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Assessment of Emotion Regulation in Adolescents with Depressive or Anxiety Disorder

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Content

Introduction

Clinical Psychological Description of Depressive Disorders in Adolescents

According to the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5th edition; American Psychiatric Association, 2013), a diagnosis of depressive disorder requires at least five symptoms to be present for a minimum of two weeks. Firstly, either a depressed mood or a noticeable loss of interest or pleasure must be present (DSM-5; American Psychiatric Association, 2013). Secondly, additional symptoms such as insomnia or hypersomnia, changes in appetite or weight, low energy or fatigue, feelings of guilt or worthlessness, agitation or slowing of psychomotor functions and recurrent thoughts of death and suicide must be observable. The severity of the disorder is categorized as mild, moderate or severe depending on the amount of occurrence of the symptoms (DSM-5; American Psychiatric Association, 2013).

Comparing 10 frequently seen depressive symptoms in adolescents with the same depressive symptoms in adults, their mean symptom score was 7.5 instead of 7.1 (Rice et al., 2019). The most common primary symptom in both age groups was depressed mood, while loss of interest was more common in adults. Symptoms more prominent in adolescents than adults are weight gain, weight loss, insomnia and energy loss (Rice et al., 2019).

In addition to clinical symptoms, the social functioning is impaired in individuals with depressive disorder. They experience a negative emotional bias which becomes apparent in the recognition of facial expressions, during the perception of emotional body language and in the detection of emotions from word descriptions (Kupferberg et al., 2016). Affected individuals often experience a diminished desire for social interaction, which can result in a significant difficulty to fulfill their social roles. Recovery from depression also involves an improvement in empathy, mentalizing and successful fulfillment of the social role which therapeutic approaches should further target (Kuperberg et al., 2016).

Research indicates that specific brain regions are particularly activated in processes associated with depression. When anticipating reward, adolescents show hypoactivation of the ventral striatum and decreased activity in orbital prefrontal cortex and nucleus accumbens (Auerbach et al., 2022; Thapar et al., 2022). A blunted response of brain activity to rewarding stimuli can be connected to the onset and maintenance of depression. When exposed to negative stimuli, adolescents show increased activity in the amygdala, supragenual anterior cingulate cortex and the orbitofrontal cortex. This hyperactivity indicates that depressed

individuals have a greater vigilance to potentially negative stimuli in the environment and thereby maintain their low mood state (Gillihan et al., 2010). Greater connectivity is shown within this affective circuitry as well as in the ventrolateral prefrontal cortex (Thapar et al., 2022).

An early onset of depression in life can lead to several long-term negative consequences throughout development, including developmental delays, social rejection, academic challenges and psychological difficulties in adulthood (Kessler et al., 2005; Ravens-Sieberer et al., 2015). Moreover, the risk of suicide is a highly dramatic consequence of the disease. As noted by the World Health Organization (World Health Organization, 2014), suicide is the second leading cause of death among individuals aged 15 to 29, which underscores the need for meticulous diagnostic and preventative efforts in adolescent populations.

Wagner et al. (2017) revealed that the point prevalence rate of depressive disorder in children and adolescents aged 10-18 years was estimated to be 2.85% in Austria. For the same sample, the lifetime prevalence rate appeared to be 6.19%. An assessment in a Dutch sample from 2001-2010 showed that the age of onset appeared to be 14.2 years on average (Ormel et al., 2015). Like many mental disorders, depression often has its onset during adolescence, and its occurrence significantly elevates the risk of developing psychiatric disorders in adulthood (Kessler et al., 2005).

An investigation about the risks and consequences of the COVID-19 pandemic states that depressive symptoms have increased in American adolescents from New York of a broader age range (12-22 years) than in times before the pandemic (Hawes et al., 2022). Their data support that the severity of symptoms only increased for females, possibly because of heightened response to stress or their exposure to stress factors like school-related problems or concerns about catching COVID-19. In a systematic review and meta-analysis, the change of depression rates in European samples during the pandemic results in the following picture: comparisons showed low certainty of evidence for clinically relevant depression rates (Exp[B]= 1.36, 95%CI [1.05–1.76]) for total population (Ludwig-Walz et al., 2022). Similar to the American sample females increased in clinically relevant depression rates.

Assigning a psychiatric diagnosis in adolescence remains a topic of ongoing debate, especially challenging because it is difficult to differentiate mental health conditions in this young age group (Lewis et al., 2014). Depression, however, stands out due to its high

population prevalence (Shorey et al., 2022), making it crucial that thorough and careful diagnostics be undertaken, ideally incorporating multiple sources of information. Despite the overall increase in depressive disorders across age groups, the rise is more pronounced among adolescents than adults (Miller et al., 2014; Shorey et al., 2022).

Clinical Psychological Description of Anxiety Disorders in Adolescents

Anxiety disorders are categorized as a distinct chapter in the DSM-5 manual, where various types of anxiety-related conditions are listed (American Psychiatric Association, 2013). Although these disorders differ in their anxiety-related domains and cognitive processes, they share common symptoms, trajectories, and neurophysiological underpinnings (Wehry et al., 2015). Anxiety is a universal emotion that can be described as emotional discomfort linked to the anticipation of danger or loss (Rockhill et al., 2010). As a natural and essential emotion, anxiety functions as a safety mechanism - the *fight or flight* response - which involves physiological changes such as increased heart rate and redirection of blood flow to muscles due to rising adrenaline levels. At mild levels, anxiety is adaptive and useful, as it helps individuals improve their preparation for situations and fosters personal growth (Rockhill et al., 2010). However, the primary feature of anxiety disorders is excessive anxiety, which is disproportionate or lasts longer than what is appropriate for the individual´s developmental stage. Symptoms must persist for more than six months to meet the diagnostic threshold (American Psychiatric Association, 2013).

Two of the most common disorders that are relevant to this study will now be described in more detail: Social Anxiety Disorder (SAD) and Generalized Anxiety Disorder (GAD). SAD is characterized by an intense fear of social situations where individuals feel they might be judged or scrutinized by others, including peers. Core symptoms include excessive worry about being negatively evaluated, fear of humiliation, and avoidance of social or performance situations (American Psychiatric Association, 2013). GAD, on the other hand, involves persistent and excessive worry about various life events or activities, such as work, school, or health. Individuals with GAD often struggle with controlling their worry, which leads to physical symptoms like restlessness, fatigue, concentration difficulties, irritability, muscle tension, and sleep disturbances (American Psychiatric Association, 2013). Another diagnostic criterium of both anxiety disorders is an impairment in social, academic or other areas of functioning. The adolescent could meet the criteria for two or more anxiety disorder diagnoses. Additionally, common comorbidities often include conditions such as attentional deficit hyperactivity disorder, oppositional defiant disorder, or

other internalizing disorders, such as depression (American Psychiatric Association, 2013; Rockhill et al., 2010).

Research suggests that the brains´ fear circuitry, including the amygdala, hippocampus, and prefrontal cortex plays a key role in processing fear and regulating responses to threats. The amygdala responds quickly to danger cues, while the prefrontal cortex contributes to contextual interpretation and fear modulation. The amygdala is highly responsive to stress hormones, strengthening fear-related memories for adaptive purposes, but this stress-induced plasticity can lead to maladaptive, excessive fear responses, which are often seen in anxiety disorders (Shin & Liberzon, 2010). Neuroimaging studies in adolescents with anxiety disorders show a hyperactivity in the amygdala that is insufficiently regulated by the prefrontal cortex (Gerber et al., 2008). In social anxiety disorder, adolescents also show stronger amygdala activation during anxiety-inducing social tasks than healthy controls, suggesting a hyper-responsiveness in neural fear circuits that contributes to their anxiety symptoms (Guyer et al., 2008).

Longitudinal studies have demonstrated that the presence of an anxiety disorder in adolescence is predictive of homotypic continuity of the disorder into early-adulthood (Copeland et al., 2009). Further, the chronic nature of these conditions affect overall mental health as individuals diagnosed with anxiety disorders during adolescence are at an increased risk for developing other psychiatric disorders, such as depression or substance use disorders, later in life (Costello et al., 2011; Pine et al., 1998).

The lifetime prevalence of anxiety disorders among American adolescents aged 13-18 years is reported to be 31.9% and therefore the most common psychiatric diagnosis in adolescence (Merikangas et al., 2010). Within this category, GAD has a lifetime prevalence of 2.2%, while SAD is more common, with a lifetime prevalence of 9.1% (Merikangas et al., 2010). The lifetime prevalence rates of anxiety disorders in an Austrian population were significantly lower (15.58%; GAD = 0.92%, SAD = 3.83%; Wagner et al., 2017). At the point of assessment, the prevalence of GAD was 0.73% and for SAD it was 3.72% in Austrian adolescents (Wagner et al., 2017). Overall, anxiety disorders are more prevalent in girls than boys, with prevalence ratios reaching 2-3:1 in adolescence (Merikangas et al., 2010; Wehry et al., 2015). The female preponderance starts early in life as girls at the age of six are already twice as likely to develop an anxiety disorder than boys after statistically controlling for psychosocial variables (Lewinsohn et al., 1998).

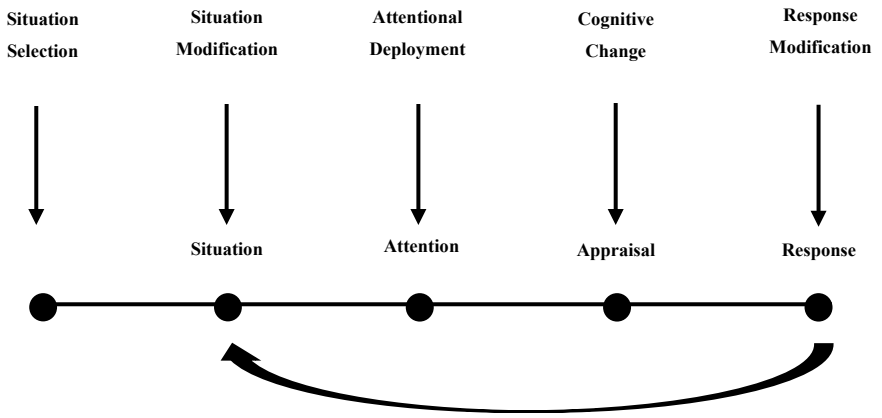
Ormel and colleagues (2015) report in their study that the age of onset for SAD is 10.1 years, while for GAD, it is 13.2 years. During the COVID-19 pandemic prevalence rates of SAD and GAD increased for adolescents in general, but especially for females in the American population (Hawes et al., 2022). Those rising numbers are connected to the adolescents´ concern of being confined at home and meeting basic needs like social interaction and struggling with schoolwork (Hawes et al., 2022).

Emotion Regulation

Many psychiatric disorders are said to be characterized by problems with emotion and their regulation (Berking & Wupperman, 2012; Sheppes, 2015). Since several definitions of Emotion and Emotion Regulation (ER) exist in the literature, appropriate definitions had to be selected for the sake of this study. Emotions consist of sets of cognitive, affective, physiological and behavioral changes after an individual´s evaluation of the value of a stimulus (Mauss et al., 2005). Given that James J. Gross has had a major influence in the field of ER through years of research, his definition will be used as the foundation for the following theoretical framework on ER (Heber et al., 2014; Thompson & Goodman, 2010). According to James Gross, ER "occurs when one activates - either implicitly or explicitly – a goal to influence the emotion-generative process" (Gross et al., 2011). An important distinction in ER lies in whether the goal of regulation is to influence one´s own emotional experience (= intrinsic ER) or to regulate the emotional state of another person (= extrinsic ER; Gross & Jazaieri, 2014). The most prominent framework for organizing emotion regulatory processes is the *Process model of Emotion Regulation* by Gross and Thompson (2007). The model suggests that five families of ER processes can be systemically classified according to when they have their primary impact on the ER process. These include situation selection, situation modification, attentional deployment, cognitive change and response modulation as displayed in Figure 1 (Gross & Thompson, 2007). The individual moves in every emotion-generative cycle from left to right as a function of time and combines various ER strategies depending on the context (Gross & Jazaieri, 2014).

Figure 1

The Process Model of Emotion Regulation. Adapted from Gross, J. J., & Thompson, R. A. (2007). Emotion Regulation: Conceptual Foundations. in J. J. Gross (Ed.) Handbook of Emotion Regulation, 3–24. The Guilford Press.

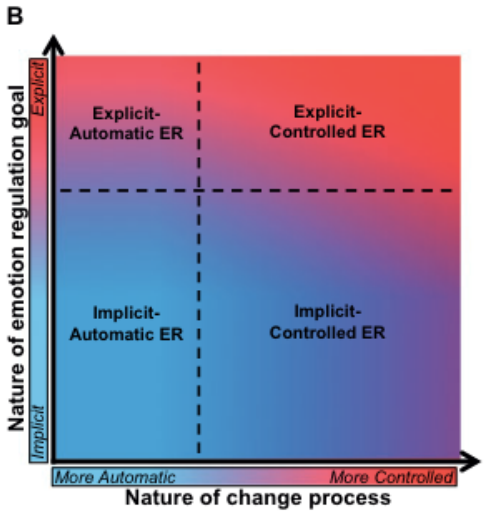


Across various ER models, the dynamic nature of ER is emphasized, particularly the effectiveness of ER strategies that is closely tied to the specific circumstances, including the situational demands and the flexibility with which individuals select and apply different strategies (Aldao, 2013; Gratz & Roemer, 2004; Gross & Thompson, 2007). According to the *Process model of ER*, strategies implemented before an emotion is fully activated (= antecedent-focused strategies) tend to be more effective than those used after an emotion has been fully activated (= response-focused strategies; Gross & Thompson, 2007).

The theoretical foundation for the current study is based on the extended model by Braunstein, Gross and Ochsner (2017), which provides a comprehensive framework for understanding both implicit and explicit ER. The model distinguishes two dimensions of psychological operations: the nature of the ER goal, ranging from implicit/nonconscious to explicit/conscious, and the nature of the emotion change process, ranging from more automatic to more controlled. As seen in Figure 2, the model yields four classes of ER strategies that offer clear criteria for strategies according to goal and process.

Figure 2

Description of the psychological Dimensions involved in different kinds of ER. (Reprinted from Braunstein, L. M., Gross, J. J., & Ochsner, K. N. (2017). Explicit and implicit emotion regulation: A multi-level framework. Social Cognitive and Affective Neuroscience, 12(10), 1545–1557. This work is licensed under a Creative Commons Attribution 4.0 International License [http://creativecommons.org/licenses/by/4.0/]).



Goals can be seen as mental representations of potential states that can be held conscious/explicit or unconscious/implicit. Examples are the desire to feel happier or an implicit goal pursuit as part of self-regulation. The process dimension ranges from more automatic to controlled operations. When the process is more automatic, few top-down processes are engaged and it´s connected to affective learning where individuals update their affective value after experiencing prior affective stimuli. More controlled processes include selection and inhibition of affective stimuli (Braunstein et al., 2017). An example for controlled ER is the use of strategies like suppression or cognitive reappraisal, where one is corresponding to an explicit goal to change emotions using cognitive control processes. This framework provides a more complete understanding of the psychological processes underlying ER strategies.

The neural correlates within this psychological process must be divided into ER and emotional reactivity. Following the framework of implicit and explicit ER (Braunstein et al., 2017), certain brain areas can be linked to the specific processes. During implicit ER, the activity of the ventral anterior cingulate cortex and ventromedial prefrontal cortex is particularly prominent. In explicit ER the following brain regions seem to be activated: dorso- and ventrolateral prefrontal cortex, pre- and supplementary motor area and parietal cortex

(Etkin et al., 2015). However, recent findings from studies on adults should be interpreted with caution, as the neural and cognitive systems of adolescents examined in this study are still in development.

Emotion Regulation Strategies

Reappraisal. The most studied explicit controlled ER strategy is reappraisal. Reappraisal involves "intentionally changing how we think about and describe a stimulus´ meaning so as to alter our emotional response to it" (Gross, 1998). This strategy can be employed either before an emotion-eliciting situation or during the emotional experience itself. It can therefore be categorized as an antecedent-focused strategy (Gross & Thompson, 2007). Neuroimaging studies found that key brain regions that are involved during employing reappraisal are the dorsolateral prefrontal cortex, ventrolateral prefrontal cortex, dorsal anterior cingulate cortex and dorsal medial prefrontal cortex (Braunstein et al., 2017). Especially when down-regulating negative emotions (i.e. during reappraisal) the amygdala, ventral striatum and insula show decreased activity. Gross and John (2003) demonstrated that participants employing reappraisal showed but also felt less negative emotions.

Suppression. Suppression is a way of response modulation that involves inhibiting ongoing emotion-expressive behavior (Gross, 1998). Based on the framework of Braunstein and colleagues (2017), suppression can be described as an explicit controlled ER strategy. Research indicates that suppression reduces outwardly visible emotional reactions, but it does not effectively diminish the intensity of negative emotions internally. Additionally, the use of suppression has been associated with a dampening of positive emotional experiences (Gross & John, 2003). The use of suppression habitually intervenes late in the emotion-generative process and can only modify the behavioral expression of the individual, therefore it is categorized as a response-focused strategy (Gross & Thompson, 2007). Neuroimaging studies report that following brain regions are activated when suppression is employed: the dorsomedial prefrontal cortex, left inferior frontal gyrus, amygdala and the insula (Dörfel et al., 2014; Goldin et al., 2008; Ohira et al., 2006). In contrast to reappraisal and despite the inhibition of emotional expression, the amygdala shows significant emotional arousal here. By around the age of 10, children are believed to gain a clear understanding of expressive suppression within social contexts (such as masking disappointment with a smile when receiving an unwanted gift) and can use this strategy intentionally (Stegge & Terwogt, 2007). Research has shown that adults who habitually use suppression, however, experience lower

well-being, particularly in social relationships, self-esteem and life satisfaction overall (Gross & John, 2003).

Emotion Regulation in Adolescents with Psychiatric Disorders

Learning to recognize and regulate a wide range of emotions plays a prominent role in childhood and adolescence. Among adolescents with psychiatric disorders, it is not the experience of negative emotions itself that becomes problematic, but rather the intensity and timing of these emotions (Kring & Werner, 2004). Additionally, these adolescents seem to struggle to find appropriate strategies compared to their healthy peers (Suveg et al., 2009). Therefore, they are struggling in two ways: they fail to downregulate their negative emotions and also find it difficult to upregulate or maintain positive emotional experiences (Yap et al., 2007). Particularly in internalizing disorders, such as depression and anxiety disorders, the dysregulation of negative emotions is central to the psychopathology. These disorders are often referred to as *overcontrolled* disorders, characterized by excessive use of maladaptive ER strategies (Groen & Petermann, 2011). It is important to emphasize that in internalizing disorders there is an especially heightened focus on negative affect (Gross & Jazaieri, 2014).

The effectiveness of adaptive ER strategies in early childhood is influenced by several key factors: a secure attachment to caregivers but also positive peer relationships during the formative years are crucial (Yap et al., 2007). Delays or disruptions in neural development can act as a risk factor for dysfunctional ER (Hannesdóttir et al., 2010).

Visted and colleagues (2018) demonstrated in their meta-analysis with an adult depressive sample that, compared to healthy adult controls, the use of suppression was significantly increased (Hedges´ g = 1.1), while the use of reappraisal was significantly decreased (g = -0.7). Even at the age of 4-6 years, dysfunctional emotion regulation has been linked to the development of anxiety symptoms (Maughan & Cicchetti, 2002). Similarly, a neuroimaging study with children aged 4-9 years could show that dysfunctional patterns of ER, supported by neural activity patterns, are also associated with increased anxiety symptoms (Hannesdóttir et al., 2010). In a subclinical sample of 9-11 year-olds, Garnefski and colleagues (2007) found that dysfunctional ER strategies were significantly associated with depressive symptoms. These findings underscore the importance of studying dysfunctional ER strategies not only in subclinical populations but also in clinically diagnosed individuals.

A meta-analysis has demonstrated the relationship between clinical samples including adults with internalizing and externalizing psychiatric disorders and diverse functional and dysfunctional ER strategies. Aldao and colleagues (2010) were able to show small to medium effect sizes for the use of the ER strategy suppression in individuals with depression (r = .36; k = 26; 95% CI [.29, .43]) and anxiety (r = .29; k = 19; 95% CI [.19, .39]) and small effect sizes for the use of the ER strategy reappraisal in individuals with anxiety (r = − .13; k = 5; 95% CI [−.28, .02]) and depression (r = − .17; k = 7; 95% CI [−.29, −.06]). A study by Carthy and colleagues (2010) investigated the use of cognitive reappraisal strategies in adolescents aged 10-17 with anxiety disorders. The findings showed that these adolescents had difficulties reinterpreting threatening stimuli. In longitudinal research designs over three years, particularly during transitional periods in adolescence, impaired ER has been identified as a significant risk factor for psychopathology, specifically for SAD, eating pathology and depression (Lincoln et al., 2022). It remains unclear whether difficulties in ER are a risk factor for the development and maintenance of psychopathology or whether the onset of psychopathology makes people less able to regulate their emotions. Research points to a bidirectional association between ER and psychopathology. Evidence from longitudinal therapy studies supports this bidirectional association, showing that therapeutic interventions can improve both: clinical symptoms *and* ER skills (Sloan et al., 2017). However, there is a gap in longitudinal studies regarding other aspects of ER beyond specific constructs like rumination in depression (Lincoln et al., 2022), where more consistent evidence exists, especially for an adolescent sample. Remitted depressive individuals reported a higher use of suppression (g = 0.6) compared to healthy controls, highlighting the long-lasting effects of depressive disorders on ER throughout life (Visted et al., 2018).

Research on psychiatric adolescent populations and their use of ER strategies remains sparse. However, to summarize the discussed studies involving subclinical samples and adults, they suggest, that ER might be a critical factor in the development and maintenance of several affective disorders, such as depression and anxiety (Lincoln et al., 2022; Schäfer et al., 2017; Visted et al., 2018). In recent years, there has been an increased focus on a transdiagnostic approach, where psychopathology is conceptualized as comprising multiple higher-order dimensions or factors shared across different disorders. Prior research suggests that ER use may follow general patterns across disorders, but the benefits and costs of the same ER strategies could vary by disorder (Sloan et al., 2017). To explore this, suitable diagnostic instruments for adolescents should be employed to detect possible subtle differences in ER patterns across disorders. Additionally, the transdiagnostic role of ER

should be systematically explored in literature on psychological treatment outcomes (Sloan et al., 2017). If relevant findings emerge, this could support efforts to more actively encourage psychiatric adolescents to adopt adaptive ER strategies in interventions and subsequently decrease psychiatric symptomatology.

Assessment of Emotion Regulation in Adolescents with Psychiatric Disorders

Experimental research in the field of ER has expanded significantly over the past few decades, also in the context of children and adolescents. While earlier research in ER has employed more static self-report questionnaires, in the last decades the focus changed towards the investigation of the dynamic structure of the ER process (Bettis et al., 2022). ER can be understood by examining various processes of the central and peripheral nervous systems, while also considering sociocultural influences and behavioral contexts (Adrian et al., 2011). Researchers interested in studying ER, operationalize the construct generally in three ways: via self-reports or third-party-reports (caregiver, teacher, peer), as well as via observational/behavioral or physiological/biological measures (Adrian et al., 2011; Zeman et al., 2007), which are briefly introduced in the following.

Compared to childhood, the self-report method is increasingly used in adolescence (Adrian et al., 2011). One issue in assessing ER through self-report is that adolescents may have difficulty identifying or being aware of their emotions, or may be unable to report such processes accurately (Zeman et al., 2007). Furthermore, self-report measures often limit their assessment to a single context and typically do not account for situational variability (Bettis et al., 2022). In addition to self-reports, observer-reports can provide a second perspective on adolescents´ emotional processes. These assessments can come from different sources, such as home or school environments, and help to incorporate a broader range of social contexts into the evaluation.

More objective are task-based measures, which provide insights into behavioral or neural responses during emotionally evocative tasks. In such paradigms, participants are often required to apply a specific ER strategy, choose from a set of ER strategies, or switch between strategies throughout the task (Bettis et al., 2022). Although it can be measured how certain ER strategies are chosen, the range of strategies and situational contexts is often limited. This restricts the ability of representing the whole repertoire of strategies the individual might use in real-life situations (McRae et al., 2012). In psychological research, observational methods are considered to have high-quality standards. However, when it comes to studying ER,

observation can only capture certain components, such as body gestures and facial expressions, but it cannot assess internal processes. Additionally, by adolescence, individuals may already be able to dissemble their emotional displays, which raises questions about the validity of observational methods in this context (Adrian et al., 2011).

Neuroimaging methods now offer insights into the biological/physiological mechanisms underlying ER. Using functional connectivity measured via functional magnetic resonance imaging (fMRI) studies to explore brain networks involved in cognition, emotion, and motivation during ER (McRae et al., 2012) as well as electroencephalography (EEG) to measure electrocortical activity during spontaneous processes and instrumental goals (e.g., increase or decrease) in ER (Seeley et al., 2015), are of great interest in this research field.

Other assessment methods include technology-based measurements that could enhance the ecological validity of operationalization. Examples are Ecological Momentary Assessments, passive sensing technologies or social media data. Despite the strengths regarding its state- and context-sensitive measurement of explicit ER, criticisms of self-report assessments still apply respectively insufficient research has been conducted regarding these methods (Bettis et al., 2022; Colombo et al., 2020; Suveg et al., 2010).

Although frequency distributions indicated 61,1% (n = 96) of published studies relied on only one method to measure ER so far (Adrian et al., 2011), it is essential to advocate for a multimethod approach to fully comprehend and assess the complex processes of ER. In conclusion, although research on ER during childhood and adolescence is beginning to accumulate, significantly more work is required to investigate the interrelationships among the various components of ER across multiple levels of analysis (Seeley et al., 2015). This will provide a more comprehensive understanding of the mechanisms involved in ER.

Parental- and Self-Report of Psychopathology and Emotion Regulation

Parents´ detection of adolescents´ emotional distress and clinical symptoms is a significant determinant for early detection and treatment of psychiatric disorders. Given the increasing incidence of mental health issues during adolescence, it gets more important to gather accurate reports by parents for clinical assessment in minors. In some cases, reports from other informants, such as teachers or close contacts, may also be beneficial. Due to the high levels of shame or stigma that adolescents may feel regarding their condition, their self-reported symptoms may be incomplete or biased (Lewis et al., 2014). However, Achenbach

and colleagues (1987) found only low agreement (r = .25) between parents and adolescents regarding reports of child behavior problems in a meta-analysis of 119 studies. This discrepancy could be influenced by factors such as the parents´ own mental state or the parent-adolescent relationship (Bertino et al., 2012).

Regarding depressive symptoms, Kim and colleagues (2020) found low levels of concordance between parents and their adolescents in a sample of 289 participants, with a correlation coefficient of r = .27. Parents tended to rate their adolescents´ depressive symptoms within the normal or non-depressive range, contrary to the adolescents´ self-reports, especially for hardly observable and internalized symptoms. In a study by Lewis and colleagues (2014), parental reports were found to underestimate suicidal thoughts and behaviors, while overestimating depressive symptoms compared to adolescents´ self-assessments.

Concerning anxiety symptoms, Miller and colleagues (2014) found low agreement between parents, teachers, and adolescents from a non-clinical sample across three time points (r = .14, p < .001). In a clinical sample, Choudhury and colleagues (2003) similarly reported low agreement (r = .23) for the presence of anxiety diagnosis between parents and children aged 7-14 when measured via a DSM-IV-based structured interview, further highlighting the risk of relying solely on parental reports in clinical assessments. Thus, care should be taken when using parent reports, as they may not provide a fully accurate reflection of the adolescents´ mental health and can be viewed more as an additional diagnostic tool, rather than a valid substitute for direct adolescent reporting.

Performance Based Measures

Experimental psychological research aims to establishing a valid measurement of ER strategies and behaviors. It has been criticized that some behavioral paradigms lack adequate clinical relevance or explanatory power (Seeley et al., 2015). Therefore, it is essential to make necessary modifications to these existing paradigms. The focus should be on the operationalization of variables, ensuring that various measurement methods show strong construct validity. Considering the critical role of ER in experiential learning and goal-directed behavior, it is essential to examine how ER impacts behavior and how behavioral outcomes, in turn, influence regulation (Seeley et al., 2015). The establishment of behavioral tasks suitable for children and adolescents presents a challenge, as stimuli must be age appropriate.

To give an example of a behavioral assessment, the construct distress tolerance can be assessed using the "Behavioral Indicator of Resiliency to Distress" (Lejuez et al., 2006). This computerized paradigm is designed to evaluate how individuals demonstrate resilience when faced with distressing situations. The primary aim is to determine how effectively individuals can maintain their composure, adapt to challenges and utilize coping mechanisms - skills that are critical for psychological regulation (Amstadter et al., 2012). Sequential or longitudinal designs are being employed to extend the understanding of the short-term effects of ER. These designs can provide better evidence for test-retest reliability. One notable example is the study by Denny and Ochsner (2014), which examined the learning of the well-known ER strategy reappraisal across two groups and an additional control group over time. This study offered evidence for the trainability of one ER strategy in healthy adults.

Examining the implicit side of the ER goal dimension is essential for a comprehensive assessment of ER processes. Identifying a task that reliably measures how emotions are regulated outside of conscious awareness is a challenge for researchers. One way to examine such emotion regulatory control processes is through a neuropsychological task. In the Emotional Conflict Task (ECT), emotional distractors are in direct conflict with task-relevant emotional information (Etkin et al., 2006).

Emotional Conflict Task (ECT)

Well established response conflict tasks, namely Stroop tasks, are widely used to study the behavioral and neural response when irrelevant information competes simultaneously with a target stimulus (Stroop, 1935). As the research of cognitive models of psychopathology has gained a lot of interest, the number of Stroop-related studies increased during the last decades (Epp et al., 2012; Williams et al., 1996). The classic Word-Stroop task involves the repeated presentation of color words (e.g. red, blue, yellow, green) presented on colored background (in two conditions: congruent and incongruent to the color word). Participants are asked to name the color word while ignoring the congruent or incongruent colored background. The so-called Stroop effect refers to the response latencies and the level of accuracy which refers to the time between onset of the stimulus and the participant´s response, depending also on the condition (congruent or incongruent word – background relationship). The classical Stroop task measures attentional control through producing response conflict (Botvinick et al., 1999; Stroop, 1935).

Etkin and colleagues (2006) adapted this experimental paradigm to emotionally valenced stimuli and referred to as Emotional Conflict Task (ECT). The ECT measures the cognitive cost of participants suppressing an overlayed emotional word (“fear” or “happy”) and only focusing on detecting the facial expression of an either fearful or happy face. The words are either congruent or incongruent with the facial expressions. The emotional conflict effect arises from emotional incompatibility between task-relevant and task-irrelevant stimulus dimensions, which was proven in several experimental studies (Etkin et al., 2006; Marusak et al., 2015; Saunders & Jentzsch, 2014).

This adaptation of the Stroop task enables the measurement of emotional conflict resolution, as behavioral effects have been observed based on trial sequences. Studies have demonstrated that reaction time interference is reduced in incongruent trials when the preceding stimulus was also an incongruent trial. This mechanism is triggered by the conflict experienced in the previous trial, leading to enhanced performance on the current incongruent trial. One explanation is, that when individuals activate their ER systems, they become better equipped to inhibit conflict that immediately follows referring to the conflict monitoring hypothesis (Botvinick et al., 1999; Marusak et al., 2015). Prior studies show that the reaction time interference for incongruent trials is less when they are preceded by an incongruent trial (incongruent adaption effect), than if they are preceded by a congruent trial (congruent adaption effect; Botvinick et al., 1999; Etkin et al., 2006).

This trial-to-trial adaptation to emotional conflict represents the functioning of a regulatory mechanism in emotional processing when individuals recognize a similar cognitive demand as the preceding incongruent trial (Alders et al., 2019; Etkin et al., 2006). The effect seems to occur outside of conscious awareness and thus is a type of automatic ER (Etkin et al., 2010). Following the concept from Etkin and Schatzberg (2011), in the present work, only the incongruent adaption effect is considered in analysis, as former studies have found that congruent and incongruent adaption reflect dissociable effects.

The ECT has been frequently utilized in psychological and neuroscientific research to examine emotional processing and conflict resolution. Studies have found an emotional Stroop effect in two indicators: reaction time and accuracy in healthy controls (Etkin et al., 2006) and clinically psychiatric participants (Chechko et al., 2009; Etkin et al., 2006; Etkin & Schatzberg, 2011).

Etkin and Schatzberg (2011) reported no difference in overall emotional conflict between healthy controls and anxious or depressed participants. This finding has also been demonstrated in other studies (Etkin et al., 2006; Marusak et al., 2015; Saunders & Jentzsch, 2014). To date, only the study by Alders et al. (2019) has identified a significant difference in accuracy on the ECT between healthy participants and adults diagnosed with depression with healthy participants showing more accurate responses.

Concerning adaption to emotional conflict, the study by Chechko and colleagues (2009), comparing individuals with panic disorder to a healthy control group, showed that the incongruent adaptation effect was only demonstrated in healthy controls ($p = .008$) but not in disordered participants ($p = .120$). Similarly, Etkin and other authors (2010) showed that participants with GAD did not manage to adapt to emotional conflict when compared to healthy controls in between group comparison ($t = 2.39$, df = 39, $p < .05$; $d = 0.8$). The authors reason this finding with deficits in non-instructed and spontaneous regulation of emotional processing in participants with GAD. In this investigation, an independent control group was surveyed, and it could be concluded that no patterns between the trials were consciously recognized by the subjects, therefore they were unable to intentionally improve their performance. Supporting this, a main effect of the specific task used in the investigation was also demonstrated ($F1,21 = 68.5$, $p < .001$) by Egner and colleagues (2007), showing faster responses in the classic Stroop task compared to the ECT, which suggests that the emotional task may have overall been more difficult.

In comparison to both, participants with depression and healthy controls, participants with GAD failed to adapt to emotional conflict in incongruent adaption in the independent factor model (Etkin & Schatzberg, 2011). Former research (Chechko et al., 2009; Etkin & Schatzberg, 2011) suggests that individuals with anxiety disorders struggle to adapt to emotional conflict outside of conscious awareness. However, it remains unclear whether this issue is specific to anxiety disorders and not observed in individuals with depression, or if these deficits are common across various affective disorders.

In a study by Saunders and Jentzsch (2014) examining three participant groups with varying symptom levels in depression, only participants with severe symptoms of depression displayed a selective impairment in the resolution of emotional conflict in the ECT, ($t(42) = 2.62$, $p = .036$, $d = 0.80$) but not in the classic Stroop task, suggesting negative moods might impair proactive control processes in highly depressed patients. Similarly, a systematic

meta-analysis on ECT in depression has shown that effect sizes between groups tend to be larger at higher levels of symptom severity (Epp et al., 2012).

Research Questions and Hypotheses

Given the limited research examining the diagnostic relationship between psychopathology and ER in adolescence (Schäfer et al., 2017; Sloan et al., 2017), this study aims to explore the matter from various diagnostic perspectives. As previous studies have shown differences between parents´ and adolescents´ own assessments in similar domains, this study investigates differences between parents and adolescents´ ratings regarding the assessment of adolescents´ clinical symptoms (Kim et al., 2020; Lewis et al., 2014). Moreover, this study seeks to examine whether ER strategy use does not differ between internalizing disorders, or whether depressive disorder and anxiety disorder exhibit distinct patterns of ER.

The importance of using multimethod approaches in psychological research has increased and will be applied in this study as well. Self- and parent reports assess only the short-term effects of explicit ER strategies in specific situations. However, behavioral assessments can capture implicit processes of ER more effectively (Aldao, 2010; Etkin et al., 2006). To ensure the most valid ER assessment, this study combines self- and parent reports with an experimental approach to provide a comprehensive understanding of ER.

Primary hypotheses

1. The reported use of ER strategies predicts clinical psychopathology (depressive or anxiety symptoms) of adolescents.
2. Low concordance (Pearson´s r = .1 to .3) of adolescent self- and parental ratings of clinical psychopathology (depressive or anxiety symptoms) is expected.
3. The ER strategy *suppression* does not differ in adolescents with depressive disorder and participants with anxiety disorder.
4. The ER strategy *reappraisal* does not differ in adolescents with depressive disorder and participants with anxiety disorder.
5. Adolescents with anxiety disorder differ from adolescents with depressive disorder in their reaction time in the emotional conflict task.
6. Deficits in implicit ER predict the specific clinical psychopathology (depressive or anxiety disorder) of adolescents.

Exploratory hypotheses

1. Are there differences in accuracy in the emotional conflict task between participants with anxiety disorder and participants with depressive disorders?
2. Are there differences in emotional conflict adaption accuracy between participants with anxiety disorders and participants with depressive disorders?
3. Are there differences in their emotional conflict adaption reaction time performance between adolescents with anxiety disorder and participants with depressive disorder?

Methods and Materials

Study Design

The data collection was conducted between August 2022 and September 2024 in the ABC BRAIN Lab in the Department of Child and Adolescent Psychiatry at the Medical University of Vienna. The data for this study were drawn from a larger, preregistered, ongoing triple-blind randomized controlled trial investigating the effects of transcranial direct current stimulation (tDCS) on emotion regulation in adolescents with psychiatric disorders (DRKS-ID: DRKS00025601X). At the time of thesis submission, the broader study is still in progress. For the purpose of this thesis, cross-sectional baseline data from adolescents diagnosed with depressive or anxiety disorders were analyzed. The intervention procedures and follow-up measures are detailed in Konicar et al. (2022) and are not within the scope of this thesis. With supervision from the research team, the participants and their parents were able to complete the questionnaire part of the data collection online. All questionnaires were designed and performed on the digital platform *SoSciSurvey* (Leiner, 2019). As part of pre-measurements of the broader study the behavioral measurements (including the ECT) were conducted.

Participants

The participants were recruited at the Department of Child- and Adolescent Psychiatry of the Medical University of Vienna and from private practice. First the adolescents and their parents were invited for a clinical psychological interview evaluating study inclusion- and exclusion criteria and giving detailed information about the study purpose, aims and risks. The participants and parents provided written informed consent.

Inclusion criteria were the presence of a primary diagnosis of either a depressive disorder (F32, F33) or anxiety disorder (F40.1, F41.1) according to ICD-10 (World Health Organization, 2016). The diagnoses were provided based on clinical impressions by clinical psychologists from the research team, as well as on previous medical reports and parental observations. To rule out any kind of mental retardation their intelligence had to be average or above average according to Wechsler Adult Intelligence Scale–Fourth Edition (WAIS-IV; Wechsler, 2012) or Wechsler Intelligence Scale for Children–Fifth Edition (WISC-V; Wechsler, 2017). Psychopharmacological medication such as methylphenidate, selective serotonin reuptake inhibitors (SSRI), antipsychotic or neuroleptic medication as well as

psychotherapeutic treatment had to be held stable in dosage. Adolescents who suffered from severe neurologic diseases, medical conditions or ongoing benzodiazepine medication were excluded from the study. Another exclusion criterion was a reported high level of suicidality of the participant. In line with the primary aim of investigating the effects of multiple tDCS sessions on ER as noted by Konicar and colleagues (2022), an additional criterion was any contraindications for fMRI, which included the presence of non-removable metallic devices.

The final sample consisted of 49 participants, 34 participants diagnosed with depressive disorder and 15 participants with an anxiety disorder. The age range was between 13 and 18 years, the mean age of the participants with depressive disorder was 15.35 (*SD* = 1,37) and participants with anxiety disorder were 15.40 (*SD* = 1,40) years old on average. Table 1 represents the demographic characteristics of the final sample group with primary depressive and the group with primary anxiety disorders. The parental sample consisted of *n* = 37 mothers, *n* = 8 fathers and *n* = 4 caregivers (3 social pedagogues and 1 stepmother).

Table 1

Demographic Characteristics of Participants with Anxiety and Depressive Disorder

Column Label	Anxiety disorder $n_1 = 15$	Depressive disorder $n_2 = 34$	*t* (df)	*p*
Gender (male/female)	1 / 14	6 / 28		
Age (years)	15.40 (1.404)	15.35 (1.368)	-.110(47)	.913

Note. Mean values and standard deviations in parentheses.

Materials

Clinical and Psychometric Measures

Two self-report questionnaires were used to obtain the adolescents´ perspective, namely the YSR/11-18 R (“Youth Self Report 11-18 Revised”; Döpfner et al., 2014) measuring the general psychopathology and the ASQ-Y (“Affective Style Questionnaire – Youth”; Graser et al., 2019) measuring ER strategies. For the third-party assessments, the CBCL/6-18R (“Child Behavior Checklist 6-18 Revised”; Döpfner et al., 2014) measuring the general psychopathology was used.

Self-Report Questionnaires

Affective Style Questionnaire – Youth (ASQ-Y).

The German adolescents´ version of the Affective Style Questionnaire by Hofmann and Kashdan (2010) is an instrument to measure three of the most significant ER strategies. The adults´ questionnaire was validated with two English samples and one German sample (Graser et al., 2012 ; Hofmann & Kashdan, 2010) before Graser et al. (2019) adapted the items to a language suitable for children (e.g. “I have my feelings well under control” or “I can allow myself to feel sad”). The German validation supported three factors, which resulted in three subscales namely suppression, acceptance and adjusting/reappraisal. The emotion regulation strategy suppression involves concealing and avoiding emotions (Hofmann & Kashdan, 2010). Adjusting/Reappraisal involves influencing one´s own emotions using individual strategies and re-evaluating the situation. Accepting emotions as a regulation strategy refers to being open towards emotions that arise and not wanting to avoid them even when unpleasant (Hofmann & Kashdan, 2010). The three subscales comprise 20 items that are answered on a five-point Likert scale reaching from 1 (*not true of me at all*) to 5 (*extremely true of me*). The ASQ-Y can be scored on each subscale through calculating the mean score. The internal consistencies of the three subscales reached acceptable values in the adolescents´ version (suppression: Cronbach´s $\alpha = .77$; reappraisal: Cronbach´s $\alpha = .76$; acceptance: Cronbach´s $\alpha = .76$; Graser et al., 2018) and was comparable to the English and German versions for adults (Graser et al., 2012; Hofmann & Kashdan, 2010). The validation showed patterns of correlations to other instruments measuring similar constructs (Graser et al., 2019).

Youth Self-Report 11-18 Revised (YSR/11-18R).

A well-validated instrument to study global psychopathology is the German version of the YSR /11-18R (Döpfner et al., 2014) which is part of the Achenbach System of Empirically Based Assessment. It assesses emotional and behavioral problems in 11 to 18-year-old children and adolescents. The participants rate the appearance of problem behavior in the preceding six months on a three-point Likert scale (0 = *not true*; 1 = *somewhat or sometimes true*; 2 = *very true or often true*). Since the latest edition of the instrument, additionally to eight syndrome scale, some DSM-oriented scales were developed by asking experts to identify items for DSM symptoms: depressive, anxiety, physical, attention-deficit/hyperactivity, oppositional, and conduct symptoms. The depressive and the anxiety scale will be of interest in this study. The anxiety scale consists of 9 items (e.g. “I feel worthless or inferior”) and the depression scale of 13 items (e.g. “I am afraid to think or do

something bad"). The YSR/11-18R can be scored on each subscale through calculating the sum score. Van Lang et al. (2005) reported moderate internal consistency for the DSM-scale anxiety symptoms (Cronbach´s α = .62) and acceptable internal consistency for depressive symptoms (Cronbach´s α = .72). Analyses show an acceptable test-retest reliability for all scales ($r_{tt} \leq .70$) in the German version (Döpfner et al., 2014). Construct validity was shown to be high for affective symptoms but less specifically related to instruments of the related construct of anxiety symptoms (van Lang et al., 2005). The manual for the German Achenbach System of Empirically Based Assessment provides normative comparison values for a representative clinical population, as shown in Table 2.

Table 2

Comparison with Children and Adolescents (ages 6–18) with internalizing Disorders on DSM-oriented Subscales of Depression and Anxiety (Döpfner et al., 2014)

Stanine scores	Percentile range	Depression	Anxiety
1	0-4	0	0
2	5-11	1	1
3	12-23	2-3	2-3
4	24-40	4-5	4-5
5	41-60	6-8	6-7
6	61-77	9-11	8-9
7	78-89	12-14	10
8	90-96	15-18	11-13
9	97-100	≥ 19	≥ 14

Parent Report Questionnaire

Child Behavior Checklist 6-18 Revised (CBCL/6-18R).

The German CBCL/6-18R (Döpfner et al., 2014) measures emotional and behavioral problems in children and adolescents aged 6-18 years old by their parents or caregiver and is part of the Achenbach System of Empirically Based Assessment. 118 items measure the

child´s functioning during the previous six months (Achenbach, 1991; Achenbach & Rescorla, 2001). All items are equivalent to the scales of the YSR/11-18R rephrased into the observer´s perspective and rated on a three-point Likert scale (0 = *not true*; 1 = *somewhat or sometimes true*; 2 = *very true or often true*). The CBCL also includes DSM-oriented scales for the following symptoms of DSM diagnoses: depressive, anxiety, physical, attention-deficit/hyperactivity, oppositional, and conduct symptoms. The depressive symptoms and anxiety symptoms subscales will be of interest in the present study. The depressive subscale consists of 13 items (e.g. "My child exhibits excessive guilt.") and the anxiety scale of 9 items (e.g. "My child is afraid of going to school."). The CBCL/6-18R can be scored on each subscale through calculating the sum score. The internal consistency was good and reached Cronbach´s $\alpha = .81$ for depressive symptoms and an acceptable value of Cronbach´s $\alpha = .79$ for anxiety symptoms (Nakamura et al., 2009). An acceptable test-retest reliability for the scales ($r_{tt} \leq .70$) was found in the German translation (Döpfner et al., 2014). Convergent and discriminant correlations provided evidence that both the anxiety and the depressive scale measured what they were designed to measure (Pandolfi et al., 2012). Diagnostic accuracy for both scales could be proven in clinical samples (Lacalle et al., 2012; Pandolfi et al., 2012). The manual for the German Achenbach System of Empirically Based Assessment provides normative comparison values for the parents reports of a representative clinical population, as shown in Table 3.

Table 3

Comparison with Parent Reports of Children and Adolescents (ages 6–18) with internalizing Disorders on DSM-oriented Subscales of Depression and Anxiety (Döpfner et al., 2014)

Stanine scores	Percentile range	Depression	Anxiety
1	0-4	0	0
2	5-11	1	1
3	12-23	2-3	2-3
4	24-40	4-5	4
5	41-60	6-7	5-6
6	61-77	8-9	7-8

7	78-89	10-12	9-10
8	90-96	13-15	11-13
9	97-100	≥ 16	≥ 14

Performance-Based Measure

Emotional Conflict Task (ECT)

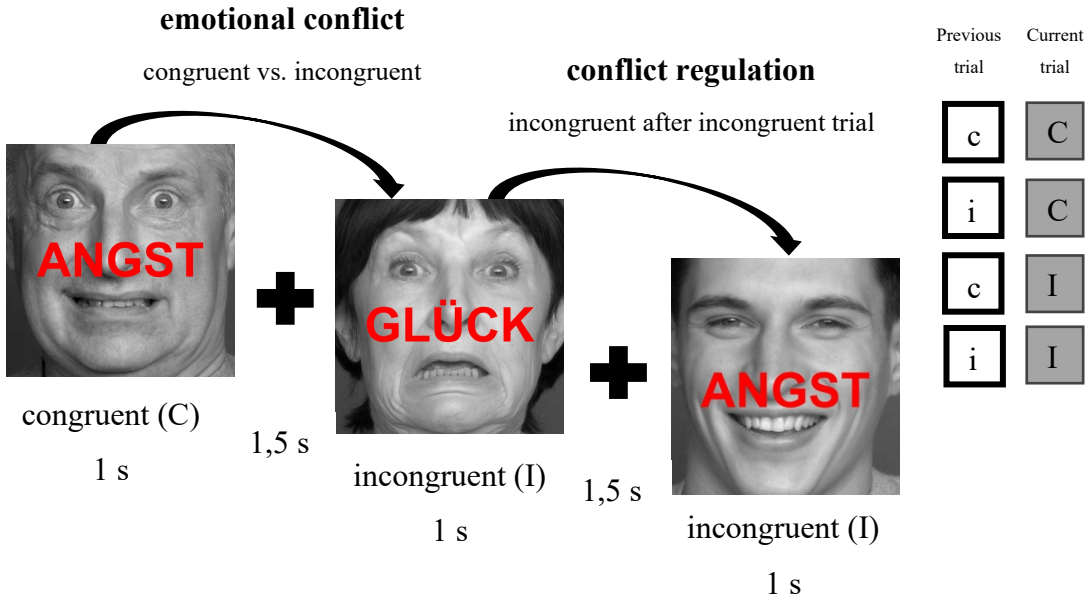
This study employed an emotional Stroop task which was originally described by Etkin et al. (2006). The task was set up by the study team and adapted to the German language. Participants were asked to identify the emotional expression of faces while ignoring the overlaid emotionally-charged words. For this study, happy and fearful facial expression photographs drawn from the set of Ekman and Friesen (1976) were used. The faces were cropped and edited in black and white. The words "GLÜCK" and "ANGST", German for "happy" and "fear" were written in bold red uppercase letters overlaid on the image just below the bridge of the nose (Etkin et al., 2006), as depicted in Figure 3. The facial expressions were either congruent or incongruent with the overlaying emotion word label. The task consisted of 149 trials in a pseudorandom order with equal numbers of postcongruent-congruent (cC), postcongruent-incongruent (cI), postincongruent-incongruent (iI) and postincongruent-congruent (iC) stimulus pairings. The gender and emotion of the facial expressions were counterbalanced and there was never a direct repetition of the same stimulus.

Participants were given a practice task before beginning the experiment. The assessment commenced with a set of slides informing the participant about the task following a reticle that was shown on the screen for 5 s before the first image was presented. The stimuli were displayed for 1 s during which the participants had to give a response. In between, a central reticle was presented in a varying inter-stimulus-interval (ISI) of ±1,5 s. Participants were instructed to respond as accurately and fast as possible. The participants gave their answer through pushing response buttons (A or G on keypad) corresponding to "fear" = left index finger ("A" on keyboard) and to "happy" = right index finger ("G" on keyboard) for the affective facial expression. An example of the visual stimuli, categorization of trials and related time frames is given in Figure 3. The total duration of the task was around 10 min.

The emotional Stroop effect is identified by reduced accuracy and greater reaction time interference on incongruent, compared to congruent trials (Reis et al., 2016). Evidence suggests that the test-retest reliability of the ECT may be relatively low (Kindt et al., 1996). Despite this, its criterion validity can be considered stronger, as the task has demonstrated an ability to distinguish between different clinical groups, particularly those with affective disorders (Etkin & Schatzberg, 2011). Outcome variables of interest were reaction time in seconds (s) and correct or incorrect behavioral responses (accuracy).

Figure 3

Emotional Conflict Paradigm: Stimuli consisting of congruent and incongruent Face Expression/Word Pairs and Categorization of Trials into four Order Types (cC, iC, cI, iI)



Data Analysis

Descriptive and inferential statistical analysis was performed by using IBM SPSS® 27 (IBM Corp, 2020) and R statistical software (R Core Team, 2023). Hypotheses testing was conducted assuming an alpha = 5 % significance level and thus results $p \leq .05$ were described as significant in the context of analyses. For the practical relevance of results, effect sizes according to Cohen´s classification were calculated. Correspondingly, standardized effect sizes *d* (values ≥ .20 are small, ≥ .50 medium and ≥ .80 large effect sizes) and Cohen´s r (values ≥ .10 are small, ≥ .30 medium and ≥ .50 large effect sizes) were applied (Cohen,

1988). The alternative hypotheses were formulated as non-directional, so the following tests were calculated as two-tailed.

To assess the relationship between the reported use of ER strategies suppression and reappraisal as dependent variables and clinical psychopathology of anxiety respectively depressive disorder as independent variable, the mean scores of the suppression and the reappraisal subscale of the ASQ-Y were calculated. The independent variable was measured by the sum score of the respective YSR/11-18R subscales. A multiple linear regression analysis was conducted, and assumptions were checked. For this analysis, the dataset was divided into two groups based on the diagnostic category to separately analyze the impact of the strategies on each clinical psychopathology. Shapiro-Wilk-Tests and Q-Q-Plots were conducted to check for normality of residuals. By plotting predicted values against residuals and examining the patterns in scatterplots, linearity and homoscedasticity were assessed. Independence of observations was assumed due to study design as RCT. Multicollinearity was assessed by inspecting the VIF (Variance Inflation Factor). All assumptions for multiple linear regression were met by the data.

Before analyzing hypothesis two, examining the extent to which self-reports and parent reports align, measured by the sum scores of the YSR/11-18R and CBCL/6-18R subscales, assumptions of Pearson´s correlation were checked. Shapiro-Wilk-Tests per disorder group were conducted to check for normality. The scatter plot showed no noticeable curvature or patterned distribution, indicating sufficient linearity. All variables of interest showed metric scale level. Outliers were inspected but not removed since they seemed to reflect genuine variability in symptoms.

A Bayesian *t*-test for two independent groups was conducted to compare the means of suppression respectively reappraisal ratings, measured by ASQ-Y subscales, between adolescents with depressive disorder and anxiety disorder. The reason for applying Bayesian statistics lies in its robustness to small sample sizes, as its statistical assumptions do not rely on large sample theory. For small samples, such as those in this study, probabilistic evaluation seems to provide more accurate results. The prior distributions for the group means were set as diffuse as no information about a normal distribution was given. The Bayes factor was estimated using Rouder´s method as no information about effect size was available.

For analyzing the fifth hypothesis regarding emotional conflict, the difference of the mean reaction time of correct incongruent and congruent trials in the ECT was calculated. Participants whose trials were not correct (incorrect answers and omissions) in more than half of the cases were excluded from the analysis. It can be assumed that these participants either did not understand the task or did not perform it correctly. Post error trials and trials with outlier RTs were excluded from calculations. First, the assumptions for an independent-samples *t*-test were checked. Normality of the dependent variable *reaction time difference* was checked with Shapiro-Wilk-Test which yielded non-significant results. The dependent variable showed metric scale level. Levene´s test indicated homogeneity of variances in both groups (independent variables) as results were non-significant as well. All assumptions for independent-samples *t*-test were met.

To test the sixth hypothesis that deficits in emotional conflict as implicit aspect of ER (dependent variable) predict clinical psychopathology (independent variable), a linear regression analysis was conducted. Implicit ER was measured by the reaction time difference of correct incongruent and congruent trials in ECT and clinical psychopathology was assessed by the sum score of the YSR/11-18R subscales. The analysis was separated for both clinical groups. Before conducting the analysis, all assumptions for linear regression were checked. Linearity between both variables could be concluded through scatterplot visualization. Homoscedasticity and normality of the residuals was tested with residual plot and Shapiro-Wilk-test. There was no autocorrelation or extreme outliers.

Exploratory analyses were conducted to gain more insight into the relationship between ECT and the two clinical groups. The accuracy of the emotional conflict effect, defined as the difference between the rate of correct incongruent and congruent trials, was analyzed to determine whether the two clinical groups differed significantly. All assumptions for independent-samples *t*-test were met. For analyzing the emotional conflict adaption effect, stimulus pairs were created of postcongruent-Incongruent trials (cI) and postincongruent-Incongruent trials (iI). Firstly, the overall performance value was calculated for the difference of postincongruent-Incongruent trials (iI) and postcongruent-Incongruent trials (cI) and compared between the two groups. In a further analysis, the reaction time difference for postincongruent-Incongruent trials (iI) and postcongruent-Incongruent trials (cI) was computed in *s* and compared between depressive and anxious participants. All prerequisites for the described independent-samples *t*-tests were met.

Results

Descriptive Analysis

The mean score of items of the ASQ-Y subscales suppression and reappraisal was calculated. Means and standard deviations per group and overall participants are listed in Table 4. There were no missing data in the completion of the questionnaires, as these were administered through an online platform that did not allow skipping individual items.

Table 4

Means and Standard Deviations of anxious, depressed and overall Participants on ER Strategies Measures

Variable	Anxiety disorder *M (SD)*	Depressive disorder *M (SD)*	All *M (SD)*
ASQ - suppression	3.33 (1.12)	3.46 (.91)	3.42 (.97)
ASQ - reappraisal	2.43 (.68)	2.34 (.74)	2.37 (.72)

Note. *M*: Mean, *SD:* Standard Deviation

For the measurement of clinical psychopathology items of the self-report measure YSR/11-18R were summed up to two subscale indices according to DSM-oriented scales: depression and anxiety symptoms. Sum scores and standard deviations per group and overall participants are listed in Table 5.

Table 5

Sums and Standard Deviations of anxious, depressive and overall Participants on clinical Psychopathology Measure YSR/11-18R

Variable	Anxiety disorder *S (SD)*	Depressive disorder *S (SD)*	All *S (SD)*
YSR-Depression	14.20 (4.69)	17.18 (4.41)	16.27 (4.66)
YSR-Anxiety	10.73 (3.77)	9.53 (3.50)	9.90 (3.59)

Note. *S*: Sum, *SD:* Standard Deviation

Two of the DSM-oriented scales, depression and anxiety symptoms, in the parent-report measure CBCL/6-18R were summed up separately for the primary disorder of the participants. The items were equivalent between parents´ and adolescents´ ratings and can

thus be directly related. Sum scores and standard deviations of self- and parent reports are depicted in Table 6.

Table 6

Sum Scores and Standard Deviations of Self-Ratings of YSR/11-18R and Parental-Ratings of CBCL/6-18R Subscales

Variable	Self-Ratings *S (SD)*	Parental-Ratings *S (SD)*
Depression	17.18 (4.41)	12.32 (4.52)
Anxiety	10.73 (3.77)	10.73 (3.77)

Note. *S*: Sum, *SD*: Standard Deviation

Hypothesis 1: The reported use of ER strategies predicts clinical psychopathology (depressive or anxiety symptoms) of adolescents.

The multiple linear regression model for participants with anxiety disorder was not significant, $F(2/12) = 0.514$, $p = .611$ and explained 8% of the variance in psychopathology ($R^2 = .08$, adjusted $R^2 = .08$). Suppression (B = 0.24, *SE* = 1,00, $t = .24$, $p = .82$) and reappraisal (B = -1.67, *SE* = 1.66, $t = -1.00$, $p = .34$) were both no significant predictors, results are reported in Table 7 and scatterplots showing the results are presented in Figure 4.

Table 7

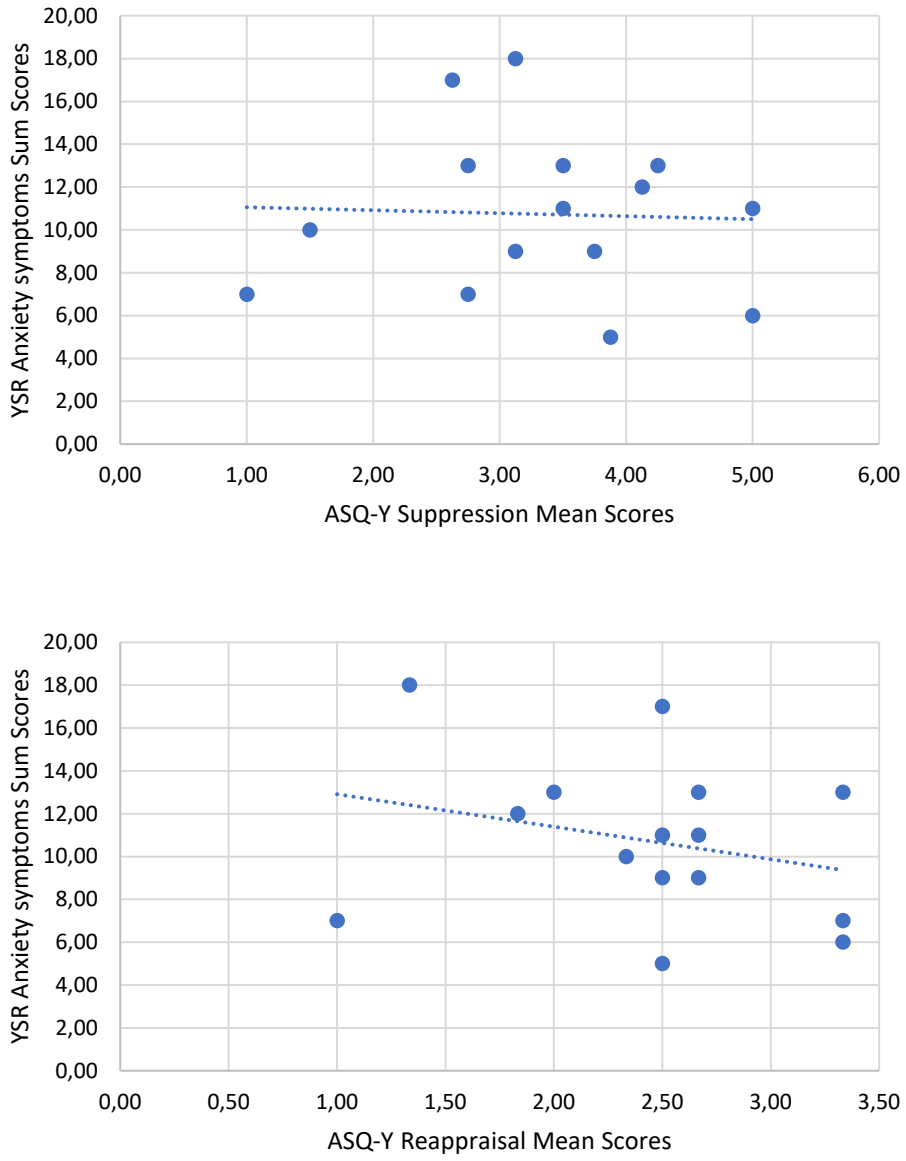
Linear Model of Predictors of Anxiety Psychopathology

Variable	B	*SE*	*t*	*p*	95% *CI*
Suppression	0.24	1.00	.24	.82	[-1.95, 2.43]
Reappraisal	-1.67	1.66	-1.00	.34	[-5.29, 1.96]

Note. B = Regression coefficient, *SE* = Standard error, *CI* = Confidence interval

Figure 4

Scatterplots with Regression Line of ASQ-Y Suppression and Reappraisal Mean Scores and YSR Anxiety Sum Scores



The multiple linear regression model with the ER strategies suppression and reappraisal as predictors of the psychopathology of depressive disorder was not significant with $F(2/31) = 0.54$, $p = .588$ and 2.9% of the variance in psychopathology explained ($R^2 = .034$, adjusted $R^2 = -.029$). Suppression (B = .57, *SE* = .85, $t = .67$, $p = .51$) and reappraisal (B = -.87, *SE* = 1.05, $t = -.83$, $p = .41$) were both no significant predictors. Results of the linear model of predictors for depressive psychopathology are presented in Table 8 and scatterplots are shown in Figure 5.

Table 8

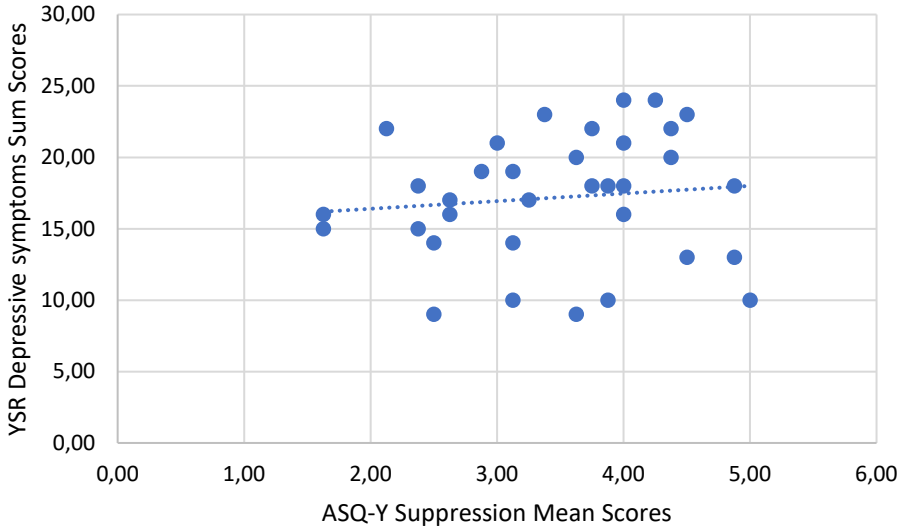
Linear Model of Predictors of depressive Psychopathology

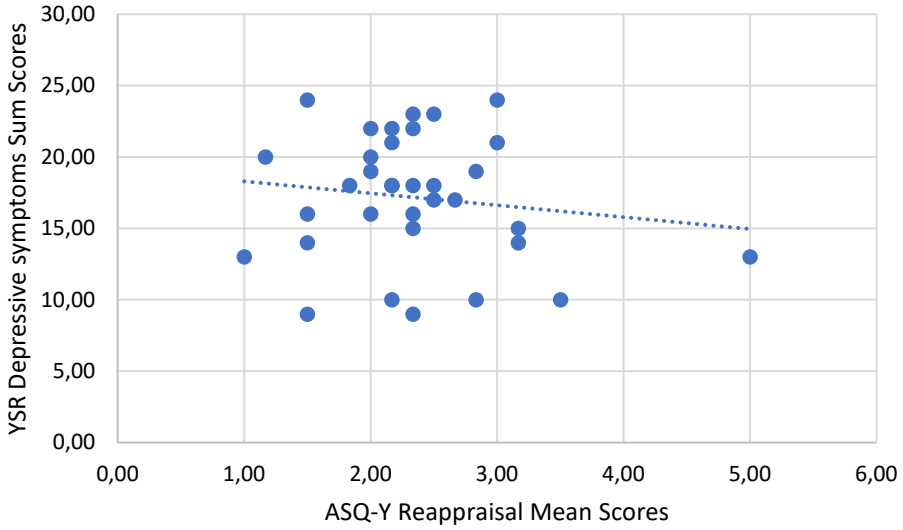
Variable	B	*SE*	*t*	*p*	95% *CI*
Suppression	0.57	.85	.67	.51	[-1.17, 2.31]
Reappraisal	-.87	1.05	-.83	.41	[-3.01, 1.27]

Note. B = Regression coefficient, *SE* = Standard error, *CI* = Confidence interval

Figure 5

Scatterplots with Regression Line of ASQ-Y Suppression and Reappraisal Mean Scores and YSR Depression Sum Scores



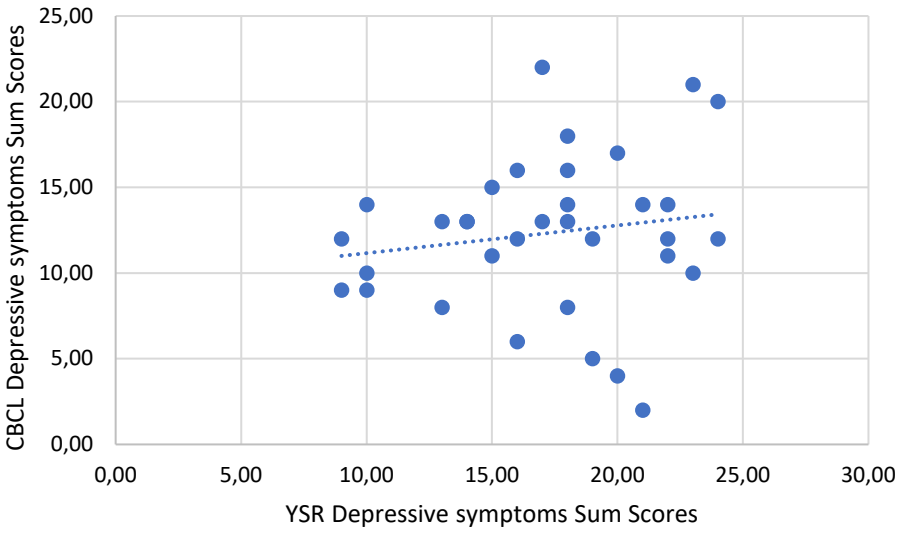


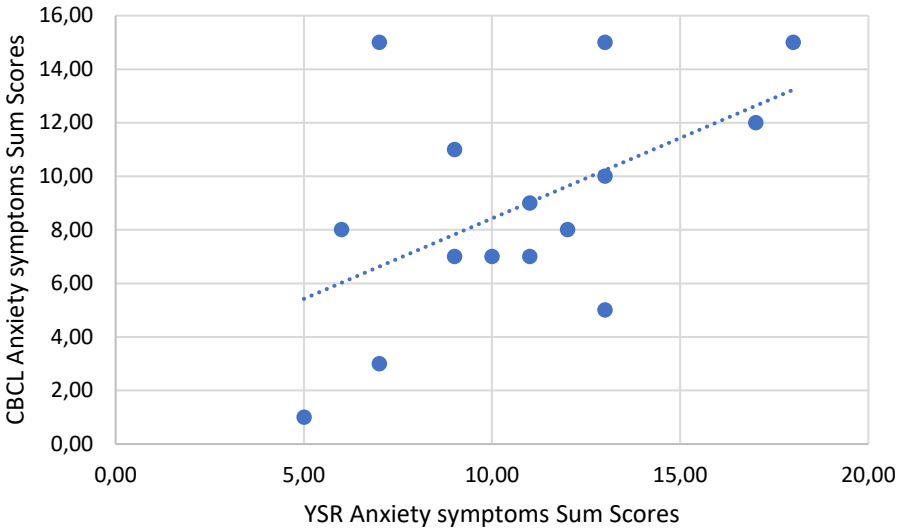
Hypothesis 2: Low concordance (Pearson´s *r* = .1 to .3) of adolescent self- and parental ratings of clinical psychopathology (depressive or anxiety symptoms) is expected.

No significant correlation was found between the two perspectives for adolescents with depression ($r = .16$, $p = .37$). In contrast, in adolescents with anxiety disorder, a significant positive correlation was found between parental report and self-report: $r = .53$, $p = .04$. The relations between both report perspectives on psychopathology are presented in Figure 6.

Figure 6

Scatterplots of CBCL and YSR Depressive and Anxious Symptoms Sum Scores





Hypothesis 3: The ER strategy *suppression* does not differ in adolescents with depressive disorder and participants with anxiety disorder.

On average, participants with a depressive disorder (M = 3.46, SD = .91) showed higher ratings in suppression than participants with an anxiety disorder (M = 3.33, SD = 1.12). The Bayesian estimate of the true difference between means was -.13, 95% CI [-.78, .51]. The associated Bayes factor, BF = 4.04, suggested that the data were moderately more probable under the alternative hypothesis than the null hypothesis.

Hypothesis 4: The ER strategy *reappraisal* does not differ in adolescents with depressive disorder and participants with anxiety disorder.

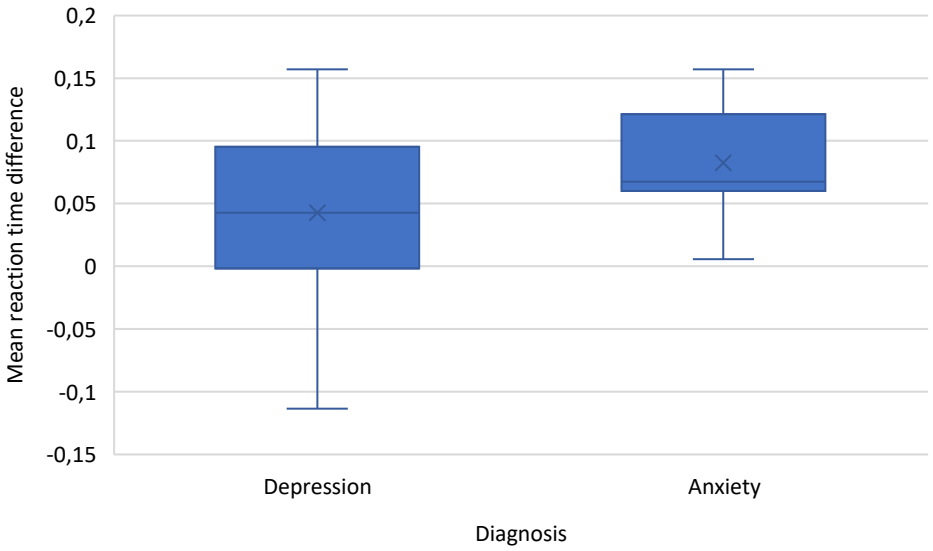
On average, participants with an anxiety disorder (M = 2.43, SD = .68) had a higher rating in reappraisal than participants with an depressive disorder (M = 2.34, SD = .74). The Bayesian estimate of the true difference between means was .10 with 95% CI [-.33, .52]. The associated Bayes factor, BF = 4.05, suggested that the data were moderately more probable under the alternative hypothesis than the null hypothesis.

Hypothesis 5: Adolescents with anxiety disorder differ from adolescents with depressive disorder in their reaction time in emotional conflict task.

Analyses including the ECT consisted of n = 14 anxious participants and n = 33 depressive participants as two participants had to be excluded due to incorrect answers in more than half of the trials. Accordingly, the total sample for the ECT analysis was n = 47. The difference of the mean reaction time of incongruent and congruent trials was calculated and compared between the two patient groups. As depicted in Figure 7, the average reaction time was significantly shorter in depressive participants (M = 0.04; SD = 0.07) than in anxious participants (M = 0.08; SD = 0.04), $t(45) = -2.06$, p = .045. This results in a medium effect size of Cohens´ d = -0.66. A post-hoc power analysis revealed a power of $1-\beta = 0.52$.

Figure 7

Mean Reaction Time Difference between incongruent and congruent Trials in depressive and anxious Participants in ECT

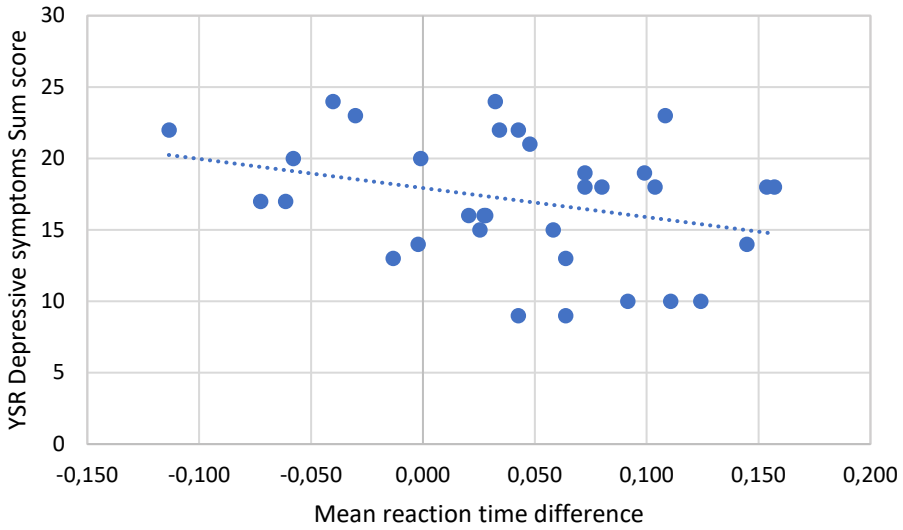


Hypothesis 6: Deficits in implicit ER predict the specific clinical psychopathology (depressive or anxiety disorder) of adolescents.

For participants with depressive disorder, the linear regression model was not statistically significant, $F(1/31) = 3.27$, $p = .080$, 95% CI [-43.36, 2.61] and explained 6.6% of the variance in depressive symptoms ($R^2 = .095$, adjusted $R^2 = .066$). Implicit ER (B = -20.38, SE = 11.27, $t = -1.81$, $p = .08$) was no significant predictor. Results of the linear model of implicit ER as predictor for depressive psychopathology are presented in Figure 8.

Figure 8

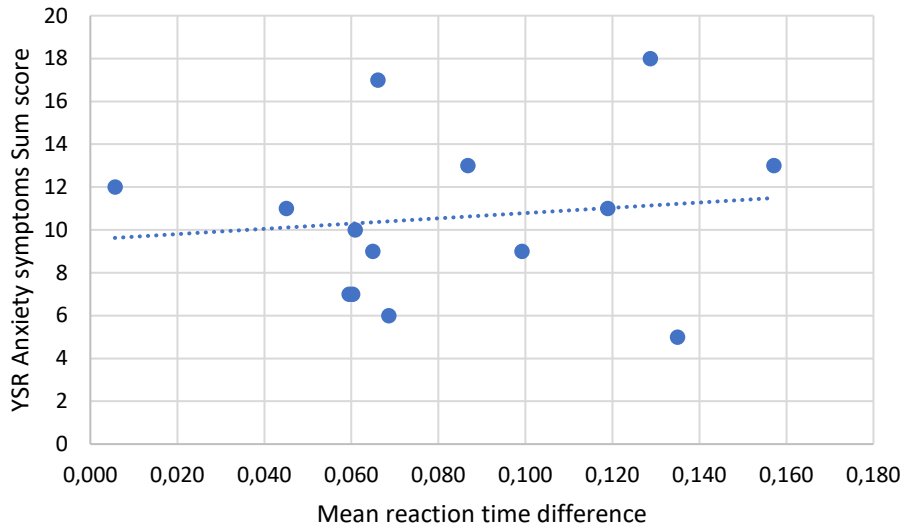
Scatterplots with Regression Line of YSR Depression sum score and Emotional Conflict Effect score (in s)



Simultaneously, linear regression model was conducted for implicit ER as predictor for participants with anxiety disorder. The linear regression model was not statistically significant, $F(1/12)= .21$, $p = .658$, 95% CI [-46.65, 71.22] and explained 6.5% of the variance in anxious symptoms ($R^2 = .017$, adjusted $R^2 = -.065$). Implicit ER (B = 12.28, SE = 27.05, $t = .45$, $p = .658$) was no significant predictor for anxiety psychopathology. Results of the linear model of implicit ER as predictor for anxiety psychopathology are presented in Figure 9.

Figure 9

Scatterplots with Regression Line of YSR Anxiety sum score and Emotional Conflict Effect score (in s)

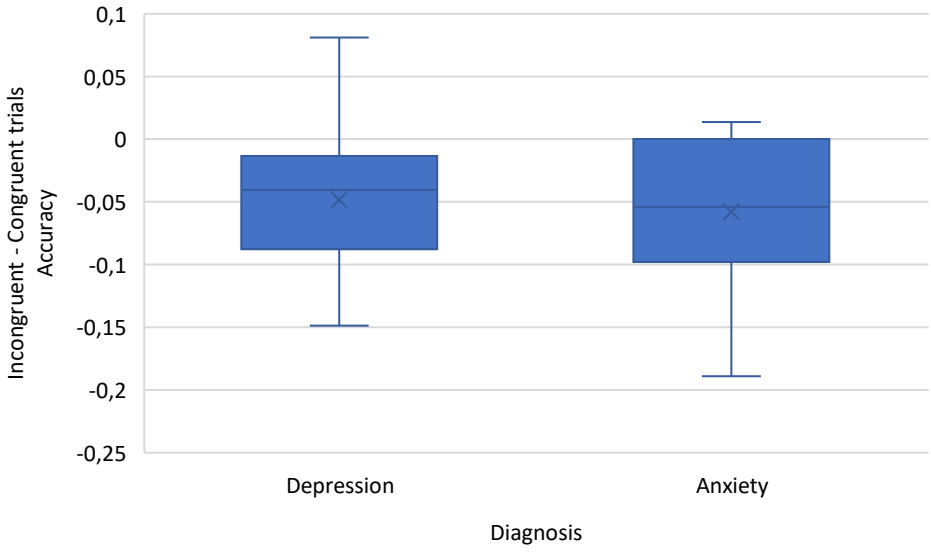


Exploratory Analyses

T-test results yielded no significant difference in accuracy ($t(45) = .53$, $p = .596$) between adolescents with depression ($M = -.05$, $SD = .05$) and those with anxiety ($M = -.06$, $SD = .06$) in emotional conflict. The effect size was $d = .17$, indicating a small effect. Results showing this relation are displayed in Figure 10.

Figure 10

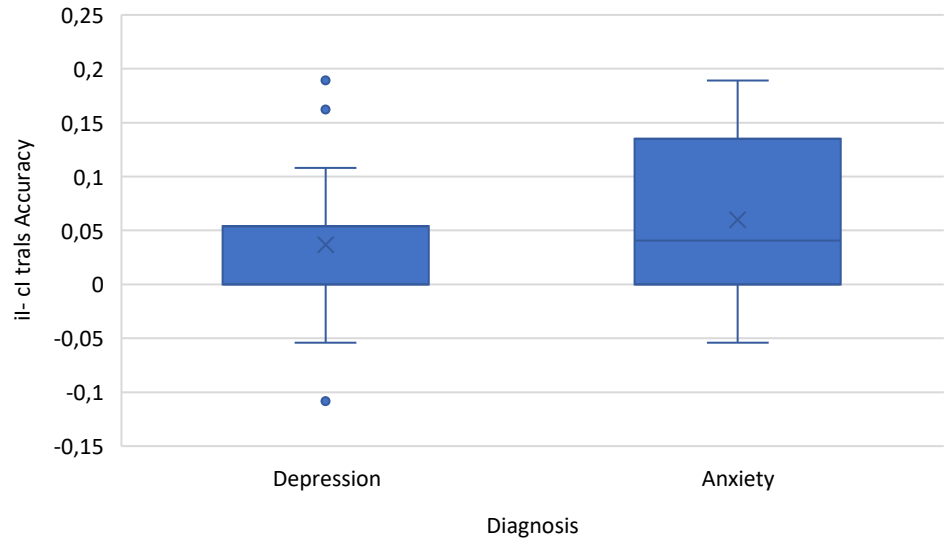
Accuracy Difference between incongruent and congruent Trials in depressive and anxious Participants in ECT



Secondly, exploratory analysis investigating the emotional conflict adaption accuracy, similarly showed no significant differences $t(45) = -1.03$, $p = .307$: participants with depressive disorder ($M = .04$, $SD = .06$) and those with anxiety disorder ($M = .06$, $SD = .08$) did not differ significantly in their ability to adapt to emotional conflict correctly. This indicates a small effect size of Cohen´s $d = -.33$, as depicted in Figure 11.

Figure 11

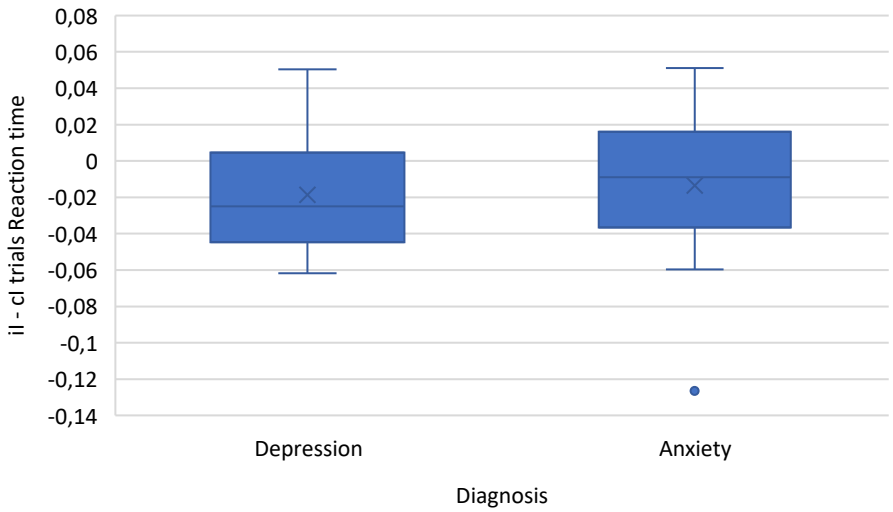
Emotional Conflict Adaption Accuracy (iI - cI trials) in depressive and anxious Participants in ECT



Participants with depressive disorder ($M = .02$, $SD = .03$) and anxiety disorder ($M = .01$, $SD = 0.45$) showed no significant difference in their reaction time during emotional conflict adaption: $t(45) = -.45$, $p = .656$. Results show an effect size of $d = -.14$. For visualization, the results are displayed in Figure 12 using a boxplot.

Figure 12

Emotional Conflict Adaption (iI – cI trials) Reaction Time (in s) in depressive and anxious Participants in ECT



Discussion

This study investigated ER in adolescents with either an anxiety disorder or a depressive disorder from different perspectives using multiple measures. The present research examined the agreement between parents and adolescents in self-reports and the role of ER strategies in predicting adolescents´ clinical psychopathology. It investigated whether the use of the ER strategies suppression and reappraisal is consistent across disorders, while differences in performance on the ECT were expected and linked to psychopathology. The findings partially support these hypotheses and are discussed below.

The results of suppression and reappraisal predicting clinical psychopathology, analyzed separately for depressive and anxious patients, indicate no significant relationships after correcting for multiple testing, with R^2 values being small. These findings are inconsistent with prior results. Previous literature has reported medium effect sizes for the use of suppression in depression and anxiety disorders and small effect sizes for reappraisal in these conditions (Aldao et al., 2010). These associations were observed regardless of the specific internalizing disorder, suggesting that alternative explanations may account for the present findings. Notably, the direction of the slope parameter in the depressive sample (n = 34) aligns with theoretical expectations, showing a negative relationship for the ER strategy reappraisal and a positive relationship for suppression. This trend supports the idea

that patients with internalizing disorders may struggle to downregulate their negative emotions while maintaining or even amplifying their positive emotional experiences, as described by Yap and colleagues (2007). Therefore, these effects warrant further investigation with a larger sample size. In particular, the high variability observed in the anxious sample (n = 15) complicates the detection of effects given the small sample size (Figure 4). Although excluding outliers might have improved model fit, this approach was not applicable due to the limited sample size in the current analysis. Furthermore, the DSM-oriented scales of the YSR/11-18R have not yet undergone sufficient validation and reliability testing, with the anxiety subscale showing notable shortcomings in construct validity. In a previous study with incarcerated boys that had to rate the YSR/11-18R instrument, DSM oriented scales were evaluated but none of the scales could screen DSM diagnoses well (Vreugdenhil et al., 2006). This limitation may have led to an inaccurate assessment of symptom severity, potentially obscuring the statistical relationships under investigation. Given the lack of significant findings, it remains uncertain whether ER strategies can be reliably considered predictors of clinical psychopathology in this context.

The parent-reported data from the CBCL/6-18R and the adolescent-reported data from the YSR/11-18R revealed a significant agreement (r = .53) on anxious symptoms, but only for adolescents with anxiety disorders. This finding, however, contradicts the hypothesis, which predicted low concordance (r = .1 to .3). In fact, the data reveal a high correlation between parent and adolescent reports. This may reflect the quality of family communication, suggesting that this sample has a relatively good ability to recognize and articulate their problems. Alternatively, it could indicate the severity of symptoms exhibited by the affected individuals or the reduced functional capacity associated with the symptomatology within this sample, which is strongly perceived by parents. These findings are inconsistent with previous research on anxiety symptoms in adolescents, which reported low agreement between parent and adolescent assessments (Choudhury et al., 2003; Miller et al., 2014). To explain these divergent findings, future research should explore the traits and circumstances that influence how adolescents and their parents perceive and evaluate symptomatology.

In line with previous studies that found low agreement between parents´ reports on adolescents´ depressive symptoms (Lewis et al., 2014), the current analyzed data showed an agreement of r = .16, although this effect was not statistically significant. Kim and colleagues (2020) reported that parents underestimated the severity of their children´s depressive symptoms, which was also observed in these data. Previous research has reported significant

findings with low agreement between parent and adolescent perspectives, particularly regarding depressive symptoms and suicidality (Lewis et al., 2014). Parent reports and a general multi-informant approach should not be disregarded, especially for sensitive information that adolescents may be reluctant to disclose. However, when it comes to suicidality, which has a strong correlation with severe depressive symptoms, reliance on parent reports alone is likely insufficient.

The hypotheses that depression and anxiety disorders do not differ in their use of the ER strategies suppression and reappraisal must be rejected. Bayesian statistics were employed due to the directional nature of the hypothesis formulation and the robustness to small sample sizes in the current data. The interpretation of the Bayes factor follows the widely cited publication by Kass and Raftery (1995). A Bayes factor of BF = 4.04 supports the rejection of the hypothesis that the two assessed disorders do not differ in their use of the ER strategy suppression. Similarly, regarding the ER strategy reappraisal, the hypothesis that depressive and anxious participants differ in its application must also be rejected, as indicated by a Bayes factor of BF = 4.05. These results can be discussed in light of previous research. Although a meta-analysis by Aldao and colleagues (2010) found comparable effect sizes for suppression ranging from r = .29 to r = .36 in both disorder groups, this finding could not be replicated in the present study. Similarly, small effect sizes for reappraisal ranging from r = -.17 to r = -.13 across the two disorders reported in the earlier publication (Aldao et al., 2010) were not confirmed here. However, the differing statistical approach using Bayesian statistics may lead to divergent conclusions, which is why a replication of the research questions from previous literature would have been beneficial for better comparability. This result may support a disorder-specific approach that emphasizes the unique deficits in the application of ER strategies in psychological disorders. Such differentiation could lead to a clearer conceptualization that may facilitate more efficient diagnostic processes (Suveg et al., 2009).

The results of the mean reaction time difference in the Emotional Conflict Task indicate that adolescents with anxiety disorders and depressive disorders do differ in the emotional conflict effect (p = .045), supported by a medium effect size. These findings align with the initial predictions and add value to the existing literature. Regarding overall emotional conflict measured by mean reaction time difference, studies to date have reported that the two clinical psychopathology groups (anxiety and depression) do not differ (Etkin & Schatzberg, 2011; Marusak et al., 2015; Saunders & Jentzsch, 2014), inconsistent with the current study result. Specifically, this analysis indicates that anxious adolescents were

significantly less effective than depressed adolescents in managing emotional conflict, indicated by their reaction times. This effect has been demonstrated in recent studies concerning only the emotional conflict adaptation effect and is evident in this study when analyzing the overall distribution of mean reaction time differences in the ECT. As proposed by Etkin and Schatzberg (2011), the deficit in anxious participants may originate from differences in brain activation patterns between the two disorders. Their neuroimaging study demonstrated that the regulation of emotional conflict was specifically linked to activation of the pregenual/ventral cingulate and suppression of amygdala reactivity through its connectivity with the cingulate (Etkin & Schatzberg, 2011). However, this brain activity pattern was not observed in patients with generalized anxiety disorder. Since prior research has exclusively involved adult patients, this study represents the first investigation focusing on adolescents with psychiatric disorders. Future research should include neuroimaging methods such as fMRI or EEG to investigate emotional conflict in adolescents using the ECT as a behavioral paradigm.

The sixth hypothesis assuming that deficits in emotion conflict, as an implicit aspect of ER, predict clinical psychopathology is rejected by the current data. Only in anxious participants, the predicted direction of the relationship align with the results (B = 12.28) but does not reach the level of significance. Given the small R^2 values observed in the current analysis, the influence of the implicit ER measure on clinical psychopathology can be considered negligible. Other predictors should be considered in future research to explore the potential impact of ER deficits on the severity of the disorder. Based on the results of this study, no conclusion can be drawn regarding the direction of the relationship. It should be noted regarding the methodology that there is still a lack of explicit numerical data concerning the reliability and validity indices of the ECT, despite this task being employed in several studies (Chechko et al., 2009; Etkin & Schatzberg, 2011; Marusak et al., 2015; Saunders & Jentzsch, 2014). Additionally, no control was applied for potential moderating variables that could influence the results, such as the socio-economic status of the participants. However, in a publication by Murasek and colleagues (2015), the influence of pubertal maturation as a moderating variable on group differences in emotional conflict was already ruled out.

Presented results indicate that the two groups do not differ in accuracy in the emotional conflict effect, consistent with previous studies (Chechko et al., 2009; Etkin & Schatzberg, 2011). Instead, deficits in accuracy appeared to be independent of group membership. This result could be explained by the notion that accuracy is often less sensitive

to subtle differences in conflict resolution behavior, whereas reaction time differences can capture more nuanced variations in cognitive processing speed and efficiency.

Analysis regarding the diverse exploratory hypotheses yielded non-significant results. Specifically, no differences in the emotional conflict adaptation effect, as measured by accuracy and reaction time difference scores, were detected between the clinical groups. These findings are not consistent with previous research conducted in adults. In previous studies, only anxious participants, compared to depressed patients or healthy controls, failed to regulate emotional conflict, as reflected in the incongruent adaptation effect (Etkin et al., 2010; Etkin & Schatzberg, 2011). However, it is noteworthy that other studies have also reported failures in emotional conflict adaptation among depressed patients (Epp et al., 2012; Saunders & Jentzsch, 2014). Note that these findings were only observed in cases of high symptom severity, which was also reported by the currently depressed sample in comparison to the normative group of patients with internalizing disorders (Table 2).

Limitations

The main limitation of this study constitutes in the sample size, which should be kept in mind when interpreting the results. With a relatively small sample (depressive: $n = 34$, anxious: $n = 15$), only large effect sizes could achieve statistical significance, and the generalizability of the findings is constrained. Furthermore, the imbalance in group sizes, with significantly fewer adolescents in the anxiety disorder group compared to the depressive disorder group, poses additional challenges for detecting meaningful and statistically significant effects. Individual outliers in the anxiety disorder group may exert a greater influence and potentially distort the interpretation of the findings. Future research should prioritize the use of a multimethod approach to assess ER and aim to replicate the study with a larger and more balanced sample.

Another constraint of this study is that the results can only be interpreted within the context of the selected theoretical assumptions. However, the field of ER remains broadly conceptualized making it challenging to effectively synthesize prior research. This is compounded by the diverse range of measurement tools employed, each targeting distinct aspects of ER assessment (Adrian et al., 2011). To address these challenges, the adoption of a unified research design with standardized operationalizations would be beneficial, enabling more consistent comparisons across studies examining different disorders and facets of ER.

This study did not account for comorbidity of participants in its sample. As shown in Table 5, self-reported anxious and depressive symptoms on the YSR/11-18R scale were markedly high among participants with the respective other disorder, falling within the above-average range compared to the norm group of adolescents with internalizing disorders. The above-average scores for adolescents with internalizing disorders are ≥ 12 for depression and ≥ 10 for anxiety, as shown in Table 2. The result is not surprising, given that the comorbidity rate of depression in adolescents with anxiety disorders is approximately 32.5%, similar numbers were shown for comorbidity in depressive disorders (Wagner et al., 2017). Including a third clinical group could have allowed for these comorbid cases to be addressed; however, this might have obscured between-group comparisons in a relatively small sample. In the future, a dimensional approach to mental disorders in adolescence may prove to be more effective. It should also be noted that no healthy control group was included in the study. Without having a normative baseline, it gets more difficult to identify pathological processes in ER specific to psychopathology and not to general adolescent variability.

Strengths

As clinical research on adolescents, particularly in the field of ER, is lagging behind, a key strength of this study lies in its selection of a sample comprising adolescents with affective disorders. Furthermore, the inclusion of not only one but two disorder groups that are already prevalent in adolescence is particularly noteworthy, as comparative analyses of these groups have been rare in prior studies (Aldao, 2013). This approach enables the direct identification of whether deficits in ER are specific to the phenomenology of a particular disorder or reflect broader markers of clinical psychopathology. Given that most studies rely on self-reports of ER, the incorporation of an automatic, behavioral and objective ER measure represents a significant advancement. Bridging the gap between laboratory experiments and treatment studies furthermore, it will be crucial to continue assessing the automation of applicable ER strategies and identifying deficits associated with specific affective disorders in adolescents.

Future Research

An increasing number of adolescents have been struggling with mental health challenges in recent years, emphasizing the urgency for intervention. Foundational research with a larger clinical sample size that assesses the regulation processes of adolescents with varying levels of stress and adversity can serve as a cornerstone for designing new therapeutic

programs. Such programs could be tailored to address the individual needs of youth effectively based on research. Lincoln and colleagues (2022) have demonstrated in their meta-analysis that positive reciprocal effects of treatment and ER on depressive and anxious symptoms can occur, at least in adults. This finding highlights the potential importance of exploring these effects in future research on adolescents.

Future research should increasingly emphasize the situational context of ER and focus on capturing strategies across different emotional states. In theory, this aligns with the *Process model of ER*, which incorporates the situational context (Gross & Thompson, 2007). Examining these spontaneous regulatory processes will be particularly intriguing in clinically affected adolescents, as they are characterized by rigid and inflexible patterns of responses to the environment. These tendencies may reveal deficits in skillfully navigating such states (Aldao, 2013). Technology-based measurements can be employed to enhance the ecological validity of operationalization which includes methods such as Ecological Momentary Assessments (EMA) where longitudinal data including behavior, affect and cognition is collected through repeated surveys administered via smartphones (Bettis et al., 2022). Another potential method involves passive sensing technologies (e.g., wearable devices) which allow for the tracking of data such as geo-location, heart rate and physical activity, potentially offering insights into both implicit and explicit ER processes.

As insights into brain activation patterns during implicit regulatory processes are currently mainly available for adults (Alders et al., 2019; Chechko et al., 2009; Etkin et al., 2006), there is a need for neuroimaging studies that incorporate behavioral measures in adolescents with anxiety and depression as well as in healthy controls. Such studies would enable comparisons between the groups during specific tasks, as changes in brain activation may reflect core deficits, compensatory mechanisms, or both.

Conclusion

The elaborations of this study highlight that adolescence (13–18 years) represents a distinct developmental period for ER. During this time, social-affective and neuro-cognitive processes undergo significant changes within evolving social contexts. The intensity and frequency of emerging emotions in this age further underscore the growing demand for focused research in this area. Contrary to expectations, this study found that suppression and reappraisal were not significant predictors of clinical psychopathology in adolescents, possibly due to data variability and a small sample size. While parents showed higher

agreement with their children´s self-reports in anxiety disorders than expected, no significant correlation was found for depressive disorders. These results may have been influenced by methodological limitations, although the existing literature remains inconclusive regarding the concordance between parent- and self-reports, warranting further investigation. Adolescents with the two internalizing disorders examined in this study, depression and anxiety, seem to differ in their utilization of the ER strategies suppression and reappraisal. Such findings could inform the development of programs aimed at supporting adolescents in employing adaptive strategies in emotion-evoking situations. Adolescents with anxiety and depression differed in their use of implicit regulation, as measured by an emotional conflict task. These findings highlight the need to explore automatic regulatory processes further, potentially through neuroimaging studies, to uncover disorder-specific deficits.

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List of Abbreviations

ASQ-Y	Affective Style Questionnaire – Youth
CBCL/6-18R	Child Behavior Checklist / 6-18 Revised
cC	Postcongruent-Congruent trial
cI	Postcongruent-Incongruent trial
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th Edition
ECT	Emotional Conflict Task
EEG	Electroencephalography
EMA	Ecological Momentary Assessment
ER	Emotion Regulation
fMRI	Functional magnetic resonance imaging
GAD	Generalized Anxiety Disorder
iC	Postincongruent-Congruent trial
ICD-10	International Statistical Classification of Diseases and Related Health Problems -10th Revision
iI	Postincongruent-Incongruent trial
ISI	Inter-stimulus-interval
SAD	Social Anxiety Disorder
SSRI	Serotonin reuptake inhibitors
tDCS	Transcranial direct current stimulation
VIF	Variance Inflation Factor
WAIS-IV	Wechsler Adult Intelligence Scale- Fourth Edition
WISC-V	Wechsler Intelligence Scale for Children- Fifth Edition
YSR/11-18R	Youth Self Report / 11-18 Revised

Appendix

Abstract

Due to the increasing prevalence of mental health problems during adolescence, it is necessary to assess the use of emotion regulation as a potential risk factor to enable early intervention aimed at improving these disorders. This study aimed to examine two internalizing disorders, specifically depression and anxiety, and their relationship to both explicit and implicit aspects of emotion regulation in adolescence. A multimethod approach was employed, including self- and parent-reports of clinical psychopathology using the YSR/11-18R and CBCL/6-18R. Adolescents' use of emotion regulation strategies was assessed through the ASQ-Y, while implicit emotion regulation was measured using an experimental behavioral paradigm, the Emotional Conflict Task. It was hypothesized that there would be low agreement between parent and self-reports. Additionally, it was assumed that affected adolescents with either disorder would not differ in their use of two selected emotion regulation strategies, suppression and reappraisal, but would differ in their performance regarding implicit emotion regulation. It was expected that adolescents' self-reports of emotion regulation strategies and their performance in implicit emotion regulation tasks would predict the reported severity of clinical psychopathology. Cross-sectional data were collected from n = 34 adolescents with depressive disorder and n = 15 adolescents with anxiety disorder, along with their respective parents. Correlation analyses revealed a high level of agreement (r = .53, p = .04) between the assessments of adolescents with anxiety disorder and their parents regarding the severity of the disorder. *T*-test analyses showed that adolescents with depressive disorders demonstrated better implicit emotion regulation performance than those with anxiety disorders [$t(45) = -2.06$, p = .045]. The two disorders differed in the application of explicit emotion regulation strategies (suppression: BF = 4.04; reappraisal: BF= 4.05). However, as shown by a multiple linear regression analysis, the reported emotion regulation strategies of suppression and reappraisal, did not predict the reported severity of the clinical psychopathology of anxiety [$F(2/12) = 0.514$, p = .611, adjusted R^2 = .08] nor depression [$F(2/31) = 0.54$, p = .588, adjusted R^2 = -.029]. The performance in implicit emotion regulation could not predict the symptom severity of depression [$F(1/31) = 3.27$, p = .080, adjusted R^2 = .066], or anxiety [$F(1/12)$= .21, p = .658, adjusted R^2 = -.065].

Abstract (Deutsch)

Aufgrund der steigenden Prävalenz mentaler Probleme im jugendlichen Alter ist es erforderlich, den Einsatz von Emotionsregulation als möglichen Risikofaktor zu erfassen, um eine frühzeitige Intervention zur Verbesserung der Störung zu ermöglichen. In dieser Studie sollten zwei internalisierende Störungsbilder, genauer Depression und Angst, behandelt und deren Zusammenhang zu expliziten, wie auch impliziten Aspekten von Emotionsregulation in der Jugend erhoben werden. Als multimethodische Erhebung sollten Selbst- und Elternberichte zur klinischen Psychopathologie mittels YSR/11-18R bzw. CBCL/6-18R erhoben werden. Eingesetzte Emotionsregulationsstrategien der Jugendlichen wurden durch das Instrument ASQ-Y und implizite Emotionsregulation durch ein experimentelles Verhaltensparadigma, den Emotional Conflict Task, gemessen. Es wurde eine geringe Übereinstimmung zwischen Eltern- und Selbstberichten angenommen. Es wurde die Annahme getroffen, dass sich die betroffenen Jugendlichen beider Störungen im Einsatz der Emotionsregulationsstrategien Unterdrückung und Neubewertung nicht unterscheiden würden, jedoch in ihrer Kompetenz bezüglich impliziter Emotionsregulation. Es wurde erwartet, dass Selbsteinschätzungen der Jugendlichen zu Emotionsregulationsstrategien und ihre Leistung in impliziter Emotionsregulation die berichtete Schwere der klinischen Psychopathologie vorhersagen würde. Querschnittsdaten von n = 34 Jugendlichen mit Depression und n = 15 Jugendlichen mit Angststörung und deren jeweiligen Eltern wurden erhoben. Korrelationsanalysen zeigten eine hohe Übereinstimmung (r = .53, p = .04) zwischen den Einschätzungen Jugendlicher mit Angststörung und ihrer Eltern bezüglich der Störungsschwere. T-Test-Analysen zeigten, dass Jugendliche mit depressiver Störung eine bessere Fähigkeit zur impliziten Emotionsregulation als ängstliche Jugendliche zeigten [t(45) = -2.06, p = .045]. Die beiden Störungsbilder scheinen sich in der Anwendung der expliziten Emotionsregulationsstrategien zu unterschieden (Unterdrückung: BF = 4.04; Neubewertung: BF= 4.05). Die berichteten Emotionsregulationsstrategien Unterdrückung und Neubewertung konnten mittels einer multiplen linearen Regressionsanalyse weder die berichtete Störungsschwere der Jugendlichen mit Angststörung [F(2/12) = 0.514, p = .611, adjustiertes R^2 = .08] noch mit Depression [F(2/31) = 0.54, p = .588, adjustiertes R^2 = -.029] vorhersagen. Auch die Fähigkeit zur impliziten Emotionsregulation sagte die Störungsschwere der Depression [F(1/31) = 3.27, p = .080, adjustiertes R^2 = .066] und der Angststörung [F(1/12)= .21, p = .658, adjustiertes R^2 = -.065] nicht vorher.