favor of non-traditional students. Non-traditional students in the present study thus appeared to be better able to regulate their learning than traditional students in the areas of cognition, motivation, behavior and context.

In the area of cognition, the non-traditional students scored significantly higher on the scales of Elaboration, Critical Thinking and Metacognitive Self-Regulation. On the Rehearsal scale, however, it was the traditional students that scored significantly higher.

There is also a significant difference in favor of non-traditional students in the area of motivation. The non-traditional students scored significantly higher on four out of the six scales (Intrinsic Goal Orientation, Task Value, Self-Efficacy and Test Anxiety). Therefore it can be concluded that the non-traditional students participating in the present study needed less encouragement, and were more motivated, than traditional students.

The non-traditional students are significantly better able to regulate their learning behavior. In the area of behavior, non-traditional students scored significantly higher on all three scales; Effort Regulation, Help-Seeking and Self-Regulation.

In the area of context, non-traditional students scored significant higher on both scales: Time and Study Environment and Peer Learning.

The second research question addressed the differences between traditional and non-traditional students in learning efficiency. The non-traditional students scored significantly higher on performance. They scored a lower mental effort during the test than traditional students, but the difference was not statistically significant. Finally, non-traditional students were found to be significantly superior in their learning efficiency, as measured by the formula of Paas and Van Merriënboer (1993). Non-traditional students learn more efficiently than traditional students, although non-traditional students did not show a significantly lower mental effort.

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