

# INTERVENTIONS UNDER THE MICROSCOPE

EMOTION REGULATION TRAINING AS A  
TREATMENT ELEMENT FOR EXTERNALIZING  
PROBLEMS IN ADOLESCENCE

Lysanne W. te Brinke





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Cover design: James Jardine | [www.jamesjardine.nl](http://www.jamesjardine.nl)  
Layout: James Jardine | [www.jamesjardine.nl](http://www.jamesjardine.nl)  
Print: Ridderprint | [www.ridderprint.nl](http://www.ridderprint.nl)  
ISBN: 978-94-6416-377-3

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**Interventions Under the Microscope**  
Emotion Regulation Training as a Treatment Element  
for Externalizing Problems in Adolescence

**Interventies Onder de Microscop:**

Emotieregulatietraining als Behandelelement  
voor Externaliserende Gedragsproblemen in de Adolescentie  
(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 5 maart 2021 des middags te 2.30 uur

door

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geboren op 21 december 1990  
te Arnhem

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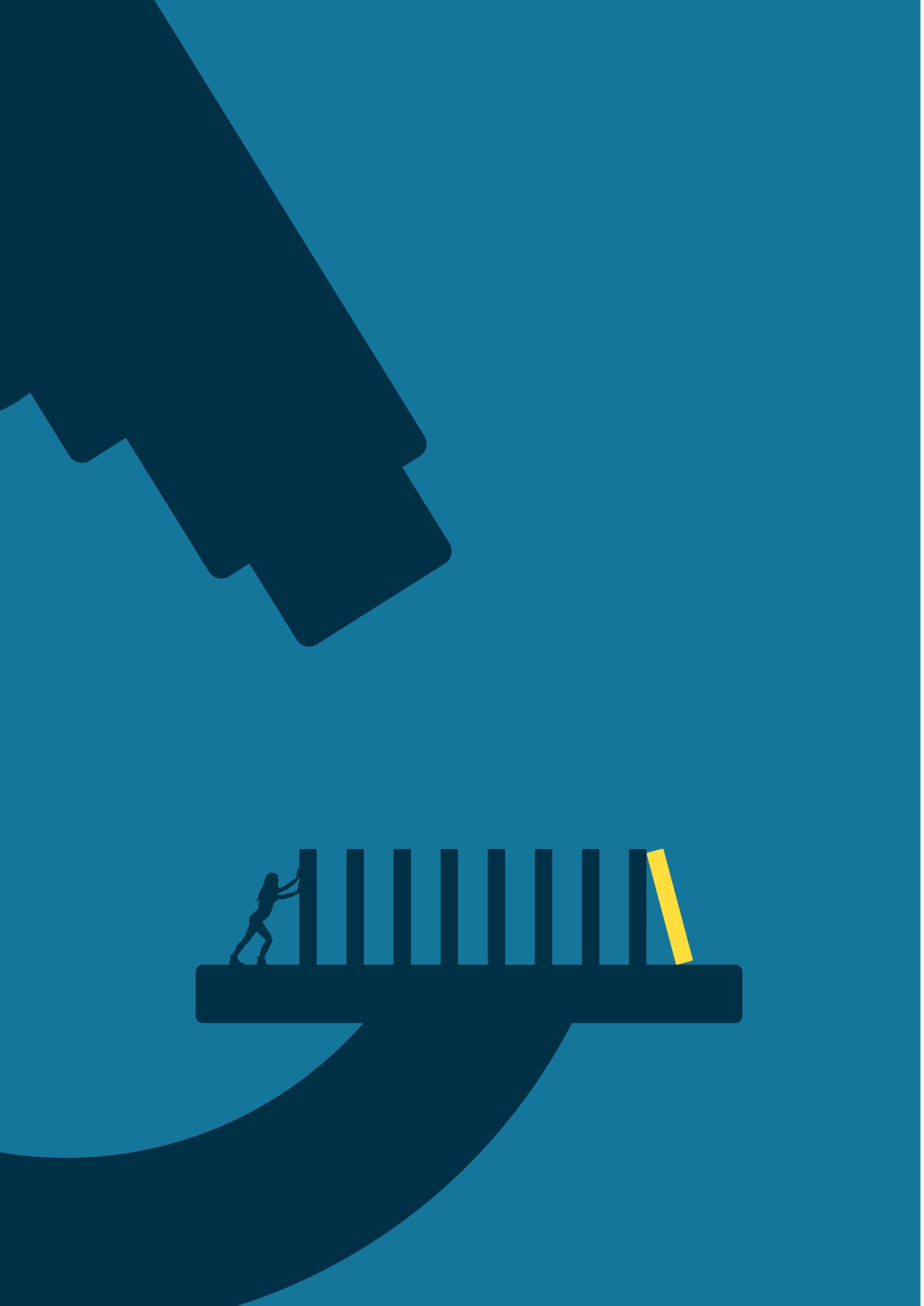
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## CHAPTER I

# GENERAL INTRODUCTION

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## ■ GENERAL INTRODUCTION

Over the past decades, numerous interventions have been developed that target externalizing problems in adolescence. Overall, these interventions have short- and long-term positive effects (Weisz et al., 2017). The magnitude of these intervention effects is, however, only small to moderate (McCart et al., 2006; Weisz et al., 2017) and the overall effect size has even decreased over the past half-century (Weisz et al., 2019). In addition, treatment responsiveness varies between individuals (Lee & DiGiuseppe, 2018; Wilson & Lipsey, 2007). Thus, there is a need for intervention optimization.

One way to optimize interventions is by zooming in on the *elements* of which interventions are composed (Chorpita et al., 2005). Treatment elements are defined as sets of clinical techniques or strategies (Chorpita et al., 2005), that target specific underlying *mechanisms* (processes that influence the development and/or continuity of problem behaviors; Bartels et al., 2004; Hinshaw, 1992). Most evidence-based interventions for externalizing problems consist of multiple treatment elements (e.g., emotion regulation training, social skills training, motivational enhancement), that target several underlying mechanisms (e.g., emotion regulation skills, social information processing, motivation to change) of externalizing problems simultaneously. These interventions can therefore be called *cocktail treatments* (Leijten et al., 2015). Because empirical research usually examines only the overall effects of these treatment packages, our understanding of the “sum of the parts” (i.e., complete cocktail treatments) is quite comprehensive, whereas relatively little is known about “the parts that make up the sum” (i.e., specific treatment elements). This dissertation strives to inform the development of optimized interventions for externalizing problems in adolescence by zooming in on approaches that target a specific underlying mechanism: emotion regulation.

In this introductory chapter, I first define externalizing problems, with a special focus on a group of adolescents with intellectual disabilities, who are at increased risk for the development of externalizing problems. Subsequently, I describe two approaches that can be used to optimize interventions for externalizing problems (i.e., zooming in on a specific underlying mechanism and treatment element). Finally, I highlight some of the methodological considerations that shaped the design of the studies included in this dissertation, and I provide a general outline.

### **Externalizing Problems**

#### ***Definition and Consequences of Externalizing Problems***

Externalizing problems are viewed as an outward, behavioral reaction characterized by turning against others (Achenbach, 1966). The term externalizing problems is used as

an umbrella term for multiple aggressive (e.g., hitting, kicking) and rule-breaking (e.g., stealing, setting fires) behaviors. Prevalence rates of severe externalizing problems range from approximately 5% to 20% (e.g., Kovess-Masfety et al., 2016; Merikangas et al., 2010; Polanczyk et al., 2015), while only a small percentage of adolescents (e.g., approximately 6%) completely abstains from externalizing behavior (Moffitt et al., 1996). Externalizing behaviors are thus relatively common in the developmental period of adolescence, and may, to some extent, be considered *normative* (Moffitt, 1993; Roisman et al., 2010). However, if they are severe, frequent or persistent over time, externalizing *problems* form a serious risk factor for adverse outcomes later in life (Matthys, 2019; Odgers et al., 2008).

Adolescents with externalizing problems are, for example, at risk for peer rejection, academic underachievement, and school dropout (Hetlevik et al., 2018; Hinshaw, 1992; Pardini & Fite, 2010). Moreover, externalizing problems during childhood and adolescence predict emotional or behavioral difficulties in adulthood, such as psychopathology and crime involvement (Kassing et al., 2019; Odgers et al., 2008; Reef et al., 2011). Adolescents' externalizing problems are also problematic for their environment. Adolescents with externalizing problems have frequent conflicts with their peers, siblings, parents and teachers (Beauchaine & Hinshaw, 2015). Besides, societal costs for public services (i.e., health services, unemployment benefits) are approximately ten times higher for pre-adolescents with (severe) externalizing problems (Scott et al., 2001).

### ***Mild Intellectual Disabilities and Borderline Intellectual Functioning***

A specific group of adolescents seems to be at an even higher risk, both for the development of externalizing problems, and for the experience of adverse long-term consequences of these problems: adolescents with a *Mild Intellectual Disability or Borderline Intellectual Functioning* (MID-BIF). Intellectual disabilities originate before the age of 18, and are characterized by "significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills" (Schalock et al., 2007, p. 118). In the Netherlands, adolescents with Mild Intellectual Disabilities (IQ from 55-70) and Borderline Intellectual Functioning (IQ 70-85 with severe limitations in adaptive functioning) are both treated in specialized mental health care institutions. Therefore, this broad definition of MID-BIF is adopted in the current dissertation.

Research shows that children with MID-BIF have a three to four times higher risk to develop externalizing problems than their peers without intellectual disabilities (Dekker et al., 2002; Simó-Pinatella et al., 2019). Their externalizing problems are frequently accompanied by other emotional and behavioral difficulties (Munir, 2016), and children

and adolescents with MID-BIF are overrepresented in child welfare and justice systems (Slayter & Springer, 2011; Thompson & Morris, 2016). In addition, adolescents with externalizing problems and MID-BIF have a poor prognosis, since their externalizing problems tend to persist over time (Emerson et al., 2011).

Although adolescents with MID-BIF are at increased risk to develop externalizing problems, relatively little is known about the factors that are associated with this increased risk. Moreover, research into the effectiveness of interventions for adolescents with externalizing problems and MID-BIF, is still in its infancy (for an exception, see Schuiringa, van Nieuwenhuijzen, de Castro, Lochman, & Matthys, 2017). In sum, it is important that clinicians have effective interventions at their disposal, in order to treat the externalizing problems of adolescents with and without MID-BIF.

## **Part 1: Emotion Regulation as a Multi-Modal Underlying Mechanism of Externalizing Problems**

### ***The Need to Zoom in on Underlying Mechanisms***

Although in the past decades, numerous empirically supported interventions have been developed for adolescents with externalizing problems, the mean effect size of interventions for children and adolescents with externalizing problems (overall ES = 0.50) has significantly *decreased* over time (Weisz et al., 2019). This decrease may in part be related to methodological and societal aspects. A possible methodological explanation for the decrease in intervention effects is that the composition of control groups has shifted over time, with more studies now including an active rather than passive control condition, such as care-as-usual (Weisz et al., 2017). Another methodological explanation is that the mean group sample size grew from 13.53 to 37.37 over the last five decades (Weisz et al., 2017). Since sample size is negatively correlated with effect size (i.e., published studies using small samples report larger effects), earlier published studies may have overestimated the magnitude of intervention effects (Kühberger et al., 2014). A possible societal explanation, is that interventions that have been developed in the last few decades do not longer fit with contemporary adolescents' lives, due to shifts in the ways adolescents communicate (e.g., social media) and increases in available ways to negatively threat others (e.g., cyberbullying) (Weisz et al., 2019). Thus, the nature of externalizing problems in adolescence may have changed faster than our interventions, and at the same time, our research methods have become more rigorous over time.

To increase the effectiveness of interventions, we may need to use different methods to examine more closely how we can make a difference. A first step towards intervention optimization, is a better understanding of the *mechanisms* that underly the development of externalizing problems (Matthys & Lochman, 2018; Weisz et al., 2019). A more nuanced

understanding of underlying mechanisms may lead to intervention optimization, because this tells us which specific underlying mechanism need to be targeted, or in other words, which “switches need to be flipped” (Weisz et al., 2019).

### **Emotion Regulation**

A crucial mechanism underlying externalizing problems is emotion regulation. Emotion regulation refers to the attempts of an individual to manage the internal experience and external expression of emotions (Thompson, 1994). Emotion regulation is a *multi-modal process* (a process that spans over multiple regulatory domains) that includes both general emotion regulation abilities (the degree to which an individual is able to understand, regard, and respond to emotional experiences) and specific emotion regulation strategies (strategies to influence the processes through which emotions are generated or manifested in behavior, such as rumination and reappraisal; Gratz & Roemer, 2004; Gross, 1998; Tull & Aldao, 2015). Emotion regulation thus consists of all the processes that individuals use to influence which emotions they have, when they have them, and how they experience and express them (Gross, 2015).

Both domains of emotion regulation (i.e., general abilities and specific strategies) are related to externalizing problems in adolescence. First, research shows that general emotion regulation *abilities* are an important underlying mechanism of externalizing problems in adolescence (Röll et al., 2012). A study that examined the longitudinal association between emotion regulation abilities and adolescent psychopathology found, for example, that emotion dysregulation increases the risk for the development of aggressive behavior problems (McLaughlin et al., 2011). Moreover, emotion regulation abilities are found to mediate the association between externalizing problems in adolescence and childhood risk factors such as: stress exposure (Herts et al., 2012), interpersonal violence (Busso et al., 2017), parental psychological control (Cui et al., 2014), and child maltreatment (Weissman, Bitran et al., 2019).

Second, research shows that (combinations of) specific emotion regulation *strategies* are also an important underlying mechanism of externalizing problems. For example, the emotion regulation strategy rumination is found to be associated to aggressive behavior, both concurrently (Harmon et al., 2019) and longitudinally (McLaughlin et al., 2014). Moreover, adolescents who use a maladaptive profile of emotion regulation strategies (i.e., frequent use maladaptive strategies such as rumination, infrequent use of adaptive strategies such as reappraisal) experience more internalizing and externalizing problems (Otterpohl et al., 2016). In addition, emotion regulation strategies are found to mediate the association between child maltreatment and externalizing symptoms (VanMeter et al., 2020).

Despite accumulating evidence suggesting that emotion regulation is an important underlying mechanism of externalizing problems, some important questions remain unanswered regarding the specific nature of this relationship. First, research has mainly examined domain-specific associations between emotion regulation and psychopathology, by focusing on either general abilities or specific (sets of) emotion regulation strategies. Thus, the multi-modal nature of emotion regulation processes has not been sufficiently captured (Hilt et al., 2015). Second, when repertoires of emotion regulation strategies are examined, emotion regulation strategies are generally clustered with classification systems that are developed for adults, whereas emotion regulation processes may be different during the developmental period of adolescence. Adolescents are expected to effectively manage their own emotions (Klimes-Dougan & Zeman, 2007), whereas at the same time, their socio-emotional environment is characterized by new social challenges (i.e., the need to be accepted by peers) and the experience of more intense and frequent negative emotions (Silk et al., 2003). Third, emotion regulation research has – for a large part – failed to take the context in which emotion regulation strategies are employed into account, whereas context may influence both the emotion regulation processes themselves, and their possible outcomes (Aldao, 2013). A recent study shows, for example, that the selection of regulation strategies is influenced by the emotional valency of the specific situation (Lennarz et al., 2019). Fourth, despite the considerable amount of research that has been published about emotion regulation processes and externalizing problems, relatively little is known about the regulation processes of adolescents with intellectual disabilities (McClure et al., 2009). Fifth, which emotion regulation processes underly externalizing problems may differ between adolescents, for example between adolescents with comorbid internalizing and externalizing problems and adolescents with mainly externalizing problems. Thus, the specificities of emotion regulation as a *multi-modal underlying mechanism* of externalizing problems warrant further research. Therefore, the first aim of this dissertation was to integrate several dimensions of emotion regulation processes, and examine differences in these dimensions between adolescents who do, and adolescents who do not have externalizing problems and/or MID-BIF.

## **Part 2: Emotion Regulation Training as a Treatment Element for Externalizing Problems**

### ***The Need to Zoom in on Treatment Elements***

A next step that is needed in optimizing interventions for externalizing problems, is disentangling the effects of specific treatment elements that are included in cocktail treatments (Leijten et al., 2015). Interventions for children and adolescents with externalizing problems consist on average of 20 sessions, and include multiple treatment

elements, such as emotion regulation training, social skills training, and problem solving (Menting et al., 2016). The effects of these cocktail treatments are usually evaluated through large scale Randomized Controlled Trials (RCTs). Although RCTs are particularly useful in evaluating the effectiveness and efficacy of cocktail treatments, they are not able to disentangle the effects of specific treatment elements. As a consequence, little is known about the individual effects of specific treatment elements (Leijten et al., 2015). In order to move forward, we thus need to determine which treatment elements actually produce change.

Moreover, we need to know which treatment *approaches* most effectively target specific underlying mechanisms (Lochman et al., 2019). Treatment approaches are defined as the modalities in which treatment elements are delivered. In the past, it was assumed that different treatment approaches were of equivalent efficacy, an idea that became known as the “Dodo Bird Verdict” (Wampold et al., 1997). This assumption was based on the finding that meta-analytic comparisons of different treatment approaches generally found no differences in the efficacy of these approaches (Budd & Hughes, 2009). Subsequently, this assumption was, however, rebutted (e.g., Beutler, 2002). It was argued that RCTs and meta-analyses are not the appropriate method for testing the relative effectiveness of treatment approaches, because cocktail treatments generally combine multiple approaches, without isolating their independent effects (Budd & Hughes, 2009; Cook et al., 2008). In order to move forward, we thus need to examine the relative effects of distinct, isolated treatment approaches, because this knowledge can lead towards adapted interventions that consist of active treatment elements that are delivered through the most effective modalities.

### ***Emotion Regulation Training***

Given what we already know about the relevance of emotion regulation processes in the development of externalizing problems in adolescence, it is not surprising that many evidence-based interventions for externalizing problems target emotion regulation (Garland et al., 2008; Menting et al., 2016). Overall, these cocktail interventions seem to have positive effects. A meta-analysis that examined the effects of cocktail interventions that included emotion regulation training as a treatment element for internalizing and externalizing problems in childhood and adolescence found moderate effects for decreases in emotion dysregulation (mean ES = - 0.46) and small effects for increases in emotion regulation skills (mean ES = 0.36; Moltrecht et al., 2020). There are, however, large differences between and within interventions in the number and nature of targeted regulation strategies, and the modality that is used to train emotion regulation abilities and strategies. Some interventions have, for example, a stronger focus on cognitive strategies (e.g., problem solving), and train these strategies through

cognitive approaches (i.e., “thought exercises” such as cognitive restructuring). Other interventions focus more on behavioral strategies (e.g., distraction), and train these strategies through behavioral approaches (i.e., “behavioral exercises” such as role-play). However, since these different treatment approaches are mostly used simultaneously, little is known about their relative effectiveness.

In line with the variety *between* interventions in the way emotion regulation is targeted, there is also variety *within* interventions. Cognitive and behavioral approaches are currently offered in conjunction across different phases of the intervention, without specifying or examining their most optimal sequence. Therefore, the second aim of this dissertation was to examine the effects of emotion regulation training as a treatment element for externalizing problems in adolescence. Specifically, overall effects (direct and indirect), approach effects (cognitive versus behavioral approach) and sequence effects (cognitive-behavioral versus behavioral-cognitive sequence) were examined with micro-trial designs.

## Methodological Considerations

### ***Micro-trials***

Micro-trials have been proposed as a way to examine the effects of specific treatment elements (Leijten et al., 2015). These trials are defined as randomized experiments testing the effects of focused environmental manipulations (Howe et al., 2010; Lochman et al., 2019). Through a focus on underlying mechanisms, micro-trials enable researchers to gain insight into the effects of specific elements of evidence-based interventions and to distinguish between less and more efficacious approaches to train these elements (Leijten et al., 2015). Micro-trial research is, however, still in its infancy and methodological considerations need to be sorted out.

A first methodological consideration relates to the ideal dosage of the experimental manipulation. In previous micro-trials, the dosage of the experimental manipulation ranged from a couple of minutes to a few weeks. For example, in a series of micro-trials into the effects of specific treatment elements of parenting interventions (i.e., attention bias modification), parents in the experimental condition received a 15-minute training video (Loop et al., 2018; Loop & Roskam, 2016; Mouton et al., 2018), whereas a micro-trial into the effects of parental praise spanned over a period of two weeks (Leijten et al., 2016), and another micro-trial included an 8-week group parental self-efficacy belief training (Roskam et al., 2015). Although a possible advantage of short, single-session experimental manipulations may be that the internal validity of these trials is high, a trade-off is that these manipulations do, in general, not resemble real-world treatment

elements, since interventions for adolescents typically consist of multiple sessions (Matthys & Lochman, 2018). In order to resemble the real-world implementation of emotion regulation training as a treatment element, the micro-trials included in this dissertation manipulated emotion regulation through an experimental emotion regulation training of ten 45 to 60 minute sessions.

A second methodological consideration relates to the specification of outcome measures. According to Howe and colleagues (2010), micro-trials should include proximal (e.g., risk factors) rather than distal (e.g., psychopathological symptoms) outcomes, because these focused experimental manipulations are not expected to bring about full treatment effects. Likewise, Leijten and colleagues (2015) stressed that micro-trials that examine the effects of parenting intervention treatment elements should include “proximal behavior in the here and now” as outcome variable. However, since the reason why specific treatment elements are incorporated into cocktail treatments is that targeting underlying mechanisms is expected to result in decreases in psychopathological symptoms, this focus on proximal outcomes may hinder our ability to examine which treatment elements actually produce change in mental health symptoms. Therefore, in this dissertation, the micro-trials include both proximal factors (i.e., emotion regulation domains) and more distal factors (i.e., externalizing problems) as outcome variables.

A third methodological consideration relates to the design and statistical analyses that are included in micro-trials. The vast majority of previous micro-trials resemble the design of a typical RCT, with pre-test and post-test assessments that are analyzed on a between-person level (e.g., Leijten et al., 2016; Loop et al., 2018; Roskam et al., 2015). These studies can conclude whether the experimental group, on average, fares better than the control group. Alternative designs, that resemble single case studies with repeated measurements that are analyzed on a within-person level, also seem to (re)gain popularity (e.g., Kazdin, 2019; Tanious & Onghena, 2019). A protocol paper describes, for example, a micro-trial into the effects of depression relapse strategies that uses Intensive Longitudinal Data (ILD) collection methods (Slofstra et al., 2017). ILD is characterized by repeated – in situ – assessments at micro timescales such as days or weeks, rather than months (Walls & Schafer, 2006). When ILD is analyzed on a within-person level, these studies can conclude whether individual adolescents experience benefits from the intervention (Plate & Aldao, 2017). Since neither of these methods can be viewed as superior, the micro-trials of this dissertation include both traditional data collection methods and ILD (weekly repeated measures).

### **The Experimental Emotion Regulation Training**

In this dissertation, emotion regulation was thus manipulated in the micro-trials with an experimental training. Together with a team of experts, I developed a modular experimental training: the Think Cool Act Cool training (te Brinke et al., 2017). The training was based on the emotion regulation elements of existing evidence-based interventions, and later adapted to the cognitive capacities of adolescents with MID-BIF (te Brinke, Albrecht et al., 2018). Both the version for adolescents with (above) average intelligence and the version for adolescents with MID-BIF consist of an introduction session and two modules of five sessions (cognitive “Think Cool” and behavioral “Act Cool”). Aside from the difference between the cognitive and behavioral approach, care was taken to ensure that the modules are identical in all other ways, such as dosage, timing, structure and lay out of materials.

In both modules, a three-step approach of emotion regulation is used. The first step focuses on creating emotional awareness, because this is an important pre-requisite for adaptive emotion regulation (Hessler & Katz, 2010). Specifically, adolescents are trained to signal their anger reactivity with an “anger thermometer” that is based on situations, feelings, sensations, and *cognitions* (e.g., “they always blame me”) or *behaviors* (e.g., “if I become angry I raise my voice”). Adolescents also learn to identify the “tipping” point, or the moment at which it is smart to use an emotion regulation strategy. The second step of the chain is to practice three *cognitive* (cognitive distraction, cognitive relaxation and cognitive reappraisal) or *behavioral* (behavioral distraction, behavioral relaxation and time-out) emotion regulation strategies. The goal of this step is to regulate anger and/or other negative emotions with adaptive regulation strategies, since research shows that adolescents with externalizing problems are inclined to use mainly maladaptive, rather than adaptive, regulation strategies (Otterpohl et al., 2016). Lastly, problem solving was practiced through *cognitive* problem solving (i.e., understanding a problem from multiple perspectives, thinking about possible solutions and consequences, choosing the most suitable solution) or *behavioral* problem solving (i.e., behavioral exercises of specific problem-solving skills such as asking for help). In many evidence-based interventions for externalizing problems, problem solving is either included as a specific emotion regulation strategy (e.g., Volkaert et al., 2018) or as a separate element that stems from the social information processing model (Lemerise & Arsenio, 2000; Lochman et al., 2015). Research shows that children and adolescents with externalizing problems (with and without MID-BIF) have more difficulties with (social) problem solving (de Castro et al., 2005; van Nieuwenhuijzen et al., 2006). Therefore, problem solving was included as an aspect of emotion regulation in the experimental emotion regulation training.

## **Outline of This Dissertation**

In this dissertation, I aimed to provide information that can be used for intervention optimization for externalizing problems in adolescence. In part one, I strived to enhance our understanding of emotion regulation as a multi-modal underlying mechanism of externalizing problems. Subsequently, in part two, I aimed to examine the effects of two kinds of emotion regulation training (cognitive versus behavioral). Both parts do not only focus on adolescents with externalizing problems and average intelligence, but also on adolescents with externalizing problems and MID-BIF.

In part one, I took into account several dimensions of emotion regulation (e.g., emotion regulation difficulties, adaptive/maladaptive regulation strategies, cognitive/behavioral regulation strategies, and mood variability), and examined differences in these dimensions between adolescents who do, and adolescents who do not, show externalizing problems and/or MID-BIF. In **Chapter 2**, I integrated two commonly used classification systems of emotion regulation strategies (i.e., an outcome- and process oriented system), in order to capture the multi-modality of emotion regulation, and examined whether the structure of emotion regulation strategies in adolescence is represented by four clusters of emotion regulation strategies (i.e., cognitive maladaptive, behavioral maladaptive, cognitive adaptive, and behavioral adaptive strategies). In addition, I examined differences between adolescents with different patterns of psychological problems in these clusters of emotion regulation strategies. Since little is known about the emotion regulation capacities of adolescents with externalizing problems and MID-BIF, I subsequently zoomed in on the emotion regulation capacities of adolescents with externalizing problems and MID-BIF. Specifically, in **Chapter 3**, differences between adolescents with externalizing behavior and MID-BIF (IQ 55-84) and adolescents with externalizing behavior and (above) average intelligence (AIQ, IQ ≥ 85) in the four clusters of emotion regulation strategies, emotion regulation difficulties, and (variability in) angry mood were examined.

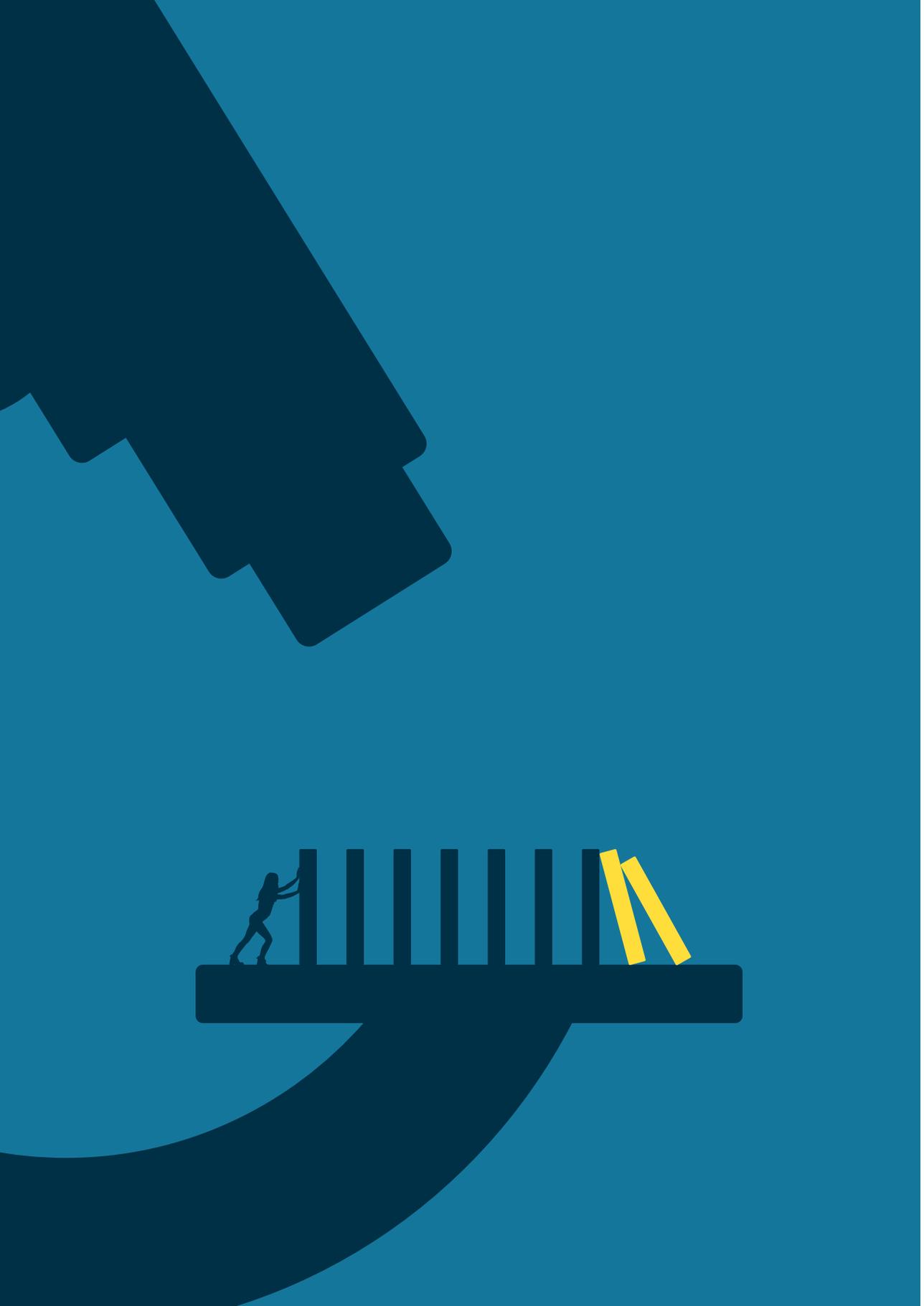
In part two, I focused on emotion regulation training as a treatment element for externalizing problems in adolescence. **Chapter 4** contains the protocol article in which we preregistered the design and hypotheses of the micro-trial for adolescents with externalizing problems and average intelligence. Subsequently, in **Chapter 5**, I examined whether the experimental emotion regulation training, offered in a school-context, is an effective treatment element to improve emotion regulation skills and decrease externalizing problems. Moreover, I examined which approach (Think Cool versus Act Cool) and which sequence (sequence Think Cool + Act Cool versus sequence Act Cool + Think Cool) is more effective for adolescents with average intelligence. In **Chapter 6**, I examined in a clinical-care context which approach (Think Cool versus Act

Cool) and which sequence (sequence Think Cool + Act Cool versus sequence Act Cool + Think Cool) is more effective for adolescents with externalizing problems and MID-BIF. At the end of this dissertation, a general discussion is provided, in which I summarize and discuss the main findings of the included studies, balance their strengths and weaknesses, and look ahead towards future research that is needed to optimize interventions for adolescents with externalizing problems.

**PART ONE**

**EMOTION REGULATION  
AS A MULTI-MODAL  
UNDERLYING  
MECHANISM**





## CHAPTER 2

# THE STRUCTURE OF EMOTION REGULATION STRATEGIES IN ADOLESCENCE: DIFFERENTIAL LINKS TO INTERNALIZING AND EXTERNALIZING PROBLEMS

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### **A revised version of this chapter has been published as:**

te Brinke, L. W., Menting, A. T. A., Schuiringa, H.D., Zeman, J., & Deković, M. (2020). The structure of emotion regulation strategies in adolescence: Differential links to internalizing and externalizing problems. *Social Development*. Advance online publication. <https://doi.org/10.1111/sode.12496>

### **Author contributions:**

LB conceptualized the study, AM and MD provided feedback; LB conducted and supervised data collection; LB analyzed the data and drafted the manuscript; AM, HS, and MD provided guidance and feedback on the manuscript. JZ critically reviewed the manuscript.

## ■ ABSTRACT

Emotion regulation is a multi-modal construct, that includes both adaptive and maladaptive cognitive-behavioral processes. However, many classifications of regulation strategies do not take this multi-modality into account. Therefore, the aim of this study was to integrate two classification systems and examine whether in adolescence the structure of emotion regulation is represented by cognitive maladaptive, behavioral maladaptive, cognitive adaptive, and behavioral adaptive strategies. Subsequently, associations with age, gender differences, and differences between adolescents with different patterns of psychological problems were examined. Participants were 336 adolescents (56% boys,  $M_{\text{age}} = 15.41$ ,  $SD = 1.45$ ). Anger regulation strategies were measured with a questionnaire that assessed general strategies, and a vignette measure that assessed contextual strategies. Confirmatory factor analyses supported the 4-factor classification. The four categories of regulation strategies were differentially associated with age, and gender and psychological problem differences were found. Adolescents with internalizing problems reported using a cognitive regulation style (cognitive maladaptive/adaptive strategies), adolescents with externalizing problems a behavioral regulation style (behavioral maladaptive strategies), and adolescents with comorbid internalizing and externalizing problems a maladaptive regulation style (cognitive and behavioral maladaptive strategies). These findings highlight the multi-modal nature of emotion regulation and may provide opportunities for treatment modifications, through alignment of treatment approaches with symptom-specific regulation styles.

*Keywords:* emotion regulation, regulation strategies, internalizing problems, externalizing problems, adolescence

## THE STRUCTURE OF EMOTION REGULATION STRATEGIES IN ADOLESCENCE: DIFFERENTIAL LINKS TO INTERNALIZING AND EXTERNALIZING PROBLEMS

The capacity to effectively regulate emotions is crucial to socio-emotional well-being (Gross & John, 2003), and deficiencies in emotion regulation are related to both internalizing and externalizing problems (Aldao et al., 2016). To examine associations between emotion regulation strategies and socio-emotional well-being, emotion regulation strategies are traditionally classified into a 2-factor model in which adaptive and maladaptive strategies are distinguished, or a 2-factor model in which cognitive and behavioral strategies are distinguished (Naragon-Gainey et al., 2017). The existence of these different classification systems reflects that emotion regulation is a multi-modal construct that includes both adaptive and maladaptive cognitive-behavioral processes (Cole et al., 2004; Thompson, 2019). However, these separate 2-factor classifications do not fully take this multi-modality into account. In the current study, we therefore propose an alternative 4-factor model to classify emotion regulation strategies, and examine this model in adolescence.

An outcome-oriented method to classify emotion regulation strategies is based on the distinction between *adaptive* and *maladaptive* strategies (Aldao et al., 2010; Naragon-Gainey et al., 2017). The adaptiveness of emotion regulation strategies is defined as the degree to which strategies allow individuals to successfully function in their environment (Bridges et al., 2004). Adaptive regulation strategies serve goal-directed behaviors, whereas maladaptive regulation strategies hinder goal-directed behaviors (Robertson et al., 2012). Consecutively, strategies that are considered *adaptive* (e.g., problem solving, distraction) are generally negatively related to negative affect and psychological problems (Aldao et al., 2010). In contrast, strategies that are classified as *maladaptive* (e.g., rumination, withdrawal) are generally positively related to negative affect and psychological problems (Aldao et al., 2010). This two-factor classification system is frequently used in empirical research (Cracco et al., 2017; Kovacs et al., 2019; van Beveren, Goossens et al., 2019). In addition, questionnaires exist that explicitly measure both maladaptive and adaptive regulation strategies (e.g., Cracco et al., 2015).

A process-oriented method to classify emotion regulation strategies differentiates strategies based on whether they involve *cognition* or *behavior* (Cole et al., 2019; Naragon-Gainey et al., 2017). Cognitive regulation strategies (e.g., problem solving, rumination) involve cognitive change, whereas behavioral regulation strategies (e.g., distraction, withdrawal) involve behavioral change. Gross's (1998, 2015) process model of emotion regulation describes emotion regulation as a sequential process, in which

cognitive and behavioral processes are employed at different points in time. Specifically, cognitive processes (i.e., plans are made to take action) *precede* behavioral processes (i.e., action is taken) (Garnefski et al., 2001). In accordance with this line of reasoning, the distinction between cognitive and behavioral strategies is also made in several emotion regulation taxonomies (Larsen, 2000; Parkinson & Totterdell, 1999) and measures (Garnefski et al., 2001; Kraaij & Garnefski, 2019). For example, the Behavioral Emotion Regulation Questionnaire (Kraaij & Garnefski, 2019) has recently been developed as an addition to the Cognitive Emotion Regulation Questionnaire (Garnefski et al., 2001).

Although both classification systems are frequently used, they have to our knowledge, not yet been integrated into one system that takes both dimensions into consideration. This is unfortunate, as it is likely that the integration of these two classification systems is particularly useful for clinical practice. Over the last decade, there has been a shift from focal treatment approaches (targeting single disorders) towards transdiagnostic treatment approaches (targeting multiple disorders) (Marchette & Weisz, 2017), and emotion regulation has been identified as an important transdiagnostic factor underlying both internalizing and externalizing psychopathology (Aldao et al., 2016; Beauchaine & Cicchetti, 2019). Transdiagnostic treatments that focus on emotion regulation seem promising (Berking & Lukas, 2015; Loevaas et al., 2019), but differ in their relative focus on cognitive versus behavioral strategies, without knowing their differential effects. Moving towards an integrated classification system, could therefore help in the finetuning of such transdiagnostic interventions. For example, knowledge about cognitive versus behavioral emotion regulation profiles for different psychological problems may allow clinicians to capitalize on strengths (i.e., enhanced focus on preferred cognitive/behavioral *adaptive* strategies), and/or compensate for weaknesses (i.e., diminished focus on preferred cognitive/behavioral *maladaptive* strategies) for adolescents (Rude & Rehm, 1991).

Recent empirical research on the structure of emotion regulation strategies provides some initial support for the necessity to integrate the outcome- and process-oriented classification systems. A study that assessed emotion regulation strategies in daily life with a person-centered approach demonstrated that well-being was highest for individuals who used a profile that was labeled as '*multiple active strategies*', and mainly consisted of behavioral adaptive strategies such as social sharing and situation modification (Grommisch et al., 2020). In addition, a study that examined the structure of emotion regulation strategies with a variable-centered approach, found support for a model in which cognitive and behavioral regulation were distinguished (Adrian et al., 2019). This study took, however, only maladaptive strategies into account. In contrast, a meta-analytic study examining the underlying structure of emotion

regulation strategies found that both 2-factor classifications (adaptive-maladaptive and cognitive-behavioral) did not show acceptable model fit (Naragon-Gainey et al., 2017); an integrated 4-factor solution was not directly tested. Thus, it is not clear yet whether the structure of emotion regulation strategies can indeed be characterized by a combination of the adaptive-maladaptive and cognitive-behavioral dimensions.

Classification systems of emotion regulation strategies have generally been developed for adults, but emotion regulation is particularly important during the developmental window of adolescence (Klimes-Dougan & Zeman, 2007). Across childhood and adolescence, emotion regulation processes shift from external (e.g., parent-regulated and/or behavioral strategies) to internal (e.g., self-regulated and/or cognitive strategies; Kopp, 1989; Zeman et al., 2006). By the time children reach adolescence, they are expected to effectively manage their own emotions (Eisenberg & Morris, 2002). The developmental period of adolescence is, however, also characterized by new social challenges (i.e., the need to be accepted by peers) (Klimes-Dougan & Zeman, 2007) and the experience of more intense and frequent negative emotions (Silk et al., 2003). Although adolescents are expected to become more independent and skilled in regulating their emotions, their emotional and social world becomes increasingly nuanced and complex. Thus, adolescents who are not able to modify their emotion regulation responses to the changing demands of their social environment are potentially at risk for the development of emotion regulation difficulties. Examining the underlying structure of habitual emotion regulation strategies with an integrated classification system during adolescence, thus has the potential to provide deeper insight into processes underlying the development of emotion regulation difficulties. Therefore, the primary aim of the current study was to examine the two emotion regulation classification systems and determine empirically whether in adolescence, these systems could be integrated into a 4-factor model. We hypothesized that cognitive maladaptive (e.g., rumination), behavioral maladaptive (e.g., withdrawal), cognitive adaptive (e.g., problem solving), and behavioral adaptive (e.g., distraction) emotion regulation strategies could indeed be disentangled and that this 4-factor classification would fit the data better than both 2-factor classifications.

A second goal of the current study was to examine the association between age and the four categories of emotion regulation strategies, within the developmental period of adolescence. Previous studies that examined the association between age and regulation strategies during adolescence show inconsistent findings. On the one hand, there is some support for a '*general maturation model*', suggesting that with increasing age, the use of adaptive regulation strategies increases (Silvers et al., 2012; Zimmermann & Iwanski, 2014) and the use of maladaptive strategies decreases (Gullone et al., 2010).

On the other hand, there is also evidence for a '*maladaptive-shift model*', as 12-15 year-old adolescents are found to use more maladaptive strategies than older or younger age groups (Cracco et al., 2017) and age is found to be negatively related to adaptive mood response repertoires in a sample of 7-14 year-olds (Kovacs et al., 2019). Previous research, however, generally did not explicitly take into account the difference between cognitive and behavioral strategies, whereas based on developmental theory, it can be expected that cognitive abilities increase during adolescence (Steinberg, 2005), and that age differences in regulation strategies thus develop according to a '*cognitive maturation model*'. Therefore, we hypothesized that age would be positively related to maladaptive and adaptive cognitive regulation strategies, but negatively related to maladaptive and adaptive behavioral regulation strategies.

A third goal of this study was to examine gender differences in the four types of emotion regulation strategies. According to gender role theories, girls might use more internally focused (i.e., cognitive) responses to emotions, whereas boys might be more likely to engage in behavioral avoidance, a behavioral strategy (Nolen-Hoeksema, 2012). Research among adults shows, however, that women report higher degrees of almost all types of emotion regulation strategies than men, including cognitive maladaptive (i.e., rumination) and adaptive (i.e., reappraisal) strategies, but also behavioral strategies (i.e., distraction) (Nolen-Hoeksema, 2012; Tamres et al., 2002). With regard to cognitive strategies, these findings are also replicated in adolescence, as adolescent girls typically report using more rumination strategies (Jose & Brown, 2008), but also more situation specific problem solving than boys (Silk et al., 2003). However, little is known about gender differences in adolescence with regard to behavioral strategies. Therefore, we hypothesized that girls will use more adaptive and maladaptive cognitive strategies, but did not make any specific predictions regarding behavioral strategies.

The last goal of the current study was to examine whether differences between the reported use of the four categories of emotion regulation strategies would emerge for youth with different patterns of psychological problems. If differences do emerge, these findings would highlight the specificity of emotion regulation difficulties that underlie certain types of psychological difficulties. Both internalizing (anxiety and depression) and externalizing (rule-breaking and aggression) symptoms were taken into account. Given the high comorbidity rates between these psychological problems in adolescence (Merikangas et al., 2010) and the transdiagnostic importance of emotion regulation (Aldao et al., 2016; Beauchaine & Cicchetti, 2019), we examined group differences among adolescents who reported mainly internalizing, mainly externalizing, comorbid internalizing and externalizing problems, and those who do not experience clinical levels of symptoms. As this is the first study that examines these four categories of regulation

strategies, there is limited direct evidence regarding group differences. Theoretically, however, according to Beck's (1967) model of depression, internalizing symptoms are characterized by cognitive processing distortions. In contrast, externalizing problems are viewed as an outward, behavioral reaction characterized by '*turning against others*' (Achenbach, 1966). Therefore, it seems plausible that adolescents with internalizing problems will report using more cognitive maladaptive strategies, whereas adolescents with externalizing problems will use more behavioral maladaptive strategies. Along these lines, it could also be expected that adolescents with comorbid internalizing and externalizing problems will use both cognitive and behavioral maladaptive strategies, whereas adolescents without clinical levels of psychological problems may use relatively more cognitive and behavioral adaptive strategies.

Given that this study is, to our knowledge, the first study that integrates an outcome-oriented and process-oriented classification system of emotion regulation strategies, and because emotion regulation is characterized by emotion specificity (e.g., specific emotions elicit distinct functional relations between an individual and the environment; Zeman et al., 2007), this study focuses on a specific emotion, rather than a combination of emotions and/or general negative affect. We selected the negative emotion of *anger*, because anger is relevant not only for externalizing, but also for internalizing problems (Harmon et al., 2019; Otterpohl et al., 2016; Zeman et al., 2002). In preadolescence, high levels of anger rumination are, for example, associated with elevations of both depressive and aggressive symptoms, independently of the levels of sadness regulation (Harmon et al., 2019). Thus, the operationalization that we used to test the integrated classification system of emotion regulation strategies is emotion-specific (i.e., strategy use is measured in response to feelings of anger), whereas the conceptualization of this system is emotion-general (i.e., this system is expected to be applicable to all emotions).

The current study further adds to the literature by including two measurement approaches of emotion regulation strategies in response to feelings of anger; a generalized questionnaire and a contextualized vignette measure. Generalized measures of emotion regulation strategies focus on combinations of strategies that an individual uses relatively consistently across time and context (Bridges et al., 2004), whereas contextualized measures focus on specific situations (Aldao, 2013). Although it can be argued that these general emotion regulation styles are specifically important for psychological functioning, the situational context needs to be taken into account as well, because context may influence both the selection and functionality of regulation strategies (Aldao, 2013). A daily diary study showed, for example, that the selection of regulation strategies was influenced by the emotional valency of the specific situation (Lennarz et al., 2019). Moreover, capturing context appears to be particularly important

when examining associations between regulation strategies and psychopathology, since psychological disorders are characterized by rigid responses to the environment (Aldao, 2013). Therefore, the current study assessed the reported use of the four categories of emotion regulation strategies and their associations with age, gender, and different patterns of psychological problems using two measures. No measure-specific hypotheses were formulated.

## ■ METHOD

### Participants

Participants were 336 adolescents (56% boys,  $M_{\text{age}} = 15.41$  years,  $SD = 1.45$ , range 12-19 year of age) who were recruited from high schools in the Eastern and Middle part of the Netherlands (grades 7-12). The participating adolescents followed a pre-vocational track (16%), higher general education track (56%) or pre-university track (26%). As one goal of this study was to examine group differences between adolescents who reported high degrees of psychological problems, we oversampled adolescents who were likely to experience behavior problems. Specifically, a subsample of 67 participants (20% of the total sample; 73% boys) were selected based on teacher report of externalizing problems. These adolescents also participated in an experimental emotion regulation study (for more details see te Brinke, Schuiringa et al., 2018).

### Procedure

First, adolescents attending the participating high school and their parents, received a general information letter about the study. In this information letter, the goal of the study was described as “understanding how adolescents deal with their emotions, in order to better help adolescents who have difficulties to regulate their emotions in the future”. Parents could then object to participation of their child in the study (3 parents objected). Adolescents with parental tacit approval who wished to participate signed an informed consent form (none of the adolescents refused to sign informed consent). Participating adolescents completed the questionnaires in their classroom or individually in a quiet room, with researchers available to answer questions and monitor the 30-minute session. All questionnaires were completed in the same session, and participants did not receive any incentives for completing the questionnaires. The study was approved by the Ethics Committee of the Faculty of Social & Behavioral Sciences and the Ethics Committee of the University Medical Center Utrecht.

**TABLE 1.** Descriptive Statistics (*M*, *SD*) and Standardized Factor Loadings of the Generalized Emotion Regulation Measure (*N* = 336)

	Item number	<i>M</i>	<i>SD</i>	Factor Loading
<i>Cognitive Maladaptive</i> ( $\alpha = .50$ )				
Self-Devaluation	8	2.85	1.16	0.38
	16	2.73	1.09	0.49
Rumination	10	2.60	1.18	0.65
<i>Behavioral Maladaptive</i> ( $\alpha = .73$ )				
Withdrawal	7	2.61	1.30	0.61
	25	2.73	1.26	0.42
Giving Up	9	2.47	1.11	0.72
	30	2.25	1.13	0.56
Aggressive Actions	13	2.43	1.17	0.42
	23	2.43	1.19	0.46
<i>Cognitive Adaptive</i> ( $\alpha = .80$ )				
Cognitive problem solving	11	3.30	1.09	0.44
	28	3.25	1.10	0.60
Humor enactment	3	2.91	1.15	0.51
	17	2.71	1.12	0.61
Forgetting	15	2.73	1.14	0.47
	20	3.58	1.08	0.43
Revaluation	12	2.85	1.15	0.51
	29	2.70	1.04	0.53
Cognitive acceptance	21	2.99	1.06	0.51
<i>Behavioral Adaptive</i> ( $\alpha = .78$ )				
Behavioral problem solving	1	3.30	0.93	0.46
	18	3.35	1.12	0.74
Distraction	4	3.56	1.06	0.56
	27	3.17	1.13	0.66
Behavioral acceptance	6	3.63	1.08	0.68

Note. Item numbers correspond to the original Dutch FEEL-KJ questionnaire, which also consists of the subscale external emotion regulation strategies.

## Measures

### **Generalized Emotion Regulation Strategies**

Generalized emotion regulation strategies were assessed with the Dutch version of the Fragesbogen zur Erhebung der Emotionsregulation bei Kinder und Jugendlichen (FEEL-KJ) (Cracco et al., 2015; Grob & Smolenski, 2009). The FEEL-KJ was selected, because this validated self-report instrument measures a large variety of both cognitive and behavioral strategies that children and adolescents habitually use to regulate emotions of anger, sadness, and anxiety. In the current study, we only measured emotion regulation strategies in response to feelings of anger, similar to other studies (e.g., Otterpohl et al., 2016). Respondents rated on a 5-point scale from 1 (*never*) to 5 (*almost always*) their general use of five maladaptive (Giving Up, Withdrawal, Rumination, Self-Devaluation, and Aggressive Actions) and seven adaptive (Problem Solving, Distraction, Forgetting, Acceptance, Humor Enhancement, Cognitive Problem Solving, and Revaluation) strategies, each assessed with two items. To determine whether the 24 items reflected cognitive or behavioral strategies, items were independently classified by the first author and a research assistant as cognitive or behavioral, based on whether they involved thought (e.g., If I am angry... I think about something that makes me happy) or action (e.g., If I am angry... I do something fun). The raters agreed on the classification of all items. See Table 1 for the classification of items and internal consistency of the four categories. Subsequently, mean scores of the four categories were constructed, with higher scores indicating that the adolescents were more likely to report the probable use of these strategies when experiencing feelings of anger.

### **Contextualized Emotion Regulation Strategies**

Contextualized emotion regulation strategies were measured with a vignette measure, developed for the current study. The measure was based on earlier vignettes that measured coping with anger provoking situations (Whitesell et al., 1993). In the current study, participants read two vignettes that were meant to elicit feelings of anger. Both vignettes consisted of peer provocation, as this type of psychological harm is found to be an important context in which adolescents experience anger (Matthys et al., 2001). The first vignette consisted of the following story: *"You are walking through the school hallway. All of a sudden your classmate pushes you. Your phone falls on the ground"*. The second vignette consisted of the following story: *"You are playing soccer. Your classmate is able to score. Instead, he suddenly runs into you"*. On average, adolescents indicated their expected level of anger with a 3.85 ( $SD = 1.45$ ) on a scale from 1 (*not angry*) to 7 (*very angry*). Thus, the vignettes indeed seemed to elicit feelings of anger. After reading the vignettes, adolescents were presented with several context specific emotion regulation strategies and rated the likelihood of using a specific emotion regulation strategy

using a 7-point scale from 1 (*definitely not likely*) to 7 (*very likely*). The cognitive adaptive strategy putting into perspective was, for example, described as “*I think... luckily my phone is not broken*” in the first vignette, and as “*I think... luckily it does not hurt too much*” in the second vignette. Per vignette, there were six cognitive strategies (three adaptive strategies: cognitive reappraisal, cognitive distraction, putting into perspective; three maladaptive strategies: self-blame, rumination, suppression), and five behavioral strategies (three adaptive strategies: relaxation, behavioral distraction, social support; two maladaptive strategies: direct expression, indirect expression). Mean scores for the four categories of regulation strategies were computed, with higher scores indicating that the adolescents were more likely to report the probable use of these strategies in the peer provocation scenarios. Across the vignettes, mean scores were positively correlated (cognitive maladaptive  $r = .59$ , behavioral maladaptive  $r = .13$ , cognitive adaptive  $r = .44$ , behavioral adaptive  $r = .48$ ).

### **Internalizing and Externalizing Problem Behavior**

Internalizing and Externalizing problems were measured with the Dutch version of the Youth Self Report (YSR; Achenbach & Rescorla, 2001; Verhulst & van der Ende, 2001). The internalizing broadband scale consists of 32 items (e.g., I am often worried) and the externalizing broadband scale consists of 31 items (e.g., I argue a lot). Items are rated on a 3-point scale (0 = *not true*, 1 = *somewhat true*, 2 = *very true or often true*). In the current study, Cronbach’s alpha was .90 for internalizing problems and .83 for externalizing problems. T-scores were constructed, with higher scores being indicative of more problems.

To examine group differences in emotion regulation strategies, groups were constructed based on the cut-off scores for the ‘*normative*’ or ‘*(sub)clinical range*’ (T-score > 60, corresponding to the 84th percentile). We identified four subgroups of adolescents: (1) Normative group (NOR;  $n = 214$ , 58% boys,  $M_{\text{age}} = 15.56$  years), scores in the normative range on both internalizing and externalizing problem scales, (2) Internalizing problem group (INT;  $n = 62$ , 40% boys,  $M_{\text{age}} = 15.27$  years), scores in the subclinical or clinical range of internalizing problems and in the normative range of externalizing problems, (3) Externalizing problem group (EXT,  $n = 36$ , 75% boys,  $M_{\text{age}} = 14.89$  years), scores in the subclinical or clinical range of externalizing problems and in the normative range of internalizing problems, and (4) Comorbid problem group (COM,  $n = 23$ , 48% boys,  $M_{\text{age}} = 15.26$  years), scores in the subclinical or clinical range on both internalizing and externalizing problems scales. One adolescent could not be classified, due to too many missing items on the problem behavior scales.

## Analyses

In order to examine whether a 4-factor classification of generalized emotion regulation strategies is preferable over a 2-factor classification, a series of Confirmatory Factor Analyses (CFAs) was performed in Mplus 8.1. (Muthén & Muthén, 2017), using the items of the generalized emotion regulation questionnaire. In each model, the factor structure of generalized emotion regulation strategies was specified based on the underlying theoretical model. Latent factors were allowed to correlate, but individual items were fixed to exclusively load on their hypothesized factor. Full Information Maximum Likelihood estimation was used. Model fit was evaluated with the  $\chi^2$  likelihood ratio statistic ( $\chi^2/\text{df}$  ratio  $\leq 5$ ), the comparative fit index (CFI  $\geq .900$ ), and the root mean square error of approximation (RMSEA  $\leq .080$ ) (Hu & Bentler, 1999). If the model fit of the initial model was not satisfactory, re-specification of the factor structure was considered. If necessary, residuals of items with similar wordings were allowed to correlate, suggesting that these items covaried due to methodological rather than structural effects (Brown & Moore, 2012).

Additionally, the fit of the final 2-factor and 4-factor models was compared. Because not all of these models were nested, we could not compare them with a chi-square difference test. However,  $\Delta\text{CFI}$  and  $\Delta\text{RMSEA}$  have been introduced as sample size insensitive means of comparing different factor models. Critical absolute values of  $\Delta\text{CFI}$  and  $\Delta\text{RMSEA}$  are .010 and .015, respectively (Chen, 2007). A cutoff criterium for statistical significance of the factor loadings of .30 was used, according to guidelines presented for larger-sample sizes (Hair et al., 1995). Subsequently, associations with age were examined with Pearson correlations and gender differences were examined with ANOVAs. Lastly, in order to examine differences between the four problem-behavior groups in use of the different categories of generalized/contextualized emotion regulation strategies, MANOVAs were performed, followed by univariate *F*-tests and Tukey post-hoc comparisons.

## ■ RESULTS

### Disentangling Emotion Regulation Strategies

Means and standard deviations of the generalized emotion regulation items are presented in Table 1. First, the internal consistencies and item-item correlations were examined. One rumination item (item 24: I do not get it out of my head) negatively affected the internal consistency, was not significantly correlated to the other rumination item ( $r = .10$ ), and had a factor loading below cutoff in the 2-factor cognitive/behavioral model and the 4-factor model. Therefore, this item was dropped from the analyses. Next, a 2-factor model was examined in which the 23 items loaded on a maladaptive and

adaptive factor. The initial model did not show acceptable model fit ( $\chi^2(229) = 1215.78$ ,  $p < .001$ , CFI = .614, RMSEA = .113). Therefore, modification indices were examined and the residuals of 10 item pairs that used similar wordings were allowed to correlate. This resulted in a final 2-factor maladaptive/adaptive model. Model fit indices of this model were, however, still below critical points for acceptable model fit ( $\chi^2(242) = 866.60$ ,  $p < .001$ , CFI = .768, RMSEA = .088). Next, a 2-factor model was examined in which items loaded on a cognitive and behavioral factor, with the residuals of the same items pairs allowed to correlate. This model was, again, below critical points for acceptable model fit ( $\chi^2(219) = 676.70$ ,  $p < .001$ , CFI = .821, RMSEA = .079), but fitted the data slightly better than the 2-factor maladaptive/adaptive model ( $\Delta\text{CFI} = .053$ , and  $\Delta\text{RMSEA} = .009$ ). Next, a 4-factor model (cognitive maladaptive, behavioral maladaptive, cognitive adaptive, behavioral adaptive) was examined with the residuals of the same item pairs allowed to correlate. This resulted in a 4-factor model that showed acceptable model fit ( $\chi^2(214) = 510.74$ ,  $p < .001$ , CFI = .884, RMSEA = .064), although the CFI remained below .900.

Lastly, the model fit of the 4-factor model was compared to both 2-factor models. The final 4-factor model fitted the data better than the final 2-factor maladaptive/adaptive model ( $\Delta\text{CFI} = .116$ , and  $\Delta\text{RMSEA} = .049$ ) and the final 2-factor cognitive/behavioral model ( $\Delta\text{CFI} = .063$ , and  $\Delta\text{RMSEA} = .015$ ). Thus, as expected, cognitive maladaptive, behavioral maladaptive, cognitive adaptive, and behavioral adaptive emotion regulation strategies could be disentangled and this 4-factor classification of generalized emotion regulation strategies fitted the data better than the 2-factor classifications. Factor loadings of the final model are presented in Table 1. Descriptive statistics and correlations between the four categories of emotion regulation strategies, as measured with both the generalized and contextualized measure are presented in Table 2. All four generalized categories of emotion regulation strategies were positively associated with the corresponding contextualized categories of emotion regulation strategies.

### **Associations with Age**

Correlations between the four categories of emotion regulation strategies and age are displayed in Table 2. Age was, as expected, positively correlated with both maladaptive and adaptive cognitive emotion regulation strategies. Moreover, age was negatively related with behavioral maladaptive strategies. Contrary to our expectations, age was however also positively correlated with behavioral adaptive strategies. These results were similar for the generalized and contextualized measure.

**TABLE 2.** Correlations Between Generalized and Contextualized Emotion Regulation Strategies, and Age (N = 336)

	1.	2.	3.	4.	5.	6.	7.	8.
<i>Generalized Emotion Regulation</i>								
1. Cognitive Maladaptive								
2. Behavioral Maladaptive	.11*							
3. Cognitive Adaptive	.46**	-.22**						
4. Behavioral Adaptive	.24**	-.45**	.70**					
<i>Contextualized Emotion Regulation</i>								
5. Cognitive Maladaptive	.31**	.16**	.29**	.14*				
6. Behavioral Maladaptive	-.20**	.18**	-.30**	-.19**	-.28**			
7. Cognitive Adaptive	.34**	-.02	.46**	.30**	.61**	-.46**		
8. Behavioral Adaptive	.20**	.16**	.17**	.16**	.58**	-.12*	.43**	
9. Age	.14*	-.11*	.21**	.16**	.20**	-.46**	.25**	.13*
Mean (SD)	2.73 (0.81)	2.49 (0.78)	3.00 (0.67)	3.40 (0.78)	2.52 (1.09)	2.12 (1.32)	3.84 (1.16)	2.67 (0.93)

**TABLE 3.** Gender Differences in Generalized and Contextualized Emotion Regulation Strategies (N = 336)

	Boys M (SD)	Girls M (SD)	F	P	95 % $\Delta$ CI			$\eta^2$
					LL	UL		
<i>Generalized Emotion Regulation</i>								
Cognitive Maladaptive	2.60 (0.81)	2.89 (0.79)	11.11	.001	-0.47	-0.12		0.03
Behavioral Maladaptive	2.33 (0.76)	2.68 (0.75)	17.53	<.001	-0.51	-0.19		0.05
Cognitive Adaptive	2.93 (0.67)	3.09 (0.67)	4.83	.029	-0.31	-0.02		0.01
Behavioral Adaptive	3.48 (0.77)	3.30 (0.79)	4.68	.031	0.02	0.35		0.01
<i>Contextualized Emotion Regulation</i>								
Cognitive Maladaptive	2.26 (0.96)	2.84 (1.19)	24.02	<.001	-0.80	-0.34		0.07
Behavioral Maladaptive	2.49 (1.37)	1.64 (1.07)	38.38	<.001	0.58	1.12		0.10
Cognitive Adaptive	3.57 (1.16)	4.18 (1.06)	24.60	<.001	-0.85	-0.37		0.07
Behavioral Adaptive	2.59 (0.91)	2.76 (0.94)	2.90	.089	-0.37	0.03		0.01

Note.  $\Delta$ CI = confidence interval for the difference between boys and girls. LL = lower limit, UL = upper limit.

## Gender Differences

Gender differences are displayed in Table 3. As expected, girls scored significantly higher in cognitive maladaptive and adaptive regulation strategies (as assessed with both the generalized and contextualized measures). For behavioral strategies, findings were mixed. Boys scored significantly higher than girls in contextualized behavioral maladaptive strategies, but lower in generalized behavioral maladaptive strategies. Moreover, boys scored significantly higher in generalized behavioral adaptive strategies, whereas the difference in contextualized behavioral adaptive strategies was not significant.

## Problem Behavior Group Differences

In order to examine differences in the four categories of emotion regulation strategies between the four problem-behavior groups, two MANOVAs were performed. For the generalized measure, the results showed that there was a significant overall difference in emotion regulation strategies between the four groups, Wilks  $\lambda = 0.73$ ;  $F(12, 868.10) = 9.23$ ,  $p < .001$ ,  $\eta^2 = 0.10$ . Univariate  $F$ -tests showed significant differences between the four groups in cognitive maladaptive ( $F(3, 335) = 14.36$ ,  $p < .001$ ,  $\eta^2 = 0.12$ ), behavioral maladaptive ( $F(3, 335) = 18.47$ ,  $p < .001$ ,  $\eta^2 = 0.14$ ), cognitive adaptive ( $F(3, 335) = 5.65$ ,  $p = .001$ ,  $\eta^2 = 0.05$ ), and behavioral adaptive strategies ( $F(3, 335) = 7.19$ ,  $p < .001$ ,  $\eta^2 = 0.06$ ). For the contextualized measure, the overall difference was also significant, Wilks  $\lambda = 0.80$ ;  $F(12, 693.48) = 6.56$ ,  $p < .001$ ,  $\eta^2 = 0.07$ . Univariate  $F$ -tests showed significant group differences in cognitive maladaptive ( $F(3, 335) = 12.45$ ,  $p < .001$ ,  $\eta^2 = 0.10$ ), behavioral maladaptive ( $F(3, 335) = 13.81$ ,  $p < .001$ ,  $\eta^2 = 0.11$ ), and cognitive adaptive strategies ( $F(3, 335) = 11.15$ ,  $p = .001$ ,  $\eta^2 = 0.09$ ), but not in behavioral adaptive strategies ( $F(3, 335) = 2.18$ ,  $p = .091$ ,  $\eta^2 = 0.02$ ).

Descriptive statistics and the results of post-hoc Tukey analyses are displayed in Table 4. Results indicated that, as expected, adolescents in the internalizing problem (INT) group scored significantly higher on generalized and contextualized cognitive maladaptive strategies than adolescents in the normative (NOR), and externalizing problem (EXT) group. Contrary to our expectations, the INT group scored also significantly higher on cognitive adaptive strategies compared to the EXT and comorbid problem (COM) group. The EXT group scored, as expected, significantly higher on generalized and contextualized behavioral maladaptive strategies than the NOR group, and significantly higher on contextualized behavioral maladaptive strategies than the INT group.

The COM group scored, as expected, significantly higher on generalized (but not contextualized) cognitive maladaptive strategies compared to the NOR and EXT groups,

and significantly higher on both generalized and contextualized behavioral maladaptive strategies compared to the NOR and INT groups. Regarding adaptive strategies, the COM group scored significantly lower on generalized and contextualized cognitive adaptive strategies than the INT group. Lastly, the COM group scored significantly lower on generalized behavioral adaptive strategies compared to the NOR and INT groups.

**TABLE 4.** Means, Standard Deviations (in brackets) and Post-hoc Tukey Differences Between Problem Behavior Groups in Generalized and Contextualized Emotion Regulation Strategies (N = 335)

	NOR	INT	EXT	COM	Post-hoc Tukey <sup>1</sup>
<i>Generalized Emotion Regulation</i>					
Cognitive Maladaptive	2.60 (0.75)	3.23 (0.74)	2.42 (0.91)	3.06 (0.79)	<b>INT&gt;NOR***</b> <b>INT&gt;EXT***</b> COM>NOR* COM>EXT*
Behavioral Maladaptive	2.29 (0.74)	2.70 (0.64)	2.74 (0.71)	3.32 (0.77)	<b>INT &gt; NOR***</b> <b>EXT&gt;NOR***</b> <b>COM&gt;NOR***</b> <b>COM&gt;INT**</b> COM>EXT**
Cognitive Adaptive	3.04 (0.67)	3.16 (0.56)	2.67 (0.73)	2.73 (0.72)	<b>NOR&gt;EXT*</b> <b>INT&gt;EXT**</b> <b>INT&gt;COM*</b>
Behavioral Adaptive	3.52 (0.77)	3.34 (0.68)	3.23 (0.81)	2.79 (0.81)	NOR>COM* INT>COM*
<i>Contextualized Emotion Regulation</i>					
Cognitive Maladaptive	2.41 (1.02)	3.22 (1.19)	2.06 (0.91)	2.41 (1.07)	<b>INT&gt;NOR***</b> <b>INT&gt;EXT***</b> INT>COM**
Behavioral Maladaptive	1.94 (1.17)	1.84 (1.14)	3.17 (1.60)	2.87 (1.56)	<b>EXT&gt;NOR***</b> EXT>INT*** <b>COM&gt;NOR***</b> <b>COM&gt;INT**</b>
Cognitive Adaptive	3.83 (1.12)	4.39 (1.05)	3.08 (1.24)	3.58 (0.93)	<b>NOR&gt;EXT**</b> <b>INT&gt;EXT***</b> <b>INT&gt;COM*</b> INT>NOR**
Behavioral Adaptive	2.60 (0.89)	2.94 (0.99)	2.63 (0.99)	2.70 (0.88)	

Note. <sup>1</sup> Only significant differences are displayed. \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ . Group differences that are found in both generalized and contextualized emotion regulation strategies are displayed in bold.

NOR = Normative group. INT = Internalizing problem group. EXT = Externalizing problem group. COM = Comorbid problem group

The NOR group scored significantly lower than all three other groups on generalized behavioral maladaptive strategies, and lower than the EXT and COM group on contextualized behavioral maladaptive strategies. In addition, they scored significantly lower than the INT group on both generalized and contextualized cognitive maladaptive strategies, and lower than the COM group on generalized cognitive maladaptive strategies. Moreover, as expected, the NOR group scored significantly higher on both generalized and contextualized cognitive adaptive strategies than the EXT group, and significantly higher than the COM group on generalized behavioral adaptive strategies.

## ■ DISCUSSION

In the current study, two commonly used classification systems of emotion regulation strategies were integrated into one system. The results demonstrated that the emotion regulation strategies of adolescents, as measured in response to feelings of anger, could be classified into four categories, consisting of cognitive maladaptive, behavioral maladaptive, cognitive adaptive, and behavioral adaptive strategies. Thus, by building on earlier research from the adaptive-maladaptive dimension (Cracco et al., 2017; Kovacs et al., 2019; Otterpohl et al., 2016; van Beveren, Goossens et al., 2019; Zimmermann & Iwanski, 2014) and cognitive-behavioral dimension (Adrian et al., 2019; Garnefski et al., 2001; Kraaij & Garnefski, 2019; Larsen, 2000; Parkinson & Totterdell, 1999), the current study showed that the underlying structure of emotion regulation strategies in adolescence could be reflected by four distinguishable categories.

These four categories of emotion regulation strategies, as measured in response to feelings of anger with both a generalized questionnaire and a contextualized vignette-based measure, were found to be differentially associated with age. As expected, older adolescents reported to use more cognitive maladaptive and cognitive adaptive regulation strategies, whereas younger adolescents reported to use more behavioral maladaptive regulation strategies. Contrary to our expectations, however, older adolescents also reported to use more behavioral adaptive regulation strategies. Thus, there seemed to be a discrepancy in the association between age and cognitive versus behavioral regulation strategies, which highlights the need to separate cognitive and behavioral regulation processes during the developmental period of adolescence. Regarding cognitive strategies, the findings of the current study seem to fit with a '*cognitive maturation model*', implying that the positive association between age and cognitive regulation is an outcome of general maturation in cognitive skills during adolescence (Steinberg, 2005), which is consistent with previous research showing that both cognitive adaptive and maladaptive strategies are reported less often by

early adolescents than late adolescents (Garnefski & Kraaij, 2006). However, regarding behavioral strategies, the current study's findings are in line with a '*general maturation model*', with expanding repertoires of adaptive strategies, and attenuating repertoires of maladaptive strategies (Cracco et al., 2017; Kovacs et al., 2019). It should be noted, however, that the cross-sectional nature of the current study might have obscured developmental transitions. Moreover, the findings of this study are restricted to the developmental stage of adolescence, whereas the development and functionality of specific emotion regulation strategies may be different in childhood or adulthood. In childhood, parental socialization may impact the development of (behavioral) regulation strategies (Zeman et al., 2006). A comparison of meta-analytic research focusing on adolescence (Schäfer et al., 2017) and adulthood (Aldao et al., 2010) furthermore suggests that the functionality of specific (cognitive) regulation strategies (i.e., acceptance, rumination) is different in youth compared to adults. Future research could build on these findings by examining the development and change in the use of the four categories of emotion regulation strategies across developmental stages, using a longitudinal design.

The current study also found gender differences in the four categories of regulation strategies. As expected, girls reported to use more cognitive maladaptive and adaptive regulation strategies in response to feelings of anger than boys. This finding is consistent with research demonstrating that adolescent girls use more cognitive regulation strategies (e.g., rumination) than boys (Jose & Brown, 2008). However, the current study also found that boys used more contextualized behavioral maladaptive and generalized behavioral adaptive strategies than girls. Although previous research among adolescents did not directly examine gender differences in behavioral regulation strategies, this finding is in contrast to research among adults showing that women report higher degrees of almost all types of emotion regulation strategies than men (Tamres et al., 2002). However, in that body of research, regulation strategies were primarily cognitive in nature, and behavioral regulation strategies were rarely assessed. Thus, disentangling cognitive and behavioral strategies may provide a more nuanced picture of gender differences in emotion regulation strategies.

The four categories of regulation strategies were also found to differentiate adolescents on the basis of type of psychological problems. Specifically, adolescents with internalizing symptoms were found to regulate feelings of anger with a '*cognitive regulation style*', whereas adolescents with externalizing symptoms use a '*behavioral regulation style*'. At the same time, adolescents with comorbid internalizing and externalizing symptoms reported to use a mixed '*maladaptive regulation style*', and adolescents who did not experience clinical levels of these symptoms reported to use a mixed '*adaptive*

*regulation style*'. These results are in accordance with previous research showing that adolescents with internalizing problems employ a variety of cognitive maladaptive strategies (Garnefski et al., 2005; van den Heuvel et al., 2020) and research indicating that in adolescence, cognitive strategies (i.e., rumination) might be critically important for internalizing problems (Schäfer et al., 2017). Moreover, children with externalizing problems have been characterized by low levels of behavioral control and high levels of impulsivity (Eisenberg et al., 2001), thus highlighting the role of behavioral predictors of externalizing problems. Lastly, adolescents with an adaptive anger regulation profile experience relatively few internalizing and externalizing problems (Otterpohl et al., 2016). Thus, the current study provides evidence for the importance of using an integrated classification system of assessing anger regulation strategies given that four psychological problem-related profiles of regulation strategies can be distinguished.

Contrary to our hypotheses, the current study found that adolescents with internalizing problems not only reported to use high levels of cognitive maladaptive strategies, but also high levels of cognitive *adaptive* strategies. This unexpected finding might indicate that adolescents with internalizing symptoms tend to *overregulate* their feelings. This interpretation builds on research showing that a multiple regulation profile (high maladaptive and adaptive strategies), is primarily associated with internalizing problems (Otterpohl et al., 2016), and that up until mid-adolescence, depressed children report a larger repertoire of (cognitive) adaptive strategies than their non-depressed peers (Kovacs et al., 2019). At the same time, this finding also highlights the *cognitive* nature of internalizing psychological problems, consistent with Beck's (1967) model of depression. Thus, adolescents with internalizing symptoms do not only experience specific cognitive functioning (Wagner et al., 2015) and cognitive processing distortions (Epkins, 2010), but also seem to manage anger in a cognitive, overregulated way. The current study examined, however, relative differences (i.e., mean-score) between the four categories of emotion regulation strategies, rather than absolute differences (i.e., total-score). Future research could build on these findings, and examine whether the total number of cognitive strategies that adolescents with internalizing problems have at their disposal is also larger in comparison to adolescents who do not experience internalizing problems.

It should be noted that labelling strategies as adaptive or maladaptive can be somewhat misleading, given that adaptive strategies might also be related to increased, rather than decreased, risks for internalizing psychological problems. This labelling problem has been identified previously, as no psychological process is inherently always adaptive (Moretti et al., 1985; Thompson, 2019). Moreover, social and cultural expectations may influence the adaptiveness of regulation strategies (Butler et al., 2007). In non-western

cultures, specific regulation strategies (i.e., suppression) might, for example, enhance, rather than decrease, the degree to which individuals are able to successfully function in their environment. According to Aldao (2013), it is critical to capture the context in which emotion regulation strategies are used. The results of the current study illustrate that both the generalized and contextualized use of adaptive strategies might not only be associated with positive outcomes, but also with negative outcomes. This indicates that, even though the conceptual distinction between adaptive and maladaptive strategies remains relevant, the labels may need qualifying.

In addition, the results of the current study highlight the importance of measuring both generalized and contextualized emotion regulation strategies. Overall, generalized strategies were positively associated with the corresponding contextualized strategies, which is consistent with research showing that the habitual use of an emotion regulation strategy predicts the use of this strategy in specific situations (Peters et al., 2020). However, the current study also found differences between the two measurement approaches. First, the associations between generalized and contextualized strategies appeared to be weaker for behavioral strategies than for cognitive strategies. Second, boys reported using more behavioral maladaptive strategies in specific situations than girls, whereas the general use of these strategies was endorsed more by girls than boys. An explanation for these measurement approach differences might be that behavioral (maladaptive) strategies are more context-dependent than cognitive strategies. Therefore, it appears to be especially important to focus not only on the habitual, but also on context-specific use of regulation strategies for researchers or clinicians who aim to measure the use of behavioral regulation strategies. Third, adolescents who experienced both internalizing and externalizing problems scored higher on generalized cognitive maladaptive strategies than adolescents with only externalizing or no clinical levels of problems, but these differences were not found for the reported use of these strategies in specific situations. As the generalized measure examined the emotion regulation strategies that individuals habitually use relatively consistent across time and context, it is possible that this difference in measurement approaches is a reflection of the inability of adolescents with comorbid psychological problems to flexibly adjust their strategy use to specific contexts. This explanation is consistent with the notion that it is not the ability to use specific emotion regulation strategies, but the flexibility in adapting one's regulatory responses across different situations that is particularly important for psychological well-being (Aldao et al., 2015).

## Strengths and Limitations

One of the unique aspects of this study was the use of two different emotion regulation measures, which enabled us to examine both the generalized, habitual use of emotion regulation strategies and the contextualized, situational use of these strategies. Using these two measurement approaches (questionnaires and vignettes) also enabled us to replicate some of our findings. In addition, we specifically focused on adolescence, which is a developmental period that has received considerably less empirical attention in the emotion regulation literature than other age groups (Klimes-Dougan & Zeman, 2007). Adolescence is an important period for cognitive-emotional development (Steinberg, 2005) and an age in which youth are specifically at-risk for developing psychological problems that may persist into and through adulthood (Kessler et al., 2005). Thus, the findings from this study help to illuminate important facets of emotion regulation that are associated with psychosocial adaptation during an important developmental period.

The findings must, however, be interpreted with limitations in mind. The current study only examined emotion regulation strategies in response to feelings of anger. Although emotion regulation is characterized by emotion-specificity (Zeman et al., 2007), future research should examine if these findings can be generalized to other emotions, since inclusion of other types of negative emotions (e.g., sadness, fear) may provide a more nuanced understanding of emotion-regulation profiles. Another limitation is that the questionnaire that measured generalized emotion regulation strategies was not specifically designed to distinguish cognitive and behavioral strategies. Some categories consisted of relatively few items (e.g., three items for the cognitive maladaptive category), which could have led to low internal consistency and possible under identification of the factor structure. As such, differences in generalized cognitive maladaptive strategy use should be interpreted with caution. Besides, the evaluation of psychopathology and emotion regulation was based solely on self-report. Although this method may be the most appropriate for measuring internal constructs such as internalizing psychological problems and cognitive regulation strategies (Moretti et al., 1985), this single-reporter approach could have resulted in shared method variance. Lastly, there appeared to be conceptual overlap between some items from the emotion regulation and psychological problem questionnaires. For example, *'aggressive actions'* and *'withdrawal'* were included as behavioral maladaptive strategies in the generalized emotion regulation questionnaire, whereas these items also tap into aspects of externalizing (e.g., aggressive behavior) and internalizing (i.e., depressive symptoms) problems. We share this shortcoming with several other studies that examine associations between regulation strategies and psychological problems,

as most measures of emotion regulation include aspects such as direct expression of negative emotionality (Eisenberg et al., 2001). Nevertheless, this conceptual overlap is problematic, as this could result in overestimation of associations between emotion regulation and psychological problems.

### **Conclusion and Clinical Implications**

In conclusion, the results from this study empirically demonstrate that both cognitive and behavioral strategies that adolescents use to regulate feelings of anger, are used in adaptive and maladaptive ways. As such, emotion researchers and practitioners might also need to take possible differences between these regulation processes into account. Moreover, the finding that adolescents with internalizing symptoms use a cognitive regulation style, whereas adolescents with externalizing symptoms use a behavioral regulation style, might have implications for the treatment and possible prevention of the emotional aspects that are present in adolescent psychological problems. For example, incorporating the knowledge learned from this study into aspects of transdiagnostic treatments seems promising. The current findings suggest that for adolescents who experience specific internalizing or externalizing symptoms, a focus on either cognitive or behavioral emotion regulation might be more effective than a combined treatment. Thus, aligning treatment with the symptom-specific regulation styles of adolescents, might possibly be a way to individualize transdiagnostic treatments.



## CHAPTER 3

# EMOTION REGULATION AND ANGRY MOOD AMONG ADOLESCENTS WITH EXTERNALIZING PROBLEMS AND INTELLECTUAL DISABILITIES

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**A revised version of this chapter has been published as:**

te Brinke, L. W., Schuringa, H. D. & Matthys, W. (2021). Emotion regulation and angry mood among adolescents with externalizing behavior and intellectual disabilities. *Research in Developmental Disabilities*. Advance online publication. <https://doi.org/10.1016/j.ridd.2020.103833>

**Author contributions:**

LB conceptualized the study, HS and WM provided feedback; LB conducted data collection, HS supervised; LB analyzed the data and drafted the manuscript; HS and WM provided guidance and feedback on the manuscript.

## ■ ABSTRACT

*Background and Aims.* Cognitive behavior therapy targeting emotion regulation is found to be effective in decreasing externalizing problems, but little is known about the emotion regulation capacities of adolescents with externalizing problems and Mild Intellectual Disabilities or Borderline Intellectual Functioning (MID-BIF). Therefore, the aim of this study was to compare emotion (i.e., anger) regulation capacities and related angry mood between two groups: adolescents with externalizing problems and MID-BIF and adolescents with externalizing problems and average intelligence (AIQ).

*Methods and Procedures.* Participants in the MID-BIF ( $n = 42$ ,  $M_{\text{age}} = 15.52$ ,  $SD = 1.43$ ) and AIQ ( $n = 39$ ,  $M_{\text{age}} = 13.67$ ,  $SD = 1.06$ ) group completed questionnaires about emotion regulation difficulties, emotion regulation strategies, angry mood and variability in angry mood.

*Outcomes and Results.* Adolescents in the MID-BIF group reported fewer emotion regulation difficulties, fewer maladaptive regulation strategies, and lower levels of angry mood than adolescents in the AIQ group. No between-group angry mood variability differences were found. Lastly, adolescents in the MID-BIF group reported to use more behavioral than cognitive regulation strategies.

*Conclusions and Implications.* These findings provide a starting point in understanding emotion regulation and angry mood of adolescents with externalizing problems and MID-BIF and show that it is important to consider differences between cognitive and behavioral regulation processes.

*Keywords:* mild intellectual disabilities, borderline intellectual functioning, externalizing problems, emotion regulation, angry mood, daily diary

## EMOTION REGULATION AND ANGRY MOOD AMONG ADOLESCENTS WITH EXTERNALIZING PROBLEMS AND INTELLECTUAL DISABILITIES

Adolescents with Mild Intellectual Disabilities or Borderline Intellectual Functioning (MID-BIF<sup>1</sup>; IQ between 50 and 85 and limitations in social adaptive skills; American Psychiatric Association, 2013) have a three to four times higher risk to develop behavior problems, compared to adolescents without intellectual disabilities (Dekker et al., 2002). This increased risk includes externalizing problems such as aggression and delinquency (Douma et al., 2007). For adolescents without intellectual disabilities, a clear link has been found between emotion regulation difficulties and externalizing problems (Compas et al., 2017), and improving emotion regulation is a core target of cognitive behavior therapy (Garland et al., 2008). However, little is known about the emotion regulation capacities of adolescents with externalizing problems and MID-BIF. This is unfortunate, as this knowledge can inform to which degree evidence-based interventions that aim to increase emotion regulation abilities, might also be suitable for adolescents with MID-BIF. Therefore, the current study explores differences in emotion regulation and angry mood between adolescents with externalizing problems and MID-BIF and adolescents with externalizing problems and average intelligence.

### Emotion Regulation and Externalizing Problems

Emotion regulation refers to the attempts of an individual to manage the internal experience and external expression of emotions (Thompson, 1994). It is a multi-modal construct, that includes both general *emotion regulation abilities* (typical ways to understand, regard, and respond to emotional experiences) and specific *emotion regulation strategies* (strategies to influence the processes through which emotions are generated or manifested in behavior) (Gratz & Roemer, 2004; Gross, 1998; Tull & Aldao, 2015). Emotion regulation strategies can involve either *cognition* (e.g., cognitive strategies such as reappraisal) or *behavior* (e.g., behavioral strategies such as withdrawal) and can be considered *adaptive* or *maladaptive* depending on their direct effects on negative affect and associations with psychopathology (Naragon-Gainey et al., 2017). Thus, emotion regulation strategies can be disentangled into four categories; cognitive maladaptive, behavioral maladaptive, cognitive adaptive, and behavioral adaptive strategies (te Brinke, Menting et al., 2020).

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1. In the Netherlands, people with mild intellectual disabilities (MID; IQ 55 - 69) and borderline intellectual functioning (BIF; IQ between 70 and 84) are generally treated by the same healthcare centers. Consistent with other Dutch studies (e.g., Seelen-de Lang et al., 2019), these two groups are therefore addressed together.

For adolescents without intellectual disabilities, all of these emotion regulation aspects are found to be related to externalizing problems. Longitudinal research shows, for example, that emotion regulation difficulties predict increases in externalizing problems (McLaughlin et al., 2011). In addition, adolescents who report to use a maladaptive profile of emotion regulation strategies (high maladaptive, low adaptive) are specifically at risk for externalizing problems (Otterpohl et al., 2016). Moreover, adolescents with externalizing problems report high degrees of behavioral (rather than cognitive) maladaptive emotion regulation strategies (te Brinke, Menting et al., 2020).

### **Emotion Regulation and Intellectual Disabilities**

To our knowledge, direct evidence regarding the emotion regulation capacities of adolescents with MID-BIF is absent. On the one hand, it seems plausible that adolescents with externalizing problems and MID-BIF have more emotion regulation difficulties than adolescents with only externalizing problems. Indeed, indirect evidence points towards a developmental delay in two constructs that are related to emotion regulation; self-regulation and coping. Research on self-regulation, which refers to the ability to regulate emotion, behavior, and cognition (Bridgett et al., 2013) shows that adolescents with mild to moderate intellectual disabilities have fewer self-regulation abilities than typically developing adolescents (Nader-Grosbois, 2014). In addition, research on coping, which refers to conscious efforts to regulate emotion, cognition, behavior, and physiology in response to stressful events or circumstances (Compas et al., 2017) shows that adults with mild intellectual disabilities use fewer emotion-focused coping strategies than non-emotional coping strategies, which might point towards specific difficulties in dealing with emotions (Hartley & MacLean, 2008). However, this study did not include a comparison group of individuals without intellectual disabilities, thus it is not clear to which degree absolute differences in regulation strategies between individuals with and without intellectual disabilities exist.

On the other hand, it may be that adolescents with externalizing problems and MID-BIF and adolescents with externalizing problems and average intelligence do not differ in emotion regulation capacities. Mechanisms that underly externalizing problems might, for example, cause the two groups to be (more) similar. An important underlying mechanism of externalizing problems is executive functioning (Granvald & Marciszko, 2016). Research shows that executive functioning is impaired in adolescents with externalizing problems, both for adolescents with average intelligence (Hobson et al., 2011) and for adolescents with MID-BIF (Schuiringa, van Nieuwenhuijzen, de Castro, & Matthys, 2017). Besides, executive functioning is found to be associated with

emotion regulation (Lantrip et al., 2016). Because in the current study both groups have externalizing problems, it is possible that the groups display comparable emotion regulation difficulties.

Lastly, it is also possible that differences in emotion regulation only emerge for specific regulation strategies. Previous research shows that adolescents with externalizing problems who do not have intellectual disabilities are more likely to use a 'behavioral', rather than 'cognitive' regulation style (te Brinke, Menting et al., 2020). Because adolescents with MID-BIF have cognitive difficulties, such as difficulties with cognitive inhibition (Bexkens et al., 2014), it seems plausible that these adolescents are even more likely to regulate emotions in a behavioral, rather than cognitive way. Therefore, the current study aimed to examine differences in cognitive/behavioral strategies at both the between-group and within-group level.

### **Angry Mood and Variability in Angry mood**

A concomitant goal of the current study was to explore between-group differences in angry mood and variability in angry mood. Emotions and moods are distinguishable, but related constructs: emotions persist from seconds to minutes and mainly motivate immediate action, whereas moods persist from hours to days and weeks, and bias patterns of cognition and behavior over time (Beauchaine & Cicchetti, 2019). Affective states, such as angry mood, are identified as both an antecedent and consequence of emotion regulation capacities (Colombo et al., 2020). A focus on angry mood seems specifically important among individuals with externalizing problems and/or MID-BIF, since high levels of angry mood are related to externalizing problems (Taylor, 2002) and related disorders such as Oppositional Defiant Disorder (ODD; American Psychiatric Association, 2013). Research shows that for adolescents without intellectual disabilities, both daily levels of anger (i.e., angry mood) and variability in anger are positively associated with externalizing problems such as (reactive) aggression (Moore et al., 2019; Silk et al., 2003). In contrast, when simultaneously examining anger level (i.e., angry mood) and variability in anger level, only anger level, but not variability, is associated with aggression (Neumann et al., 2011). Thus, evidence regarding angry mood and variability in angry mood among adolescents with externalizing problems and average intelligence is mixed. Besides, to our knowledge, angry mood and variability in angry mood have not yet been examined among adolescents with MID-BIF.

### **Current Study**

In summary, the current study aimed to gain more insight into the emotion regulation capacities and angry mood of adolescents with externalizing problems and MID-BIF, by

comparing emotion regulation difficulties, emotion regulation strategies, angry mood, and variability in angry mood between two groups: adolescents with externalizing problems and MID-BIF and adolescents with externalizing problems and average intelligence (AIQ). As this is the first study that targets emotion regulation and angry mood among adolescents with both externalizing problems and intellectual disabilities, and indirect evidence is mixed, we were not able to formulate hypotheses regarding between-group differences in emotion regulation difficulties, angry mood, and variability in angry mood. Regarding regulation strategies, it is however hypothesized, first, that adolescents in the MID-BIF group report fewer cognitive adaptive/maladaptive strategies and more behavioral adaptive/maladaptive strategies than adolescents in the AIQ group. Second, it is hypothesized that within the MID-BIF group, the average emotion-regulation profile is characterized by the reported use of fewer cognitive adaptive/maladaptive than behavioral adaptive/maladaptive strategies.

This study adds to the literature in several ways. In previous research, mainly non-clinical samples of individuals with and without intellectual disabilities were compared, whereas the current study focused on adolescents with externalizing problems, and therefore can potentially be of relevance to clinical science and practice. Besides, a multi-modal perspective of emotion regulation is used, as both overall emotion regulation difficulties and emotion regulation strategies are taken into account, using self-reports. In general, self-reports appear to be best suited to examine (cognitive aspects of) emotion regulation (Zeman et al., 2007) and are also used for adolescents with MID-BIF (Douma et al., 2006). Lastly, the current study examined angry mood and variability in angry mood with a daily diary measure. Using daily reports might be of additional value for individuals with MID-BIF, as this method uses concrete formulations (e.g., “how angry did you feel today”) and does not include recall over longer periods of time.

## ■ METHOD

### Participants

In total, 81 adolescents between 12 and 18 years old ( $M = 14.63$ ,  $SD = 1.57$ , 60.5% boys) participated in this study. Of these adolescents, 13.6% was born in another country than the Netherlands (of which 27.4% East-European, 18.2% West-European, 9.0% South-European, 18.2% South-American, 18.2% Caribbean, 9.0% African).

Participants in the MID-BIF group ( $n = 42$ ) were recruited from a residential treatment center for adolescents with intellectual disabilities and behavior problems, and participants in the average intelligence (AIQ) group ( $n = 39$ ) were recruited at (special

education) schools. Inclusion criteria were: (1) a score above the 84<sup>th</sup> percentile on one or both of the externalizing problems subscales (rule-breaking/aggressive behavior) of the Child Behavior Checklist (CBCL: Achenbach & Rescorla, 2001) as reported by residential care-staff (MID-BIF group) or parents (AIQ group), (2) for the MID-BIF group: mild intellectual disabilities (IQ 55-69) or borderline intellectual functioning (IQ 69-84), and for the AIQ group: (above) average intelligence (IQ  $\geq$  85). Exclusion criteria were: (1) severe autism spectrum symptoms, as evidenced by a score above the 98<sup>th</sup> percentile on the Autism Spectrum Questionnaire (ASV: van der Ploeg & Scholte, 2014) reported by residential care-staff (MID-BIF; combined with an autism spectrum diagnosis) or parents (AIQ). See Table 1 for a description of the groups. The groups differed significantly regarding IQ, gender, age, and externalizing problems.

**TABLE 1.** Means, Standard Deviations and Group Differences for Demographic and Screening Variables

	MID-BIF (n = 42)		AIQ (n = 39)		F / $\chi$	p	$\eta^2/\Phi$
	M	SD	M	SD			
IQ	75.67	6.55	96.82	9.52	137.40	<.001	0.64
Externalizing (T-scores <sup>a</sup> )	71.64	5.68	64.31	5.02	31.38	<.001	0.28
Age	15.52	1.43	13.67	1.06	43.34	<.001	0.35
Gender (% male)	50.00		71.79		4.02	.045	0.22
Ethnicity (% non-Dutch)	19.05		7.69		2.22	.136	0.17

Note. <sup>a</sup>F and p values are based on the sum scores. MID-BIF = Mild Intellectual Disabilities or Borderline Intellectual Functioning, AIQ = Average IQ.

## Procedure

This study was part of a larger experimental emotion regulation study (te Brinke, Schuiringa et al., 2018) and approved by The Ethics Committee of the University Medical Center Utrecht. In the current study, data from the eligibility screening and baseline measurement were used. First, information letters were sent to all possibly eligible adolescents. After informed consent was obtained from the adolescent and parent(s) or legal guardian(s) of adolescents aged 12–15 (for adolescents aged 16 consent of a parent/guardian was not required), the residential care-staff, teachers, and parents filled out the screening measures. In addition, information about the adolescent's IQ score was obtained. If this information was not available, a short IQ-test was administered by a trained research assistant.

If participants met the inclusion criteria, self-report questionnaires were administered individually by a trained research assistant in a quiet room. For adolescents in the MID-BIF group, the questions were posed orally to ensure comprehension. Adolescents in the AIQ group filled out the questionnaires on a computer. Subsequently, the daily diary questionnaires were administered at five consecutive days (Monday-Friday). Adolescents received a notification and could answer the questions on their smartphones. If this was not possible (e.g., no smartphone access), the daily diary questionnaires were administered via e-mail.

## Measures

### **Screening Measures**

**Externalizing Problems.** Externalizing problems were assessed with the rule-breaking and aggression subscales of the CBCL (Achenbach & Rescorla, 2001). The rule-breaking scale consists of 17 items (e.g., “vandalism”) and the aggression scale consists of 18 items (e.g., “argues a lot”). Items are rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*). T-scores were obtained based on Dutch norm scores, and the subscales were aggregated to form the broadband externalizing problems scale. In the current study, Cronbach’s alpha was .89.

**Autism Spectrum Symptoms.** Severity of autism spectrum symptoms was measured with the ASV (Van der Ploeg & Scholte, 2014). This questionnaire consists of 24 items (e.g., “does not seek eye contact”) that are rated on a 5-point scale from 1 (*totally disagree*) to 5 (*totally agree*). Percentile scores were obtained based on Dutch norm scores. Cronbach’s alpha was .87.

**Intelligence.** Intelligence was assessed with the Dutch version of the Wechsler Intelligence Scale for Children (WISC; Kort et al., 2005) or the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 2012). A full-scale IQ-score from the adolescents’ clinical file was used if the WISC or WAIS was administered within 24 months before the start of the study. If this score was not available, the subtests “Block Design” and “Vocabulary” were administered. Subsequently, total-IQ was estimated with the formula for approximation of Full-Scale IQ (FIQ; Silverstein, 1970). FIQ estimates are found to be reliable and strongly correlated with the total-IQ (Hrabok et al., 2014) and have also been used in MID-BIF populations (Schuiringa, van Nieuwenhuijzen, de Castro, & Matthys, 2017).

### **Adolescent Self-Report Measures**

**Emotion Regulation Difficulties.** Emotion regulation difficulties were measured with a short version of the Dutch Difficulties in Emotion Regulation Scale (DERS; de Castro et

al., 2018; Gratz & Roemer, 2004; Neumann et al., 2010). Adolescents rated 15 items (e.g., “when I am upset, I become out of control”) on a 5-point scale from 1 (*almost never*) to 5 (*almost always*). Cronbach’s alpha was .83 for the MID-BIF group and .93 for the AIQ group.

**Emotion Regulation Strategies.** Emotion regulation strategies were assessed with the anger scale of the Dutch version of the Fragesbogen zur Erhebung der Emotionsregulation bei Kinder und Jugendlichen (FEEL-KJ; Cracco et al., 2015; Grob & Smolenski, 2009). Based on this measure, four types of regulation strategies can be specified (te Brinke, Menting et al., 2020); cognitive maladaptive (3 items, e.g., “if I feel angry... I think it is my own problem”), behavioral maladaptive (6 items, e.g., “.. there is nothing I can do against it”), cognitive adaptive (9 items, e.g., “... I think about possible solutions”), and behavioral adaptive (5 items, e.g., “... I do something to distract myself”). Items are rated on a 5-point scale from 1 (*never*) to 5 (*almost always*). Cronbach’s alpha ranged from .50 to .80 for the MID-BIF group and from .55 to .84 for the AIQ group.

**Angry Mood and Variability.** The Daily Mood measure was used to assess angry mood and variability in angry mood (Hoeksma et al., 2000; Maciejewski et al., 2015). Adolescents were asked to rate the intensity of their daily mood (e.g., “how *angry* did you feel today”) on 5 consecutive days, using a 9-point scale from 1 (*not angry*) to 9 (*angry*). In the current study, the scores of the three items measuring anger were used. Items were summed, resulting in a total anger score per day. Subsequently, these total scores were summed and divided by the valid number of daily scores, resulting in the average angry mood level. To calculate variability in angry mood, absolute differences in total angry mood scores between consecutive days were calculated, summed, and divided by the valid number of absolute difference scores. Cronbach’s alpha ranged from .78 to .96 for the MID-BIF group, and from .67 to .92 for the AIQ group.

### **Missing Data**

There was no missing data on the screening measures and adolescent-reported emotion regulation questionnaires. In accordance with other diary studies with youth (e.g., Suveg et al., 2010), there was, however, missing data on the daily mood measure. In total, for 16 adolescents (20%), angry mood scores were missing on all five days and 14 adolescents (17%) reported their mood only on one day. Angry mood and variability in angry mood were only calculated when at least two valid (consecutive) days were available. Angry mood data of 50 adolescents (62% of the total sample), and variability data of 44 adolescents (54% of the sample) were used. Adolescent with at least two valid daily diary reports did not differ from adolescents with missing data regarding gender ( $\chi^2(1) = 0.34, p = .560, \Phi = 0.07$ ) and ethnicity ( $\chi^2(1) = 0.02, p = .889, \Phi = 0.16$ ). However,

adolescents with valid daily diary reports were significantly younger ( $F(1, 79) = 7.88, p = .006, \eta^2 = 0.09$ ), displayed fewer externalizing problems ( $F(1, 79) = 7.17, p = .009, \eta^2 = 0.08$ ), and were more likely to belong to the AIQ group ( $\chi^2(1) = 10.04, p = .002, \Phi = -0.35$ ).

## Analyses

In all analyses concerning between-group differences, gender (0 = boy, 1 = girl) and externalizing problems (mean score) were included as covariates, because these aspects, theoretically, influence emotion regulation (McLaughlin et al., 2011; Zimmermann & Iwanski, 2014), and differed between the groups (Table 1). Age was not included as a covariate, because, although chronological age was higher in the MID-BIF group compared to the AIQ group, mental age is usually lower (e.g., Nader-Grosbois, 2014).

First, an univariate analysis of covariance (ANCOVA) was performed with group as independent variable and the mean score of emotion regulation as dependent variable. Subsequently, a multivariate analysis of covariance (MANCOVA) was performed with group as independent variable, and the mean of the four categories of regulation strategies as dependent variables. Next, within-group differences between cognitive/behavioral strategies were examined with pairwise t-tests. Lastly, two ANCOVA's were performed with group as independent variable and angry mood/variability as dependent variables.

## RESULTS

### Between-Group Differences in Emotion Regulation Difficulties

Results of an ANCOVA showed that, after controlling for gender ( $F(1, 77) = 7.86, p = .006, \eta^2 = 0.09$ ) and externalizing problems ( $F(1, 77) = 3.04, p = .085, \eta^2 = 0.04$ ), the MID-BIF and AIQ group differed significantly in their reported emotion regulation difficulties (Table 2). A comparison of the estimated marginal means (Table 2) showed that adolescents in the MID-BIF group reported fewer emotion regulation difficulties than adolescents in the AIQ group.

### Between-Group Differences in Emotion Regulation Strategies

Results of a MANCOVA showed that, after controlling for gender (Wilks  $\lambda = 0.90; F(4, 74) = 2.18, p = .080, \eta^2 = 0.11$ ) and externalizing problems (Wilks  $\lambda = 0.91; F(4, 74) = 1.84, p = .129, \eta^2 = 0.09$ ), there was a significant overall difference in emotion regulation strategies between the two groups, Wilks  $\lambda = 0.83; F(4, 74) = 3.77, p = .008, \eta^2 = 0.17$ . A comparison of the estimated marginal means (Table 2) showed that adolescents in the MID-BIF group reported to use significantly fewer cognitive maladaptive and behavioral

maladaptive emotion regulation strategies than adolescents in AIQ group. Differences between the MID-BIF and AIQ group were non-significant for cognitive adaptive and behavioral adaptive emotion regulation strategies.

**TABLE 2.** Adjusted Means, Standard Errors, and Group Differences Between the MID-BIF and AIQ Group, While Controlling for the Covariates Gender and Externalizing Problems

	MID-BIF group			AIQ group			F	p	$\eta^2$
	M	SE	n	M	SE	n			
ER Difficulties	2.08	0.13	42	2.90	0.14	39	15.23	<.001	0.17
Cognitive Maladaptive ER	2.12	0.15	42	2.89	0.16	39	10.59	.002	0.12
Behavioral Maladaptive ER	2.56	0.12	42	2.94	0.13	39	4.23	.043	0.05
Cognitive Adaptive ER	2.63	0.13	42	2.52	0.13	39	0.32	.574	0.01
Behavioral Adaptive ER	2.97	0.16	42	2.74	0.17	39	0.86	.356	0.01
Anger level	4.51	1.13	19	8.66	0.82	31	6.92	.012	0.13
Anger variability	2.32	0.81	15	3.65	0.52	29	1.51	.227	0.04

Note. ER = Emotion Regulation, MID-BIF = Mild Intellectual Disabilities or Borderline Intellectual Functioning group, AIQ = Average IQ group.

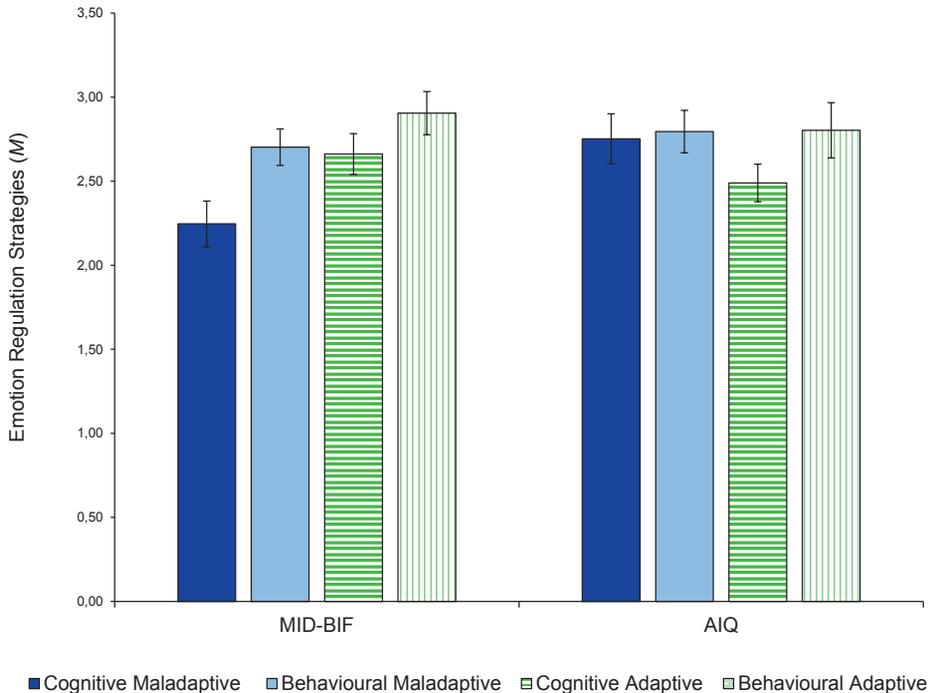
### Within-Group Differences in Emotion Regulation Strategies

Absolute means of emotion regulation strategies are displayed in Figure 1. Results of pairwise t-tests showed that adolescents in the MID-BIF group reported to use significantly fewer cognitive maladaptive than behavioral maladaptive strategies,  $t(41) = -2.82, p = .007$ . In addition, these adolescents reported to use significantly fewer cognitive adaptive than behavioral adaptive strategies,  $t(41) = -2.73, p = .009$ . For adolescents in the AIQ group, the difference between cognitive maladaptive and behavioral maladaptive strategies was not significant,  $t(38) = -0.25, p = .807$ . These adolescents reported, however, also to use significantly fewer cognitive adaptive than behavioral adaptive strategies,  $t(38) = -2.73, p = .009$ .

### Between-Group Differences in Angry Mood Level and Variability

Results of an ANCOVA showed that, after controlling for gender ( $F(1, 46) = 1.60, p = .213, \eta^2 = 0.03$ ) and externalizing problems ( $F(1, 46) = 6.44, p = .015, \eta^2 = 0.12$ ), the MID-BIF and AIQ group differed significantly in angry mood level (Table 2). A comparison of the estimated marginal means (Table 2) showed that adolescents in the MID-BIF group reported a lower average level of angry mood than adolescents in the AIQ group.

Results of an ANCOVA showed that, after controlling for gender ( $F(1, 40) = 15.16, p < .001, \eta^2 = 0.28$ ) and externalizing problems ( $F(1, 40) = 0.03, p = .862, \eta^2 = 0.00$ ), there was no significant overall difference in variability in angry mood between the two groups (Table 2).



**FIGURE 1.** Absolute Means ( $M$ ) of Emotion Regulation Strategies Within the Mild Intellectual Disabilities or Borderline Intellectual Functioning Group (MID-BIF) and Average IQ Group (AIQ). Error Bars Denote one Standard Error Around the Mean

## DISCUSSION

The aim of the current study was to gain more insight into the emotion regulation capacities and angry mood of adolescents with externalizing problems and MID-BIF. Results showed that adolescents with externalizing problems and MID-BIF report fewer overall difficulties in emotion regulation and fewer maladaptive emotion regulation strategies than adolescents with only externalizing problems, whereas no differences were found for adaptive emotion regulation strategies. Within the MID-BIF group,

however, adolescents reported to use fewer cognitive than behavioral strategies. Finally, adolescents in the MID-BIF group reported lower levels of angry mood, whereas no between-group differences were found for variability in angry mood.

The findings of the current study, first of all, show that adolescents with externalizing problems and MID-BIF report fewer overall difficulties and fewer (cognitive and behavioral) maladaptive emotion regulation strategies than adolescents with externalizing problems and average intelligence. On the one hand, this might imply that adolescents with externalizing problems and MID-BIF have fewer difficulties in regulating their emotions than their peers without intellectual disabilities. On the other hand, it may also be that adolescents with MID-BIF have more difficulties in *reporting* their emotion regulation skills than adolescents with average intelligence. Although self-reports of psychological difficulties are considered reliable for adolescents with MID-BIF (e.g., Boström et al., 2018; Douma et al., 2006; Hurley, 2006), these adolescents possibly experience more difficulties in reporting internal processes, such as dealing with emotions, rather than concrete behaviors (Finlay & Lyons, 2001). Future research could test these differential explanations of the current study's findings, through incorporation of parent- or teacher-reports of emotion regulation (e.g., van Beveren et al., 2020) and observational methods.

Second, the results of the current study indicate that adolescents in the MID-BIF group report lower levels of angry mood than adolescents in the AIQ group. Thus, adolescents with externalizing problems and MID-BIF seem to experience lower levels of angry mood in their daily life, in comparison to their peers who do not have intellectual disabilities. However, adolescents with MID-BIF and externalizing problems, in comparison to adolescents with only externalizing problems, may also have more difficulties in *labeling and identifying* anger. Indeed, emotional awareness, which can be defined as the process by which individuals attend to, identify, differentiate, and evaluate emotions (Rieffe et al., 2008), is linked to externalizing problems (Hessler & Katz, 2010) and a core element of emotion regulation (Gross & Jazaieri, 2014). Thus, results of the current study could indicate that adolescents with externalizing problems and MID-BIF have more difficulties in labeling their emotions, and as a result, reported lower levels of angry mood than adolescents with externalizing problems and average intelligence.

Third, no between-group differences in variability of angry mood were found. These findings should, however, be interpreted with caution, due to a large amount of missing daily diary data. Variability scores could only be calculated for 54% of the total sample,

and the amount of missing data was larger in the MID-BIF group. This implies that, although diary methods are promising, adolescents with MID-BIF might require more guidance when participating in a daily diary study.

Fourth, contrary to our expectations, adolescents in the MID-BIF group did not report to use fewer cognitive adaptive regulation strategies than adolescents in the AIQ group, whereas within the MID-BIF group, adolescents reported, as expected, to use fewer cognitive adaptive/maladaptive than behavioral adaptive/maladaptive strategies. Within the AIQ group, the difference between cognitive and behavioral maladaptive strategies was not significant, but these adolescents also reported to use fewer cognitive adaptive than behavioral adaptive strategies. These results are in line with previous research, showing that adolescents with externalizing problems use more behavioral (maladaptive) regulation strategies than adolescents without behavior problems or adolescents with internalizing problems (te Brinke, Menting et al., 2020). Combined, these results seem to imply that adolescents with externalizing problems, and specifically adolescents with both externalizing problems and MID-BIF, rely less on cognitive than behavioral strategies.

### **Clinical Implications**

The current study's finding that adolescents with externalizing problems and MID-BIF seem to experience fewer difficulties in regulating their emotions than adolescents with externalizing problems and average intelligence, might have implications for clinical practice. Cognitive behavior therapy (CBT) focusing on emotion regulation skills and social problem solving skills is an effective treatment for children and adolescents with externalizing problems who do not have intellectual disabilities (McCart et al., 2006; Sukhodolsky et al., 2004) and CBT interventions are adjusted to the cognitive capacities of children with MID-BIF (e.g., Schuringa, van Nieuwenhuijzen, de Castro, Lochman, & Matthys, 2017). However, if children and adolescents with MID-BIF and externalizing problems do not have difficulties in regulating their emotions, this might imply that the focus on the emotion regulation element of CBT could be reduced.

In contrast, if it is the case that adolescents with externalizing problems and MID-BIF do not have fewer emotion regulation problems, but *report* low levels of emotion regulation difficulties and low levels of angry mood due to difficulties in emotional awareness, this implies that CBT interventions for adolescents with MID-BIF need to pay specific attention to emotional awareness. Emotional awareness is considered the first step in the emotion regulation treatment sequence (Berking & Lukas, 2015). This treatment step often includes teaching adolescents emotional labeling, emotion differentiation and awareness of bodily sensations, for example with "anger thermometer" exercises

(e.g., Boxmeyer et al., 2007). It is possible that for adolescents with MID-BIF more time should be spent on this first treatment step, because if increases in negative emotions such as anger are not recognized, it is difficult to apply adaptive regulation strategies.

Lastly, the finding that the within-group emotion regulation profile of adolescents with externalizing problems and MID-BIF can be characterized by relatively low levels of cognitive regulation strategies could have treatment implications. CBT targeting emotion regulation differs in the degree to which the focus is on cognitive (e.g., cognitive reappraisal or problem solving) and/or behavioral (e.g., behavioral distraction or skills training) approaches (te Brinke, 2020). The finding that adolescents with MID-BIF are less likely to use a cognitive, rather than behavioral regulation style, could imply that a behavioral approach is specifically useful, because the treatment approach is then aligned to their preferred regulation style. Alternatively, a cognitive approach could be more effective, because this strengthens underdeveloped skills. Future experimental research is needed to examine the differential effectiveness of these possible treatment adaptations.

### **Strengths and Limitations**

Strengths of the current study include the participation of a difficult to reach, understudied population; adolescents with MID-BIF and externalizing problems. Moreover, emotion regulation was examined from a multi-modal perspective, as both overall emotion regulation difficulties and emotion regulation strategies were taken into account. Besides, both self-report questionnaires and daily diaries were used. Lastly, the difference between cognitive/behavioral regulation strategies was taken into account.

This study does contain limitations. First of all, although the internal consistencies of the questionnaires used in the current study were comparable in the MID-BIF and AIQ group, these questionnaires were not specifically validated for adolescents with MID-BIF. Besides, some of the scales measuring emotion regulation strategies consisted of relatively few items, which could have caused low internal consistency. Second, to ensure comprehension, questionnaires were administered orally in the MID-BIF group. Even though this approach is often used with this group (e.g., Douma et al., 2006), this might have increased social desirability bias. At the same time, we do not have reasons to believe that adolescents in the MID-BIF group responded more social-desirable on the emotion-regulation questionnaires, as they also reported lower levels of angry mood when they were alone (i.e., daily diary report). Third, adolescents in the MID-BIF group were recruited through residential treatment centers, whereas adolescents in the AIQ group were recruited through schools. Thus, adolescents in the MID-BIF group lived in a more structured environment, and their emotion regulation skills could have been

influenced through previous interventions. However, adolescents in the AIQ group also experienced externalizing problems, and therefore, possibly also received mental health care.

## **Conclusions**

Notwithstanding these limitations, the current study, for the first time, examined emotion regulation and angry mood among adolescents with MID-BIF and externalizing problems. Adolescents with MID-BIF and externalizing problems reported fewer emotion regulation difficulties, fewer maladaptive emotion regulation skills, and lower levels of angry mood than adolescents with externalizing problems without intellectual disabilities. Moreover, the current study showed that the emotion regulation profile of adolescents with externalizing problems and MID-BIF is characterized by a greater reliance on behavioral rather than cognitive regulation strategies. These findings need replication using not only similar self-report methods but also parent and teacher reports of emotions and mood, as well as observational methods, because of uncertainties about the adequacy of self-reporting of emotions and related mood by adolescents with MID-BIF.



## **PART TWO**

# **EMOTION REGULATION TRAINING AS A TREATMENT ELEMENT**





## CHAPTER 4

# A COGNITIVE VERSUS BEHAVIORAL APPROACH TO EMOTION REGULATION TRAINING FOR EXTERNALIZING BEHAVIOR PROBLEMS IN ADOLESCENCE: STUDY PROTOCOL OF A RANDOMIZED CONTROLLED TRIAL

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### **This chapter is published as:**

te Brinke, L. W., Schuiringa, H. D., Menting, A. T. A., Deković, M., & de Castro, B. O. (2018). A cognitive versus behavioral approach to emotion regulation training for externalizing behavior problems in adolescence: Study protocol of a randomized controlled trial. *BMC Psychology*, 6, 1–12. <https://doi.org/10.1186/s40359-018-0261-0>

### **Author contributions:**

All authors conceptualized the study; LB drafted the manuscript; all co-authors provided guidance and feedback on the manuscript.

## ■ ABSTRACT

*Background.* Interventions for adolescents with externalizing behavior problems are generally found to be only moderately effective, and treatment responsiveness is variable. Therefore, this study aims to increase intervention effectiveness by examining effective approaches to train emotion regulation, which is considered to be a crucial mechanism involved in the development of externalizing behavior problems. Specifically, we aim to disentangle a cognitive and behavioral approach to emotion regulation training.

*Methods.* A randomized controlled parallel-group study with two arms will be used. Participants are adolescents between 12 and 16 years old, with elevated levels of externalizing behavior problems. Participants will be randomly assigned to either the control condition or the intervention condition. Participants in the intervention condition receive both a cognitive and behavioral emotion regulation module, but in different sequences. Primary outcome measures are emotion regulation skills, emotion regulation strategies, and externalizing behavior problems. Questionnaires will be completed at pre-test, in-between modules, and post-test. Moreover, intensive longitudinal data is collected, as adolescents will complete weekly and daily measures.

*Discussion.* Gaining insight into which approaches to emotion regulation training are more effective, and for whom, is important because it may lead to the adaptation of effective intervention programs for adolescents with externalizing behavior problems. Eventually, this could lead to individually tailored evidence-based interventions.

*Keywords:* externalizing behavior, aggression, emotion regulation, cognitive behavior therapy, intervention components, adolescence

## **A COGNITIVE VERSUS BEHAVIORAL APPROACH TO EMOTION REGULATION TRAINING FOR EXTERNALIZING BEHAVIOR PROBLEMS IN ADOLESCENCE: STUDY PROTOCOL OF A RANDOMIZED CONTROLLED TRIAL**

If left untreated, externalizing behavior problems are a serious risk factor for the development of adverse outcomes later in life, such as rejection by peers, school failure, crime involvement and psychopathology (Hinshaw, 1992; Odgers et al., 2008; Pardini & Fite, 2010). Costs to society are estimated to be 10 times higher for youth with elevated levels of externalizing behavior problems than for typically developing youth (Romeo et al., 2006). Over the past years, knowledge regarding the effectiveness of interventions for externalizing behavior problems in adolescence has increased. These interventions are, however, still found to be only moderately effective and treatment responsiveness is variable (McCart et al., 2006; Wilson & Lipsey, 2007). Therefore, this study aims to increase intervention effectiveness by examining effective approaches to train a crucial mechanism involved in behavior problems: emotion regulation.

Emotion regulation is a multidimensional construct, that is defined as the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions (Thompson, 1994). Emotion regulation skills entail both the overall trait-level difficulties in regulating emotions (emotion regulation difficulties) and the habitual use of specific adaptive or maladaptive emotion regulation strategies (e.g., rumination) (Aldao et al., 2016). Both aspects of emotion regulation are found to be related to the development of externalizing behavior problems (Röll et al., 2012). For example, emotion regulation difficulties predict increases in aggressive behavior during adolescence (Herts et al., 2012; McLaughlin et al., 2011), whereas the use of adaptive emotion regulation strategies (such as problem solving) are related to less psychopathology (Aldao & Dixon-Gordon, 2014; de Castro et al., 2005). The interplay between the use of adaptive (e.g., problem solving) and maladaptive (e.g., rumination) emotion regulation strategies is also important. Specifically, research shows that for adults who report to use high levels of maladaptive strategies, the use of adaptive strategies is negatively related to problem behavior, whereas this association is non-significant for participants who report to use low levels of maladaptive strategies (Aldao & Nolen-Hoeksema, 2012). So, the use of adaptive emotion strategies might have compensational effects. Similar results are found in adolescents. For example, adolescents who report to use a maladaptive emotion regulation profile (high use of maladaptive emotion regulation strategies combined with the low use of adaptive strategies) are specifically at risk for experiencing externalizing behavior problems (Otterpohl et al., 2016).

Given the association between emotion regulation and externalizing behavior problems, it is not surprising that aspects of emotion regulation training (e.g., anger management, cognitive problem solving) are incorporated in many evidence-based interventions that aim to decrease externalizing behavior problems (Garland et al., 2008; Menting et al., 2016). For example, of all interventions targeting externalizing behavior problems in adolescence that are described in recent literature, 75% include an emotion regulation component (Menting et al., 2016). In addition, research shows that incorporating aspects of emotion regulation training increases treatment effectiveness (Sukhodolsky et al., 2004). A meta-analysis that investigated the effectiveness of Cognitive Behavioral Treatment (CBT) for anger in children and adolescents showed that the broadly defined construct 'skills training' (that includes emotion regulation skills training) was significantly more effective than affective education (Sukhodolsky et al., 2004). It is important to note, however, that these meta-analyses look at broadly defined common components, which, in addition to emotion regulation training, also include for example social skills training or exposure. Moreover, the approaches to train emotion regulation differ. Therefore, we do not know whether different approaches to emotion regulation training are equally effective for all adolescents.

An important differentiation among training approaches seems to be a focus on cognitive emotion regulation (e.g., cognitive reappraisal or problem solving) or behavioral emotion regulation (e.g., behavioral distraction or skills training) (Parkinson & Totterdell, 1999). Evidence from literature on coping shows that cognitive and behavioral aspects can be disentangled (de Boo & Wicherts, 2009) and that behavioral coping training might be more effective for adolescents than cognitive coping training (Sanchez-Craig, 1976). However, coping refers to processes that are generated in response to stressful events, whereas emotion regulation refers to responses that are specifically aimed at the response to and modulation of emotions (Compas et al., 2017). Results from the coping literature might therefore not be generalizable to the construct emotion regulation. Moreover, adolescents with externalizing behavior problems may have characteristics that make them more or less susceptible to specific training approaches. To our knowledge, the differences in effects between cognitive and behavioral emotion regulation training have not yet been investigated for adolescents with externalizing behavior problems.

On the one hand, indirect evidence suggests that behavioral emotion regulation training might be more effective than cognitive emotion regulation training. Sukhodolsky and colleagues (2004) argued that CBT components that were "more behavioral" (e.g., skills development) seemed to be more effective than components that were "less behavioral" (e.g., problem solving). This implicates that treatments that teach actual

behaviors might be more effective than treatments that attempt to modify internal constructs. This may pertain particularly to adolescents with behavior problems, who may be less susceptible to cognitive approaches than others because they are on average more impulsive, less verbally intelligent, and less self-critical than their peers (Matthys & Lochman, 2017). On the other hand, there is also evidence that behavioral training is less effective than cognitive training for adolescents with externalizing behavior problems. Specifically, a meta-analysis by Candelaria and colleagues (2012) found that anger management interventions for children and adolescents that used role play (a behavioral technique) were relatively ineffective, compared to other methods such as teaching problem solving or emotional awareness. It has been argued that specific behavior training transfers less to other situations than changing fundamental underlying cognitions. Another possibility is that behavioral and cognitive training approaches are only effective when they are combined, because they supplement or reinforce each other. This is in line with the notion that CBT is developed to integrate cognitive and behavioral therapeutic approaches (Beck, 2011). If both approaches are useful, the sequence in which they are used may also influence effectiveness. It might be that cognitive changes only transfer to changes in behavior when cognitive training is followed by behavioral exercises. Alternatively, it might be that abstract cognitive instructions are only properly understood after behavioral exercises have made participants familiar with emotion regulation.

The current study therefore aims to examine which approach (cognitive or behavioral emotion regulation training) is more effective in improving emotion regulation skills and reducing externalizing behavior. To this end, we designed an experimental emotion regulation training (the Think Cool Act Cool training) consisting of two modules: cognitive training and behavioral training. These modules are presented to participants in different sequences to examine which (combination of) approaches improve emotion regulation skills and decrease externalizing behavior problems. With this experimental design we aim to test the direct effects on emotion regulation and externalizing behavior problems in order to examine relative contributions. The experiment is not intended to have the pervasive long-lasting effects of comprehensive multi-component interventions and does therefore not include follow-up assessments. To examine changes in emotion regulation and externalizing behavior problems, we will use baseline to post-intervention assessments, and intensive longitudinal data. Specifically, participants will report on weekly changes in aggression and emotion regulation. This allows us to examine dynamic within-subject changes in response to specific training experiences. In addition, this study incorporates a daily diary assessment, in order to examine whether emotion regulation training also effects mood variability. This is important, because emotional dynamics such as mood variability are viewed as an

aspect of emotion regulation (Silk et al., 2003) and research shows that higher mood variability is associated with increases in externalizing behavior problems (Silk et al., 2003; Stringaris & Goodman, 2009).

In addition, this study will look at the effects of emotion regulation training on comorbid internalizing problems. Research shows that externalizing behavior problems frequently co-occur with internalizing problems such as anxiety and depression (McLaughlin et al., 2014; Merikangas et al., 2010; Wolff & Ollendick, 2006). A factor that might underlie this co-occurrence is emotion regulation. Emotion regulation is proposed to be a transdiagnostic factor, that relates to heterotypic continuity across externalizing and internalizing behavior problems (Aldao et al., 2016). For example, a longitudinal study showed that for early adolescent boys, the emotion regulation strategy rumination mediated the transition from aggressive behavior to anxiety symptoms (McLaughlin et al., 2014). Given the transdiagnostic nature of emotion regulation, it is possible that an emotion regulation training that aims to decrease externalizing behavior problems, also effects comorbid internalizing problems. If this is the case, a transdiagnostic emotion regulation treatment approach might result in greater treatment efficacy for comorbid conditions (Trooper et al., 2009).

In summary, emotion regulation training is a core component for the treatment of externalizing behavior problems in adolescence, but it is unclear whether cognitive and/or behavioral approaches make this component effective. Therefore, we aim to disentangle the effects of cognitive and behavioral emotion regulation training with an intensive longitudinal experiment. Important moderators and mediators will be taken into account to assess why and for whom which approach is effective.

## **Hypotheses**

We hypothesize that the Think Cool Act Cool emotion regulation training is effective in improving emotion regulation skills and decreasing externalizing behavior problems, compared to care-as-usual. We also hypothesize that the training has a small effect on mood variability and comorbid internalizing problems. In addition, we compare the contrasting hypotheses that the cognitive (Think Cool) module is more effective than the behavioral (Act Cool) module or vice versa and hypothesize that completing both modules is more effective than completing only one module. In addition, we compare the contrasting hypotheses that it is more effective to first receive the cognitive module and secondly the behavioral module (sequence Think Cool + Act Cool) or vice versa (sequence Act Cool + Think Cool). We expect that overall, emotion regulation mediates the effect of the Think Cool Act Cool training on externalizing behavior problems. In particular, we expect that behavioral emotion regulation mediates the effect of the

Act Cool module on externalizing behavior problems and that both cognitive emotion regulation and social information processing mediate the effects of the Think Cool module. Regarding moderation effects, we expect that overall, the Think Cool Act Cool training is more effective for adolescents who report higher levels of affective reactivity, and for adolescents whose parents show more acceptance and less rejection (Barker et al., 2010; Hale et al., 2005). In addition, we expect that the Think Cool module is more effective for adolescents with higher intelligence, whereas the Act Cool module is more effective for adolescents with lower intelligence (Holmbeck et al., 2006; Matthys & Lochman, 2017). Finally, we expect that higher treatment integrity is related to increased effectiveness (Durlak & DuPre, 2008).

## ■ METHOD/DESIGN

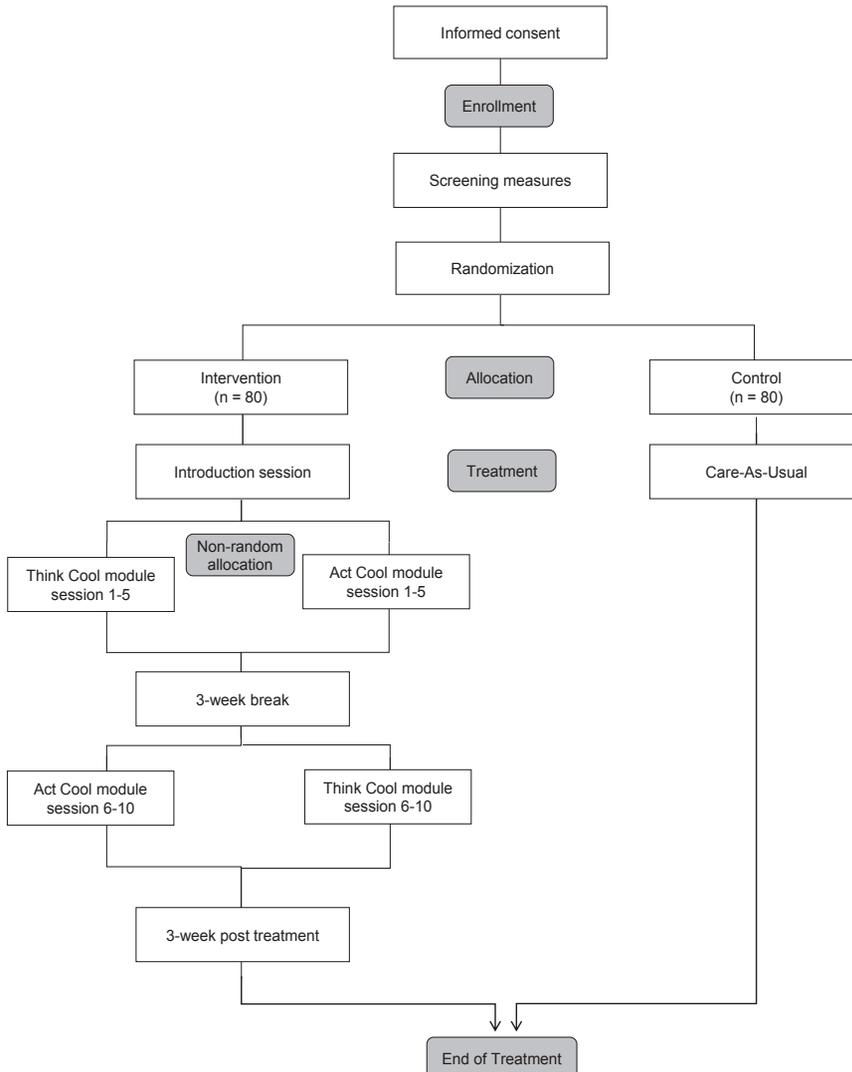
### **Study Design**

This study is a randomized controlled parallel-group experiment with two conditions and two arms in the intervention condition. Participants are randomly assigned to either the control condition or the intervention condition. Participants in the intervention condition receive both the cognitive and behavioral module, but in different sequences. Specifically, participants in the intervention condition follow either first the cognitive and then the behavioral module (first treatment arm) or the reverse sequence (second treatment arm). In order to minimize contamination between the cognitive and behavioral module, individual participants in the intervention condition are not randomly assigned to a training sequence. Participants in the intervention condition from the same location (i.e. school) who start with the training at the same time (i.e. wave) follow the same sequence. In successive waves at the same school, the sequence will be reversed. An overview of the study design is presented in Figure 1. Ethical approval for this study was granted by an independent medical ethics committee of the University Medical Center Utrecht.

### **Eligibility Criteria**

Participants are recruited from Dutch high schools. Participants are between 12 and 16 years old, with elevated levels of externalizing behavior problems. The following inclusion criteria will be used: a subclinical or clinical level of externalizing behavior problems as reported by teachers (TRF externalizing subscale > 84<sup>th</sup> percentile) and average or above average intelligence (estimated IQ score > 80). Participants are excluded if they experience severe Autism Spectrum symptoms as reported by their teacher (ASV symptom score > 98<sup>th</sup> percentile) and/or if their language, auditory or visual skills are

severely hindered (as evidenced by an indication of the school psychologist that the adolescent possesses insufficient Dutch language skills to understand questionnaires and training, or has an auditory or visual disability). Participants with mild Autism Spectrum symptoms (ASV symptom score < 98th percentile) and/or other comorbid psychiatric problems (e.g., depression, ADHD) are not excluded from participation in this study.



**FIGURE 1.** Overview of Study Design

## Sample Size

The sample size of this study is based on the expected difference on the primary outcome variables (emotion regulation and externalizing behavior problems) between the intervention condition (both sequences together) and the control condition. Meta-analyses demonstrated that the expected effect size ( $d$ ) of cognitive behavioral therapy for children and adolescents with externalizing behavior problems is between 0.25 and 0.30 (McCart et al., 2006; Wilson & Lipsey, 2007). To detect a small to medium effect (Cohen's  $d = 0.25-0.30$ ), with a two-sided type I error rate of 0.05, a power of 0.95, and three measurement moments, we will need between 100 and 142 participants (Faul et al., 2007). To account for dropout, we have determined the total sample size to be 160 (80 participants in the control condition and 80 participants in the intervention condition).

Because previous research did not investigate differences between cognitive and behavioral training modules, it is not possible to estimate the expected effect size for the difference between modules. However, a sensitivity-power analyses showed that with 80 participants in the two intervention arms, an error rate of 0.05, a power of 0.95, and 19 repeated weekly measurements, even small effect sizes of 0.09 can be demonstrated with within-subjects analyses (Faul et al., 2007).

## Procedure and Randomization

First, participating schools send an information letter and consent form to all possibly eligible adolescents and their parents. After informed consent is obtained from both the adolescent and the parent(s) of adolescents aged 12-15 (for adolescents aged 16 informed consent of a parent was not required), teachers fill out the screening measures (externalizing behavior problems and severity of autism spectrum symptoms, see screening measures). Next, information about the adolescent's intelligence is provided by the school. If information about IQ is not available or is derived from an intelligence test administered more than 2 years ago, a short IQ test will be administered. Figure 2 shows the trial process with a Standard Protocol Items Recommendations for Interventional Trials (SPIRIT) figure.

If participants meet the inclusion criteria, they are randomly assigned to either the intervention or the control condition. Randomization takes place at the individual level, by means of computer-generated random numbers. Adolescents, their parents and teachers will obviously notice the condition in which they are participating, so allocation will not be blind. Nevertheless, participants will not be aware of the fact that we examine the difference between two training sequences. Subsequently, adolescent

download a questionnaire application on their smartphone and start with the weekly and daily questionnaires. First, a 3-week baseline of the weekly measure (see measures section) will be established. Moreover, adolescents fill in the first Daily Diary measure on five consecutive days. In addition, adolescents, their parents and teachers complete the baseline measures at T1, the first of three assessments. The adolescent questionnaires and tasks are administered individually at school by a trained research assistant at each assessment point. Adolescents fill out the questionnaires on a computer. Teachers fill out the questionnaires on paper. Parents are sent links to the questionnaires via email.

Participants in the intervention condition start with either the cognitive module (Think Cool) or the behavioral module (Act Cool). After five weeks, in which participants in the intervention condition follow five individual therapy sessions, all participants, parents and teachers complete the T2 measures. Next, there is a 3-week training break, which allows us to measure possible delayed effects. During the training break, all participants continue to fill in the weekly questionnaire and fill in the second Daily Diary measure. Subsequently, participants in the intervention condition follow the second module (Think Cool or Act Cool, depending on the first module), which also consists of five individual sessions. Eventually, the post-test measures are completed by all participants at T3. There also is a 3-week post-measure of the weekly measure, in which participants also complete the third Daily Diary measure.

## **Experimental and Control Condition**

### ***Experimental Manipulation***

Participants in the intervention condition will receive 11 individual 45-minute sessions of the Think Cool Act Cool emotion regulation training. This is a manualized experimental training, that is designed based on components of evidence-based treatments for adolescents with externalizing behavior problems, such as Coping Power (Lochman et al., 2015) and Aggression Replacement Training (Currie et al., 2012). The training is provided at the school of the participant, by a trained clinician with a background in child psychology.

Before the actual modules, participants start with an introduction session, in which they get to know the trainer, the content of the training, and set personal goals. Next, participants first receive either the Think Cool module or the Act Cool module, followed by the other module. Both modules consist of five individual sessions. The content of the modules is displayed in Table 1. In both modules, adolescents are instructed to make daily at-home assignments, the “anger thermometer logbook”, in which they briefly describe in which situations they became angry and what strategies they used

TIMEPOINT (weeks = w)	STUDY PERIOD						
	Enrolment	Allocation	Post-allocation				Close-out
			3 w (T1)	8 w	11 w (T2)	16 w	
<b>ENROLMENT:</b>							
Informed consent	X						
Eligibility screen	X						
Allocation		X					
<b>INTERVENTIONS:</b>							
<i>Think Cool + Act Cool</i>				●————●		●————●	
<i>Control condition CAU</i>			●————●				●————●
<b>ASSESSMENTS:</b>							
<b>Screening</b>							
<i>Externalizing behavior</i>	X						
<i>Autism spectrum symptoms</i>	X						
<i>Intelligence</i>	X						
<b>Primary Outcomes</b>							
<i>Emotion regulation difficulties</i>			X		X		X
<i>Emotion regulation strategies</i>			X		X		X
<i>Externalizing behavior</i>			X		X		X
<i>Weekly measure</i>			X	X	X	X	X
<b>Secondary Outcomes</b>							
<i>Mood variability</i>			X		X		X
<i>Internalizing problems</i>			X		X		X
<b>Mediators</b>							
<i>Emotion regulation difficulties</i>			X		X		X
<i>Emotion regulation strategies</i>			X		X		X
<i>SIP</i>			X		X		X
<b>Moderators</b>							
<i>Affective reactivity</i>			X				
<i>Acceptance - rejection</i>			X				
<i>Treatment integrity</i>				X		X	
<b>Other Variables</b>							
<i>Demographic variables</i>			X				
<i>Received care</i>							X

FIGURE 2. Spirit Diagram

to regulate their anger and solve the issues. The situations they describe in the logbook are used in the training sessions as practice material. If adolescents do not complete the at-home assignment, clinicians use other situations from adolescents' lives.

**Think Cool.** In this module, participants learn cognitive emotion regulation strategies. The module is based on the Think Cool Chain, and consists of a cognitive approach to emotion regulation that is typically used in current interventions (e.g., Goldstein et al., 1987; Lochman et al., 2008). The first step of the chain (session 1) is to signal anger, with an anger thermometer that is based on situations, feelings, sensations and cognitions (e.g., "they always blame me"). Adolescents also learn to identify the "tipping" point, the point on the thermometer where it is smart to use one of the emotion regulation strategies. The second step of the chain is to practice three cognitive emotion regulation strategies (cognitive distraction, cognitive relaxation and cognitive reappraisal). Adolescents practice with these strategies in session 1 and 2. The third step of the chain is cognitive problem solving, which is practiced stepwise in session 3, 4, and 5. Adolescents learn specific cognitive problem-solving skills (understand a problem from multiple perspectives, think about possible solutions and possible consequences of these solutions, decide which is the most suitable solution) and practice these skills in a stepwise manner with paper-and-pencil exercises.

**Act Cool.** In this module, participants learn behavioral emotion regulation strategies with the Act Cool Chain, consisting of a behavioral approach to emotion regulation that is typically used in current interventions e.g., (Albrecht & Spanjaard, 2011; Goldstein et al., 1987). The first step (session 1), is to signal anger with an anger thermometer, similar to the thermometer that is used in the Think Cool module. However, in the Act Cool module the thermometer is based on behaviors (e.g., "if I become angry I raise my voice") rather than cognitions. The second step of the chain is to practice behavioral emotion regulation strategies (behavioral distraction, behavioral relaxation and time out). Adolescents practice these strategies in session 1 and 2. The third step of the chain is behavioral problem solving, which is practiced with behavioral exercises in session 3, 4, and 5. Adolescents learn specific behavioral skills (set a boundary, ask for help, ask for an explanation) and practice with difficult situations (accusations, disappointments, frustration).

**TABLE 1.** Content of the Think Cool Act Cool Emotion Regulation Training

<b>Session</b>	<b>Session components Think Cool module</b>	<b>Session components Act Cool module</b>
Introduction session		<ul style="list-style-type: none"> <li>• participant and clinician get to know each other</li> <li>• training objectives are explained</li> <li>• brainstorm about words for anger</li> <li>• formulate personal training goals</li> </ul>
Session 1 / 6	<ul style="list-style-type: none"> <li>• make or adjust* an anger thermometer, based on situations, bodily sensations and cognitions</li> <li>• explain the Think Cool Chain</li> <li>• practice with regulation strategy 'think about something fun' (cognitive distraction)</li> <li>• introduce at-home assignments</li> </ul>	<ul style="list-style-type: none"> <li>• make or adjust* an anger thermometer, based on situations, bodily sensations and behaviors</li> <li>• explain the Act Cool Chain</li> <li>• practice with regulation strategy 'do something fun' (behavioral distraction)</li> <li>• introduce at-home assignments</li> </ul>
Session 2 / 7	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice regulation strategy 'talk in your head' (cognitive relaxation)</li> <li>• practice regulation strategy 'helping thoughts' (cognitive reappraisal)</li> <li>• summarize and discuss new at-home assignment</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice regulation strategy 'deep breathing' (behavioral relaxation)</li> <li>• practice regulation strategy 'time out' (behavioral modification)</li> <li>• summarize and discuss new at-home assignment</li> </ul>
Session 3 / 8	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignment</li> <li>• practice to look at a situation from multiple viewpoints</li> <li>• introduce cognitive problem solving</li> <li>• practice perspective taking with</li> <li>• summarize and discuss new at-home assignment</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignment</li> <li>• practice behavioral problem solving skills (set a boundary, ask for help, ask for an explanation)</li> <li>• summarize and discuss new at-home assignment</li> </ul>
Session 4 / 9	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignment</li> <li>• practice cognitive problem solving</li> <li>• summarize and discuss new at-home assignment</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignment</li> <li>• practice behavioral problem solving in difficult situations (accusations, disappointments, frustration)</li> <li>• summarize and discuss new at-home assignment</li> </ul>
Session 5 / 10	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignment</li> <li>• practice complete Think Cool Chain</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice complete Act Cool Chain</li> </ul>

Note: \* During the first session of the second module, the existing thermometer is adjusted. Therefore column "cognitions / behaviors" from the thermometer that was developed in the first session of the first module, is removed and a new column is added. Besides this, the sessions are the same, irrespective of the sequence in which the modules are followed.

### Control Condition

Participants in the control condition will receive care-as-usual (CAU). CAU is defined as the standard care that is available at school for all adolescents with behavior problems. This includes, for example, behavior management techniques provided by teachers (e.g., reinforcing positive behavior). Moreover, participants in both conditions are not withheld to receive other kind of help, if necessary (e.g., psychopharmaca). The received CAU and additional help will be measured and reported.

### Measures

All constructs, measures and informants are summarized in Table 2.

**TABLE 2.** *Overview of Measures and Informants*

Variable	Concept	Measure	Informant
Eligibility screening	Externalizing behavior	TRF	Teacher
	Autism Spectrum Problems	ASV	Teacher
	Intelligence	WISC-III-NL	Adolescent
Primary outcomes	Emotion regulation difficulties	DERS	Adolescent
	Emotion regulation strategies	FEEL-KJ, Vignette	Adolescent
	Externalizing behavior	YSR, TRF, CBCL	Adolescent, teacher, parent
	Weekly primary outcomes	Weekly questionnaire	Adolescent
Secondary outcomes	Mood variability	Daily Diary	Adolescent
	Internalizing problems	YSR	Adolescent
Mediators	Emotion regulation difficulties	DERS	Adolescent
	Emotion regulation strategies	FEEL-KJ, Vignette	Adolescent
	Social information processing	SIVT	Adolescent
Moderators	Affective reactivity	ARI-S	Adolescent
	Parental acceptance-rejection	PARQ	Parent
	Intelligence	WISC-III-NL	Adolescent
	Treatment integrity	TIQ, audiotapes	Clinician
Other variables	Demographics	Questions	Adolescent, parent
	Received care	Questions	School psychologist

*Note.* TRF = Teacher Report Form, ASV = Autisme Spectrum Vragenlijst, YSR = Youth Self Report, CBCL = Child Behavior Checklist, DERS = Difficulties in Emotion Regulation Scale, FEEL-KJ = Fragesbogen zur Erhebung der Emotionsregulation bei Kinder und Jugendlichen, SIVT = Sociale Informatie Verwerkings Test, ARI-S = Affective Reactivity Index, PARQ = Parental Acceptance-Rejection Questionnaire, TIQ = Treatment Integrity Questions.

### **Screening Measures**

**Externalizing Behavior Problems.** Teachers will report on the externalizing behavior problems of the adolescent with the externalizing subscale of the Teacher Report Form age 6 – 18 (TRF; Achenbach & Rescorla, 2001). This scale consists of 32 items (e.g., “Fights a lot”) that are rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*).

**Severity of Autism Spectrum Symptoms.** The severity of autism spectrum symptoms will be measured with the teacher reported *Autisme Spectrum Vragenlijst* (ASV; van der Ploeg & Scholte, 2014). This questionnaire consists of 24 items (e.g., “Exhibits odd, repetitive behaviors”) on a 5-point scale from 1 (*totally not agree*) to 5 (*totally agree*).

**Intelligence.** Intelligence will be assessed with the Dutch version of the Wechsler Intelligence Scale for Children (WISC-III-NL; Kort et al., 2005; Wechsler, 1991). If the WISC-III-NL was completed by the adolescent within 24 months before the start of the study, this total IQ score will be used. If this score is not available, the subtests “Block Design” and “Vocabulary” will be completed by the adolescent. Subsequently, global intelligence will be estimated, based on the sum of the scaled subtest scores, with the formula for approximation of Full Scale IQ (FIQ; Silverstein, 1971). FIQ estimates are found to be reliable and strongly correlated with the total IQ score (Hrabok et al., 2014; Silverstein, 1970).

### **Primary Outcome Measures**

**Emotion Regulation Difficulties.** The Dutch version of the brief Difficulties in Emotion Regulation Scale (DERS) will be used to measure emotion regulation problems (Bjureberg et al., 2016; Neumann et al., 2010). The DERS is a 15-item self-report measure that assesses difficulties in emotion regulation. The items (e.g., “When I am upset, I become out of control”) are rated on a 5-point scale from 1 (*almost never*) to 5 (*almost always*).

**Emotion Regulation Strategies.** Emotion regulation strategies in response to feelings of anger will be assessed with the Dutch version of the Fragesbogen zur Erhebung der Emotionsregulation bei Kinder und Jugendlichen (FEEL-KJ; Cracco et al., 2015). The subscale anger is assessed in this study and consists of 30 items (e.g., “If I feel angry... I do something fun”) that are rated on a 5-point scale from 1 (*never*) to 5 (*almost always*). The questionnaire distinguishes adaptive and maladaptive emotion regulation strategies.

In addition, cognitive and behavioral emotion regulation strategies will be measured with a newly developed vignette measure. The measure is based on earlier vignette measures (de Castro et al., 2005; Whitesell et al., 1993). The adolescent reads a vignette

that is meant to elicit feelings of anger, and rates how likely it is that he/she will use a specific emotion regulation strategy, on a 7-point scale from 0 (*definitely not*) to 6 (*definitely*). Per vignette, there are six behavioral strategies (adaptive strategies: relaxation, behavioral distraction, social support; maladaptive strategies: direct expression, indirect expression, avoidance), and six cognitive strategies (adaptive strategies: cognitive reappraisal, cognitive distraction, putting into perspective; maladaptive strategies: self-blame, rumination, suppression).

**Externalizing Behavior.** Externalizing behavior will be measured from a multi-informant perspective, with subscales of the ASEBA-questionnaires that are administered to adolescents, their teachers, and parents (Achenbach & Rescorla, 2001). Adolescents (YSR), Teachers (TRF), and Parents (CBCL) will complete respectively the 32, 32, and 35 items of the externalizing scale of the Dutch ASEBA versions (Verhulst & van der Ende, 2001). Items (e.g., “Fights a lot / I fight a lot”) are rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*).

**Weekly Measure.** Emotion regulation and aggression will also be assessed with a 6-item self-reported weekly measure. The questionnaire contains three items for emotion regulation (e.g., “how often this week did you become so angry, that you could not control yourself?”) and 3 items for aggression (e.g., “How often did you hit someone this week?”) that are rated on a 5-point scale from 0 (*never*) to 4 (*more often, ... times*). The measure is based on items of the DERS and YSR (Achenbach & Rescorla, 2001; Bjureberg et al., 2016).

### **Secondary Outcome Measures**

**Mood Variability.** Mood variability will be measured with the Daily Mood Device, an adapted version of the Electronic Mood Device (Hoeksma et al., 2000; Maciejewski & Lier, 2014). In the current study, the mood variability measure is integrated in the weekly measure smartphone application. At each measurement moment, adolescents are asked to rate the intensity of their daily mood for happiness, sadness, anger, and anxiety (“Today I feel ...”) on five consecutive days. Each mood state will be measured with three items (12 items in total), that are rated on 9-point scale from 1 (*not happy / angry / ...*) to 9 (*happy / angry / ...*). The words that are used for happiness are “glad”, “happy”, and “cheerful”, for sadness: “sad”, “down”, and “dreary”, for anger: “angry”, “cross”, and “short-tempered”, and for anxiety: “afraid”, “anxious”, and “worried”.

**Internalizing Problems.** Internalizing problems will be reported by the adolescents with the internalizing scale of the Youth Self Report age 11-18 (Achenbach & Rescorla, 2001). This subscale consists of 34 items (e.g., “I cry a lot”) that are rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*).

### ***Potential Mediators***

Emotion regulation skills (see for measures the primary outcome section) and social information processes are viewed as protentional mediators for models in which the effects of the Think Cool Act Cool training on externalizing behavior problems are tested.

**Social Information Processing.** Social information processing skills biases and deficits will be assessed with the *Sociale Informatie Verwerkings Test* (SIVT) (Rest et al., 2014). The SIVT consists of six videos that show hostile, ambiguous or accidental interpersonal problems, involving a peer or adult perpetrator. In all videos, the outcome of the situation is negative for the victim. Different steps of social information processing (encoding, interpretation, goal setting, response generation, response evaluation and selection) are measured with a semi-structured interview and multiple-choice questions. In the current study, only ambiguous and accidental situations will be used because earlier research shows that with hostile situations, aggressive and non-aggressive are not very well distinguishable (Dodge & Coie, 1987). At each time point, the adolescent will view two videos; an ambiguous and an accidental situation with both a peer and adult perpetrator, but the order will be counterbalanced.

### ***Potential Moderators***

**Affective Reactivity.** Reactivity will be assessed with the Affective Reactivity Index (ARI-S; Stringaris et al., 2012). The ARI-S is a 6-item self-report measure that assesses irritability (e.g., “I often lose my temper”) on a 3-point scale from 0 (*not true*) to 2 (*certainly true*).

**Parental Acceptance-Rejection.** Parental acceptance-rejection will be measured with 18-items of the short version Parental Acceptance-Rejection Questionnaire (PARQ; Rohner & Khaleque, 2005). Parents will report on three subscale of the PARQ; warmth, neglect and undifferentiated rejection (e.g., “I say nice things about my child”). Items are rated on a 4-point scale from 1 (*almost never true*) to 4 (*almost always true*).

**Treatment Integrity.** Treatment integrity is conceptualized in this study as the extent to which the intervention is implemented as intended (Schulte et al., 2009). To measure treatment integrity, clinicians will fill in a questionnaire after each session. The questionnaire is based on other measures of treatment integrity (McLeod et al.,

2015; Sanetti & Kratochwill, 2009; Schulte et al., 2009) and consists of several domains; treatment exposure, treatment adherence, and treatment differentiation (e.g., “It was difficult to focus on behavior rather than cognitions in this session”). The questionnaire also measures participant comprehension and responsiveness (e.g., “The adolescent participated actively in this session”). In total, the measure consists of approximately 25 items, depending on the content of the session. Items are answered on 4-point scale from 1 (*not at all*) to 4 (*totally*). Moreover, all training sessions will be audiotaped. A random selection of 10% of the sessions will be scored on different aspects of treatment integrity (e.g., adherence, differentiation) by independent coders.

### **Other Information**

Demographic information (gender, ethnicity and socioeconomic status) will be assessed at baseline. In addition, the received care-as-usual and additional help will be measured at T3.

### **Analyses**

Data will be analyzed according to the intention-to-treat principle (White et al., 2011), with multiple imputation as technique to handle missing data. To answer the first research question, whether the Think Cool Act Cool emotion regulation training is effective in enhancing emotion regulation skills and decreasing externalizing behavior problems, data of T1-T3 will be analyzed with analysis of variance and/or structural equation modeling. We will examine whether different aspects of emotion regulation and multi-informant perspectives of externalizing behaviors problems can be combined into latent variables. If this is the case, these latent variables will be used, in structural equation models. Otherwise, the analyses of variance will be conducted separately for the different constructs. To examine which module (Think Cool versus Act Cool) and which sequence most effectively increases emotion regulation capacities, we will use piecewise growth curve analyses and analysis of variance. Moderation will be tested by using multi-group analyses or regression analyses, and mediation will be tested with random-intercept cross-lagged panel models and parallel-process piecewise latent growth curve modeling. The analyses and reporting of results will be carried out according to the Consolidated Standards of Reporting Trials (CONSORT; Moher, et al., 2001).

## **■ DISCUSSION**

The goal of the current randomized controlled parallel-group study is to examine the effects of the Think Cool Act Cool emotion regulation training. Zooming in on the

component emotion regulation allows us to make inferences about the efficacy of this specific treatment component. This will supplement the literature, because current knowledge about intervention component efficacy is mainly based on meta-analyses and reviews, and although these studies inform us which components are associated with larger program effectiveness, they do not allow to make causal inferences (Leijten et al., 2015). Moreover, the present study examines the differential effects of cognitive and behavioral emotion regulation training. As current interventions for adolescents with externalizing behavior problems are generally found to be only moderately effective (McCart et al., 2006), this knowledge is important, because it can lead to the future adaptation of current intervention programs.

A specific strength of the current study is that it includes the use of intensive longitudinal data, which allows us to examine dynamic within-subject changes. An additional advantage of this assessment method is that the weekly and daily diary questionnaires are less retrospective than regular measures and therefore might be less susceptible to recall bias (Bamberger, 2016). Moreover, the current study will use multiple sources of information, as externalizing behavior problems will be reported by adolescents, parents, and teachers.

Despite the strengths and innovative aspects of the current study, there are some issues that the study is not able to take into account. Because the study does not include a condition in which adolescents receive only the behavioral or the cognitive module, we will not be able to examine follow-up effects of the separate training modules. Nevertheless, as the goal of the current study is to examine direct effects, we also do not intend to examine long-lasting effects. Another limitation of the study is the open design, as adolescents and other informants included in the assessments (parents and teachers) are aware of the fact that they are either in the control or intervention condition. Nevertheless, adolescents are not aware that we examine the difference between two training sequences.

In conclusion, the intensive longitudinal experiment that is described in this protocol will provide valuable information for both research and clinical practice, as it may inform the adaptation of intervention programs for adolescents with externalizing behavior problems. Gaining insight into which emotion regulation training approaches are more effective, and for whom, will eventually enable us to develop more effective individually tailored interventions.



## CHAPTER 5

# EMOTION REGULATION TRAINING AS A TREATMENT ELEMENT FOR EXTERNALIZING PROBLEMS IN ADOLESCENCE: A RANDOMIZED CONTROLLED MICRO-TRIAL

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### **This chapter is submitted as:**

te Brinke, L. W., Menting, A. T. A., Schuiringa, H. D., Deković, M., Weisz, J. R., & de Castro, B. O. Emotion regulation training as a treatment element for externalizing problems in adolescence: A randomized controlled micro-trial.

### **Author contributions:**

LB, AM, HS, MD, and BC conceptualized the study; LB conducted and supervised data collection, HS and AM provided guidance; LB analyzed the data and drafted the manuscript; AM, HS, MD and BC provided guidance and feedback on the manuscript. JW critically reviewed the manuscript.

## ■ ABSTRACT

Improving interventions for externalizing problems in adolescence may require determining which treatment elements actually produce change. In this micro-trial, we tested a treatment element addressing one widely-hypothesized mechanism underlying externalizing problems: emotion regulation. We tested whether emotion regulation could be improved via training, whether adolescents who received such training would subsequently show reduced externalizing problems, and which training approach and sequence was most effective. We randomized 108 adolescents with elevated externalizing problems (71.3% boys,  $M_{\text{age}} = 13.66$ ,  $SD = 1.10$ ) to a control condition or an experimental condition teaching emotion regulation through either a cognitive or behavioral approach, in alternated sequences. Effects of the modules were assessed before and after the modules, and with weekly assessments. The results showed a positive effect of the experimental training on self-reported use of adaptive emotion regulation strategies. However, self-reported externalizing problems decreased more in the control condition than in the experimental condition. No mediation, approach (cognitive versus behavioral) or sequence (cognitive-behavioral versus behavioral-cognitive sequence) effects were found. These findings illustrate that change in a proposed mechanism may not be accompanied by change in targeted problems; this highlights the importance of testing the hypothesized impact of specific treatment elements on targeted mental health problems.

*Trial registration:* This trial was registered in the Dutch Trial Register (NTR7334, July 10th, 2018) and the study protocol was published (te Brinke, Schuiringa et al., 2018).

*Keywords:* externalizing behavior, aggression, emotion regulation, cognitive behavior therapy, intervention elements, adolescence

## **EMOTION REGULATION TRAINING AS A TREATMENT ELEMENT FOR EXTERNALIZING PROBLEMS IN ADOLESCENCE: A RANDOMIZED CONTROLLED MICRO-TRIAL**

If left untreated, externalizing problems form a serious risk factor for the development of adverse outcomes later in life, such as rejection by peers, school failure, crime involvement and psychopathology (Odgers et al., 2008; Pardini & Fite, 2010). Thus, clinicians need effective interventions to target these problems. Over the past decades, numerous interventions have been developed for externalizing problems in adolescence, but the overall effects of these interventions are only small to moderate (McCart et al., 2006), and the effectiveness of youth psychotherapy for externalizing problems has even decreased over time (Weisz et al., 2019). To optimize interventions, it is important to examine not only overall effects of treatment packages, but also specific effects of distinct treatment elements, since this knowledge can be used to optimize interventions (Chorpita et al., 2005; Leijten et al., 2015). This randomized controlled micro-trial therefore zooms in on a specific treatment element that targets an important underlying mechanism of externalizing problems: emotion regulation.

Emotion regulation can be defined as the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions (Thompson, 1994). It is a multi-modal construct, that entails both trait-level abilities (e.g., emotion regulation difficulties) and specific adaptive or maladaptive strategies (e.g., reappraisal or rumination) (Aldao et al., 2016). Both trait-level abilities and specific emotion regulation strategies are related to externalizing problems (Röll et al., 2012). Emotion regulation difficulties predict, for example, increases in aggression during adolescence (Herts et al., 2012; McLaughlin et al., 2011), whereas adaptive emotion regulation strategies, such as problem solving, are related to decreases in psychopathology (Aldao & Dixon-Gordon, 2014; Orobio de Castro et al., 2005).

Aspects of emotion regulation training (e.g., anger management, cognitive problem solving) are incorporated in many evidence-based interventions for externalizing problems in adolescence (Garland et al., 2008; Menting et al., 2016). Overall, these evidence-based interventions seem to have positive effects (McRae & Gross, 2020). A meta-analysis shows, for example, that psychosocial interventions for children and adolescents with various psychopathological symptoms that include emotion regulation training elements, result in decreases in emotion regulation difficulties and increases in (adaptive) emotion regulation skills (Moltrecht et al., 2020). In addition, a

study among preadolescent boys with externalizing problems showed that the Stop Now and Plan program had a positive effect on emotion regulation skills (Derella et al., 2019).

Emotion regulation has thus been identified as an important underlying mechanism and treatment target for externalizing problems. Many interventions for externalizing problem are, however, so-called *cocktail treatment packages* (Leijten et al., 2015) that consist of multiple treatment elements, or in other words, multiple sets of clinical techniques or strategies (Chorpita et al., 2005). The effects of these cocktail treatments are typically evaluated with large-scale randomized controlled trials. As a result, our understanding of the “sum of the parts” (i.e., overall effects of treatment packages) is quite extensive, whereas relatively little is known about the “parts that make up the sum” (i.e., emotion regulation training as a treatment element). This is unfortunate, since this knowledge may be used to enhance efficiency and (cost) effectiveness of interventions for adolescents with externalizing problems (Leijten et al., 2015).

*Micro-trials* have been proposed as a suitable research method to examine the effects of specific treatment elements (Leijten et al., 2015; Lochman et al., 2019). These trials can be defined as experimental studies that test the effects of focused environmental manipulations that are designed to suppress specific risk mechanisms (Howe et al., 2010). The first goal of the current study is, therefore, to examine through a micro-trial design, the direct and indirect effects of emotion regulation training as a treatment element for externalizing problems in adolescence. Given what we already know about the overall effects of interventions that target emotion regulation (Moltrecht et al., 2020), we hypothesized that the experimental emotion regulation training would result in improvements in emotion regulation and decreases in externalizing problems. Moreover, we hypothesized that improvement in emotion regulation would mediate the effects of the experimental training on externalizing problems.

Aside from the fact that interventions for externalizing problems in adolescence include multiple treatment elements, there are also large differences between intervention protocols in the way in which they target emotion regulation (Moltrecht et al., 2020), since different *treatment approaches* (i.e., the modalities in which treatment elements are delivered) are used. Emotion regulation strategies involve either *cognitions* (i.e., cognitive strategies such as reappraisal) or *behaviors* (i.e., behavioral strategies such as distraction) (Naragon-Gainey et al., 2017). Consequently, interventions that target emotion regulation also differ in the degree to which they use a cognitive or behavioral approach (Menting et al., 2016). Some interventions have, for example, a stronger focus on cognitive strategies, and train these strategies through cognitive approaches

(i.e., “thought exercises” such as cognitive restructuring), whereas other interventions focus more on behavioral strategies through behavioral approaches (i.e., “behavioral exercises” such as role-play).

The relative effects of these different approaches are, however, not clear. On the one hand, Sukhodolsky and colleagues (2004) argued that treatment elements that are “more behavioral”, are more effective for youth with externalizing problems than elements that are “less behavioral”. On the other hand, a meta-analysis by Candelaria and colleagues (2012) found that anger management interventions for youth that used role-play (a behavioral approach) were relatively ineffective compared to interventions that used, for example, problem solving (a cognitive approach). The second goal of the current study was, therefore, to examine the contrasting hypotheses that: (1) a cognitive approach to emotion regulation training is more effective than a behavioral approach, and (2) a behavioral approach to emotion regulation training is more effective than a cognitive approach.

In line with the variety *between* treatment packages in the way emotion regulation is targeted, there is also variety *within* treatment packages. Cognitive and behavioral approaches are frequently offered in conjunction across different phases of the treatment, without specifying or examining their most optimal sequence. Theoretically, both sequences seem plausible. According to treatment motivation theories (e.g., DiClemente & Velasquez, 2002), cognitive treatment aspects (i.e., considering change) need to precede behavioral aspects (i.e., acting on desired change). Thus, it may be most optimal if a cognitive approach precedes a behavioral approach. Alternatively, learning theories (e.g., Shuell, 1986), imply that abstract cognitive instruction are more easily understood after behavioral exercises have established some initial familiarity with the to-be-learned constructs. Thus, it may also be that it is most optimal if a behavioral approach precedes a cognitive approach. The last goal of the current study was, therefore, to examine the contrasting hypotheses that: (1) it is more effective to receive a cognitive approach before a behavioral approach, and (2) it is more effective to receive a behavioral approach before a cognitive approach.

## **Current Study**

The current study uses a micro-trial design to examine the effects of emotion regulation training as a treatment element for adolescents with externalizing problems. Participating adolescents were randomly assigned to either an experimental or control condition. The experimental manipulation consisted of a manualized experimental emotion regulation training that was developed for the current study, based on emotion regulation elements of evidence-based interventions, and consisted of two

modules: a cognitive (Think Cool) and behavioral (Act Cool) module. Adolescents in the experimental condition followed both modules, but the sequence was alternated. The effects of the experimental manipulation were examined with assessments before and after each of the two experimental modules. These pre-post measurements were supplemented with continuing weekly assessments during a baseline period and the two experimental phases/modules, because this enabled us to examine not only whether the experimental group, on average, fared better than the control group, but also whether individual adolescents experienced benefits from the experimental modules. Thus, both inter-individual (between-group) differences and intra-individual (within-person) change were examined.

## ■ METHOD

### Design

The design of this study was a randomized controlled parallel-group experiment with two conditions (experimental condition versus control condition), and two arms in the experimental condition (cognitive-behavioral sequence versus behavioral-cognitive sequence). Participants were recruited from ten Dutch high schools for regular and special education<sup>2</sup>, and randomly assigned to either the experimental or control condition. Randomization took place at the individual level, by means of computer-generated random numbers. Participants in the experimental condition received either first the cognitive and then the behavioral module or the reverse sequence. To minimize contamination between the two sequence groups within schools, individual participants were not randomly assigned to a sequence. Rather, participants from the same school who started with the experimental training at the same time, followed the same sequence. In successive waves at the same school, the sequence was reversed. Ethical approval for this study was granted by an independent medical ethics committee of the University Medical Center Utrecht.

### Eligibility Criteria

The following inclusion criteria were used: a subclinical or clinical level of externalizing problems as reported by teachers (externalizing subscale > 84th percentile) and average or above average intelligence (estimated IQ score > 80). Participants were excluded

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2. In the Netherlands, adolescents with behavioral difficulties follow either “regular education” or “special education”. In special education, classrooms are smaller, but children can receive additional support in both types of education. Research shows that children who are placed in either regular or special education schools do not differ prior to placement in social, emotional, behavioral and academic functioning (Zweers et al., 2019). Therefore, the current study included adolescents from both types of education.

if they experienced severe Autism Spectrum symptoms as reported by their teacher (autism spectrum score > 98th percentile) and/or if their language, auditory or visual skills were severely hindered (as evidenced by an indication of the school psychologist that the adolescent possessed insufficient Dutch language skills to understand the training and questionnaires, or had an auditory or visual disability).

## **Procedure**

First, participating schools sent an information letter and consent form to all adolescents who were eligible to participate in the study according to the on-site contact person (typically a school psychologist). After informed consent was obtained from both the adolescent and the parent(s) of adolescents aged 12-15 (for adolescents aged 16 informed consent of a parent was not required), teachers filled out the screening measures. Next, information about the adolescent's IQ was provided by the school. If IQ information was not available, or derived from an intelligence test administered more than 2 years ago, a short IQ test was administered (see screening measures).

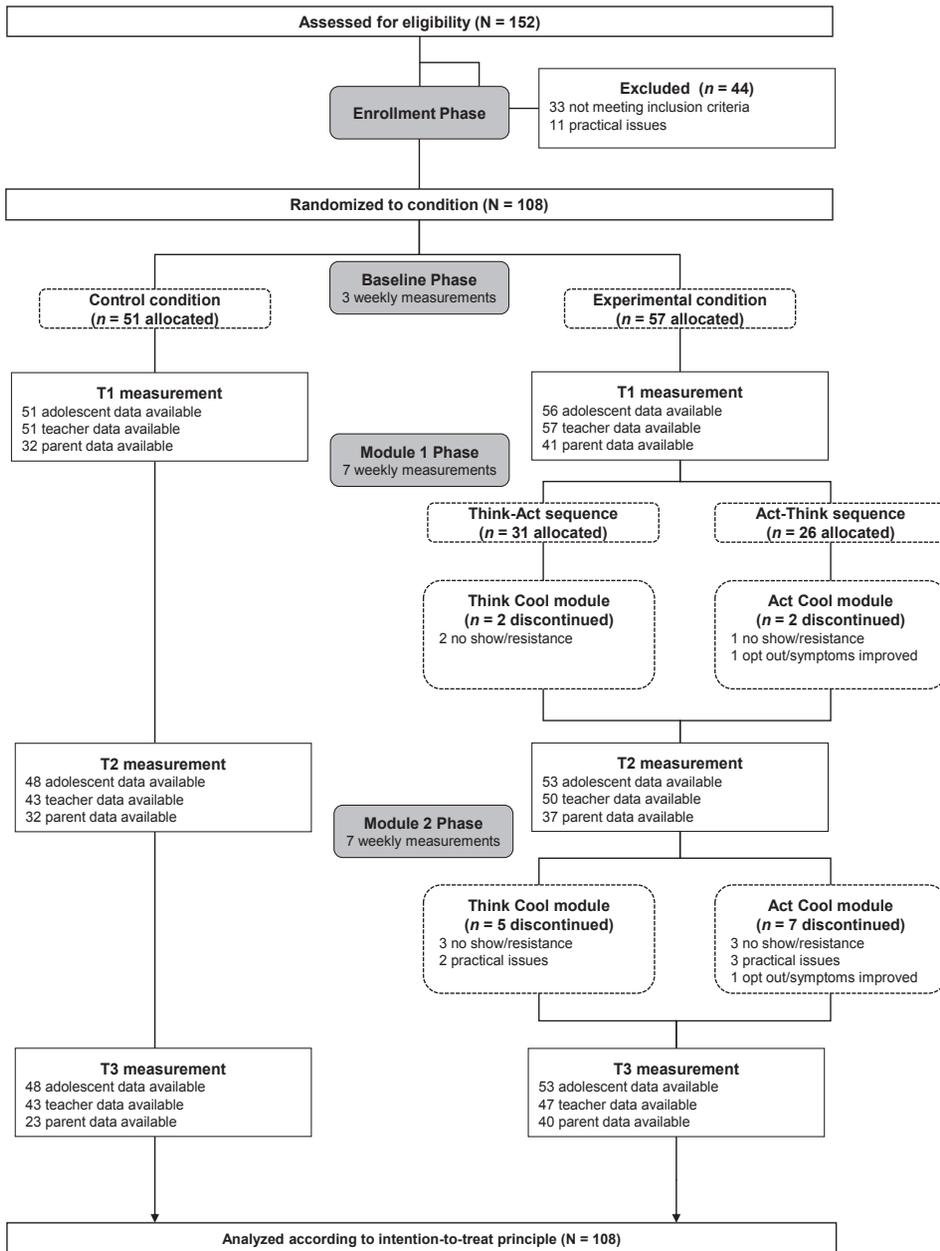
Subsequently, adolescents who met the inclusion criteria participated in three phases of the experiment: a baseline phase, first experimental phase, and second experimental phase (see Figure 1). During the two experimental phases, adolescents in the experimental condition received the cognitive and behavioral experimental module, both consisting of five individual sessions. Data collection consisted of adolescent, teacher, and parent reports (T1 = Pretest, T2 = Posttest phase one, T3 = Posttest phase two), and continuing weekly adolescent self-report measurements (3 weeks during baseline, 7 weeks during phase one, 7 weeks during phase two<sup>3</sup>). Adolescent questionnaires at T1-T3 were administered individually at school by a trained research assistant, whereas teachers and parents filled out the questionnaires on paper/online. Weekly measurements were administered via a smartphone application. At T2 and T3, adolescents received a monetary reward for filling out the questionnaires.

## **Participants**

The participant flow is displayed in Figure 1. In total, 152 adolescents were assessed for eligibility. Of these adolescents, 33 adolescents did not meet the eligibility criteria. In addition, 11 adolescents could not participate due to practical issues (e.g., internships

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3. In the original design of the study, 3-week breaks were planned after the first and second experimental module (see te Brinke, Schuiringa et al., 2018). However, during the data collection, some sessions needed to be rescheduled. As a result, the 3-week break period could not be analyzed as a 'break' period. Therefore, the assessment during these week were added to the experimental phase. Subsequently, to make sure that weekly self-report measurements of the first and second experimental phase were equally long and did not overlap, the data of week 11 and 19 was disregarded.



**FIGURE 1.** Participant Flow Diagram

outside school). Thus, the total sample consisted of 108 adolescents (71.3% boys,  $M_{\text{age}} = 13.66$ ,  $SD = 1.10$ ). The majority of adolescents (94.4%) was born in the Netherlands. However, for 60.2% of the sample, at least one parent was born in a different country than the Netherlands, and therefore, these adolescents were considered of non-Dutch ethnicity (Keij, 2000). Of these adolescents, 52% had a Moroccan-Dutch background, 14% a Turkish-Dutch background, 9% an African-Dutch background, and 25% a different ethnic background. The majority of participating adolescents came from low socio-economic backgrounds, with 12.3% of mothers and 10.0% of fathers completing only primary education, and 55.6% of mothers and 52.5% of fathers completing only lower secondary education.

Data availability ranged across assessments from 93.1% to 99.1% percent for adolescent self-reports, from 83.3% to 100.0% for teacher reports, and from 58.3% to 67.6% for parent reports (see Figure 1). The weekly questionnaire was completed on average on 9 out of the 17 measurement weeks (with 1001 available data points). Little's Missing Completely At Random (MCAR) test showed that adolescent self-reports ( $\chi^2/df = 0.98$ ,  $p = .192$ ), teacher reports ( $\chi^2/df = 0.64$ ,  $p = .669$ ), parent reports ( $\chi^2/df = 1.38$ ,  $p = .192$ ), and weekly measurements ( $\chi^2/df = 0.94$ ,  $p = .954$ ) were missing completely at random.

## Measures

### Screening Measures

**Externalizing Problems.** Externalizing problems were measured with the broadband externalizing scale of the Teacher Report Form age 6 – 18 (Achenbach & Rescorla, 2001). This scale consists of 32 items (e.g., "Fights a lot"), rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*). During the screening of the current study, Cronbach's alpha was .92.

**Autism Spectrum Symptoms.** Teachers reported the severity of autism spectrum symptoms with the Autism Spectrum Questionnaire (van der Ploeg & Scholte, 2014). This questionnaire consists of 24 items (e.g., "Exhibits odd, repetitive behaviors"), rated on a 5-point scale from 1 (*totally not agree*) to 5 (*totally agree*). Percentile scores were based on the Dutch norm scores (van der Ploeg & Scholte, 2014). Cronbach's alpha was .84 in the current study.

**Intelligence.** Intelligence was assessed with the Wechsler Intelligence Scale for Children (WISC; Kort et al., 2005). A full-scale IQ score from the adolescents' clinical file was used in case the WISC was administered within 24 months before the start of the study. If this score was not available, the subtests "Block Design" and "Vocabulary" were administered. Subsequently, total-IQ was estimated with the formula for approximation of Full Scale

IQ (FIQ; Silverstein, 1970). FIQ estimates are found to be reliable and strongly correlated with the total-IQ (Hrabok et al., 2014). In the current study, FIQ estimates were used for 80% of the adolescents.

### **T1-T3 Emotion Regulation Measures**

**Emotion Regulation Difficulties.** Emotion regulation difficulties were measured with a short version of the Difficulties in Emotion Regulation Scale (DERS; de Castro et al., 2018; Gratz & Roemer, 2004; Neumann et al., 2010). Adolescents rated 15 items (e.g., “when I am upset, I become out of control”) on a 5-point scale from 1 (*almost never*) to 5 (*almost always*). Cronbach’s alpha ranged from .89 to .91 across measurement moments.

**Emotion Regulation Strategies.** The anger scale of the Fragesbogen zur Erhebung der Emotionsregulation bei Kinder und Jugendlichen (FEEL-KJ; Cracco et al., 2015; Grob & Smolenski, 2009) was used to assess emotion regulation strategies. Items (e.g., “If I feel angry... I do something fun”) were rated on a 5-point scale from 1 (*never*) to 5 (*almost always*). The questionnaire distinguishes adaptive (14 items) and maladaptive (10 items) emotion regulation strategies. Cronbach’s alpha ranged from .86 to .93 for adaptive strategies and from .71 to .76 for maladaptive strategies.

### **T1-T3 Externalizing Problem Measures**

Externalizing problems were assessed from a multi-informant perspective, with the ASEBA-questionnaires (Achenbach & Rescorla, 2001). Adolescents (Youth Self Report), their Teachers (Teacher Report Form), and their Parents (Child Behavior Checklist) completed respectively the 32, 32, and 35 items of the broadband externalizing scale of the Dutch ASEBA versions (Verhulst & van der Ende, 2001). For the teacher pre-test report, the screening scores were used, as the screening took place just before the start of the study. All items (e.g., “Fights a lot / I fight a lot”) were rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*). Cronbach’s alpha ranged from .84 to .89 for adolescent reports, from .90 to .94 for teacher reports, and from .91 to .92 for parent reports.

### **Weekly Measures**

**Emotion Regulation Difficulties.** Weekly emotion regulation difficulties were measured with a 3-item scale, based on the DERS (Gratz & Roemer, 2004). Items (e.g., “how often did you become so angry this week, that you could not control yourself?”) were rated on a 5-point scale with the following answer options: 1 (*never*), 2 (*a few times*), 3 (*two to three times*), 4 (*four to five times*), 5 (*more often, ... times*). Cronbach’s alpha ranged

from .82 to .87 across measurement phases. The baseline-average score of the weekly emotion regulation scale was significantly positively correlated with the T1-score of the full-scale DERS (see Supplementary materials Table S1).

**Aggression.** Weekly aggression (hitting, kicking and swearing) was measured with a 3-item scale, based on the YSR (Achenbach & Rescorla, 2001). Items (e.g., “how often did you *hit* someone this week?”) were rated on the same 5-point scale as the weekly emotion regulation scale. Cronbach’s alpha ranged from .77 to .81 across measurement phases. The baseline-average of the weekly aggressive behavior scale was significantly positively correlated with the T1-score of the YSR (see Supplementary materials Table S1).

### The Experimental Training

Participants in the experimental condition received the manualized experimental Think Cool Act Cool emotion regulation training (te Brinke et al., 2017). The training was delivered individually at the participants’ school, by an experienced clinician (e.g., clinical psychologist or social worker). The content of the training is based on elements of evidence-based treatments for adolescents with externalizing problems targeting emotion regulation (e.g., Currie et al., 2012; Lochman et al., 2008). The training consists of an introduction session and two modules (cognitive “Think Cool” and behavioral “Act Cool”). Both modules consist of 5 individual 45-minute sessions, and incorporate a three-step approach of regulating emotions; 1. Emotion awareness, 2. Emotion regulation, 3. Problem solving. In the Think Cool module, these steps are practiced through a cognitive approach, whereas the Act cool module uses a behavioral approach. Care was taken to ensure that both modules are identical in all other ways, such as dosage, timing, structure and lay out of materials. Emotion awareness was practiced with an ‘anger thermometer’ in both modules, but the modules differed in the use of cognitions or behaviors as anchors. In addition, the modules differed in the regulation strategies that were trained in the cognitive (cognitive distraction, cognitive relaxation, cognitive reappraisal) and behavioral (behavioral distraction, behavioral relaxation, behavioral modification) module. Lastly, problem solving was practiced through cognitive problem solving (i.e., understanding a problem from multiple perspectives, thinking about possible solutions and consequences, choosing the most suitable solution) or behavioral problem solving (i.e., behavioral exercises of specific problem-solving skills such as asking for help). For more information about the content of the training, see te Brinke, Schuiringa et al (2018).

## Care as Usual

Participants in both the experimental condition and control condition received care-as-usual (CAU). Thus, the experimental training was added on CAU. Information about CAU was available for 35 adolescents in the experimental condition and 32 adolescents in the control condition (62.0% of the sample). School psychologists indicated that the majority of these adolescents did not receive additional care outside of the school context (experimental condition = 65.6%, control condition = 60.0%). The remaining adolescents either received family-focused care (experimental condition = 11.4%, control condition = 15.6%), child-focused care (experimental condition = 11.4%, control condition = 6.3%), pharmacotherapy (experimental condition = 14.3%, control condition = 6.3%), or were placed in foster care/ detention (experimental condition = 2.9%, control condition = 6.3%).

## Exposure and Delivery of the Experimental Training

### Exposure

In total, 16 adolescents (28%) in the experimental condition discontinued the experimental training (see Figure 1). Exposure did not differ between the Think Cool ( $M = 3.74$ ,  $SD = 1.78$ ) and Act Cool ( $M = 4.02$ ,  $SD = 1.62$ ) module ( $t(56) = -1.28$ ,  $p = .206$ ). Adolescents who continued the intervention followed on average 9 out of the 10 sessions.

### Delivery

The modules were carried-out by 10 experienced clinicians (clinical psychologists and social workers). Before the start of the study, all participating clinicians received a two-day training course, guided by the developers of the training manual (te Brinke et al., 2017). During the intervention period, care was taken to ensure quality of delivery through ongoing consultation and supervision meetings (for more information, see te Brinke, Schuringa et al., 2018).

To measure whether the experimental modules were delivered as intended, all sessions were audiotaped. Subsequently, 104 randomly selected sessions (23.5% of all delivered sessions) were independently coded by four trained research assistants on two main components of treatment integrity: adherence to the training manual and differentiation between modules (McLeod et al., 2009). The coding scheme was based on previous studies (e.g., McLeod et al., 2015; Schuringa, van Nieuwenhuijzen, de Castro, Lochman, & Matthys, 2017), and all components were rated on a 4-point scale (1 = *totally not*, 2 = *slightly*, 3 = *mostly*, 4 = *totally*). To assess inter-rater reliability, 40% of all coded sessions were coded by two raters.

**Adherence to Training Manual.** To measure treatment adherence, coders rated the degree to which clinicians delivered general session content (e.g., ‘Discussed homework assignment’, 4 items per session), session-specific content (e.g., ‘Performed helping thoughts exercise’, 6-13 items per session), and session-specific goals (e.g., ‘Adolescent learns to identify problems’, 2-3 items per session). Interrater reliability ranged from good (.63 for general content) to excellent (.81 for session-specific content) (Cicchetti, 1994). Treatment adherence may be considered good in both modules, with high average percentages scored as ‘totally’ or ‘mostly’ for general session content (Think Cool:  $M_{\%} = 76.89$ ,  $SD = 27.23$ , Act Cool:  $M_{\%} = 68.46$ ,  $SD = 27.70$ ,  $F(1,102) = 2.44$ ,  $p = .121$ ), session-specific content (Think Cool:  $M_{\%} = 85.27$ ,  $SD = 19.41$ , Act Cool:  $M_{\%} = 84.42$ ,  $SD = 24.40$ ,  $F(1,102) = 0.04$ ,  $p = .843$ ), and session-specific goals (Think Cool:  $M_{\%} = 90.88$ ,  $SD = 22.06$ , Act Cool:  $M_{\%} = 90.85$ ,  $SD = 23.88$ ,  $F(1,102) = 0.01$ ,  $p = .995$ ).

**Differentiation Between Modules.** Treatment differentiation (the extent to which treatment modules differ from one another and/or match their underlying theory; Schulte et al., 2009) was measured by coding both positive differentiation (e.g., ‘There was a focus a cognitions/behavior’, 3 items per session) and negative differentiation (e.g., ‘The clinician included content of the opposing module’, 2 items per session). Interrater reliability ranged from good (.65 for negative differentiation) to excellent (.77 for positive differentiation). Overall, differentiation between the two modules was high, with trainers displaying high degrees of theoretical focus (positive differentiation scored as ‘totally’: Think Cool:  $M_{\%} = 90.39$ ,  $SD = 24.99$ , Act Cool:  $M_{\%} = 82.35$ ,  $SD = 25.26$ ,  $F(1,102) = 2.63$ ,  $p = .108$ ). Moreover, clinicians seemed to include little content of the opposing modules (negative differentiation scored as ‘totally not’: Think Cool:  $M_{\%} = 88.46$ ,  $SD = 25.47$ , Act Cool:  $M_{\%} = 86.28$ ,  $SD = 30.13$ ,  $F(1,102) = 0.16$ ,  $p = .691$ ).

## Data Analyses

Differences between the experimental and control condition at baseline were examined with ANOVAs and Chi-square tests. Next, between-group differences between the control condition and experimental condition, and between the Think-Act sequence and Act-Think sequence were examined with Structural Equation Modeling (SEM) path analyses in Mplus version 8.1, using the MLR estimator (Muthén & Muthén, 2017). The advantage of this approach is that all randomized participants can be included in the analyses, because a Full Information Maximum Likelihood (FIML) estimation approach is used. In addition, the MLR estimator produces standard errors that are robust in the case of a non-normal distribution (Muthén & Muthén, 2017).

To examine whether the experimental emotion regulation training was effective in improving emotion regulation skills and decreasing externalizing problems, T3 was

regressed on T1 and condition (0 = control condition, 1 = experimental condition). To examine which approach (Think Cool versus Act Cool) was more effective during the first experimental phase, T2 was regressed on T1 and module (0 = Think Cool, 1 = Act Cool). To examine which approach was more effective during the second experimental phase, T3 was regressed on T2 and module (0 = Act Cool, 1 = Think Cool). To examine whether it is more effective to receive the cognitive module followed by the behavioral module (sequence Think Cool + Act Cool) or vice versa (sequence Act Cool + Think Cool), T3 was regressed on T1 and sequence (0 = Think-Act, 1 = Act-Think). For all regression analyses, effect size estimates were computed as Cohen's  $d$ , with a two-step approach, as recommended by Feingold (2019). First, the pooled standard deviation was calculated ( $\sqrt{(SD^2_{\text{group1}} + SD^2_{\text{group2}})/2}$ ), and subsequently, Cohen's  $d$  was calculated by using the MODEL CONSTRAINT option in Mplus. An effect size of  $d = 0.2$  was considered small,  $d = 0.5$  medium and  $d = 0.8$  large (Cohen, 1992).

To examine whether the effect of condition (0 = control condition, 1 = experimental condition) on externalizing problems was mediated by changes in emotion regulation, mediation analyses with bootstrapping were performed in Mplus (Hayes, 2009). First, residual change scores were calculated, in order to represent the change from T1-T3 in externalizing problems, and the change from T1-T2 in emotion regulation. Thus, emotion regulation was defined as a sequential mediator. Next, the direct effects (condition on the residual change in externalizing problems and emotion regulation), and indirect effects (from the experimental condition to externalizing problems, through emotion regulation) were modeled simultaneously, using the MODEL INDIRECT option in Mplus. All parameters were estimated through bootstrapping, generated from 10,000 resamples.

Subsequently, within-person change during the Think Cool and Act Cool module was examined with Piecewise Hierarchical Linear Growth Models in HLM8, using the RML estimator (Raudenbush et al., 2019). Hierarchical models are best suited to examine trajectories of change, because these models take the nested structure of the data into account, with weekly measurements (Level 1) nested within participants (Level 2) (Tasca & Gallop, 2009). Another advantage of this framework is that it handles unbalanced designs efficiently, allowing the number of observations to vary across participants. Weekly emotion regulation and aggression were entered as dependent variables, and models were examined separately for participants in the control condition, Think-Act sequence and Act-Think sequence, because we were specifically interested in within-person (Level 1) change. All time coefficients were modeled as random effects, which allows for variation across participants.

First, the stability of emotion regulation difficulties and aggression during the baseline period (Week 1-3) was examined, with univariate linear growth models. If the change during baseline was not significantly different from zero (i.e., baseline stability), weekly baseline assessments were coded as “0” in subsequent models, to model the average level of emotion regulation difficulties and aggression before the start of the experimental manipulation. Subsequent weekly assessments were scaled, to represent the change in outcome across a one-unit change in time during the first (Week 4-10) and second (Week 12-18) experimental phase. To examine within-person change during the cognitive and behavioral module, piecewise linear growth models were examined, in which the slopes of the first and second experimental phase were modeled simultaneously.

## ■ RESULTS

### Preliminary Analyses

Correlations among study variables at pretest are displayed in the supplementary materials (Table S1). The two conditions and the two sequence groups did not differ significantly at pretest in demographic or screening variables (Table 1). Moreover, ANOVAs indicated that participants did not differ significantly in emotion regulation or externalizing problems at pretest (Supplementary materials Table S2).

### Between-Group Differences

#### *Direct Effects of the Experimental Training*

There was a significant overall effect of the experimental emotion regulation training, with a small effect size, on adaptive emotion regulation strategies ( $\beta = 0.16$ ,  $p = .011$ , 95% CI = [0.04, 0.29],  $d = 0.32$ ). Examination of the means (Table 2) shows that from T1 to T3, the use of adaptive emotion regulation strategies increased for adolescents in the experimental condition, but decreased for adolescents in the control condition. Thus, the experimental training resulted in an increase in the reported use of adaptive emotion regulation strategies. There were, however, no significant effects of the experimental training on emotion regulation difficulties ( $\beta = 0.05$ ,  $p = .565$ , 95% CI = [-0.12, 0.23],  $d = 0.10$ ) or maladaptive emotion regulation strategies ( $\beta = 0.08$ ,  $p = .275$ , 95% CI = [-0.07, 0.23],  $d = 0.16$ ).

With regard to externalizing problems, there was a significant effect with a small effect size on self-reported externalizing problems ( $\beta = 0.13$ ,  $p = .026$ , 95% CI = [0.02, 0.25],  $d = 0.27$ ). Examination of the means (Table 2) shows, that from T1 to T3, the decrease in self-reported externalizing problems was, unexpectedly, larger in the control condition than

**TABLE 1.** Means, Standard Deviations (in Brackets) and Group Differences for Demographic and Screening Variables for the Control Condition ( $n = 51$ ) Versus the Experimental Condition ( $n = 57$ ), and for the Think-Act Sequence Group ( $n = 31$ ) Versus the Act-Think Sequence Group ( $n = 26$ )

	Control condition			Experimental condition			Think-Act sequence			Act-Think sequence		
	M	SD		M	SD	F / X	P	M	SD	F / X	P	
Externalizing (T-score)	69.02	6.11		68.81	5.00	0.04	.843	69.10	5.78	0.23	.636	
Autism symptoms (Sum)	73.31	8.23		70.89	10.47	1.75	.188	71.87	10.02	0.59	.447	
IQ-score	92.88	10.65		91.51	9.74	0.49	.485	93.58	10.55	3.20	.079	
Age	13.53	1.12		13.77	1.09	1.30	.256	13.87	1.02	0.56	.457	
Gender (% male)	70.60			71.90		0.24	.878	74.20		0.17	.678	
Ethnicity (% non-Dutch)	66.70			54.40		1.69	.193	48.40		0.99	.321	

in the experimental condition. There were no significant effects of the experimental training on externalizing problems as reported by teachers, ( $\beta = 0.04, p = .561, 95\% \text{ CI} = [-0.10, 0.18], d = 0.08$ ) or parents ( $\beta = 0.03, p = .837, 95\% \text{ CI} = [-0.22, 0.27], d = 0.04$ ).<sup>4</sup>

### ***Indirect Effects of the Experimental Training***

Subsequently, we performed mediation analyses. The direct effects of the change in emotion regulation on change in externalizing problems are displayed in the supplementary materials (Table S3), and show that the change in emotion regulation difficulties from T1-T2 predicted the change in self-reported externalizing problems from T1-T3.

The indirect effects of the experimental training on self-reported externalizing problems through emotion regulation difficulties ( $\beta = 0.03, 95\% \text{ CI} [-0.01, 0.10], p = .290$ ), adaptive regulation strategies ( $\beta = 0.00, 95\% \text{ CI} [-0.02, 0.05], p = .902$ ), and maladaptive strategies ( $\beta = 0.01, 95\% \text{ CI} [-0.02, 0.07], p = .560$ ) were, however, not significant. For teacher-reported externalizing problems, the indirect effects for emotion regulation difficulties ( $\beta = 0.02, 95\% \text{ CI} [-0.01, 0.09], p = .409$ ), adaptive regulation strategies ( $\beta = -0.02, 95\% \text{ CI} [-0.11, 0.05], p = .531$ ), and maladaptive strategies ( $\beta = -0.01, 95\% \text{ CI} [-0.04, 0.02], p = .710$ ) were also not significant. Finally, for parent-reported externalizing problems, the indirect effects for emotion regulation difficulties ( $\beta = 0.02, 95\% \text{ CI} [-0.03, 0.09], p = .551$ ), adaptive regulation strategies ( $\beta = 0.01, 95\% \text{ CI} [-0.05, 0.07], p = .734$ ), and maladaptive strategies ( $\beta = 0.01, 95\% \text{ CI} [-0.03, 0.06], p = .688$ ) were also not significant. Thus, the effects of the experimental training on changes in externalizing problems were not mediated by changes in emotion regulation.

### ***Effects of Approach***

During the first experimental phase, there were no significant effects of approach (Table 3, first column). Thus, adolescents who first received the Think Cool module did not differ at T2 in emotion regulation or externalizing problems from adolescents who first received the Act Cool module. During the second experimental phase, there were no significant effects of approach on the different aspects of emotion regulation (Table 3, second column). There was, however, a significant effect of approach on self-reported externalizing problems. Examination of the means shows that from T2 to T3, adolescents who received the Act Cool module decreased slightly in self-reported

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4. We conducted post-hoc multi-group analyses in Mplus to check whether school type moderated the main effects of the experimental training. The model constraint option showed that the effect of condition on all outcome variables was not significantly different between school type (0 = regular education, 1 = special education). Thus, the effect of experimental condition did not depend on school context. Results of these analyses are available from the first author upon request.

**TABLE 2.** Means and Standard Deviations (in Brackets) for Emotion Regulation and Externalizing Behavior at Three Measurement Moments for the Control Condition ( $n = 51$ ) Versus the Experimental Condition ( $n = 57$ ), and for the Think-Act Sequence Group ( $n = 31$ ) Versus the Act-Think Sequence Group ( $n = 26$ )

	Conditions			Sequences			
	Pre-test (T1)	In-between test (T2)	Post-test (T3)	Pre-test (T1)	In-between test (T2)	Post-test (T3)	
<i>ER Difficulties</i>							
Control condition	2.47 (0.82)	2.19 (0.72)	2.12 (0.68)	Think-Act sequence	2.60 (0.75)	2.50 (0.88)	2.35 (0.91)
Experimental condition	2.55 (0.83)	2.41 (0.86)	2.23 (0.79)	Act-Think sequence	2.50 (0.93)	2.29 (0.83)	2.06 (0.57)
<i>ER Adaptive strategies</i>							
Control condition	2.66 (0.83)	2.54 (1.01)	2.47 (1.05)	Think-Act sequence	2.77 (0.51)	2.83 (0.74)	2.90 (0.69)
Experimental condition	2.87 (0.66)	2.87 (0.80)	2.94 (0.82)	Act-Think sequence	2.99 (0.80)	2.91 (0.87)	2.99 (0.98)
<i>ER Maladaptive strategies</i>							
Control condition	2.46 (0.69)	2.20 (0.75)	2.15 (0.67)	Think-Act sequence	2.69 (0.60)	2.58 (0.60)	2.51 (0.58)
Experimental condition	2.66 (0.67)	2.43 (0.67)	2.37 (0.64)	Act-Think sequence	2.63 (0.75)	2.25 (0.71)	2.17 (0.67)
<i>EXT Self-reported</i>							
Control condition	0.41 (0.23)	0.36 (0.29)	0.29 (0.22)	Think-Act sequence	0.51 (0.20)	0.45 (0.25)	0.43 (0.25)
Experimental condition	0.48 (0.23)	0.40 (0.25)	0.40 (0.26)	Act-Think sequence	0.45 (0.26)	0.34 (0.25)	0.38 (0.27)
<i>EXT Teacher-reported</i>							
Control condition	0.79 (0.34)	0.76 (0.38)	0.72 (0.41)	Think-Act sequence	0.78 (0.32)	0.67 (0.40)	0.78 (0.45)
Experimental condition	0.78 (0.29)	0.70 (0.42)	0.73 (0.45)	Act-Think sequence	0.77 (0.25)	0.75 (0.45)	0.68 (0.46)
<i>EXT Parent-reported</i>							
Control condition	0.49 (0.32)	0.49 (0.30)	0.42 (0.26)	Think-Act sequence	0.40 (0.25)	0.30 (0.27)	0.36 (0.25)
Experimental condition	0.38 (0.24)	0.32 (0.24)	0.36 (0.25)	Act-Think sequence	0.35 (0.22)	0.34 (0.19)	0.36 (0.27)

**TABLE 3.** Between-Group Effects of Approach and Sequence on Emotion Regulation Difficulties and Externalizing Problems During the First Experimental Phase (Effect of Module 0 = Think, 1 = Act on T2 with T1 as Covariate), the Second Experimental Phase (Effect of Module 0 = Act, 1 = Think on T3 with T2 as Covariate), and the Total Experimental Phase (Effect of Sequence 0 = Think-Act, 1 = Act-Think on T3 with T1 as Covariate)

	First Experimental Phase			Second Experimental Phase			Total Experimental Phase		
	$\beta$ [95% CI]	<i>p</i>	<i>d</i>	$\beta$ [95% CI]	<i>p</i>	<i>d</i>	$\beta$ [95% CI]	<i>p</i>	<i>d</i>
ER Difficulties	-0.08 [-0.29, 0.13]	.464	-0.15	0.01 [-0.11, 0.12]	.888	0.02	-0.10 [-0.22, 0.02]	.109	-0.21
ER Adaptive strategies	-0.03 [-0.23, 0.17]	.749	-0.06	-0.01 [-0.19, 0.16]	.894	-0.02	-0.04 [-0.27, 0.18]	.722	-0.08
ER Maladaptive strategies	-0.23 [0.50, 0.03]	.086	-0.46	-0.05 [-0.24, 0.13]	.582	-0.10	-0.22 [-0.49, 0.04]	.097	-0.45
EXT Self-reported	-0.10 [-0.29, 0.08]	.281	-0.21	0.16 [0.05, 0.27]	.005	0.33	0.03 [-0.11, 0.17]	.379	0.06
EXT Teacher-reported	0.02 [-0.27, 0.31]	.883	0.04	-0.16 [-0.33, 0.01]	.066	-0.32	-0.08 [-0.25, 0.08]	.327	-0.16
EXT Parent-reported	0.08 [-0.25, 0.41]	.618	0.18	-0.15 [-0.34, 0.04]	.113	-0.30	-0.03 [-0.19, 0.13]	.721	-0.06

**TABLE 4.** Within-Person Effects of Change in Weekly Emotion Regulation Difficulties and Aggression During Baseline (Univariate Model A) and During the First and Second Experimental Phase (Piecewise Model B)

	Weekly ER Difficulties				Weekly Aggression			
	Coefficient	SE	t ratio	p	Coefficient	SE	t ratio	p
<i>Control group</i>								
Model A: Baseline slope	-0.14	0.07	-2.00	.051	-0.14	0.08	-1.69	.097
Model B: Phase 1 slope	-0.04	0.02	-1.94	.058	-0.02	0.02	-0.91	.367
Model B: Phase 2 slope	0.01	0.02	0.31	.759	0.02	0.03	0.79	.432
<i>Sequence group Think-Act</i>								
Model A: Baseline slope	-0.06	0.08	-0.75	.458	-0.03	0.09	-0.38	.707
Model B: Phase 1 slope	-0.01	0.02	-0.27	.785	-0.02	0.02	-0.77	.445
Model B: Phase 2 slope	-0.01	0.03	-0.25	.803	0.02	0.03	0.61	.547
<i>Sequence group Act-Think</i>								
Model A: Baseline slope	-0.05	0.07	-0.77	.448	-0.19	0.10	-1.87	.074
Model B: Phase 1 slope	-0.04	0.02	-1.68	.106	-0.03	0.03	-1.31	.203
Model B: Phase 2 slope	-0.02	0.02	-0.63	.536	-0.03	0.02	-1.31	.202

externalizing problems from T2-T3, whereas adolescents who received the Think Cool module increased. This effect was, however, not found for teacher- or parent-reported externalizing problems.

### **Effects of Sequence**

There were no significant effects of sequence (Table 3, third column). Thus, the average change in emotion regulation or externalizing problems from T1 to T3 did not differ between the two sequence conditions.

### **Within-Person Change**

The results of the univariate and piecewise growth models are displayed in Table 4, and the mean scores on the weekly measure in Table 5. The participants reported relatively low levels of emotion regulation difficulties and aggression on the weekly measures.

**TABLE 5.** Available Data, Means and Standard Deviations of the Weekly Measure

Week Number	Phase	% Data Available	Weekly ER Difficulties		Weekly Aggression	
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	Baseline	90%	1.99	0.92	2.12	1.10
2	Baseline	72%	1.95	0.94	2.11	1.02
3	Baseline	70%	1.96	1.07	2.02	1.15
4	Phase 1	56%	1.82	0.85	1.92	1.04
5	Phase 1	64%	1.76	0.78	1.71	0.91
6	Phase 1	58%	1.78	0.93	1.89	1.01
7	Phase 1	57%	1.84	0.94	1.87	0.99
8	Phase 1	53%	1.77	0.92	1.86	0.86
9	Phase 1	44%	1.88	1.06	2.05	1.07
10	Phase 1	45%	1.74	0.97	2.01	1.05
11	Phase 2	44%	1.69	0.82	1.83	0.83
12	Phase 2	48%	1.71	1.00	1.82	0.93
13	Phase 2	43%	1.60	0.87	1.86	0.93
14	Phase 2	41%	1.74	0.96	1.76	0.90
15	Phase 2	30%	1.71	1.01	1.78	0.87
16	Phase 2	29%	1.65	0.71	1.87	1.07
17	Phase 2	25%	1.83	0.74	2.09	1.05

Baseline stability (model A) was established for both emotion regulation difficulties and aggression in all three groups (i.e., control condition, Think-Act sequence, and Act-Think sequence). None of the slopes of the piecewise model (model B) were, however, significantly different from zero. Thus, weekly emotion regulation and aggression stayed stable during the first and second experimental phase.

## ■ DISCUSSION

In this micro-trial, we examined the overall effects, approach effects (cognitive approach versus behavioral approach), and sequence effects (cognitive-behavioral sequence versus behavioral-cognitive sequence) of an experimental emotion regulation training. The results indicated that the training had a positive effect on the self-reported use of adaptive emotion regulation strategies, but no effects were found for maladaptive emotion regulation strategies and emotion regulation difficulties. Moreover, unexpectedly, the decrease in self-reported externalizing problems was larger in the control condition than in the experimental condition, whereas teacher- and parent-reported externalizing behavior problems did not change over time. No systematic mediation, approach or sequence effects were found.

The finding that the self-reported use of adaptive emotion regulation strategies increased for adolescents who followed the experimental training, but decreased for adolescents in the control condition, seems to imply that the emotion regulation skills of adolescents with externalizing problems indeed improve from the treatment element emotion regulation training. This conclusion is in line with previous meta-analytic research (Moltrecht et al., 2020). Contrary to our expectations, however, the training did not have an effect on the self-reported use of maladaptive regulation strategies and trait-level emotion regulation difficulties, whereas previous research suggests that overall effects on emotion dysregulation (i.e.,  $g = -0.46$ ) might actually be stronger than effects on (adaptive) emotion regulation (i.e.,  $g = 0.36$ ; Moltrecht et al., 2020). A possible explanation for the current study's lack of effects on emotion regulation difficulties and maladaptive strategies might be that the experimental training had a stronger focus on enhancing the use of adaptive strategies than on decreasing the use of maladaptive strategies. Thus, participating adolescents did not explicitly learn how they could avoid using maladaptive strategies.

Contrary to our expectations, the experimental emotion regulation training did not have a positive effect on externalizing problems according to parents and teachers. The training had even a small negative effect on self-reported externalizing problems.

Moreover, even though changes in difficulties in emotion regulation predicted changes in self-reported externalizing problems, mediation analyses showed that the effects of the experimental training on externalizing problems were not mediated by changes in emotion regulation. Although this is, to our knowledge, the first micro-trial that examined the specific effects of emotion regulation training as a treatment element, this finding is in contrast with research indicating that changes in (adaptive) emotion regulation skills co-occur with changes in externalizing symptoms (e.g., for childhood irritability; Derella et al., 2019). Several factors could potentially explain the lack of positive effects on externalizing problems. First, it may be that the current experimental emotion regulation training was too short to have positive effects on more distal outcomes such as externalizing problems. This interpretation is in line with conceptualizations of micro-trial research, in which a focus on proximal (i.e., skill improvements), rather than distal (i.e., symptom reductions) outcomes is stressed (Leijten et al., 2015). It is thus possible that for externalizing problems, training effects become only apparent sometime after intervention termination, when adolescents have had time to practice the learned skills (Larsson et al., 2020). Second, it may be that emotion regulation training is, by itself, not sufficient to improve externalizing problems. This might imply that emotion regulation training is only an effective treatment element for externalizing problems when it is combined with other treatment elements (i.e., motivational enhancement), as typically done in evidence-based cocktail treatments (e.g., Derella et al., 2019; Lochman et al., 2008). An alternative implication of the present findings may be that emotion regulation training is a non-essential treatment element for externalizing problems. However, before drawing such conclusions, more research is needed that examines the effects of treatment elements through the use of “factorial” (i.e., contrasting emotion regulation with/without motivational interview) or “dismantling” (i.e., removing emotion regulation training as a treatment element) micro-trial designs (Collins et al., 2005; Leijten et al., 2015).

These explanations do, however, not apply to the current's study's *negative* between-group effect on self-reported externalizing problems. Specifically, we found that the decrease in self-reported externalizing problems was larger in the control condition than in the experimental condition. A possible explanation for this finding may be that adolescents in the control condition received a more powerful – personalized – intervention (Ng & Weisz, 2016). A recent study shows that interventions for youths with externalizing problems may be most effective when they are delivered in a flexible, transdiagnostic way (Evans et al., 2020). It should be noted, however, that the current's study's experimental emotion regulation training was added on to care-as-usual, and

that the majority of adolescents in both the experimental and control condition did not receive additional psychological interventions. Thus, we do not have reason to believe that the control condition was more powerful than the experimental condition.

Alternatively, the unexpected findings for self-reported externalizing problems, may be an artefact of the limited behavior insight that adolescents with externalizing problems may have. Previous research indicated that the general agreement between adolescent self-reports, on one hand, and teacher- or parent-reports of behavior problems, on the other hand, is low (Salbach-Andrae et al., 2009), and that especially adolescents with clinical levels of behavior problems tend to underreport externalizing problems such as delinquency (Asscher et al., 2014). It is possible that participating adolescents in the current study did not identify their externalizing problems as problematic at pre-test, and that their reference frame subsequently shifted during the intervention (i.e., response shift bias; Rioux & Little, 2020), because both modules included extensive exercises and psycho-education on identifying problematic situations and behaviors. Thus, the current study's findings for self-reported externalizing problems, may also be explained by an increased problem insight, which (some) adolescents in the experimental group could have experienced. Interestingly, our results indicated that during the second experimental phase, adolescents who received the cognitive module on top of the behavioral module, *increased* slightly in their self-reported externalizing problems. Since the cognitive module included a step-wise approach to cognitive problem-solving strategies, and focused on problem-understanding, it may be that this module enhanced the longer-term insight of adolescents into their own externalizing problems.

With regard to effects of approach, no further differences between the cognitive and behavioral approach were found. Thus, for adolescents with externalizing problems, a cognitive and behavioral approach to emotion regulation training may be equally (in)effective. Moreover, the sequence in which the cognitive and behavioral approach were offered, did not have an effect on emotion regulation or externalizing problems. Although findings for approach and sequence need to be interpreted with caution due to the relatively low sample size of the two sequence groups that were included in this set of analyses, these findings may implicate that the treatment modality of emotion regulation training does not matter. The current study's findings do not mean, however, that differences between a cognitive and behavioral emotion regulation training approach are irrelevant for all adolescents with externalizing problems. Differences between cognitive and behavioral approaches to emotion regulation training appear, for example, to be more profound for adolescents with externalizing problems and intellectual disabilities (te Brinke, Schuringa et al., 2020).

This study supplemented between-group analyses with within-person analyses of intensive longitudinal data. Specifically, adolescents reported their weekly emotion regulation difficulties and aggression symptoms via a smartphone application. These data were analyzed on the within-person level, in order to examine whether individual adolescents benefited from the experimental emotion regulation modules. The results showed that weekly emotion regulation and aggression stayed stable during the first and second experimental phase. Thus, with regard to emotion regulation difficulties and aggression, individual adolescents did not seem to benefit from the cognitive or behavioral approach of the experimental emotion regulation training. These findings thus confirm our conclusion from the between-group analyses. At the same time, these findings also indicate that the lack of between-group effects of approach and sequence, may not necessarily be a consequence of the relatively low sample size, since analyses with repeated measurements (i.e., 17 weeks in this study) require fewer participants to reach adequate power (Bolger et al., 2003).

### **Strengths and Limitations**

Strengths of the current study include the focus on an experimental emotion regulation training, which enabled us to zoom in on specific effects of the treatment element emotion regulation. In addition, the current study included a thorough assessment of treatment adherence and differentiation, and included multiple assessments, which enabled us to examine not only between-group differences, but also within-person change. Moreover, between-group differences in externalizing problems were measured from a multi-informant perspective, which may specifically be important for adolescents with behavior problems, who may have limited insight into their own behavior problems (Asscher et al., 2014)

In evaluating the findings of this study, some limitations need to be considered. First, it should be noted that although participants were randomly assigned to the control or intervention condition, allocation to the sequence groups was not random, in order to minimize the possibilities for contamination between the cognitive and behavioral approach. Although the two sequence groups did not differ at baseline, this design might have limited the power to detect approach and sequence effects, because the analyses on approach and sequence were performed with a relatively small sample size. The sample size was also slightly smaller than originally planned (te Brinke, Schuiringa et al., 2018), due to recruitment difficulties. Second, the questionnaire that was used to measure within-person change was not validated, and mean levels on the subscales appeared to be relatively low. Therefore, the possibility cannot be ruled out that the lack of within-person differences between the cognitive and behavioral approach was

a consequence of a possible floor effect of the weekly measure. Third, the percentage of adolescents from non-Dutch ethnicity was higher in comparison to the general population (CBS, 2018), and the average socio-economic status of our sample was relatively low (CBS, 2019). Although this could be considered a strength, since these groups of adolescents have an increased risk for the development of externalizing problems (Duijnhof et al., 2020), and are historically underrepresented in (mental) health research (e.g., Okazaki & Sue, 1995), this may at the same time limit the generalizability of our findings.

### **Conclusion and Implications**

Notwithstanding these limitations, the current micro-trial showed, for the first time, that emotion regulation training has a positive impact on the adaptive emotion regulation strategies of adolescents with externalizing problems. On its own, emotion regulation training may, however, not be sufficient as a school-based treatment element for externalizing problems during adolescence, and the modality in which emotion regulation training is delivered (i.e., through a cognitive or behavioral approach), does not seem to matter. These findings highlight the importance of testing specific treatment elements to gauge their individual impact on mental health problems that are targeted in treatment.

## SUPPLEMENTARY MATERIAL

**SUPPLEMENTARY TABLE S1.** *Pearson Correlations*

	1.	2.	3.	4.	5.	6.	7.
1. Baseline weekly ER	-						
2. Baseline weekly Aggression	.73**	-					
3. T1 ER difficulties	.60**	.44**	-				
4. T1 ER adaptive strategies	-.32**	-.27**	.43**	-			
5. T1 ER maladaptive strategies	.37**	.28**	.56**	-.17	-		
6. T1 EXT self-reported	.61**	.55**	.55**	-.27**	.46**	-	
7. T1 EXT teacher-reported	.08	.10	.17	.05	-.33**	.04	-
8. T1 EXT parent-reported	.40**	.31**	.28*	-.33**	.26*	.41**	.07

Note. ER = Emotion Regulation, EXT = Externalizing problems

\*  $p < .05$ . \*\*  $p < .01$

**SUPPLEMENTARY TABLE S2.** *ANOVA Results for Differences in Baseline Variables Between Conditions (Control Condition Versus Experimental Condition) and Sequences (Think-Act Sequence Group Versus Act-Think Sequence Group)*

	Conditions		Sequences	
	F	p	F	p
Baseline weekly ER	0.01	.974	0.01	.909
Baseline weekly Aggression	0.27	.606	0.13	.718
T1 ER Difficulties	0.29	.590	0.17	.680
T1 ER Adaptive strategies	2.26	.136	1.59	.213
T1 ER Maladaptive strategies	2.19	.142	0.12	.734
T1 EXT Self-reported	2.28	.134	0.85	.361
T1 EXT Teacher-reported	0.03	.871	0.01	.918
T1 EXT Parent-reported	2.76	.101	0.39	.536

Note. ER = Emotion Regulation, EXT = Externalizing problems

**TABLE S3.** Effects of Change in Emotion Regulation Difficulties (Residual Change T1-T2) on Change in Externalizing Problems (Residual Change T1-T3)

	Change EXT self-reported		Change EXT teacher-reported		Change EXT parent-reported	
	$\beta$ [95% CI]	<i>p</i>	$\beta$ [95% CI]	<i>p</i>	$\beta$ [95% CI]	<i>p</i>
Change ER Difficulties	0.23 [0.01, 0.45]	.035	0.13 [-0.16, 0.44]	.410	0.15 [-0.05, 0.35]	.137
Change ER Adaptive strategies	0.04 [-0.16, 0.25]	.683	0.08 [-0.27, 0.43]	.637	-0.10 [-0.31, 0.12]	.341
Change ER Maladaptive strategies	0.14 [-0.09, 0.35]	.222	0.09 [-0.17, 0.38]	.513	-0.05 [-0.24, 0.15]	.592

Note. ER = Emotion Regulation, EXT = Externalizing problems





## CHAPTER 6

# DIFFERENTIAL EFFECTS OF A COGNITIVE VERSUS BEHAVIORAL TREATMENT APPROACH FOR ADOLESCENTS WITH EXTERNALIZING PROBLEMS AND INTELLECTUAL DISABILITIES

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### **This chapter is submitted as:**

te Brinke, L. W., Schuiringa, H. D., Menting, A. T. A., Deković, M., Westera, J. J., & de Castro, B. O. Differential effects of a cognitive versus behavioral treatment approach for adolescents with externalizing problems and intellectual disabilities.

### **Author contributions:**

LB, HS, AM, MD, and BC conceptualized the study; LB and JW conducted and supervised data collection, HS and AM provided guidance; LB analyzed the data and drafted the manuscript; AM, HS, MD and BC provided guidance and feedback on the manuscript. JW critically reviewed the manuscript.

## ■ ABSTRACT

*Background.* Over the past years, it has become clear that adapted Cognitive Behavior Therapy can be effective for adolescents with externalizing problems and Mild Intellectual Disabilities or Borderline Intellectual Functioning (MID-BIF). Most adapted treatment protocols consist, however, of a combined cognitive and behavioral approach, even though it is actually unclear which approach is most suitable for these adolescents. This experimental study aimed to examine which treatment approach (cognitive versus behavioral) and which treatment sequence (cognitive-behavioral versus behavioral-cognitive) is most effective.

*Methods.* Participating adolescents ( $N = 42$ , 50% boys,  $M_{\text{age}} = 15.52$ ,  $SD = 1.43$ ) consecutively received a cognitive and behavioral emotion regulation training module, but were randomly assigned to a different module sequence condition. Emotion regulation and externalizing problems were measured before and after the modules, and with continuing weekly assessments.

*Results.* Results showed that the cognitive module, by itself, was more effective than the behavioral module. In addition, the results indicated that it is most effective to include behavioral exercises after (rather than before) cognitive training.

*Conclusions.* These findings highlight the importance of cognitive treatment approaches for adolescents with MID-BIF, and show that treatment approaches may have different effects, depending on the order in which they are presented.

*Keywords:* externalizing problems, intellectual disabilities, adolescence, cognitive behavior therapy, micro-trial

## **DIFFERENTIAL EFFECTS OF A COGNITIVE VERSUS BEHAVIORAL TREATMENT APPROACH FOR ADOLESCENTS WITH EXTERNALIZING PROBLEMS AND INTELLECTUAL DISABILITIES**

Adolescents with Mild Intellectual Disabilities or Borderline Intellectual Functioning (MID-BIF<sup>5</sup>; IQ between 50 and 85 and limitations in social adaptive skills; American Psychiatric Association, 2013) have a higher risk of developing externalizing problems than adolescents without MID-BIF (Dekker et al., 2002; Simó-Pinatella et al., 2019). Besides, their prognosis is poor (Emerson et al., 2011; Odgers et al., 2008; Reef et al., 2011), and they are overrepresented in child welfare and justice systems (Kaal, 2010; Slayter & Springer, 2011; Thompson & Morris, 2016). Therefore, interventions are needed that effectively target externalizing problems in this specific population.

For adolescents *without* intellectual disabilities, Cognitive Behavior Therapy (CBT) is among the most effective approaches to treat externalizing problems (e.g., McCart et al., 2006; Sukhodolsky et al., 2004). Over the past years, several CBT protocols have been adapted for adolescents with MID-BIF. These adapted protocols are promising, and seem to result in decreases in teacher reported externalizing problems (Schuiringa, van Nieuwenhuijzen, de Castro, Lochman, & Matthys, 2017), and increases in social problem solving abilities (Nestler & Goldbeck, 2011). The overall effectiveness of CBT-based interventions for youth with MID-BIF is, however, only small to moderate (Kok et al., 2016), and seems to lag behind in comparison to interventions for youth without MID-BIF (Kazdin, 2003). Besides, adolescents with MID-BIF seem to be at higher risk for treatment drop-out (van den Bogaard et al., 2020). It is important that the treatment approaches of CBT protocols are matched to the needs of these adolescents, and offered in the most optimal sequence. The aim of the current study is, therefore, to enable finetuning of CBT protocols, by examining both relative effects and sequence effects of two approaches to treat externalizing problems among adolescents with MID-BIF: a cognitive and behavioral approach of emotion regulation training.

### **Relative Effects of Cognitive versus Behavioral Treatment Approaches**

Historically, behavioral approaches, such as applied behavior analysis, are widely used for adolescents with MID-BIF (Remington, 1998), and for a long time, cognitive difficulties were considered a contraindication for the use of cognitive approaches

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5. In the Netherlands, people with mild intellectual disabilities (MID; IQ 55 - 69) and borderline intellectual functioning (BIF; IQ between 70 and 84) are generally treated by the same healthcare centers. Consistent with other Dutch studies (e.g., Seelen-de Lang et al., 2019), these two groups are therefore addressed together in the current study.

(Cooney et al., 2018; Willner, 2006). Recently, this assumption was rebutted, with empirical research showing that individuals with MID-BIF seem to possess the basic cognitive skills that are required to engage in CBT-based treatments (e.g., Cooney et al., 2018; Oathamshaw & Haddock, 2006; Taylor et al., 2008). As a result, treatment protocols for adolescents with externalizing behavior and MID-BIF currently consist of a combined cognitive and behavioral approach. Empirical studies, however, mainly examined the overall effectiveness of these so-called *cocktail treatment* packages (Leijten et al., 2015). Therefore, the debate about the relative effects of cognitive and behavioral approaches still continues (i.e., McGillivray & Kershaw, 2015; Vereenoghe & Langdon, 2013), with two contrasting views.

On the one hand, it has been suggested that individuals with MID-BIF are more likely to benefit from behavioral rather than cognitive approaches (Sturmey, 2004; 2006). Problems with abstract thinking, might for example hinder the effectiveness of a cognitive approach, because this approach relies on a variety of abstract verbal skills (Sturmey, 2004). On the other hand, it has been suggested that cognitive approaches may be more effective than behavioral approaches (Lindsay, 2006; McGillivray & Kershaw, 2015). Adolescents with intellectual disabilities might, for example, be more likely to already use behavioral strategies to regulate their emotions, which leaves more room for the improvement of cognitive strategies.

Although direct empirical evidence about the relative effects of cognitive and behavioral approaches is lacking for adolescents with externalizing problems and MID-BIF, some indications can be drawn from the adult intellectual disability literature. A pilot study into the effectiveness of CBT for anxiety showed that, after intervention termination, the majority of participating adults with mild intellectual disabilities could be rated competent in specific cognitive skills, such as generating alternative thoughts (Roberts & Kwan, 2018). The findings of another pilot study, into the effectiveness of CBT for depression, found that the participating adults with mild intellectual disabilities who received the intervention improved in their ability to infer emotions and thoughts based on various situation-thought-emotion pairings, whereas the participants who received treatment as usual, did not improve (Hartley et al., 2015). In both of these pilot studies, post-treatment implementation or improvement in behavioral skills was, however, not examined. A study into the differential effectiveness of a cognitive, behavioral, and combined treatment approach for depression among adults with mild intellectual disabilities found no differences between the three approaches (McGillivray & Kershaw, 2015). Although it thus seems that adults with internalizing problems and mild intellectual disabilities may benefit from both cognitive and behavioral approaches, findings from adult internalizing problems cannot simply be generalized

to adolescent externalizing behavior, due to maturation effects and differential roles of cognition and behavior in internalizing and externalizing problems. Therefore, the first aim of this study is to test the contrasting hypotheses that for adolescents with externalizing problems and MID-BIF: (1) a cognitive approach is more effective versus (2) a behavioral approach is more effective.

### **Sequence Effects of Cognitive Versus Behavioral Treatment Approaches**

Besides the relative effects of a cognitive and behavioral approach, the current study also examines possible sequence effects of offering either of those two approaches as first or as second. Because CBT protocols for adolescents with MID-BIF typically consists of a *combined* treatment approach, cognitive and behavioral approaches are currently offered in conjunction across different phases of the treatment, without specifying the most optimal sequence. Thus, little is known with regard to sequence effects.

From a theoretical viewpoint, effects of both sequences seem plausible. Adolescents with MID-BIF often have difficulties to understand abstract cognitive instructions (van den Bogaard et al., 2020) and the transfer from the intervention setting to daily life might be challenging due to problems in generalizing learned skills across contexts (Hayes & Conway, 2000). Given these difficulties, it may be that abstract cognitive instructions are only properly understood after behavioral exercises have made participants familiar with the treatment concepts. Alternatively, it may be that cognitive change only transfers to behavior change when cognitive training is followed by behavioral exercises in different contexts (i.e., role plays). This last possibility would be in accordance to theories of treatment motivation, in which cognitive aspects (considering change) are expected to *precede* behavioral aspects (acting on the desired behavior change; DiClemente & Velasquez, 2002). Given that both sequences are theoretically plausible, the second aim of this study is to examine the contrasting hypotheses that for adolescents with externalizing problems and MID-BIF: (1) a cognitive-behavioral sequence is more effective, versus (2) a behavioral-cognitive sequence is more effective.

### **Current Study**

In the current study, we examine which treatment approach (cognitive versus behavioral) and which sequence (cognitive-behavioral versus behavioral-cognitive) is more effective in decreasing emotion regulation difficulties and externalizing problems among adolescents with MID-BIF, by using a micro-trial design. Micro-trials have been described as randomized experiments testing the effects of brief and focused environmental manipulations, such as different treatment modules (Howe et al., 2010; Lochman et al., 2019). The environmental manipulation of the current study is

an experimental training (the Think Cool Act Cool training; te Brinke, Albrecht et al., 2018) consisting of two modules: a cognitive module (Think Cool) and a behavioral module (Act Cool). Both modules cover the same general topics in the same number of sessions, from respectively a cognitive or behavioral approach. The protocol focuses on the specific skill emotion regulation, because inadequate emotion regulation is a well-known maintaining factor of externalizing problems (McLaughlin et al., 2011), and many evidence-based CBT treatments for externalizing problems focus on enhancing emotion regulations skills (Garland et al., 2008; Menting et al., 2016).

Participating adolescents received both the Think Cool and Act Cool module, but were randomly assigned to a module sequence condition, which enabled us to examine the following research questions: 1) Which module (Think Cool versus Act Cool) is more effective? 2) Which sequence (Think-Act Cool versus Act-Think Cool) is more effective? Effects of the experimental manipulation were assessed from both a randomized pre-post-measurement perspective, with assessments before and after each of the two experimental modules, and an intensive longitudinal data perspective, with continuing weekly assessments during a baseline period and two experimental phases in which adolescents received the two experimental modules. This assessment method enabled us to examine both inter-individual (between-group) differences and intra-individual (within-person) change during the cognitive and behavioral module.

## ■ METHOD

### **Design**

This study used a randomized parallel group micro-trial design with two conditions. Participants were recruited from a residential treatment center for adolescents with intellectual disabilities and behavior problems, and randomly assigned to a modular sequence condition: they either received first the cognitive and then the behavioral module or the reverse sequence. Randomization took place on the individual level by means of computer-generated random numbers. Ethical approval for this study was granted by the independent medical ethics committee of the University Medical Center Utrecht.

### **Eligibility Criteria**

Adolescents were selected to participate in the current study when: (1) they scored above the 84th percentile on the externalizing behavior subscale of the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) as reported by clinical-staff, and (2) had a mild intellectual disability (IQ 55-69) or borderline intellectual functioning (IQ 70-

84). Exclusion criteria were: (1) severe autism spectrum symptoms, as evidenced by an autism spectrum diagnosis and a score above the 98th percentile on the Autism Spectrum Questionnaire (ASQ; van der Ploeg & Scholte, 2014) reported by clinical-staff, and (2) assumed insufficient Dutch language skills and/or visual and auditorily disability to understand questionnaires and the experimental training.

## **Procedure**

First, the treatment center sent out information letters to all adolescents who were eligible to participate in the study according to the on-site research coordinator (i.e., based on practical considerations such as expected length of stay and their age). Informed consent was obtained from adolescents and the parent(s) or legal guardian(s) of adolescents aged 12–15 (for adolescents aged 16–18 consent of a parent/guardian was not required, though their parent(s) or legal guardian(s) were always informed about the study). Second, the residential clinical-staff filled out the screening measures (see measures). In addition, information about the adolescent's IQ score and possible ASS diagnosis was obtained. If this information was not available, a short IQ-test was administered by a trained research assistant (see measures).

Subsequently, adolescents who met the inclusion criteria participated in three phases of the experiment; a baseline phase, the first experimental phase, and the second experimental phase (see Figure 1). During the two experimental phases, each lasting for 7 weeks, adolescents received the cognitive and behavioral experimental module, both consisting of five individual sessions. Data collection consisted of both adolescent self-report and clinical-staff reported measurements (T1 = Pretest, T2 = Posttest phase one, T3 = Posttest phase two), and continuing weekly adolescent self-report measurements (3 weeks during baseline, 7 weeks during phase one, 7 weeks during phase two). Adolescent self-reports at T1-T3 were administered in interview format, to ensure comprehension. Weekly measures and clinical-staff reported measures were administered online. At T2 and T3, adolescents received a small monetary reward for filling out the questionnaires.

## **Participants**

The flow of participants is displayed in Figure 1. In total, 75 adolescents were assessed for eligibility, and 42 adolescents (50% boys) met the inclusion criteria. The participating adolescents were between 12 and 18 years old ( $M_{\text{age}} = 15.52$ ,  $SD = 1.43$ ). The majority of participating adolescents (81%) was born in the Netherlands. Of the adolescents that were not born in the Netherlands, 37.5% was born in an East-European country, 25% in a West-European country, 25% in a South-American country, and 12.5% in the Caribbean.

However, for 59.5% of the sample, at least one parent was born in a different country than the Netherlands, and therefore, these adolescents were considered of non-Dutch ethnicity (Keij, 2000).

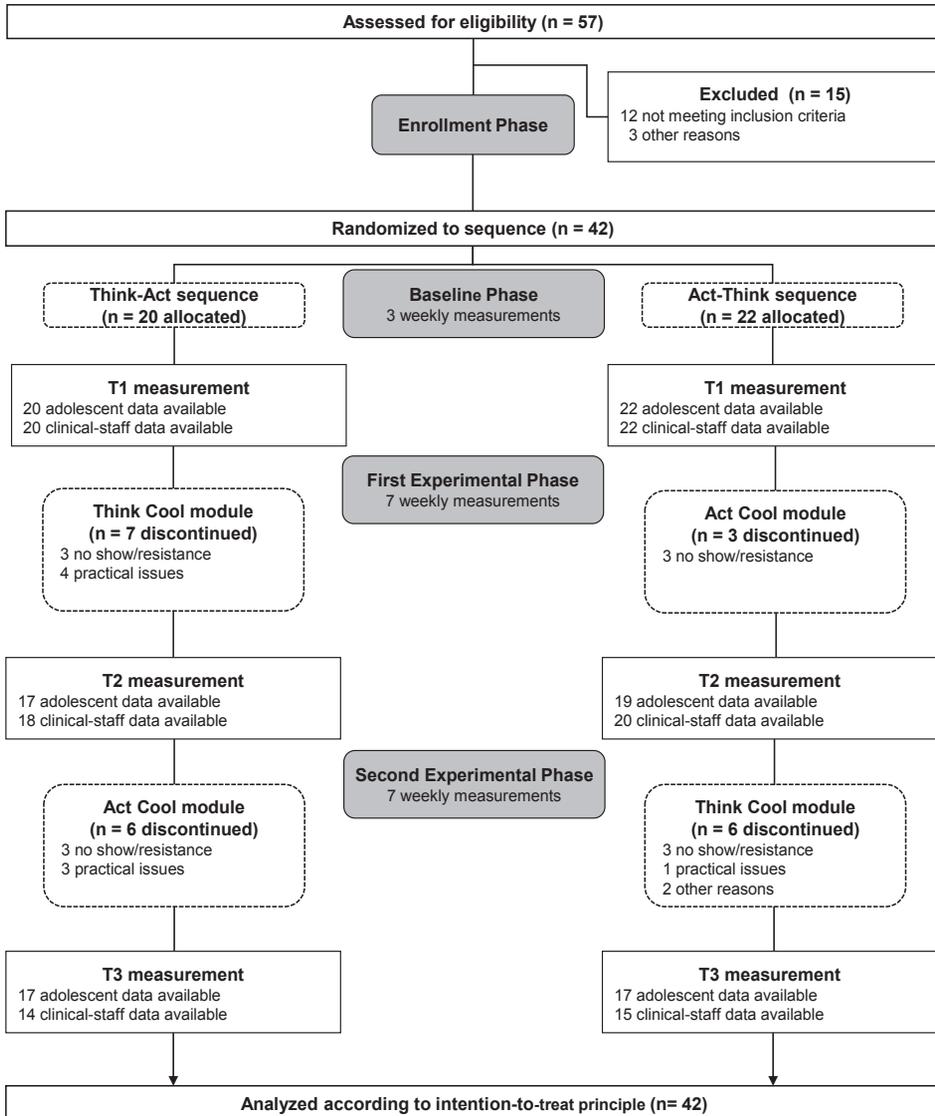


FIGURE 1. Participant Flow Diagram

Of the adolescents who filled out the questionnaires at T1, 85.7% also filled out the questionnaires at T2, and 81.0% also filled out the questionnaires at T3 (see Figure 1). Clinical-staff reported questionnaires were available for 90.5% of the adolescents at T2, and 69.0% of the adolescents at T3. The weekly questionnaire was completed on average on 9 out of the 17 measurement weeks (with 381 available data points). Little's Missing Completely At Random (MCAR) test showed that adolescent T1-T3 measurement data ( $\chi^2/df= 1.34, p = .234$ ), clinical-staff T1-T3 measurement data ( $\chi^2/df= 2.28, p = .077$ ), and weekly measurement data ( $\chi^2/df= 0.78, p = .999$ ) were missing completely at random.

## **Measures**

### **Screening Measures**

**Externalizing Problems.** Clinical-staff reported externalizing problems were assessed with the broadband externalizing problems scale of the CBCL (Achenbach & Rescorla, 2001). This scale consists of 35 items (e.g., "argues a lot") that are rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*). During the screening of the current study, Cronbach's alpha was .90 for the externalizing problems scale.

**Autism Spectrum Symptoms.** Severity of autism spectrum symptoms was measured with the ASV (van der Ploeg & Scholte, 2014). This questionnaire consists of 24 items (e.g., "does not seek eye contact") that are rated on a 5-point scale from 1 (*totally disagree*) to 5 (*totally agree*). Percentile scores were obtained based on the Dutch norm scores (van der Ploeg & Scholte, 2014). Cronbach's alpha was .90 in the current study.

**Intelligence.** Intelligence was assessed with the Wechsler Intelligence Scale for Children for participants aged 12-16 (WISC; Kort et al., 2005) or the Wechsler Adult Intelligence Scale for participants aged 17-18 (WAIS; Wechsler, 2012). A full-scale IQ score from the adolescents' clinical file was used in case an intelligence test (WISC or WAIS) was administered within 24 months before the start of the study. If this score was not available, the subtests "Block Design" and "Vocabulary" were administered. Subsequently, total-IQ was estimated with the formula for approximation of Full Scale IQ (FIQ; Silverstein, 1970). FIQ estimates are found to be reliable and strongly correlated with the total-IQ (Hrabok et al., 2014) and have also been used in MID-BIF populations (Schuiringa, van Nieuwenhuijzen, de Castro, & Matthys, 2017). In the current study, FIQ estimates were used for 33.3% of the adolescents.

### **T1-T3 Measures**

**Emotion Regulation Difficulties.** Emotion regulation difficulties were measured with a short version of the Difficulties in Emotion Regulation Scale (DERS; de Castro et al., 2018;

Gratz & Roemer, 2004; Neumann et al., 2010). Adolescents rated 15 items (e.g., “when I am upset, I become out of control”) on a 5-point scale from 1 (*almost never*) to 5 (*almost always*). Cronbach’s alpha ranged from .89 to .91 across measurement moments.

**Externalizing Problems.** Externalizing problems were assessed from a multi-informant perspective, with subscales of the ASEBA-questionnaires (Achenbach & Rescorla, 2001; Verhulst & van der Ende, 2001). Adolescents (Youth Self Report; YSR) and clinical-staff (Child Behavior Checklist; CBCL) completed respectively the 32 and 35 items of the broadband externalizing scale. For the clinical staff pre-test report, the externalizing behavior screening scores were used, as the screening took place just before the start of the study. Items (e.g., “I fight a lot / fights a lot”) were rated on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*). Cronbach’s alpha ranged from .83 to .85 across measurement moments for adolescent self-reports and from .86 to .93 for clinical-staff reports.

### **Weekly Measures**

**Emotion Regulation Difficulties.** Weekly self-perceived emotion regulation difficulties were measured with a 3-item scale, that was based on the DERS (Bjureberg et al., 2016). Items (e.g., “how often did you become so angry this week, that you could not control yourself?”) were rated on a 5-point scale with the following answer options: 1 (*never*), 2 (*a few times*), 3 (*two to three times*), 4 (*four to five times*), 5 (*more often, ... times*). Cronbach’s alpha ranged from .75 to .79 across measurement phases. The baseline-average score of the weekly emotion regulation scale was significantly positively correlated with the T1-score of the full-scale DERS (see Supplementary materials Table S1).

**Aggression.** Weekly self-perceived aggression (hitting, kicking and swearing) was measured with a 3-item scale, based on the YSR (Achenbach & Rescorla, 2001). Items (e.g., “how often did you *hit* someone this week?”) were rated on the same 5-point scale as the weekly emotion regulation measure. Cronbach’s alpha ranged from .47 to .62 across measurement phases. The baseline-average of the weekly aggressive behavior scale correlated significantly in the expected direction with the T1-score of the YSR (see Supplementary materials Table S1).

### **The Experimental Modules**

Participants received the manualized experimental Think Cool Act Cool emotion regulation training for adolescents with MID-BIF (te Brinke, Albrecht et al., 2018). The training is based on components of evidence-based treatments for adolescents with externalizing problems, such as Coping Power (Lochman et al., 2015) and Aggression Replacement Training (Currie et al., 2012), and adjusted to the cognitive capacities

of adolescents with MID-BIF (de Wit et al., 2011). The main adjustments included simplification of language use, longer treatment sessions with fewer skills per session, and use of visual aids.

The training consists of an introduction session and 10 individual 60-minute sessions (five cognitive sessions “Think Cool” and five behavioral sessions “Act Cool”). Both modules use a three-step approach of regulating emotions, but consist of either a cognitive or behavioral approach. Care was taken to ensure that both modules are identical in all other ways, such as dosage, timing, structure and lay out of materials. In both modules, adolescents were instructed to make daily at-home assignments. The content of the modules is displayed in Table 1.

### ***Think Cool***

In the Think Cool module, participants learn to regulate emotions via a cognitive approach. This module is based on the Think Cool chain, a cognitive approach to emotion regulation that is typically used in current interventions (e.g., Goldstein et al., 1987; Lochman et al., 2008). The first step of the chain (Session 1) is to signal anger, with an anger thermometer that is based on situations, feelings, sensations and cognitions (e.g., “they always blame me”). The second step (Session 1 and 2) is to practice three cognitive emotion regulation strategies (cognitive distraction, cognitive relaxation and cognitive reappraisal). The third step (Session 3, 4, and 5) is cognitive problem solving (understand a problem from multiple perspectives, think about possible solutions and possible consequences of these solutions, decide which is the most suitable solution), which is practiced with step-by-step paper-and-pencil exercises.

### ***Act Cool***

In the Act Cool module, participants learn to regulate emotion via a behavioral approach, with the Act Cool Chain, consisting of a behavioral approach to emotion regulation that is typically used in current interventions (e.g., Albrecht & Spanjaard, 2011; Goldstein et al., 1987). The first step of the Act Cool Chain (Session 1), is to signal anger with an anger thermometer, similar to the thermometer that is used in the Think Cool module. However, in the Act Cool module, the thermometer is based on behaviors (e.g., “if I become angry, I raise my voice”) rather than cognitions. The second step (Session 1 and 2) is to practice behavioral emotion regulation strategies (behavioral distraction, behavioral relaxation and time out). The third step (Session 3, 4, and 5) is behavioral problem solving (behavioral role-play exercises). Adolescents learn specific behavioral skills (set a boundary, ask for help) and practice these skills in difficult situations (e.g., disappointments, frustration).

**TABLE 1.** Content of the Think Cool Act Cool Plus Emotion Regulation Training

Session	Session components Think Cool module	Session components Act Cool module
Acquaintance Session	<ul style="list-style-type: none"> <li>• participant and clinician get to know each other</li> <li>• training objectives are explained</li> <li>• brainstorm about words for anger</li> <li>• formulate personal training goals</li> </ul>	
Session 1 / 6	<ul style="list-style-type: none"> <li>• make or adjust* an anger thermometer, based on situations, bodily sensations and cognitions</li> <li>• explain the Think Cool Chain</li> <li>• practice with regulation strategy “think about something fun” (cognitive distraction)</li> <li>• introduce at-home assignments</li> </ul>	<ul style="list-style-type: none"> <li>• make or adjust* an anger thermometer, based on situations, bodily sensations and behaviors</li> <li>• explain the Act Cool Chain</li> <li>• practice with regulation strategy “do something fun” (behavioral distraction)</li> <li>• introduce at-home assignments</li> </ul>
Session 2 / 7	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice regulation strategy “talk in your head” (cognitive relaxation)</li> <li>• practice regulation strategy “helping thoughts” (cognitive reappraisal)</li> <li>• summarize and discuss new at-home assignment</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice regulation strategy “deep breathing” (behavioral relaxation)</li> <li>• practice regulation strategy “time out” (behavioral modification)</li> <li>• summarize and discuss new at-home assignment</li> </ul>
Session 3 / 8	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice to look at a situation from multiple viewpoints</li> <li>• introduce cognitive problem solving</li> <li>• practice perspective taking with</li> <li>• summarize and discuss new at-home assignment</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice behavioral problem solving skills (set a boundary, ask for help)</li> <li>• summarize and discuss new at-home assignment</li> </ul>
Session 4 / 9	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice cognitive problem solving</li> <li>• summarize and discuss new at-home assignment</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice behavioral problem solving in difficult situations (e.g., disappointments, frustration)</li> <li>• summarize and discuss new at-home assignment</li> </ul>
Session 5 / 10	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice complete Think Cool Chain</li> </ul>	<ul style="list-style-type: none"> <li>• look back and discuss at-home assignments</li> <li>• practice complete Act Cool Chain</li> </ul>

Note: \* During the first session of the second module, the existing thermometer is adjusted. Therefore column “cognitions / behaviors” from the thermometer that was developed in the first Session of the first module, is removed and a new column is added. Besides this, the Sessions are the same, irrespective of the sequence in which the modules are followed.

## Delivery of the Experimental Training

### Attendance

In total, 23 adolescents (54.8% of the total sample) discontinued the experimental training at some point, after following on average 3 out of the 10 sessions (see Figure 1). The main reasons from discontinuation of the experimental training were no show/resistance and practical/scheduling issues. Adolescents who continued the training followed on average 9 out of the 10 sessions (Think Cool:  $M = 4.74$ ,  $SD = 0.56$ , Act Cool:  $M = 4.42$ ,  $SD = 1.12$ ).

### Delivery

The modules were carried-out by 12 experienced clinicians (i.e., clinical psychologists or social workers) who worked at the treatment center. Before the start of the study, all participating clinicians received a two-day training course, guided by the developers of the training manual (te Brinke, Albrecht et al., 2018). To measure whether the experimental treatment modules were delivered as intended, all sessions were audio taped. Subsequently, 67 sessions (28% of all delivered sessions) were randomly selected and independently coded by four trained research assistants on two main components of treatment integrity: adherence and differentiation (McLeod et al., 2009). The coding scheme was based on previous studies (e.g., McLeod et al., 2019; Schuiringa, van Nieuwenhuijzen, de Castro, Lochman, & Matthys, 2017) and all components were rated on a 4-point scale (1 = *totally not*, 2 = *slightly*, 3 = *mostly*, 4 = *totally*). To assess inter-rater reliability, 40% of all coded sessions were coded by two raters. Average scale Intra Class Coefficients (ICCs) were calculated as two-way random coefficients, and the codes of the coder who first rated the session were used in the analyses.

**Adherence to Training Manual.** To measure treatment adherence, coders rated the degree to which a clinician delivered general session content (e.g., “discussed homework assignment”, 4 items per session), session-specific content (e.g., “performed helping thoughts exercise”, 6-13 items per session), and session-specific goals (e.g., “adolescent learns to identify problems”, 2-3 items per session). Interrater reliability was excellent (Cicchetti, 1994), ranging from .79 (session-specific content) to .89 (general content). Treatment adherence may be considered good in both modules, with high average percentages scored as “totally” or “mostly” for general session content (Think Cool:  $M_{\%} = 81.31$ ,  $SD = 22.34$ , Act Cool:  $M_{\%} = 69.36$ ,  $SD = 25.76$ ,  $F(1,65) = 4.10$ ,  $p = .047$ ), session-specific content (Think Cool:  $M_{\%} = 88.48$ ,  $SD = 17.56$ , Act Cool:  $M_{\%} = 75.76$ ,  $SD = 32.78$ ,  $F(1,64) = 3.86$ ,  $p = .054$ ), and session-specific goals (Think Cool:  $M_{\%} = 87.88$ ,  $SD = 22.54$ , Act Cool:  $M_{\%} = 71.72$ ,  $SD = 40.72$ ,  $SD = 25.76$ ,  $F(1,64) = 3.52$ ,  $p = .050$ ).

**Differentiation Between Modules.** Treatment differentiation, or the extent to which treatment modules differ from one another and/or match their underlying theory (Schulte et al., 2009), was measured by coding both positive differentiation (e.g., “there was a focus at cognitions/behavior”, 3 items per session) and negative differentiation (e.g., “the clinician included content of the opposing module”, 2 items per session). Interrater reliability for positive differentiation was excellent (.96) (Cicchetti, 1994). Overall, differentiation between the two modules was high, with trainers displaying high degrees of theoretical focus (positive differentiation scored as “totally”: Think Cool:  $M_{\%} = 95.96$ ,  $SD = 11.05$ , Act Cool:  $M_{\%} = 73.74$ ,  $SD = 34.11$ ,  $F(1,64) = 12.67$ ,  $p = .001$ ). Findings for negative differentiation need to be interpreted with caution due to the poor (.34) agreement between coders (Cicchetti, 1994). Clinicians seemed to include, however, little content of the opposing modules (negative differentiation scored as “totally not”: Think Cool:  $M_{\%} = 93.94$ ,  $SD = 16.57$ , Act Cool:  $M_{\%} = 98.49$ ,  $SD = 8.70$ ,  $F(1,64) = 1.95$ ,  $p = .168$ ).

## Data Analyses

First, differences between the two conditions at baseline were examined. Subsequently, between-group differences in approach (Think Cool versus Act Cool) and sequence (Think-Act versus Act-Think) were examined with Structural Equation Modeling (SEM) path analyses in Mplus version 8.1, using the MLR estimator (Muthén & Muthén, 2017). The advantage of SEM is that all randomized participants who completed the pretest assessment can be included in the analyses, because a full information approach is used. In addition, the MLR estimator produces standard errors that are robust in the case of a non-normal distribution (Muthén & Muthén, 2017).

To examine the effect of module during the first experimental phase, T2 was regressed on T1 and module (0 = Think Cool, 1 = Act Cool). To examine the effect of module during the second experimental phase, T3 was regressed on T2 and module (0 = Act Cool, 1 = Think Cool). To examine the effect of sequence, T3 was regressed on T1 and sequence (0 = Think-Act, 1 = Act-Think). For all regression analyses, effect size estimates were computed as Cohen’s  $d$ , with a two-step approach, as recommended by Feingold (2019). First, the pooled standard deviation was calculated ( $\sqrt{(SD^2_{\text{group1}} + SD^2_{\text{group2}})/2}$ ), and subsequently, Cohen’s  $d$  was calculated by using the MODEL CONSTRAINT option in Mplus. An effect size of  $d = 0.2$  was considered small,  $d = 0.5$  medium and  $d = 0.8$  large (Cohen, 1992).

Within-person change during the Think Cool and Act Cool module was examined with Piecewise Hierarchical Linear Growth Models in HLM8, using the RML estimator (Raudenbush et al., 2019). Hierarchical models are best suited to examine trajectories of

change, because these models take the nested structure of the data into account, with weekly measurements (Level 1) nested within participants (Level 2) (Tasca & Gallop, 2009). Another advantage of this framework is that it handles unbalanced designs efficiently, allowing the number of observations to vary across participants. Weekly emotion regulation and aggression were entered as dependent variables, and models were examined separately for participants in the Think-Act and Act-Think sequence conditions, because we were specifically interested in within-person (Level 1) change. All time coefficients were modeled as random effects, which allows for variation across participants.

First, the stability of emotion regulation difficulties and aggression during the baseline period (Week 1-3) was examined, with univariate linear growth models. If the change during baseline was not significantly different from zero (i.e., baseline stability), weekly baseline assessments were coded as “0” in subsequent models, to model the average level of emotion regulation difficulties and aggression before the start of the experimental manipulation. Subsequent weekly assessments were scaled, to represent the change in outcome across a one-unit change in time during the first (Week 4-10) and second (Week 11-17) experimental phase. To examine within-person change during the cognitive and behavioral module, piecewise linear growth models were examined, in which the slopes of the first and second experimental phase were modeled simultaneously.

## ■ RESULTS

### **Preliminary Analyses**

Demographic and screening variables are displayed in Table 2, mean scores of study variables in Table 3, and correlations between study variables in Table S1 (supplementary materials). The participants in the two sequence conditions did not differ significantly in demographic or screening variables at pretest (Table 2), and there were no significant differences at T1 in difficulties in emotion regulation ( $F(1,40) = 1.24, p = .273$ ), self-reported externalizing problems ( $F(1,40) = 0.01, p = .963$ ), and clinical-staff reported externalizing problems ( $F(1,40) = 0.01, p = .983$ ). In addition, the average scores of the weekly measure during baseline did not differ between the two conditions (weekly emotion regulation difficulties:  $F(1,40) = 0.35, p = .556$ , weekly aggression:  $F(1,40) = 0.04, p = .842$ ).

**TABLE 2.** Means, Standard Deviations and Group Differences for Demographic and Screening Variables

	Think-Act (n = 20)		Act-Think (n = 22)		F / $\chi$	p
	M	SD	M	SD		
Externalizing (T-score)	71.60	5.74	71.68	5.76	0.01	.964
Autism symptoms (Sum)	78.65	11.97	79.18	15.06	0.01	.964
IQ-score	74.80	7.40	76.45	7.40	0.66	.421
Age	15.65	1.09	15.41	1.71	0.29	.593
Gender (% male)	50.00		50.00		0.00	.999
Ethnicity (% non-Dutch)	60.00		59.10		0.01	.952

Note. *p* = significance of difference between sequence conditions at baseline

**TABLE 3.** Means and Standard Deviations (in Brackets) of Emotion Regulation and Externalizing Problems for the Two Intervention Sequence Groups at Three Measurement Moments

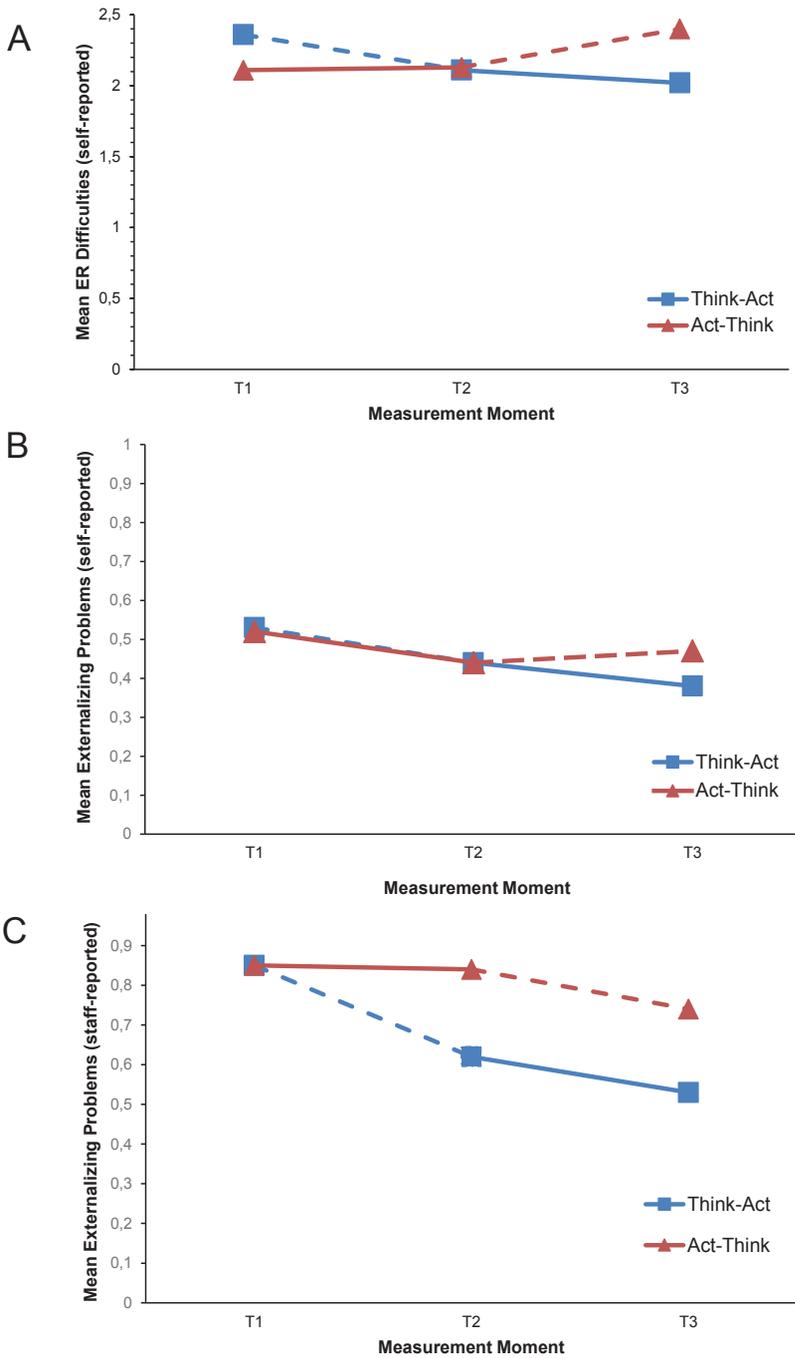
		Pre-test (T1)	In-between test (T2)	Post-test (T3)
<i>Adolescent self-reported</i>				
ER difficulties	1. Think-Act	2.36 (0.74)	2.11 (0.63)	2.02 (0.66)
	2. Act-Think	2.11 (0.74)	2.13 (0.74)	2.40 (0.69)
Externalizing problems	1. Think-Act	0.53 (0.25)	0.44 (0.24)	0.38 (0.21)
	2. Act-Think	0.52 (0.26)	0.44 (0.20)	0.47 (0.23)
<i>Clinical-staff reported</i>				
Externalizing problems	1. Think-Act	0.85 (0.28)	0.62 (0.30)	0.53 (0.28)
	2. Act-Think	0.85 (0.28)	0.84 (0.37)	0.74 (0.31)

## Between-Group Differences

The results of path analyses are displayed in Table 4, and a graphical display of the means is shown in Figure 2.

**TABLE 4.** Between-Person Effects of the Experimental Manipulation on Emotion Regulation Difficulties and Externalizing Problems During the First Experimental Phase (Effect of Module 0 = Think, 1 = Act on T2 with T1 as Covariate), the Second Experimental Phase (Effect of Module 0 = Act, 1 = Think on T3 with T2 as Covariate), and the Total Experimental Phase (Effect of Sequence 0 = Think-Act, 1 = Act-Think on T3 with T1 as Covariate)

	First Experimental Phase			Second Experimental Phase			Total Experimental Phase		
	$\beta$ [95% CI]	p	d	$\beta$ [95% CI]	p	d	$\beta$ [95% CI]	p	d
<i>Adolescent self-reported</i>									
ER difficulties	0.03 [-0.19, 0.25]	.321	0.07	0.26 [0.04, 0.49]	.022	0.52	0.30 [0.09, 0.51]	.004	0.63
Externalizing problems	-0.03 [-0.22, 0.17]	.773	-0.06	0.21 [-0.01, 0.19]	.063	0.42	0.19 [-0.01, 0.39]	.058	0.40
<i>Clinical-staff reported</i>									
Externalizing problems	0.26 [0.04, 0.48]	.020	0.53	0.16 [-0.08, 0.40]	.184	0.44	0.29 [-0.01, 0.58]	.057	0.79



**FIGURE 2.** Mean Scores at T1 (Pretest), T2 (Posttest Phase One), and T3 (Posttest Phase Two)

### ***Effects of the First Module***

There was a significant effect with a medium effect size of the first module on clinical-staff reported externalizing behavior problems (Table 4). Examination of the means (see panel C of Figure 2) shows that the decrease in clinical-staff reported externalizing problems from T1 to T2 was larger in the group of adolescents who first received the Think Cool module, than in the group of adolescents who first received the Act Cool module. Thus, during the first experimental phase, the cognitive module was significantly more effective in decreasing clinical-staff reported externalizing problems than the behavioral module. For the adolescent-reported outcome variables, this effect was, however, not found.

### ***Effects of the Second Module***

There was a significant effect with a medium effect size of the second module on difficulties in emotion regulation (Table 4). Emotion regulation difficulties increased from T2 to T3 for adolescents who received the Think Cool module after the Act Cool module, whereas for the group of adolescents who received the Act Cool module after the Think Cool module, emotion regulation difficulties (slightly) decreased from T2 to T3 (see panel A of Figure 2). Thus, during the second experimental phase, there appeared to be a negative effect of receiving the cognitive module after the behavioral module. For adolescent- and clinical-staff reported externalizing problems, this effect was, however, not found.

### ***Effects of Sequence***

There was a significant effect of sequence on adolescent-reported emotion regulation difficulties, with a medium effect size (Table 4). Emotion regulation difficulties decreased from T1 to T3 for adolescents who received the Think-Act sequence, whereas emotion regulation difficulties increased for the group of adolescents who received the Act-Think sequence (see panel A of Figure 2). Thus, for adolescent-reported emotion regulation difficulties, the cognitive-behavioral sequence appeared to be significantly more effective than the behavioral-cognitive sequence. For adolescent- and clinical-staff reported externalizing problems, this effect of sequence was, however, not found.

### ***Within-Person Change***

The results of the univariate and piecewise growth models are displayed in Table 5, and the means scores of the weekly measure in Table S2 (supplementary materials). Baseline stability was established for both emotion regulation difficulties and aggression in both sequences.

**TABLE 5.** Within-Person Fixed Effects of Change in Weekly Emotion Regulation Difficulties and Aggression During Baseline (Univariate Model A) and the Think Cool and Act Cool Module (Piecewise Model B)

	Weekly ER Difficulties				Weekly Aggression			
	Coefficient	SE	t ratio	p	Coefficient	SE	t ratio	p
<i>Sequence group Think-Act</i>								
Model A: Baseline slope	-0.05	0.08	-0.69	.498	0.05	0.06	0.78	.446
Model B: Slope Think	-0.05	0.02	-2.38	.028	0.02	0.03	0.29	.775
Model B: Slope Act	0.05	0.03	1.83	.083	-0.04	0.03	-1.14	.268
<i>Sequence group Act-Think</i>								
Model A: Baseline slope	-0.07	0.10	-0.71	.487	-0.12	0.07	-1.72	.100
Model B: Slope Act	-0.03	0.02	-1.19	.249	0.01	0.02	0.70	.494
Model B: Slope Think	0.02	0.03	0.74	.466	-0.03	0.02	-1.32	.202

### **Think-Act Sequence**

There was a significant within-person decrease in emotion regulation difficulties during the Think module, whereas the slope of emotion regulation difficulties was not significantly different from zero during the Act module (Table 5). The slopes of aggression were not significantly different from zero. Thus, for adolescents in the Think-Act sequence condition, emotion regulation difficulties decreased during the Think module, and subsequently stabilized during the Act module, whereas aggression stayed stable.

### **Act-Think Sequence**

The slopes of emotion regulation difficulties and aggression were not significantly different from zero during the Act and Think module (Table 5). Thus, for adolescents in the Act-Think sequence condition, weekly emotion regulation difficulties and aggression stayed stable.

## ■ DISCUSSION

This experimental study aimed to examine which treatment approach (cognitive versus behavioral) and which treatment sequence (cognitive-behavioral versus behavioral-cognitive) is most effective in decreasing emotion regulation difficulties and externalizing problems among adolescents with MID-BIF. The results indicated that by itself, the cognitive module was more effective than the behavioral module. Specifically, between-group analyses showed that after the first module, clinical-staff reported lower levels of externalizing problems for the group of adolescents who first received the cognitive module than for the group of adolescents who first received the behavioral module. Within-person analyses partly confirmed this finding, by showing that a stable baseline period was followed by a significant within-person decrease in weekly self-reported emotion regulation difficulties during the cognitive module for adolescents in the cognitive-behavioral sequence. The finding that the cognitive module was more effective, is in line with theoretical views in which the relevance of cognitive approaches for individuals with intellectual disabilities are emphasized (e.g., Lindsay, 2006; McGillivray & Kershaw, 2015). Besides, the finding that the behavioral module was less effective in decreasing externalizing problems, is in contrast to the idea that behavioral approaches are more effective for individuals with intellectual disabilities (e.g., Sturmey, 2004; 2006).

With regard to sequence effects, the results of the current study indicated that it is most effective to include behavioral exercises *after* cognitive training. Specifically, at the end

of the experimental training, self-reported emotion regulation difficulties were lower in the group of adolescents who received the cognitive-behavioral sequence than in the group of adolescents who received the behavioral-cognitive sequence. Although this sequence effect was not significant for externalizing problems, it should be noted that the between-group differences in both self-reported and staff-reported externalizing problems showed a trend in the same direction. Importantly, this conclusion was also supported through the within-person analyses, as for adolescents who received the behavioral-cognitive sequence, weekly reported emotion regulation difficulties and aggression did not change, whereas for adolescents who received the cognitive-behavioral sequence, there was a decrease in emotion regulation difficulties during the cognitive module. The finding that the cognitive-behavioral sequence was more effective than the behavioral-cognitive sequence, is in accordance with theories of treatment motivation, in which cognitive aspects (considering change) are expected to precede behavioral aspects (acting on the desired behavior; DiClemente & Velasquez, 2002).

In addition, some of the findings from the current study also pointed towards a *negative* effect of the behavioral-cognitive sequence. When looking at the between-group differences of the second module, we found that emotion regulation difficulties actually *increased* after the cognitive module for adolescents who followed the behavioral-cognitive sequence. Thus, the exact same treatment approach may have opposite effects, depending on the order in which it is presented. It is possible that the (ineffective) behavioral module *desensitized* adolescents to the (effective) cognitive module. Adolescents may have experienced that behavioral strategies did not seem to work in the first module, which consecutively made them less motivated and more pessimistic about the cognitive strategies in the second module. If so, this suggests that we need to be cautious with iatrogenic effects, that may compromise the effects of further intervention. An alternative explanation may be that behavioral strategies were already used more than cognitive strategies, due to pre-existing preferences of adolescents with MID-BIF (te Brinke et al., 2021), or previous treatment focus at the residential treatment center, and that as a result, there was less room for improvement in behavioral strategies. Lastly, it is also possible that a behavioral approach is not effective by itself, but only functions as *booster*, and thereby fosters the effect of a cognitive approach.

It should be noted, however, that although the current study indicated that the behavioral module was, by itself, less effective than the cognitive module, this does not mean that clinicians should be inclined to omit behavioral techniques in all CBT protocols for adolescents with MID-BIF. The experimental modular training that was

examined in the current study focused specifically on enhancing emotion regulation skills among adolescents with externalizing problems. Thus, it cannot be ruled out that a behavioral approach is more effective than a cognitive approach when other underlying mechanisms are targeted (e.g., contingency management for desirable behavior), or when the psychological symptoms of the target group differ (e.g., behavioral activation for adolescent with MID-BIF and depression). Besides, the current study only included adolescent-focused training, whereas a behavioral approach also frequently includes operant conditioning with mediating parents or teachers (i.e., response change of care-givers and teachers). Standing Strong Together, an evidence-based intervention for adolescents with behavioral problems and MID-BIF, includes for example a parent-component, in which several sessions focus on the use of praise and tokens (Schuiringa, van Nieuwenhuijzen, de Castro, Lochman, et al., 2017). Little is known about the differential effects of these operant behavioral techniques. It could, therefore, be an interesting direction of future micro-trial research to examine the additional effect of behavioral caregiver-oriented approaches, on top of cognitive child-oriented approaches.

### **Strengths and Limitations**

Strengths of the current study include the focus on an understudied, difficult-to-reach population of adolescents with externalizing problems and MID-BIF, the thorough assessment of treatment adherence and differentiation, and the use of multiple assessment methods, which enabled us to examine not only between-group differences, but also within-person change. Between-group differences in externalizing problems were examined from a multi-informant perspective, which might be of additional importance for research among adolescents with MID-BIF, because these adolescents may have difficulties in understanding verbal information, and limited insight into their own behavior (Bramston & Fogarty, 2000; Pavlović et al., 2013). The addition of within-person analyses of weekly reported emotion regulation difficulties and aggression also strengthens this study, because weekly assessments do not rely on the recall of experiences over longer periods of time. It should, however, be noted that the response rate to the weekly assessments was relatively low (i.e., on average 9 out of the 17 weeks), and that for the aggression subscale, the internal consistency was suboptimal. In future research, a validated assessment of weekly problem behaviors may be included. An example of a validated measure is the idiographic Top Problems measure, in which adolescents and/or caregivers identify and repeatedly rate the severity of their top three problems (Weisz et al., 2011). Such an idiographic approach might potentially increase the response rate of weekly assessments among adolescents with MID-BIF, because it is more personalized.

Another limitation of the current study was its small sample size, which might have diminished the power to detect (between-person) differences. Besides, the drop-out of the experimental training was relatively high, a problem commonly encountered when working with adolescents with MID-BIF (e.g., Nestler & Goldbeck, 2011). These power issues could, potentially, be an explanation for the fact that even though the effect sizes for the differences between the two sequences were large and all in the same direction, some effects were only significant for clinical-staff reported problems, and not for adolescent-reported problems.

Lastly, participants were recruited through a residential treatment center for adolescents with behavior problems and intellectual disabilities, and the experimental training was added on to their existing treatment. Therefore, we cannot rule out the possibility that participants were already familiar with the therapeutic techniques that were included in the experimental intervention. We do, however, not have reasons to believe that this familiarity might have had a differential impact on one of the two experimental modules, since existing treatments mainly focus on a combination of cognitive and behavioral approaches.

## **Conclusion and Implications**

This study showed that for adolescents with externalizing behavior problems and MID-BIF, a cognitive approach of an emotion regulation training was, by itself, more effective than a behavioral approach. Moreover, it seems to be more effective to include behavioral exercises after cognitive training than vice versa. Although this is the first, relatively small sample experimental study that examined differences between cognitive and behavioral treatment approaches for adolescents with externalizing problems and MID-BIF, these findings may have implications for existing CBT protocols and clinical guidelines. First of all, these findings suggest that when clinicians aim to *enhance* the effectiveness of existing CBT protocols for adolescents with externalizing problems and MID-BIF, they preferably start by adjusting the relative focus and sequence of the intervention. Second, guidelines for CBT among adolescents with MID-BIF, in which it is currently stated that there should be a stronger focus on behavioral, rather than cognitive approaches (van den Bogaard et al., 2020), may be adapted, in order to highlight the importance of cognitive approaches for this particular target group. Eventually, these adjustments may lead towards more effective ways to treat externalizing behavioral problems among adolescents with MID-BIF.

## SUPPLEMENTARY MATERIALS

**SUPPLEMENTARY TABLE S1.** Pearson Correlations Between Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Baseline weekly ER										
2. Baseline weekly Aggression	.48**									
3. T1 ER difficulties	.59**	.17								
4. T1 EXT self-reported	.63**	.49**	.67**							
5. T1 EXT clinical-staff reported	-.14	-.08	.12	.01						
6. T2 ER difficulties	.68**	.59**	.68**	.74**	.12					
7. T2 EXT self-reported	.54**	.32	.58**	.80**	-.08	.80**				
8. T2 EXT clinical-staff reported	.02	.04	.02	.09	.65**	.13**	.17			
9. T3 ER difficulties	.54**	.39*	.67**	.66*	-.14	.72**	.61**	.16		
10. T3 EXT self-reported	.49**	.28	.59**	.77**	-.09	.68**	.73**	.19	.61**	-.09
11. T3 EXT clinical-staff reported	.05	-.10	.09	.13	.49**	.24	.27	.77**	.43*	.42*

Note. ER = Emotion Regulation, EXT = Externalizing problems

\*  $p < .05$ . \*\*  $p < .01$

**SUPPLEMENTARY TABLE S2.** Available Data, Means and Standard Deviations of the Weekly Measure

Week number	Percentage data available	Emotion regulation difficulties		Aggressive behavior	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	67%	1.92	0.72	1.76	0.72
2	98%	1.68	0.67	1.75	0.60
3	74%	1.83	0.81	1.61	0.65
4	76%	1.83	0.66	1.52	0.57
5	71%	2.11	0.95	1.88	0.72
6	60%	1.49	0.48	1.57	0.83
7	45%	1.51	0.39	1.61	0.51
8	45%	1.54	0.39	1.35	0.36
9	55%	1.46	0.45	1.59	0.70
10	40%	1.59	0.46	1.82	0.88
11	40%	1.59	0.58	1.41	0.45
12	50%	1.49	0.49	1.52	0.70
13	48%	1.82	0.68	1.65	0.62
14	48%	1.78	0.66	1.67	0.72
15	36%	1.71	0.78	1.51	0.60
16	29%	1.86	0.81	1.44	0.50
17	26%	1.55	0.60	1.36	0.55





## CHAPTER 7

# GENERAL DISCUSSION

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## ■ GENERAL DISCUSSION

The general aim of this dissertation was to inform the development of optimized interventions for externalizing problems in adolescence. To this end, in the first part of this dissertation, I zoomed in on emotion regulation as a multi-modal *underlying mechanism* of externalizing problems. Subsequently, in the second part, the effects of emotion regulation training as a *treatment element* for externalizing problems in adolescence were examined with a micro-trial approach.

In this final chapter, I first summarize and discuss the findings of this dissertation. Subsequently, I balance the strengths and weaknesses of the included studies, discuss the theoretical implications, and look ahead towards future research that is needed to optimize interventions for adolescents with externalizing problems. Finally, I discuss implications that this dissertation's findings have for policy makers and clinicians.

### **Part 1: Emotion Regulation as a Multi-Modal Underlying Mechanism of Externalizing Problems**

I started this dissertation with the notion that emotion regulation spans over multiple regulatory domains (**Chapter 1**), such as general emotion regulation abilities (the degree to which an individual is able to understand, regard, and respond to emotional experiences, for example, emotion dysregulation) and specific emotion regulation strategies (strategies to influence the processes through which emotions are generated or manifested in behavior, for example, withdrawal, a behavioral regulation strategy). Although emotion regulation is viewed as an important underlying mechanism of externalizing problems (Aldao et al., 2010; Röhl et al., 2012), the multi-modal nature of emotion regulation processes, and how these processes relate to externalizing problems in adolescence was not fully captured in earlier research, since earlier research has mainly examined domain-specific associations. Specifically, earlier research has either focused on general emotion regulation difficulties (e.g., Adrian et al., 2019; Eisenberg et al., 2001; Skripkauskaitė et al., 2015) or specific (sets of) emotion regulation strategies (e.g., Aldao & Nolen-Hoeksema, 2012; Garnefski et al., 2005; van Beveren, Mueller et al., 2019). Therefore, in the first part of this dissertation, several dimensions of emotion regulation processes were integrated, and differences in these dimensions between adolescents who do, and adolescents who do not show externalizing problems and/or Mild Intellectual Disabilities or Borderline Intellectual Functioning (MID-BIF) were examined.

In **Chapter 2**, two commonly used classification systems of emotion regulation strategies were integrated into one system that takes two dimensions of emotion regulation

strategies into account. Specifically, an outcome-oriented system that distinguishes between adaptive regulation strategies (i.e., strategies that promote emotional and psychological wellbeing, such as reappraisal and distraction) and maladaptive regulation strategies (i.e., strategies that temper emotional and psychological wellbeing, such as rumination and withdrawal) was integrated with a process-oriented system that distinguishes between strategies that involve cognition (e.g., reappraisal, rumination) and strategies that involve behavior (e.g., distraction, withdrawal).

The results showed that the underlying structure of emotion regulation strategies in adolescence is best captured with an integrated system, in which four categories of emotion regulation strategies are disentangled: cognitive maladaptive, behavioral maladaptive, cognitive adaptive, and behavioral adaptive strategies. These four categories of emotion regulation strategies, as measured in response to feelings of anger with both a generalized questionnaire and a contextualized vignette measure, were found to differentiate adolescents with different patterns of psychological problems. The emotion regulation style of adolescents with only externalizing problems was characterized as a behavioral maladaptive style, whereas the style of adolescents with internalizing problems was characterized as cognitive. In contrast, the style of adolescents with comorbid internalizing and externalizing problems was characterized as maladaptive, and the style of adolescents who did not experience psychological difficulties as adaptive. These findings highlight the multi-modal nature of emotion regulation strategies, and show that a combination of outcome- and process focused classification systems needs to be used.

Subsequently, I turned my attention towards adolescents with MID-BIF. Although this group has an increased risk to develop externalizing problems (Dekker et al., 2002; Douma et al., 2007), which theoretically, might be explained by emotion regulation processes (McClure et al., 2009), little was empirically known about the emotion regulation capacities of adolescents with MID-BIF. Therefore, in **Chapter 3**, differences in several dimensions of emotion regulation (i.e., emotion regulation difficulties, strategies, and angry mood) between adolescents with externalizing problems MID-BIF and adolescents with externalizing problems and average intelligence were examined. In this chapter, a combination of generalized questionnaires and daily diary methods were used. Moreover, the integrated system of emotion regulation strategies, that was developed in **Chapter 2**, was also used in this chapter.

The results of **Chapter 3** showed that the emotion regulation profile of adolescents with externalizing behavior and MID-BIF could also be characterized by a greater reliance on behavioral rather than cognitive regulation strategies. Adolescents in the MID-BIF

group reported, however, fewer emotion regulation difficulties, fewer maladaptive regulation strategies, and lower levels of angry mood than adolescents in the average intelligence group. Thus, even though adolescents with MID-BIF have a higher risk for the development of externalizing problems, they do – according to their own reports – not seem to experience more emotion regulation difficulties.

Based on the results of the first part of this dissertation, multiple discussion points need to be raised. A possible conclusion that one might draw, based on the findings of **Chapter 3**, may be that emotion regulation processes do not explain the heightened risk that adolescents with MID-BIF have for the development of externalizing problems. However, since we only compared two groups of adolescents with (sub)clinical levels of externalizing problems, it was not possible to examine whether adolescents with MID-BIF and externalizing problems experienced more emotion regulation difficulties than adolescents with MID-BIF who do not have externalizing problems. Moreover, the study relied solely on self-reports of emotion regulation. Therefore, an alternative conclusion is that adolescents with externalizing problems and MID-BIF only have more difficulties in labeling and identifying their emotional reactions than adolescents with externalizing problems and average intelligence. Since emotional awareness is considered an important dimension of emotion regulation (Hessler & Katz, 2010), and underlying mechanism of psychopathology (Weissman, Nook et al., 2019), it may be that for adolescents with MID-BIF, emotion regulation difficulties emerge earlier in the emotion-regulation process, before cognitive or behavioral regulation attempts emerge. Alternatively, the results of **Chapter 6**, a study that zoomed in on the effects of emotion regulation training for adolescents with externalizing problems and MID-BIF, do in fact underline the importance of emotion regulation as an underlying mechanism of externalizing problems for adolescents with MID-BIF. Specifically, the results of this experimental study show that treatment elements that focus on emotion regulation skills have a positive effect on the clinical-staff reported externalizing problems of adolescents with MID-BIF. Thus, it may also be that self-reported dimensions of emotion regulation processes do not explain the *heightened* risk for the development of externalizing problems among adolescents with MID-BIF, but nevertheless form an important multi-modal underlying mechanism of externalizing problems in this group.

A second discussion point that was raised in the first part of this dissertation, is the importance to take *context* into account when examining emotion regulation processes. In **Chapter 2**, emotion regulation strategies were examined with both a generalized and contextualized measure, whereas in **Chapter 3** and subsequent chapters of this dissertation, only general measures were used. Generalized measures of emotion regulation strategies focus on the combination of strategies that an

individual uses relatively consistently across time and context (Bridges et al., 2004), whereas contextualized measures focus on the use of emotion regulation strategies in specific situations. These measures thus tap into the difference between *habitual* versus *situation specific* regulation processes. Although **Chapter 2** showed that these processes are related to each other (i.e., generalized strategies were positively associated with the corresponding contextualized strategies), the findings of this study also highlight the need to separate these processes, because contextualized strategies may be an indicator of *emotion regulation flexibility*. Specifically, this study showed that adolescents who experienced both internalizing and externalizing problems reported more generalized cognitive maladaptive strategies than adolescents with only externalizing or no clinical levels of psychological problems, but these differences were not found for the reported use of these strategies in specific situations, which can be interpreted as a reflection of an inability to flexibly adjust responses across different situations. Thus, it may be that not only an individual's habitual profile of regulatory processes predicts psychological functioning, but also their ability to flexibly select and adjust regulatory strategies. These interpretations are in line with a relatively recent development in emotion regulation research, in which the importance of emotion regulation flexibility is underlined (e.g., Conroy et al., 2020; Pruessner et al., 2020).

From a developmental viewpoint, the findings of the first part of this dissertation also underline the multi-modal nature of emotion regulation processes. Although the studies of **Chapter 2** and **Chapter 3** were cross-sectional, they provide some initial evidence for the distinct roles that cognitive and behavioral processes may play in the development of emotion regulation. The four categories of emotion regulation strategies, as measured in **Chapter 2** in a community sample of adolescents aged 12-19, were found to be differentially associated with age. Older adolescents reported to use more cognitive maladaptive and cognitive adaptive emotion regulation strategies, whereas younger adolescents reported to use more behavioral maladaptive strategies. However, older adolescents also reported to use more behavioral adaptive emotion regulation strategies. Thus, age was differentially related to cognitive versus behavioral regulation strategies. With regard to cognitive strategies, these findings seem to fit with a "*cognitive maturation model*", implying that the positive association between age and cognitive regulation is an outcome of general maturation in cognitive skills during adolescence (Steinberg, 2005), whereas the findings for behavioral strategies are in line with a "*general maturation model*", with expanding repertoires of adaptive strategies, and attenuating repertoires of maladaptive strategies (Cracco et al., 2017; Kovacs et al., 2019). Besides, the findings of **Chapter 3** could also be viewed as evidence for a general maturation model. Since the socio-emotional development of adolescents with MID-BIF may lack behind in comparison to adolescents without MID-BIF (e.g., Nader-Grosbois,

2014), the finding that adolescents with externalizing problems and MID-BIF reported lower levels of adaptive and maladaptive strategies than adolescents with externalizing problems and average intelligence, may be interpreted as a developmental delay.

Together, the studies included in the first part of this dissertation highlight the multi-modal nature of emotion regulation as an underlying mechanism of externalizing problems, and show that (1) the underlying structure of emotion regulation strategies in adolescence needs to be captured with an integrated outcome- and process oriented system, and both general and contextualized measures; (2) adolescents with externalizing problems are more inclined to use behavioral rather than cognitive regulation strategies; and (3) adolescents with externalizing problems and MID-BIF do not report more emotion regulation difficulties than adolescents with externalizing problems and average intelligence.

## **Part 2: Emotion Regulation Training as a Treatment Element for Externalizing Problems**

In part two, I examined the effects of an experimental training that explicitly targeted the different dimensions of the underlying emotion regulation processes that were examined in part one. Since the effectiveness of “cocktail treatments” (e.g., interventions that consist of multiple treatment elements; Leijten et al., 2015) is typically evaluated through large-scale randomized controlled trials, little is known about individual effects of specific treatment elements. Therefore, I described in **Chapter 4** the methodological aspects of a micro-trial study that aimed to examine the specific effects of emotion regulation training as a treatment element for the externalizing problems of adolescents with average intelligence. In order to test not only the direct and indirect effects of emotion regulation training as a treatment element, but also the effects of approach (cognitive versus behavior) and sequence (cognitive-behavioral versus behavioral-cognitive), an experimental emotion regulation training was developed; the Think Cool Act Cool training. In this experimental training, adolescents are instructed to regulate their emotions through either a cognitive (cognitive distraction, cognitive relaxation and cognitive reappraisal) or behavioral (behavioral distraction, behavioral relaxation and time-out) approach.

The results of this micro-trial (**Chapter 5**) indicate that the experimental emotion regulation training had a positive effect on the self-reported use of adaptive emotion regulation strategies. No systematic effects of approach (Think Cool versus Act Cool) or sequence (Think Cool + Act Cool sequence versus Act Cool + Think Cool sequence) were found. Unexpectedly, the decrease in self-reported externalizing problems was, however, larger in the control condition than in the experimental condition. No

between-group or within-person effects were found for teacher- and parent-reported externalizing behavior problems, self-reports of emotion regulation difficulties and maladaptive strategies, and weekly reported emotion regulation difficulties and aggression. Moreover, changes in emotion regulation skills did not seem to mediate the effects of the experimental training on externalizing problems. These findings may suggest that for adolescents with externalizing problems and average intelligence, emotion regulation training does improve one aspect of emotion regulation (i.e., adaptive emotion regulation strategies), but is not sufficient as a treatment element for externalizing problems during adolescence.

This conclusion seems to contradict the findings in part one, in which the role of emotion regulation as a multi-modal underlying mechanism was highlighted. Based on the association between (adaptive) emotion regulation strategies and externalizing problems, one would expect that targeting emotion regulation processes would not only result in increases in adaptive emotion regulation strategies, but also in decreases in externalizing problems. Several factors could potentially explain the lack of positive effects of emotion regulation training on externalizing problems. First, it may be that the current experimental emotion regulation training was too short to have positive effects on more distal outcomes such as externalizing problems. This interpretation is in line with conceptualizations of micro-trial research, in which a focus on proximal (i.e., skill improvements), rather than distal (i.e., symptom reductions) outcomes is stressed (Howe et al., 2010; Leijten et al., 2015). It is, however, still possible that for externalizing problems, training effects become only apparent sometime after intervention termination, when adolescents have had time to practice the skills that they have learned (Larsson et al., 2020). Second, it may be that training effects on (adaptive) emotion regulation skills are too weak to – subsequently – impact externalizing problems, due to, for example, the existence of other (interpersonal) processes (e.g., low motivation, adverse family or peer dynamics) that exert influence on both emotion regulation and externalizing problems during the developmental period of adolescence. This might imply that emotion regulation training is only effective when it is combined with other active treatment elements, such as motivational enhancement or parental praise. Third, it may be that more flexible, personalized approaches are needed to decrease the externalizing problems of adolescents with average intelligence (Chorpita & Weisz, 2009; Ng & Weisz, 2016; Weisz & Bearman, 2016). A recent study shows that interventions for youths with externalizing problems may be most effective when they are delivered in a flexible, transdiagnostic way (Evans et al., 2020).

Subsequently, **Chapter 6** presented the results of a micro-trial into the differential effects of a cognitive versus behavioral approach to emotion regulation training for adolescents

with externalizing problems and MID-BIF. The results indicated that for adolescents with MID-BIF, both approach and sequence had a significant effect on emotion regulation and/or externalizing problems. Specifically, the cognitive module was found to be more effective than the behavioral module, as between-group analyses showed that after the first module, clinical-staff reports of externalizing problems were lower for the group of adolescents who first received the cognitive module than for the group of adolescents who first received the behavioral module. Within-person analyses partly confirmed this finding, by showing that a stable baseline period was followed by a significant within-person decrease in weekly self-reported emotion regulation difficulties during the cognitive module for adolescents in the cognitive-behavioral sequence. Thus, approach effects were found for both emotion regulation difficulties and (clinical-staff reported) externalizing problems. With regard to sequence, this study showed that it was more effective for adolescents with MID-BIF to include behavioral exercises after cognitive training than vice versa. Specifically, at the end of the experimental training, self-reported emotion regulation difficulties were lower in the group of adolescents who received the cognitive-behavioral sequence than in the group of adolescents who received the behavioral-cognitive sequence. Thus, for adolescents with MID-BIF, the Dodo Bird's verdict (i.e., the assumption that different treatment approaches are of equivalent efficacy; Wampold et al., 1997) does not hold. The findings of this study thus indicate that for adolescents with MID-BIF, the effectiveness of interventions could be enhanced through an increased focus on cognitive, rather than behavioral approaches to emotion regulation training.

When combining the findings from **Chapter 5 and 6**, it may be tentatively concluded that emotion regulation training is only an effective treatment element for externalizing problems among adolescents with MID-BIF, and not for adolescents with average intelligence, which would be in contrast to the results of **Chapter 3**, in which I found that the adolescents with MID-BIF report fewer emotion regulation difficulties than adolescents with average intelligence. However, some considerations need to be taken into account before jumping to conclusions. From a methodological perspective, it should first be noted that in contrast to the micro-trial among adolescents with average intelligence (**Chapter 5**), the micro-trial among adolescents with MID-BIF (**Chapter 6**), did not include a control condition. Thus, it is not possible to attribute with certainty the decreases in clinical-staff reported externalizing problems for adolescents with MID-BIF to the experimental training. Second, the negative effects of the experimental training on the self-reported externalizing problems of adolescents with average intelligence (**Chapter 5**), and the lack of effects of the experimental training on the self-reported problems of adolescents with MID-BIF (**Chapter 6**) could be an artefact of the limited behavior insight that these adolescents may have. Previous research indicated that the

general agreement between adolescent self-reports and teacher- or parent-reports of behavior problems is low, both for adolescents with average intelligence (Salbach-Andrae et al., 2009) and for adolescents with MID-BIF (Douma et al., 2006). Moreover, especially adolescents with clinical levels of behavior problems tend to underreport externalizing problems such as delinquency (Asscher et al., 2014). Hence, it is possible that participating adolescents did not identify their externalizing problems as problematic before the experimental training. Since both modules included extensive exercises that focused on identifying problematic situations and behaviors, adolescents in the experimental condition might subsequently have become better able to self-report their externalizing problems (i.e., response shift bias; Rioux & Little, 2020), which might have repressed changes in externalizing problems. Thus, the findings for self-reported externalizing problems should be interpreted with caution.

From a contextual perspective, differences between the two micro-trials should also be taken into account. The evidence-based treatment elements on which the experimental Think Cool Act Cool training was based (e.g., Lochman et al., 2008), are typically delivered in mental health care clinics. In **Chapter 6**, the research context thus matched with the intended delivery context (i.e., in the MID-BIF trial, the training was delivered in a mental health care context), whereas in **Chapter 5**, the context did not match, because in the average intelligence micro-trial, the training was delivered in schools. According to Yeager and colleagues (2018), traditional skill-based interventions that are delivered in the school context are less effective in middle adolescence than in childhood, because these interventions do not honor the adolescent's sensitivity to status and respect. This need for status and respect may be especially important in schools, because adolescents do not want to be an "exception" from their peers. Thus, a possible alternative explanation of the negative effects of the experimental training on the self-reported externalizing problems of adolescents with average intelligence (**Chapter 5**) may be that adolescents in the experimental condition felt less respected because they were apparently considered in need of help, and therefore were not motivated to respond to adult-based attempts to decrease externalizing problems. This may imply that intervention elements might have different effects, depending on the context in which they are delivered.

Together, the studies in the second part of this dissertation show (1) the importance of examining which elements and which delivery modalities contribute to treatment effects; (2) that for adolescents with average intelligence, the treatment element emotion regulation training has a positive effect on adaptive emotion regulation strategies, but

not on externalizing problems; (3) that for adolescents with MID-BIF, the effectiveness of interventions could be enhanced through an increased focus on cognitive, rather than behavioral approaches to emotion regulation training.

### **Strengths and Limitations**

This dissertation focused on difficult-to-reach, understudied populations of adolescents with externalizing problems. Specifically, not only adolescent with externalizing problems and average intelligence were included, but also adolescents with externalizing problems and MID-BIF. Adolescents with MID-BIF were in the past often excluded from participation in intervention studies, since it was expected that these adolescents were unable to benefit from cognitive behavioral therapy (Iacono, 2006). Thus, it is a strength of this dissertation that those two groups of adolescents with externalizing problems were reached.

In evaluating the findings of this dissertation, additional strengths and limitations regarding the measurement approach, design, and statistical analyses need to be considered. On the one hand, the multi-modal measurement approach that was used in this dissertation, could be considered a strength, since this enabled me to assess multiple dimensions of emotion regulation. A unique aspect of **Chapter 2** was, for example, the use of two different measures; the generalized, habitual use of emotion regulation strategies and the contextualized, situational use of these strategies. Additionally, **Chapter 3** included both self-reports and a daily diary measure. Moreover, in the two micro-trials (**Chapter 5 and 6**), effects of the experimental manipulation were assessed from both a randomized pre-post-measurement perspective, with assessments before and after each of the two experimental modules, and an intensive longitudinal data perspective, with continuing weekly assessments during a baseline period and two experimental phases in which adolescents received the two experimental modules. This assessment method enabled me to examine both inter-individual (between-group) differences and intra-individual (within-person) differences.

At the same time, the measurement approach of the studies included in this dissertation also has some limitations. First, the weekly measure that was used to assess intra-individual change in emotion regulation and aggression (**Chapter 5 and 6**), was not yet validated, and mean levels of weekly reported emotion regulation and aggression appeared to be relatively low. Therefore, the possibility cannot be ruled out that the results of these analyses suffer from low validity and/or possible floor effects. Second, although a multi-modal approach was included, all domains of emotion regulation were assessed with self-reports. When setting up the studies included in this dissertation, relatively few validated teacher- or parent-report measures of adolescent emotion

regulation were available, but recently, new measures have been developed (i.e., Bunford et al., 2020; van Beveren et al., 2020). Although self-reports may be the most appropriate for measuring internal constructs such as (cognitive) regulation strategies (Moretti et al., 1985), future research may consider to include these new measures, in order to limit the effects of shared method variance.

The novel micro-trial designs that were used in this dissertation, also have both strengths and limitations. Rather than examining a complete intervention package, this dissertation zoomed in on approaches to train a crucial underlying mechanism of externalizing problems. Cognitive and behavioral approaches to emotion regulation training were disentangled, and care was taken to ensure that the experimental modules were delivered as intended. To this end, a detailed training manual and a two-day training course were developed, and clinicians who delivered the experimental training received ongoing supervision and consultation meetings. Moreover, treatment adherence and differentiation were thoroughly assessed, with ratings of more than 170 audio-taped sessions.

It further could be considered a strength that the experimental emotion regulation training consisted of ten sessions, and therefore resembled the way in which this treatment element is currently included in evidence-based treatments. At the same time, the lengthiness of the experimental manipulation could be considered a limitation, since one could argue that the manipulation did not purely consist of emotion regulation training, but also contained some other treatment elements. Within the current dissertation's multi-modal conceptualization of emotion regulation, *emotional awareness* was, for example, viewed as the starting point of the regulation process and *problem solving* was included as a separate cognitive regulation strategy. Alternatively, these aspects could, however, also be classified as distinct treatment elements. Thus, although the dosage of the experimental manipulation may have enhanced the external validity of the findings, this may have limited the internal validity. Moreover, the outcome variables that were included in the two micro-trials (e.g., emotion regulation and externalizing problems) may both have been too distal and broad to capture subtle differences between cognitive and behavioral approaches. Thus, it may be the case that differences between the modules would also have emerged for adolescents with average intelligence when alternative measures were used (e.g., in vivo observations or experimental paradigms).

Finally, some statistical limitations need to be considered. In the micro-trials, pre-post measures and weekly measures were analyzed separately, from either a between-person or within-person perspective. Thus, the statistical models *either* took within-person

or between-person variability into account. This approach limited the complexity of the models, and required fewer participants. For statistical models that capture both between- and within-person variability at multiple time scales (i.e. DSEM; Asparouhov et al., 2018) more time points and larger sample sizes are required. Moreover, it should be noted that the statistical models of this dissertation did not fully capture the structure of the data, since, for example, randomization took place on the between-person level whereas weekly data was analyzed on the within-person level. This may have led to over- or under-estimation of effects. Nevertheless, the assessment of both between- and within-person change was clearly more comprehensive than – all too common – reliance on just one of these two approaches.

### **Theoretical Implications and Future Research Directions**

The findings from this dissertation provide novel insights into the multi-modal structure of emotion regulation as an underlying mechanism of externalizing problems, and highlight which approaches may (not) be used to target this underlying mechanism. At the same time, the findings from this dissertation also raise more questions. A first question that remains unanswered, is whether individual differences in initial preferences for cognitive and/or behavioral emotion regulation strategies impact the subsequent effects of distinct approaches to target these strategies. In the first part of this dissertation, I found that in contrast to adolescents with internalizing or comorbid problems, adolescents with externalizing problems are more inclined to use a behavioral regulation style. The emotion regulation style of adolescents with externalizing problems and MID-BIF could be classified as behavioral as well. Subsequently, in part two, I concluded that for adolescents with externalizing problems and MID-BIF – on average – a cognitive approach to emotion regulation seems to be more effective than a behavioral approach. This finding may be interpreted as evidence for a compensation model (Rude & Rehm, 1991), suggesting that a focus on deficiencies (i.e., use of fewer cognitive regulation skills) is more beneficial than a focus on strengths (i.e., capitalization model). Individual differences in strategy or approach preferences, were, however not taken into account in this dissertation. Thus, it may be that although in general, a cognitive versus behavioral approach did not have a differential effect on emotion regulation and externalizing problems for adolescents with average intelligence, pre-existing individual differences still played a role. Therefore, an interesting direction for future research, possibly using the data from this dissertation, might be to examine whether individual differences in strategy preference and/or skill deficits moderate the effects of treatment elements or approaches. Given the transdiagnostic nature of emotion regulation (Aldao et al., 2016; Cludius et al., 2020), and the current dissertation's finding (**Chapter 2**) that adolescents with comorbid internalizing and externalizing

problems are inclined to use a mixed cognitive/behavioral maladaptive emotion regulation style, this may be especially interesting from a transdiagnostic perspective. For example, a functional analysis of individual emotion regulation profiles may be used as a decision instrument for the delivery of tailored profile-congruent or profile-incongruent treatment elements. Subsequently, micro-trials may be used to evaluate the transdiagnostic effects of individualized versus standardized treatment elements.

A second question that remains unanswered is whether this dissertation's finding that for adolescents with MID-BIF a cognitive approach to emotion regulation training is more effective than a behavioral approach transfers to other treatment elements. Since this dissertation focused exclusively on the treatment element emotion regulation training, it cannot be ruled out that a behavioral approach is more effective than a cognitive approach when other underlying mechanisms are targeted (e.g., contingency management for desirable behavior), or when the psychological symptoms of the target group differ (e.g., behavioral activation for adolescent with MID-BIF and depression). Moreover, the current study only included adolescent-focused training, whereas a behavioral approach also frequently includes operant conditioning with mediating parents or teachers (i.e., response change of caregivers). It could, therefore, be an interesting direction of future micro-trial research to examine the additional effects of behavioral caregiver-oriented approaches, on top of cognitive child-oriented approaches.

This dissertation also provides avenues for possible design choices in future micro-trial research. In part, this dissertation's methodological considerations (e.g., inclusion of both proximal and distal outcomes, and both intensive longitudinal and pre-post data) might be considered a reflection of the struggle to balance novel micro-trial methods with traditional randomized controlled (macro) trial methods, which still are considered the golden standard in intervention science (e.g., Creemers et al., 2017). In my opinion, micro-trials and macro-trials are not two completely distinct methods, but rather form a continuum, with strengths and weaknesses distributed equally along this continuum. Thus, future research carefully needs to match its research questions to a suitable design along the micro-macro trial continuum.

The micro-trials in this dissertation were designed from a top-down approach; with existing evidence-based interventions and existing knowledge of underlying mechanisms as their starting point. However, because interventions for adolescents with externalizing problems are still only moderately effective (McCart et al., 2006; Weisz et al., 2017), especially in school contexts, the treatment element emotion regulation training may not necessarily improve the effectiveness of treatments for adolescents

with average intelligence. Therefore, future research may consider to take a bottom-up approach; with novel treatment elements as their starting point. This approach does not necessarily need to be based on existing evidence based interventions, but may move outside of the existing intervention boxes (e.g., Yeager et al., 2018). In this process, voicing the needs and ideas of adolescents (i.e., citizen science, co-creation; Rowbotham et al., 2019) may have a positive impact. For example, in close collaboration with adolescents themselves, treatment elements may be developed that can be delivered in the peer context (i.e., positive peer-to-peer influencing through the use of social media). In addition, technology (i.e., virtual reality, social media platforms; Fairburn & Patel, 2017; Freeman et al., 2017), may also play a role in the development of new treatment elements. Next, the effects of these novel treatment elements may be tested on a scale from micro (i.e., single session) to macro (i.e., intervention package) designs, in order to gradually move towards more effective treatments for adolescents with externalizing problems.

### **Implications for Policy Makers and Clinicians**

The findings of this dissertation do not only have implications for intervention science, but also for policy makers and clinicians that care for adolescents with externalizing problems. In the Netherlands, evidence-based interventions for youth are summarized in a database (Nederlands Jeugdinstituut, 2020). Policy makers may consider to include the results of micro-trials into this database as well, since these findings can inform future adaptations of evidence-based interventions. At the same time, care should be taken that treatment elements are not displayed as some sort of pick-and-choose menu, since the effects of distinct treatment elements may depend on their level of embeddedness in a structured intervention context, in which elements are delivered by trained clinicians.

Specifically for adolescents with externalizing problems and MID-BIF, the findings of this dissertation furthermore suggest that when clinicians aim to *enhance* the effectiveness of existing interventions for adolescents with externalizing problems and MID-BIF, they preferably start by adjusting the relative focus and sequence of the intervention. Subsequently, clinical guidelines for Cognitive Behavior Therapy with adolescents with MID-BIF, in which it is currently stated that there should be a stronger focus on behavioral, rather than cognitive approaches (van den Bogaard et al., 2020), may need to be adapted, in order to highlight the importance of cognitive approaches to emotion regulation training for this particular target group.

## **General Conclusion**

If left untreated, externalizing problems in adolescence form a serious risk factor for the development of adverse outcomes later in life, such as rejection by peers, school failure, crime involvement and psychopathology (Odgers et al., 2008; Pardini & Fite, 2010). Therefore, clinicians need effective interventions to target these problems. In order to improve the effectiveness of interventions, it is important to examine closely which “switches need to be flipped”. This dissertation showed that emotion regulation is an important multi-modal underlying mechanism of externalizing problems and highlighted the importance of distinguishing cognitive and behavior delivery modalities to effectively enhance emotion regulation. Moreover, this dissertation showed that the treatment of externalizing problems among adolescents with MID-BIF could be improved through an enhanced focus on cognitive, rather than behavioral, emotion regulation training.





## **APPENDICES**

**REFERENCES**

**SAMENVATTING (SUMMARY IN DUTCH)**

**DANKWOORD (ACKNOWLEDGEMENTS)**

**ABOUT THE AUTHOR**

**PUBLICATIONS**

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## ■ SAMENVATTING

Externaliserend gedrag is een verzamelnaam voor verschillende agressieve en regel-overtredende gedragingen, zoals schoppen, slaan, stelen en brandjes stichten. De meeste jongeren vertonen weleens dit soort gedrag. Wanneer dit gedrag echter regelmatig voorkomt en ernstig is, noemen we dit externaliserende gedragsproblemen. Externaliserende gedragsproblemen zijn nadelig voor jongeren zelf, maar ook voor hun sociale omgeving en de maatschappij. Zo hebben jongeren met externaliserende gedragsproblemen een verhoogd risico op schooluitval, delinquentie en psychiatrische stoornissen (Hinshaw, 1992; Pardini & Fite, 2010). Daarnaast hebben zij vaak ruzie met ouders, leerkrachten en/of leeftijdsgenoten. Een specifieke groep jongeren die een verhoogd risico heeft op het ontwikkelen van externaliserende gedragsproblemen zijn jongeren met een Licht Verstandelijke Beperking (LVB; IQ tussen de 55 en 85 met sociale aanpassingsproblemen). Deze jongeren ervaren ook vaker de negatieve consequenties van externaliserende gedragsproblemen. Vanwege de negatieve consequenties van externaliserende gedragsproblemen is het van belang dat er effectieve interventies beschikbaar zijn om deze problemen te behandelen, zowel voor jongeren met een gemiddelde intelligentie (IQ boven de 80), als voor jongeren met een LVB.

De afgelopen decennia zijn er diverse interventies gericht op het verminderen van externaliserende gedragsproblemen in de adolescentie ontwikkeld en onderzocht. Deze interventies hebben positieve effecten, zowel op de korte als lange termijn. Helaas zien we ook dat de effecten gemiddeld genomen beperkt blijven (kleine tot matige effectgroottes; Weisz et al., 2017). Dit betekent ook dat lang niet alle adolescenten voldoende profiteren van deze interventies. Dit proefschrift richt zich daarom op het *optimaliseren* van interventies voor jongeren met externaliserende gedragsproblemen. Om dit doel te bereiken, heb ik mij in het eerste deel van dit proefschrift gericht op een specifiek onderliggend mechanisme dat het ontstaan van externaliserende gedragsproblemen kan verklaren: emotieregulatie. Vervolgens heb ik in het tweede deel van dit proefschrift onderzocht op welke manier interventies de emotieregulatievaardigheden van jongeren het beste kunnen verbeteren. In beide delen van het proefschrift heb ik zowel aandacht besteed aan jongeren met een gemiddelde intelligentie als aan jongeren met een LVB.

### **Deel 1: Emotieregulatie als een Multi-Dimensionaal Onderliggend Mechanisme van Externaliserende Gedragsproblemen**

Emotieregulatie refereert naar de processen die mensen gebruiken om met hun emoties om te gaan (Gross, 1998). Emotieregulatie is een multi-dimensionaal proces, wat betekent dat het meerdere 'domeinen' omvat. Zo kan er onderscheid worden gemaakt

tussen algemene emotieregulatievaardigheden (zoals emotieregulatieproblemen) en specifieke emotieregulatiestrategieën (zoals rumineren, het herhaaldelijk langdurig denken over gevoelens). Van beide domeinen weten we inmiddels dat zij onderliggend zijn aan externaliserende gedragsproblemen. Wetenschappelijk onderzoek laat bijvoorbeeld zien dat jongeren die moeite hebben met het reguleren van hun emoties vaker externaliserende gedragsproblemen ontwikkelen (Röll et al., 2012). Ook gebruiken deze jongeren vaker maladaptieve emotieregulatiestrategieën, oftewel strategieën die jongeren beperken in het succesvol reguleren van hun emoties, zoals het onderdrukken van een emotie (McLaughlin et al., 2014). In **Hoofdstuk 1** van dit proefschrift komt echter naar voren dat een aantal belangrijke vragen met betrekking tot de link tussen emotieregulatie en externaliserende gedragsproblemen nog niet beantwoord kunnen worden, omdat eerder wetenschappelijk onderzoek voornamelijk domein-specifiek is, omdat er bijvoorbeeld alleen naar specifieke emotieregulatiestrategieën werd gekeken.

In **Hoofdstuk 2** werden daarom allereerst twee verschillende manieren om emotieregulatiestrategieën te classificeren geïntegreerd tot één systeem. De resultaten van ons onderzoek onder 336 middelbare scholieren lieten zien dat de onderliggende structuur van emotieregulatie in de adolescentie het best kan worden gekarakteriseerd door middel van dit geïntegreerde systeem. In dit systeem werden uitkomst-georiënteerde strategieën (het verschil tussen *adaptieve* en *maladaptieve* emotieregulatiestrategieën) en proces-georiënteerde strategieën (het verschil tussen *gedragsmatige* en *cognitieve* emotieregulatiestrategieën) gecombineerd. Daarnaast bleek dat jongeren met externaliserende gedragsproblemen geneigd zijn om hun emoties (specifiek de emotie boosheid) te reguleren met gedragsmatige maladaptieve regulatie strategieën, zoals zich terugtrekken uit de situatie, terwijl jongeren die geen psychische problemen ervaren geneigd zijn om een mix van cognitieve en gedragsmatige adaptieve regulatie strategieën, zoals probleem-oplossen, te gebruiken.

Vervolgens heb ik mij in **Hoofdstuk 3** gericht op jongeren met een LVB. Hoewel we weten dat deze groep jongeren een verhoogd risico heeft op het ontwikkelen van externaliserende gedragsproblemen, is er vanuit de literatuur weinig bekend over hoe deze jongeren met hun emoties omgaan. Daarom zijn in **Hoofdstuk 3** de emotieregulatievaardigheden van jongeren met externaliserende gedragsproblemen en een LVB vergeleken met de emotieregulatievaardigheden van jongeren met externaliserende gedragsproblemen en een gemiddelde intelligentie. Hierbij werden verschillende domeinen van emotieregulatie in beschouwing genomen, zoals emotieregulatieproblemen, het gebruik van emotieregulatiestrategieën en dagelijkse niveaus van boosheid. De bevindingen lieten zien dat het emotieregulatieprofiel van jongeren met externaliserende gedragsproblemen en een LVB kan worden

gekaracteriseerd als *gedragmatig*. De groep jongeren met een LVB rapporteerde echter minder emotieregulatieproblemen, minder maladaptieve regulatiestrategieën en lagere niveaus van boosheid dan de groep jongeren met een gemiddelde intelligentie. Hoewel jongeren met een LVB dus een hoger risico hebben op de ontwikkeling van externaliserende gedragsproblemen dan jongeren met een gemiddelde intelligentie, lijkt het erop dat zij niet meer problemen ervaren met het reguleren van hun emoties.

Samenvattend blijkt uit het eerste deel van mijn proefschrift dat (1) de onderliggende structuur van emotieregulatie in de adolescentie het best kan worden gekarakteriseerd door middel van een geïntegreerd systeem; (2) jongeren met externaliserende gedragsproblemen geneigd zijn om emoties te reguleren op een gedragsmatige (maladaptieve) manier; en (3) jongeren met externaliserende gedragsproblemen en een LVB niet méér problemen rapporteren met het reguleren van emoties dan jongeren met externaliserende problemen en een gemiddelde intelligentie.

## **Deel 2: Emotieregulatietraining als een Behandelelement voor Externaliserende Gedragsproblemen**

In het tweede deel van mijn proefschrift werd vervolgens ingezoomd op emotieregulatietraining als een behandelelement voor externaliserende gedragsproblemen. Vanwege de relatie tussen emotieregulatie en externaliserende gedragsproblemen, is het niet verrassend dat bestaande interventies zich regelmatig richten op het versterken van emotieregulatievaardigheden. Deze interventies bestaan echter vaak uit allerlei verschillende elementen en technieken. Ze richten zich dus niet alleen op emotieregulatie, maar ook op andere aspecten, zoals het verhogen van motivatie of het verminderen van vijandige intentietoekenning. Deze interventies worden daarom “cocktail-interventies” genoemd (Leijten et al., 2015). De effectiviteit van cocktail-interventies wordt meestal onderzocht door middel van Randomized Controlled Trials (RCTs). Hoewel dergelijke RCTs van groot belang zijn, omdat zij zicht geven op de werkzaamheid van complete interventies, kunnen op basis van RCTs geen uitspraken worden gedaan over de werkzaamheid van *specifieke* behandelelementen. Er was daarom tot nu toe ook weinig bekend over de werkzaamheid van het specifieke behandelelement emotieregulatietraining. Bovendien bleek de therapeutische aanpak (zoals de relatieve nadruk op cognitieve of juist gedragsmatige technieken) waarmee emotieregulatievaardigheden worden getraind in bestaande interventies erg divers, zonder dat we wisten wat beter werkte. Het is dan ook van meerwaarde om te weten wat het relatieve effect van een bepaalde therapeutische aanpak is, omdat de emotieregulatietrainingselementen uit bestaande interventies hiermee verbeterd kunnen worden.

Om de effectiviteit van het behandelelement emotieregulatietraining te onderzoeken heb ik allereerst, samen met een team van experts, een experimentele training ontwikkeld: de Denk en Doe Cool training. De training werd ontwikkeld op basis van bestaande, bewezen effectieve interventies en later aangepast voor jongeren met een LVB. In **Hoofdstuk 4** werd deze training beschreven, evenals de methodologische aspecten van het onderzoek naar de effecten van de training (een zogenoemde preregistratie van het onderzoeksprotocol). De training richt zich op het aanleren van emotieregulatievaardigheden, via ofwel een cognitieve aanpak (de Denk Cool module; 5 sessies van 45-60 minuten), ofwel een gedragsmatige aanpak (de Doe Cool module; 5 sessies van 45-60 minuten). In beide modules wordt een drie-stapsmodel van emotieregulatie gebruikt. Stap één richt zich op het herkennen van boosheid via een boosheid-thermometer die zich richt op situaties, lichaamssignalen en gedachten of gedragingen. Stap twee richt zich op het verminderen van boosheid, via ofwel cognitieve adaptieve strategieën (aan iets leuks denken, praten in je hoofd, helpende gedachten), ofwel gedragsmatige adaptieve strategieën (iets leuks doen, diep ademhalen, uit de situatie stappen). Stap drie richt zich op het oplossen van de situatie die voorafging aan de oplopende boosheid. Deze laatste stap wordt geoefend via cognitieve probleemoplossing of gedragsoefeningen, afhankelijk van de aanpak.

Vervolgens werden in **Hoofdstuk 5** de resultaten van een *micro-trial* onder 108 jongeren met externaliserende gedragsproblemen en een gemiddelde intelligentie beschreven. In tegenstelling tot RCTs, richten micro-trials zich op de effecten van specifieke behandelelementen doormiddel van gericht experimenteel onderzoek. In de micro-trial, die op scholen plaatsvond, werden jongeren willekeurig toegewezen aan een experimentele of controleconditie. Alle jongeren in de experimentele conditie volgden de Denk en Doe Cool modules, maar de volgorde werd afgewisseld (één groep volgde eerst de cognitieve module, de andere groep eerst de gedragsmatige module). De resultaten van het onderzoek lieten zien dat jongeren in de experimentele conditie na afronding van de training meer adaptieve emotieregulatiestrategieën tot hun beschikking hadden dan jongeren in de controleconditie. Het behandelelement emotieregulatietraining bleek dus een positief effect te hebben op de adaptieve emotieregulatiestrategieën die jongeren tot hun beschikking hebben. We vonden echter geen effect op - door ouders en leerkrachten gerapporteerde - externaliserende gedragsproblemen. Bovendien was de afname van door jongeren zelf gerapporteerde externaliserende gedragsproblemen onverwachts groter in de controle conditie dan in de experimentele conditie. Tot slot vonden we ook geen effecten van therapeutische aanpak (de cognitieve Denk Cool versus de gedragsmatige Doe Cool) of volgorde (eerst Denk Cool of eerst Doe Cool).

In **Hoofdstuk 6** werden vervolgens de resultaten van een micro-trial onder 42 jongeren met externaliserende gedragsproblemen en een LVB beschreven. In deze micro-trial, die in een residentiële behandelinstelling plaatsvond (waarbij jongeren dus in de instelling wonen), werden jongeren willekeurig toegewezen aan de Denk Cool – Doe Cool volgorde, of omgekeerd. De resultaten van het onderzoek lieten zien dat er voor jongeren met een LVB zowel effecten van de therapeutische aanpak als de volgorde zijn. Wat betreft de therapeutische aanpak, bleek dat de cognitieve module effectiever was dan de gedragsmatige module, in zowel het verminderen van emotieregulatieproblemen (wekelijkse metingen, door jongeren gerapporteerd) als in het verminderen van externaliserende gedragsproblemen (vóór- en nameting, door groepsleiding gerapporteerd). Bovendien hadden jongeren in de Denk Cool – Doe Cool volgorde na afloop van de training minder emotieregulatieproblemen dan jongeren in de Doe Cool – Denk Cool volgorde.

Samenvattend blijkt uit het tweede deel van mijn proefschrift dat (1) het van belang is om te onderzoeken welke elementen en welke therapeutische aanpak bijdragen aan het effect van interventies; (2) voor jongeren met een gemiddelde intelligentie het behandelelement emotieregulatietraining een positief effect heeft op adaptieve emotieregulatiestrategieën, maar *niet* op maladaptieve emotieregulatiestrategieën en externaliserende gedragsproblemen; en (3) dat voor jongeren met een LVB de werkzaamheid van interventies voor externaliserende gedragsproblemen waarschijnlijk geoptimaliseerd kan worden door een sterkere focus op een cognitieve, in plaats van gedragsmatige, therapeutische aanpak van emotieregulatietraining.

## **Discussie**

Wanneer de resultaten van het eerste en tweede deel van dit proefschrift worden geïntegreerd, valt allereerst op dat in deel één naar voren kwam dat jongeren met externaliserende gedragsproblemen en een LVB niet méér problemen lijken te ervaren met het reguleren van hun emoties dan jongeren met externaliserende problemen en een gemiddelde intelligentie (**Hoofdstuk 3**), terwijl in deel twee enkel positieve effecten van (cognitieve) emotieregulatietraining werden gevonden op de externaliserende gedragsproblemen van jongeren met een LVB (**Hoofdstuk 5**). Bovendien was de afname van zelf-gerapporteerde externaliserende gedragsproblemen - voor jongeren met een gemiddelde intelligentie - onverwachts sterker in de controle conditie dan in de experimentele conditie (**Hoofdstuk 6**). Op het eerste oog lijken deze bevindingen tegengesteld aan elkaar. Omdat emotieregulatie echter alleen door middel van zelfrapportage werd gemeten, is een alternatieve verklaring voor de bevindingen uit **Hoofdstuk 3** dat jongeren met externaliserende gedragsproblemen niet daadwerkelijk

*minder* emotieregulatie problemen hebben, maar juist meer *moete* hebben met het herkennen en rapporteren van emotionele processen. Het zou kunnen dat jongeren met een LVB door de (cognitieve) emotieregulatietraining vervolgens meer zicht kregen op hun emoties. Ook zou het zo kunnen zijn dat emotieregulatie-aspecten geen verklaring vormen voor het *verhoogde* risico dat deze jongeren hebben op het ontwikkelen van externaliserende gedragsproblemen, maar desondanks toch een belangrijk multi-dimensioneel onderliggend mechanisme is van externaliserende gedragsproblemen.

Een mogelijke verklaring voor de onverwachte bevinding dat jongeren in de controle conditie (**Hoofdstuk 6**) een sterkere afname rapporteerden in externaliserende gedragsproblemen dan jongeren in de experimentele conditie, is eveneens dat jongeren die de training volgden – gaandeweg – beter werden in het herkennen van hun problemen, waardoor mogelijk de effecten van de training werden onderdrukt. De bevindingen van zelf-gerapporteerde externaliserende gedragsproblemen moeten dus voorzichtig geïnterpreteerd worden. Tot slot moet opgemerkt worden dat de micro-trial bij jongeren met een LVB (**Hoofdstuk 6**) - in tegenstelling tot de micro-trial bij jongeren met een gemiddelde intelligentie (**Hoofdstuk 5**) – geen controleconditie bevatte. De effecten zijn daarom niet met zekerheid toe te schrijven aan de emotieregulatietraining, maar kunnen bijvoorbeeld ook door andere factoren ontstaan zijn.

Dit onderzoek biedt onder meer verschillende aanknopingspunten voor toekomstig micro-trial onderzoek. Een aantal methodologische overwegingen binnen de twee micro-trials uit dit proefschrift (zoals het wel/niet toevoegen van een controleconditie en het gebruikmaken van zowel traditionele vragenlijstmethododes als wekelijks herhaalde metingen) kenmerken de balans die men als onderzoeker probeert te zoeken tussen traditionele en vernieuwende onderzoeksmethododes. In mijn ogen zijn micro- en macro-trials (RCTs) echter niet twee totaal verschillende onderzoeksmethododes, maar vormen deze een continuüm. Aan beide kanten van dit continuüm kleven zowel voor- als nadelen. Voor vervolgonderzoek is het dus van belang om weloverwogen methodologische keuzes te maken en gebruik te maken van het optimale design voor de betreffende onderzoeksvraag.

In dit onderzoek is vanuit bestaande interventies toegewerkt naar een training bestaande uit emotieregulatie-elementen. Er is dus gebruik gemaakt van een “top-down” aanpak. Vervolgonderzoek zou echter ook een “bottom-up” aanpak kunnen overwegen, waarin niet gestart wordt vanuit bestaande interventies, maar juist nieuwe behandel-elementen worden ontwikkeld. Voor de ontwikkeling van deze nieuwe elementen, lijkt samenwerking met jongeren (zogenoemde *citizen science*) van groot belang. Behandel-elementen die vanuit deze samenwerking tussen onderzoekers en

jongeren ontstaan, kunnen vervolgens stapsgewijs worden getoetst, vanuit micro-naar macro- onderzoekniveau. Op deze manier kan er gradueel toegewerkt worden naar effectievere behandeling voor externaliserende gedragsproblemen, voor zowel jongeren met een gemiddelde intelligentie als jongeren met een LVB.

### **Implicaties voor de Klinische Praktijk**

De bevindingen van dit onderzoek hebben diverse implicaties voor de klinische praktijk, zowel op het gebied van richtlijnen en beleid, als op het gebied van therapeutische aanpak. Op dit moment wordt (wetenschappelijke) kennis met betrekking tot de effectiviteit van jeugdinterventies gebundeld in de Databank Effectieve Jeugdinterventies van het Nederlands Jeugdinstituut. Op basis van de huidige bevindingen zouden beleidsmakers kunnen overwegen om de resultaten van micro-trial onderzoek naar behandel-elementen ook in de databank op te nemen, omdat dit onderzoek aanknopingspunten biedt voor optimalisering van interventies. Tegelijkertijd moet er echter voor worden gewaakt dat behandel-elementen niet als een soort 'keuzemenu' worden voorgeschoteld, omdat de effecten van behandel-elementen afhangen van de inbedding in een gestructureerde interventiecontext, waarbij de interventie wordt gegeven door goed opgeleide trainers.

Specifiek voor jongeren met een LVB, laten de huidige bevindingen daarnaast zien dat wanneer behandelaren de effectiviteit van bestaande interventies willen versterken, ze zouden kunnen beginnen met het bewust kiezen van een cognitieve therapeutische aanpak, alvorens een gedragsmatige aanpak toe te passen. Dat is wellicht contra-intuïtief: veelal wordt er bij deze jongeren nu juist gericht op gedrag in plaats van op cognities. In lijn hiermee zouden dan ook de richtlijnen voor cognitieve gedragstherapie bij jongeren met een LVB aangepast kunnen worden. Hierin wordt op dit moment namelijk gesteld dat interventies voor een LVB zich sterker moeten focussen op gedrag, terwijl de bevindingen van dit onderzoek aantonen dat een focus op cognities effectiever is voor deze specifieke doelgroep, althans in ieder geval als het gaat om emotieregulatie.

### **Conclusie**

Externaliserende gedragsproblemen hebben nadelige gevolgen voor zowel jongeren zelf als hun omgeving. Het is dus van belang dat deze problemen aangepakt worden, zowel voor jongeren met een gemiddelde intelligentie als voor jongeren met een LVB. Om de effectiviteit van bestaande interventies te optimaliseren is het noodzakelijk om meer zicht te krijgen op onderliggende mechanismes, zodat we weten "aan welke knoppen we moeten draaien". Dit proefschrift heeft laten zien dat emotieregulatie een belangrijke, multidimensionale onderliggende factor van externaliserende

gedragsproblemen in de adolescentie is. Daarnaast benadrukt dit proefschrift het belang van onderzoek naar welke specifieke behandlelementen en welke therapeutische aanpakken, voor welke groepen jongeren, bijdragen aan de effecten van interventies. Tot slot bleek dat interventies voor jongeren met externaliserende gedragsproblemen en een LVB verbeterd kunnen worden door een sterkere focus te leggen op cognitieve, in plaats van gedragsmatige emotieregulatietraining.





## ■ DANKWOORD

*Humans grow in connection with others, and time has shown me that dissertations grow in the same way! I am grateful for everyone who contributed to the birth and growth of this dissertation. Together, each and every one of you shaped me into the researcher, and person, that I am becoming.*

Allereerst wil ik mijn promotoren bedanken. Jullie onvoorwaardelijke steun en vertrouwen hebben mij doen floreren. **Bram**, vanaf dag één dat wij elkaar kennen bewonder ik jouw snelheid van denken en vermogen om projecten, ideeën en mensen te verbinden. Het enthousiasme waarmee jij werkt is bovendien aanstekelijk! Als begeleider weet jij de perfecte balans te vinden tussen afremming, waar nodig, en stimulans, waar mogelijk. Toen ik bijvoorbeeld tijdens een kerstdiner mijn wens voor het organiseren van een Bachelorstage Psychologie uitsprak, was jouw eerste reactie “laten we het gewoon proberen!” Met jou als begeleider gaan (internationale) deuren open en komen bijzondere kansen voorbij. Hier ben ik je enorm dankbaar voor. **Maja**, tijdens het schrijven van mijn research master scriptie wist ik al dat jij met jouw oprechte, uitdagende en stimulerende begeleidingsstijl het beste in mij naar boven haalt. Het liefst breng ik een zo’n complex mogelijk ‘probleem’ mee naar onze afspraken want discussiëren met jou is een feestje! Jouw kritische blik, uitgesproken directe persoonlijkheid en oplossingsgerichtheid hebben mij in de afgelopen jaren in staat gesteld om een eigen visie op interventieonderzoek te ontwikkelen. Wat bof ik met jou als mentor!

Waar ik ook enorm mee bof is dat ik niet één, maar twee dagelijks begeleiders had, die elkaar ook nog eens heel goed aanvulden: **Ankie** en **Hilde**. Tijdens onze vrijdagmiddag afspraken, waarin ik meestal met een enorme lijst aan vraagstukken kwam, vonden we de tijd om niet alleen alle inhoudelijke dilemma’s te bespreken (gaan we voor titel optie A, B – of toch misschien optie C?), maar was er ook ruimte voor gezelligheid en persoonlijke dilemma’s. **Ankie**, jouw scherpe blik en hands-on ervaring met interventie onderzoek bij complexe doelgroepen was van enorme waarde binnen dit project. Met al mijn vragen kon ik bij jou terecht en als jij een document had bekeken dan kon ik met een gerust gevoel op verzenden klikken, wetende dat ook alle details zouden kloppen! **Hilde**, ik heb enorm veel geleerd van jouw communicatie- en organisatietalent. Complexe vraagstukken leken ineens simpel als we er samen naar keken! Jouw onderzoekservaring bij jongeren met gedragsproblemen kwam enorm van pas tijdens

alle fases van het project en stelde mij bovendien in staat om af en toe even afstand te nemen van de lopende zaken (althoewel een dataverzameling managen vanuit de Oostenrijkse bergen wel een extra dimensie gaf aan mijn promotietijd).

Daarnaast wil ik het **ExtrAct consortium** bedanken voor de fantastische samenwerking. We zijn gezamenlijk opgetrokken om de zorg voor jongeren met externaliserende gedragsproblemen te verbeteren, met elk van jullie een eigen expertise én invalshoek. Toen ik in 2016 met mijn promotieonderzoek startte, kwam ik dankzij jullie in een warm onderzoeks-bad terecht. In het bijzonder wil ik **Ypke** en **Gonnie** van PiResearch bedanken, jullie inbreng was van groot belang bij het ontwikkelen van de Denk en Doe Cool training. **Gonnie**, gezamenlijk hebben wij niet alleen de training en alle materialen ontwikkeld, maar ook de trainersopleidingsdagen en supervisies vormgegeven. Dankjewel voor je kennis en ervaring die je zo goed over kon brengen op onze trainers-cursisten, je creatieve werkwijze, je oplossingsgerichtheid en de manier waarop wij op elkaar konden inspelen. Het liefst had ik nog veel meer trainingdagen gegeven met jou, met extra veel lekkers en originele bedankjes! Daarnaast wil ik **Jolanda** en **Bas** van 'Heerenloo bedanken. Dankzij jullie heb ik een aantal avond-shifts mogen meedraaien op de Keulenkamp in Ermelo, een behandelgroep voor jongeren met gedragsproblemen en een Licht Verstandelijke Beperking (LVB). Dit heeft mij de kans geboden om deze fantastische doelgroep te leren kennen (en gaf de bevestiging dat mijn gym-motoriek er na de middelbare school niet meer op vooruit is gegaan). **Jolanda**, jouw inbreng binnen het Denk en Doe Cool Plus onderzoek was van onschatbare waarde. Ik wil je bedanken voor jouw hulp bij zowel de inhoudelijke als praktische organisatie op locatie, voor het enthousiasmeren en informeren van alle betrokkenen en voor het doelgroep specifiek maken van de behandelmodules. Maar bovenal wil ik je bedanken voor de fijne samenwerking, je flexibiliteit en onze gedeelde aanpakken-mentaliteit. Tot slot wil ik **Walter** bedanken. Van jouw enorme hoeveelheid kennis, ervaring en bedachtzaamheid heb ik veel geleerd.

Dit project was niet van de grond gekomen zonder alle inzet van **scholen, leerkrachten, ouders en natuurlijk de jongeren zelf**. Ik realiseer mij dat voor ieder van jullie meewerken aan het Denk en Doe Cool onderzoek bovenop de hectiek van alledag kwam. Bedankt voor jullie eindeloze energie! In het bijzonder wil ik onze contactpersonen van de Denk en Doe Cool Regulier scholen (**Afke, Annemiek, Aukje, Bibian, Ed, Elly, Hanny, Job, Kirsten, Liane, Lisa** en **Marijn**) bedanken voor het enthousiasmeren van het team, het vrij roosteren van lokalen en het oppakken van al onze – vaak last-minute – vragen en verzoeken. Zowel de onderzoeksmedewerkers als trainers werden met open armen én het benodigde kopje koffie of thee ontvangen. Daarnaast wil ik

mijn eigen middelbare school, **het Baudartius College** in Zutphen bedanken. Wat bijzonder dat ik in de beginfase van mijn promotietraject bij jullie langs mocht komen voor dataverzameling!

Ook onmisbaar in dit project zijn alle trainers die met eindeloos veel doorzettingsvermogen, oplossingsgerichtheid en creativiteit de Denk en Doe Cool Regulier (**Anouk, Aukje, Juliëtte, Marit, Melvin, Robin, Monique, Peter, Ursula** en **Vanja**) en de Denk en Doe Cool Plus (**Anne, Brigitte, Chantal, Helga, Jolanda, Kim, Lieke, Linda, Majolijn, Patrick, Sandra** en **Jordy**) training hebben gegeven. Wat bijzonder dat jullie de jongeren altijd op de eerste plek konden zetten en tegelijkertijd een gedetailleerd protocol konden volgen (zelfs wanneer opname apparaten ineens een waardevol voorwerp bleken te zijn of de onderkant van de tafel boeiender was dan de bovenkant). Van jullie heb ik geleerd hoe je de taal van de individuele jongere kunt spreken! In het bijzonder wil ik **Vanja** en **Bertyl** van de TopGroep bedanken. Jullie zijn vanaf het begin betrokken geweest, hebben de pilot uitgevoerd en ons in contact gebracht met een groot aantal van de trainers. Ik kan me niet voorstellen hoe dit project eruit had gezien zonder jullie inbreng! Ook **Anouk** wil ik in het bijzonder bedanken, niet alleen voor je enthousiasme als trainer, maar ook voor onze inspirerende gesprekken over interventieonderzoek en het motiveren van jongeren.

Hoewel dit proefschrift in het teken staat van twee zogenoemde micro-trials, was de dataverzameling absoluut niet van micro niveau. Dit had ik nooit alleen kunnen doen, dus veel dank aan de **31 bachelor- en masterstudenten** die in het kader van hun scriptie data hebben verzameld. Niet zelden leverde dit uitdagende momenten op, waarbij er een groot beroep werd gedaan op jullie creativiteit. **Karlijn**, voor jouw researchmaster stage hielp jij mee tijdens de meest hectische fase van het project, de start van de dataverzameling. Ik zie ons zo weer zitten met alle mappen en printjes om ons heen (waar moet deze – shit bijlage X is kwijt!). Dankjewel voor al je hulp en wat fantastisch dat we onze prettige samenwerking hebben kunnen voort zetten! **Jessica**, tijdens de tweede ronde van de dataverzameling kwam jij het team versterken. Je hebt enorm veel werk verzet rondom het coördineren van zowel de dataverzameling als het codeerwerk, waardoor we uiteindelijk ruim 200 uur aan sessies hebben gecodeerd. Dankjewel voor je doorzettingsvermogen, je sterke communicatievaardigheden en je flexibiliteit (als er bijvoorbeeld een jongere even 'kwijt' was of het noro-virus onze strakke planning in de war leek te schoppen)!

A special word of thanks to **Prof. John Weisz** for giving me the opportunity to work 3.5 months on my dissertation at the Harvard Lab for Youth Mental Health. John, thank you for the warm collaboration and for the opportunities that you have given me. Your work

has enriched and inspired my thinking. **Olivia**, solving problems together is so much fun! I am grateful to continue our collaboration. **Sherelle**, and **the rest of the team**, thank you for all outings, pub nights, and for making me feel at home in the lab. Dear Amory House friends, thank you for being my Boston-family. **Max** and **Ana**, I hope we are able to meet again, soon!

Al mijn **collega's van de afdeling ontwikkelingspsychologie** wil ik bedanken voor de fantastische werksfeer. Ik heb met enorm veel plezier ruim 7,5 jaar – eerst als student-assistent en daarna als promovenda – met jullie samengewerkt. Deze samenwerking heeft de basis en een stevig fundament gelegd voor mijn academische ontwikkeling. In de afrondingsfase van mijn proefschrift heb ik jullie door mijn verblijf in Amerika en de daaropvolgende corona pandemie minder gezien, maar bij jullie voel ik mij online én offline geborgen. De inspirerende werkomgeving, openheid, warmte en betrokkenheid bij elkaars werk en leven draag ik met mij mee.

Een aantal collega's wil ik in het bijzonder bedanken. **Yolanda, Liesbeth, Helen**, ik beschouw jullie als mijn owp-mama's! **Sophie**, als stas-duo waren wij al een gouden combinatie en in de daaropvolgende jaren is onze band alleen maar verder gegroeid. Hoeveel kopjes koffies – die ik zeer regelmatig koud liet worden – hebben we gehaald? Hoe vaak bleek jij mijn reddende engel (voor last-minute dataverzameling of studenten problemen, feedback op stukken, punten op mijn i, beschimmelde kopjes, dode planten of vergeten ontbijtjes)? Hoe vaak vond ik slingers, lieve briefjes of zomaar een grapje van jou op mijn bureau? Hoe vaak deden we de deur van onze werkkamer even 'subtiel' dicht omdat we ófwel de slappe lach hadden, ófwel even moesten sparren? Hoeveel gezelligheid tijdens vrijdagmiddag borrels, congresbezoeken en feestjes hebben wij gehad? Hoe vaak heb jij mij geholpen met het vinden van de (academische) weg in Nederland, Berlijn, Baltimore of Washington? Dankjewel voor alles wat jij voor mij bent: mede interventie-onderzoeker, steun en toeverlaat, paranimf maar bovenal vriendin. **Rogier**, partner in crime, jij hebt mijn promotietijd enorm verrijkt. Dankjewel voor alle verfrissende onderzoeks-inzichten, fantastische discussies én weergalozes borrels. Wanneer gaan we eindelijk bij de bowlingvereniging langs? **Nagila**, onze schrijfweken in Zeeland, 'pandemische' werkdagen en eindeloze gesprekken over onderzoek, ambities en dromen betekenen heel veel voor mij. Wat fijn dat jij samen met Sophie mijn paranimf wil zijn! Ook de (oud)-Jonkies **Meike, Inge, Ziyang, Wieteke, Yue, Shuyang, Mengtian, Danni, Anouk, Tessa, Yixin** en **Eva** wil ik enorm bedanken. I really enjoyed being part of Jonkie!

Daarnaast wil ik een aantal collega's bedanken die niet in de fameuze H-gang van het Langeveldgebouw zaten, maar wél heel belangrijk voor mij zijn geweest. **Janet**,

**Karima, Amal** en de andere medewerkers van het secretariaat, ik wil jullie bedanken voor de oprechte interesse als ik weer eens enorme stapels mappen, flip-overs of pennen kwam halen (of gewoon even zin had om te kletsen en de ontbrekende pen een excuus was voor gezelligheid). **Roy** en **Dennis** van de ICT-afdeling wil ik bedanken voor het ontwikkelen van de Denk en Doe Cool app én alle aanpassingen aan de app toen de deelnemende jongeren al direct doorhadden hoe de app te 'hacken' was. **Maroesjka** en **Maaïke**, wat fijn dat we de SIVT konden toevoegen, ik hoop dat we snel tijd hebben om ermee aan de slag te gaan! **Esther**, ik vond het fantastisch om samen met jou naar Australië te gaan. Hoewel ik de eerste week vooral onder bergen dekens op de bank lag (lang leve de jetlag) hebben we dit meer dan goed gemaakt met (veel te dure) IPA's, flat whites en wandelingen door de Blue Mountains (sorry voor mijn slechte kaartleesvaardigheden). I also want to thank **Prof. Mark Dadds** and his team at the Sydney Child Behaviour Research Clinic for their warm welcome in Sydney. The way in which your clinic combines research and practice is very inspiring. I also wish to thank **Prof. Janice Zeman**, for inviting me to your SRCD emotion regulation symposium, after an inspiring coffee break at the ISSBD conference in Australia. I am grateful for our collaboration on the first chapter of my dissertation and hope that we will meet again. Maybe this time on the third continent – Europe?

Ook alle collega's waarmee ik in de afgelopen jaren heb samengewerkt aan projecten die enigszins los stonden van mijn proefschrift – waarbij ik mijn behoefte tot vernieuwing, uitdaging, afwisseling en extra samenwerkingen zo goed kwijt kon – wil ik enorm bedanken. **Anne, Yolanda, Annerieke** en **Nathalia**, wat ontzettend tof dat we de bachelorstage K&J bij de Tussenvoorziening hebben kunnen opzetten! **Spark, Fayette, Rianne, Imke** en **Oisín**, wat was het fijn om gezamenlijk ons schrijfproces te evalueren onder het genot van een cappuccino in de Village. **VNOP-CAS Research Days** mede-organisatoren, onze afspraken bij Bistro Centraal waren in de hectiek van dataverzameling een super welkome afwisseling! **Anneloes, Anke, Catrin, Maja, Sander, Wilma** ik heb enorm veel geleerd van jullie tijdens de CAS-vergaderingen. **Sander**, dankjewel voor het meedenken en je goede adviezen! **EADP Early Researchers Union** colleagues, it is so much fun to collaborate with young scholars all over Europe. Our writing week in Sicily was fantastic, and I am proud that we published the review article!

Niet direct betrokken bij dit proefschrift, maar wel van onschatbare waarde voor mijn ontwikkeling en voor de nodige relativering en ontspanning in de afgelopen vier jaar, is mijn directe omgeving. Ik voel mij een rijk mens met zoveel lieve mensen om mij heen. Dankjewel voor jullie eindeloze geduld als ik even 'onder een steen zat' omdat ik een deadline wilde halen, voor de momenten waarop jullie mij aanvulden, opvingen

en uitdaagden. Het is moeilijk onder woorden te brengen hoeveel jullie voor mij betekenen, maar een aantal van jullie wil ik tóch graag persoonlijk bedanken. **Eline**, al sinds de kleuterklas ben jij met recht mijn 'hartsvriendin'. Zo verschillend als wij zijn, zo onvoorwaardelijk is onze vriendschap. **Laura**, op verschillende momenten tijdens mijn promotieonderzoek heb jij mij geholpen en uitgedaagd, hoewel wij promoveren in een totaal ander vakgebied. Ik vind het fantastisch dat jullie mij zijn komen opzoeken in Boston en ik hoop dat wij – als drie-eenheid – de wereld blijven ontdekken. **Julia**, al sinds wij samen op het conservatorium in Amsterdam zaten zijn de avonturen die wij samen beleven ongekennd. **Suze, Loes, Lente, Iris, Esther** en **Nagila** – a.k.a. DaSCA-squat – wat bijzonder dat wij elkaar kunnen blijven inspireren en steunen. **Patrick**, lieverd, dankjewel voor je relativiseringsvermogen, je zorgzaamheid, je begrip, maar vooral voor je grenzeloze liefde. In Sicilië wist ik het zeker, samen met jou kan ik de hele wereld aan.

Tot slot wil ik mijn ouders bedanken. Jullie gaven mij doorzettingsvermogen, creativiteit en een liefde voor taal mee. Jullie daagden mij uit om het beste uit mijzelf te halen en leerden me trots te zijn op mijn prestaties. Jullie gaven mij de kracht om te beginnen en genoten met volle teugen mee van iedere stap die ik zette. **Mama**, dankjewel dat ik altijd op jou kan terugvallen, dat je met mij meedenkt, mee leest en mijn voorbeeld bent. **Papa**, dankjewel voor jouw kracht, optimisme en vermogen om in iedere tegenslag een uitdaging te zien.





## ■ ABOUT THE AUTHOR

Lysanne te Brinke (1990) completed both the research master Development and Socialization in Childhood and Adolescence (2015) and the clinical master Developmental Psychology (2016, cum laude) at Utrecht University. During her studies, she worked as a student-assistant, completed a clinical internship at Curium-LUMC Leiden, and obtained a certificate of psychological assessment (BAPD). In 2016, Lysanne started her four-year PhD project at the department of Developmental Psychology at Utrecht University. During her PhD project, she also gained international experience: a VVAO travel grant enabled her to visit the Child Behaviour Research Clinic (University of Sydney, three weeks) and a Prins Bernhard Cultuurfonds and Kind & Adolescent travel grant enabled her to visit the Lab for Youth Mental Health (Harvard University, 3.5 months). Currently, Lysanne works as a post-doctoral researcher at Erasmus University Rotterdam, where she continues to explore her research interests into optimization of evidence-based interventions.



## ■ PUBLICATIONS

### Manuscripts in this Dissertation

- te Brinke, L. W.**, Menting, A. T. A., Schuiringa, H.D., Zeman, J., & Deković, M. (2020). The structure of emotion regulation strategies in adolescence: Differential links to internalizing and externalizing problems. *Social Development*. Advance online publication. <https://doi.org/10.1111/sode.12496>
- te Brinke, L. W.**, Schuiringa, H. D., & Matthys, W. (2021). Emotion regulation and angry mood among adolescents with externalizing behavior and intellectual disabilities. *Research in Developmental Disabilities*. Advance online publication. <https://doi.org/10.1016/j.ridd.2020.103833>
- te Brinke, L. W.**, Schuiringa, H. D., Menting, A. T. A., Deković, M., & de Castro, B. O. (2018). A cognitive versus behavioral approach to emotion regulation training for externalizing behavior problems in adolescence: Study protocol of a randomized controlled trial. *BMC Psychology*, 6, 1-12. <https://doi.org/10.1186/s40359-018-0261-0>
- te Brinke, L. W.**, Menting, A. T. A., Schuiringa, H. D., Deković, M., Weisz, J. R., & de Castro, B. O. Emotion regulation training as a treatment element for externalizing problems in adolescence: A randomized controlled micro-trial. *Submitted for publication*.
- te Brinke, L. W.**, Schuiringa, H. D., Menting, A. T. A., Deković, M., Westera, J. J., & de Castro, B. O. Differential effects of a cognitive versus behavioral treatment approach for adolescents with externalizing problems and intellectual disabilities. *Submitted for publication*.

### Other Manuscripts

- Lo Cricchio, M. G., García-Poole, C., **te Brinke, L. W.**, Bianchi, D., & Menesini, E. (2021). Moral disengagement and cyberbullying involvement: A systematic review. *European Journal of Developmental Psychology*, 18(2), 271-311. <https://doi.org/10.1080/17405629.2020.1782186>
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- Stoltz, S., van Londen, M., **te Brinke, L. W.**, & Deković, M. (2018). Effecten van Alles Kidzzz in de dagelijkse praktijk. [Effects of Stay Cool Kidzzz in daily practice]. *Kind en Adolescent*, 39(1), 41-57. <https://doi.org/10.1007/s12453-018-0164-0>

- te Brinke, L. W.,** Albrecht, G., Matthys, W., Schuiringa, H. D., & Menting, A. T. A. (2017). *De DenkCool en DoeCool training: Introductie, theoretische onderbouwing en trainershandleiding*. [The ThinkCool ActCool training: Introduction, theoretical background, and treatment manual]. Universiteit Utrecht.
- te Brinke, L. W.,** Albrecht, G., Schuiringa, H. D., Westera, J., Matthys, W., & Menting, A. T. A. (2018). *De DenkCool en DoeCool training voor jongeren met een Licht Verstandelijke Beperking: Introductie, theoretische onderbouwing en trainershandleiding*. [The ThinkCool ActCool training for Adolescents with a Mild to Borderline Intellectual Dissability: Introduction, theoretical background, and treatment manual]. Universiteit Utrecht.
- te Brinke, L. W.,** Deković, M., Stoltz, S. E., & Cillessen, A. H. (2017). Bidirectional effects between parenting and aggressive child behavior in the context of a preventive intervention. *Journal of Abnormal Child Psychology*, 45(5), 921-934. <https://doi.org/10.1007/s10802-016-0211-3>



Over the past decades, numerous interventions have been developed that target externalizing problems in adolescence. The effects of these interventions are, however, only small to moderate. The overall aim of this dissertation was therefore to provide information that can be used for intervention optimization.

The first part of this dissertation focuses on an important *underlying mechanism* of externalizing problems: emotion regulation. Findings indicate that the structure of emotion regulation strategies may best be captured with an integrated system, combining adaptive, maladaptive, cognitive and behavioral strategies, and that adolescents with externalizing problems are more inclined to use behavioral rather than cognitive regulation strategies. In the second part of this dissertation, the effect of emotion regulation training as a *treatment element* for externalizing problems in adolescence was examined with a micro-trial approach. Findings show that for adolescents with average intelligence, emotion regulation training has a positive effect on adaptive regulation strategies, but not on externalizing problems. For adolescents with mild to borderline intellectual disabilities, findings suggest that the effectiveness of interventions could be enhanced through an increased focus on cognitive, rather than behavioral approaches to emotion regulation training.