The Relation Between Emotion Regulation & Anxiety: The Moderating Effect of Age-defined Developmental Stages

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Abstract

Anxiety poses a risk factor for normal development in children and adolescents. Previous research suggest that anxiety may occur at an early age, and with transition to adolescence, anxiety levels, specifically social anxiety levels, increases. There is a growing body of evidence showing that difficulties in emotion regulation are correlated with the expression of anxiety and social anxiety in youth. Even though there is increasing research in the field, it is unknown if the correlation is moderated by age-defined developmental stages. This study examined the relation between emotion regulation and, general anxiety and social anxiety in Dutch youth (N=166, M= 14.3 years), and whether age defined developmental stages ($n_{midlle\ childhood}$ = 47, $n_{early\ adolescence}$ = 48, $n_{late\ adolescence}$ = 71) moderates this relation. Data were collected among 8 to 18-years-olds with an online survey. Difficulties in emotion regulation were measured with the Difficulties in Emotion Regulation Scale (DERS). Level of general anxiety was measured with the anxiety items of Patient Health Questionnaire-4 (PHQ-4) and for social anxiety the social anxiety subscale of Screening for Child Anxiety Related Emotional Disorders (SCARED) was included. A significant strong association was found between difficulties in emotion regulation and both general anxiety and social anxiety. However, no significant moderation effect was found for age-defined developmental stages. The results of the current study might indicate that difficulties in emotion regulation and anxiety symptoms co-develop regardless of age. Further research should consider a longitudinal design to understand a possible causal pathway between emotion regulation and the different expressions of anxiety at different developmental stages.

Keywords: Emotion regulation, anxiety, social anxiety, childhood, adolescence, DERS, PHQ-4, SCARED

In child and adolescent psychopathology, anxiety disorders pose a great developmental risk factor. Many studies showed that anxiety disorders are the most prevalent DSM5 disorders and have the earliest age of onset (Beesdo et al., 2009; Orgiles et al., 2012; Last et al., 1996). Anxiety is not only a problem when it is a full-blown disorder but also when the symptoms are thus severe, that they interrupt daily functioning and interfere with typical development (Beesdo et al., 2019; Vasey et al., 2014; Kashani & Orvaschel, 1990). Beesdo et al.'s (2009) definition of anxiety as a brain response to danger, which is a basic emotion that is present since infancy, helps us understand that anxiety might not always be considered as a problem since it enables one to avoid danger. Differentiating normal developmental fears such as fear of lightning or fear of separation from atypical fears such as separation anxiety in adolescents is an important step to identifying problematic anxiety. Research shows that the experience of different normal developmental fears, such as fear of lightning or separation anxiety during infancy, lead to different anxiety expressions across different ages (Beesdo et al., 2009; Orgiles et al., 2012; Vasey et al., 2014; Kashani & Orvaschel, 1990; Gullone et al., 2001).

In a community study conducted by Orgiles et al. (2012), among 8- to 17-year-olds, separation anxiety disorder is the most prevalent disorder but the prevalence decreased with age, whereas the prevalence of social phobia and generalized anxiety disorder increased. These results support that the expression of anxiety is affected by developmental age, i.e., separation anxiety is a developmental fear that decreases with maturity whereas social phobia is triggered by social fears that generally start to appear from late childhood (Orgiles et al., 2012).

Many risk factors and predictive factors of anxiety have been identified, e.g., both psychobiological and environmental factors (Beesdo et al., 2009). Importantly, researchers showed for emotion regulation specifically that this variable is highly correlated with the

experience of anxiety (Schaffer et al., 2016; Suveg & Zeman, 2004; Cracco et al., 2017; Zeman et al., 2002; McGlinchey et al., 2021). Although the direction of the effect is not known yet, a few studies showed that problems in emotion regulation predict the occurrence of anxiety disorders (Schneider et al., 2016; Klemanski et al., 2016). There are various definitions of emotion regulation in use in research, many definitions suggest a similar understanding, however. The similarity is that emotion regulation is considered the process of how one experiences, influences, and expresses emotions (originally defined by Gross, 1998).

As with expression of anxiety, emotion regulation differs with age. The emotion regulation process starts to develop from infancy and continues through childhood and adolescence. During development, there are important milestones related to cognitive and socio-emotional changes such as thinking less egocentrically (Sabatier et al., 2017). Also when transitioning to adolescence, individuals start experiencing negative emotions more intensely and more often which coincides with an increase in the importance of peers (Sanchis-Sanchis et al., 2020). These milestones also have an impact on the development of emotion regulation (Schaffer et al., 2016). From infancy to near middle childhood, emotion regulation relies on external influences from parents/caregivers and starts transitioning to self-regulation with increased awareness of intrinsic influences such as memories and fears (Sabatier et al., 2017). From middle childhood individuals become more aware of their emotions and the management of their emotions (Schaffer et al., 2016). Around age eight, children become less egocentric which allows them to understand there are different points of view and different experiences may lead to different emotional reactions in others. At this stage children can get extrinsic support when worried and choose to verbally react when feeling angry rather than expressing physical aggression.

The transition from childhood to adolescence marks an important development of emotion regulation in which the emotion regulation processes become internal around age

ten. From early adolescence to mid adolescence, individuals learn to take different perspectives and can consider consequences of their own actions (Sabatier et al., 2017). Also, the dependence to external care to regulate emotions leaves its place to an increase in importance of peer influences during adolescence (Keil et al., 2017). By late adolescence, individuals' emotion regulation skills are almost similar to adults (Sabatier et al., 2017; Sanchis-Sanchis et al., 2020). These milestones reflect major change during certain developmental stages and lesser change during other developmental stages, which suggest the importance studying the underlying emotional mechanism in the expression of psychopathological symptoms per developmental stage.

Research has focused on considering the quality of emotion regulation as a mechanism of developmental differences that accounts for socioemotional functioning. Notably, there is a growing body of evidence proposing that emotion regulation difficulties play a role in the expression of childhood and adolescence psychopathology (Schaffer et al., 2016; Suveg & Zeman, 2004; Cracco et al., 2017; Zeman et al., 2002; McGlinchey et al., 2021; Aldao et al., 2010). Anxiety being one of the most prevalent disorders during childhood and adolescence, researchers have started studying the relationship between emotion regulation and the onset of anxiety. Although the direction of this relationship is unknown, a few studies found evidence suggesting that children and adolescents with anxiety symptoms and disorders show greater difficulty in using adaptive emotion regulation strategies (Schneider et al., 2016). The available research suggests that children and adolescents who show internalizing symptoms that are indicative of anxiety, show lower self-efficacy in improving their mood and use less adaptive coping skills (Suveg & Zeman, 2004). Research furthermore suggests that use of maladaptive strategies can be a risk factor for developing internalizing symptoms whereas use of adaptive strategies can be a protective factor (Aldao et al, 2010). The important discussion that is lacking from the research

available, is the differences of results in different developmental stages. Considering that emotion regulation strategies repertoire broadens with age and the importance of social functioning increases with age, analysing the change in the weight of emotion regulation's effect on general anxiety and social anxiety symptoms might allow understanding the underlying emotional mechanisms that takes part in the expression of anxiety.

This study will firstly examine the relation between emotion regulation and general anxiety and secondly examine if this relation is moderated by age-defined developmental stages. Although previous research differs on the direction of this relation, this study does not aim to establish causality but aims understand the possible mechanisms of this relation. This model is proposed based on the important developmental and cognitive changes that occur during middle childhood, early adolescence and late adolescence and which were shown to affect emotion regulation abilities. Thirdly, this study will examine the relation between emotion regulation and social anxiety and fourthly examine if this relation is moderated by age-defined developmental stages. Based on prior findings four hypothesis are formulated: Higher levels of difficulties in emotion regulation are related to higher levels of overall anxiety symptoms (1), this relationship is not moderated by age (2), increased difficulties in emotion regulation will be expressed in increased social anxiety symptoms (3), this increase is strengthened with age (4).

Methods

Participants

The current study included 171 Dutch youths who are in primary or secondary education, out of which 166 participants completed the survey. One hundred five of the participants were girls and 61 of the participants were boys, including participants from ages 8 to 18. The gender distribution according to the age-defined developmental stages can be found in *Table 1*. The mean age of participants is 14.3 (SD=2.86). For this cross-sectional study, a power

analysis was conducted using the G*Power 3.1.9.7 software. The target sample size was found to be 102 based on a medium effect size f^2=0.13, α=0.05, power=0.95 including one moderator and two independent variables (Serdar et al., 2021). This power analysis does not differ for both moderator analysis.

Table 1

Distribution of age groups according to gender

		Gender		
		Girl	Boy	Total
AgeGroup	Middle Childhood (8 to 12.11 years)	27	20	47
	Early Adolescence (13 to 15.11 years)	26	22	48
	Late Adolescence (16 to 18.11 years)	52	19	71
Total		105	61	166

Note. Chi-square distribution of age groups and gender did not show any significant difference.

Materials

A survey called "Vragenlijsten De Jeugd van Tegenwoordig" was provided to participants which included two subscales of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), the Patient Health Questionnaire-4 (PHQ-4; Kroenke et al., 2011), and the social anxiety subscale of the Screen for Child Anxiety Related Emotional Disorders (SCARED; Muris & Steerneman, 2001). All materials were provided in Dutch. The survey furthermore includes questions regarding demographic data such as age, gender, and nationality. This study is part of a larger study that is being conducted at the department of developmental psychology, Utrecht University.

Difficulties in Emotion Regulation Scale (DERS)

In order to measure emotion regulation levels, two subscales of the Dutch Version of the Difficulties in Emotion Regulation Scale (DERS) were used; the subscales "Impulse control difficulties" and "Limited access to emotion regulation strategies". This includes a total of 16 statements with answer options rated on a 5-point Likert scale, ranging from "Almost Never" to "Almost Always". Example statements are "Als ik van streek ben, duurt het lang voordat ik me weer beter voel (When I am upset, it takes me a long time to feel better)", "Als ik van streek ben, heb ik geen controle meer over mijn gedrag (When I am upset, I lose control over my behaviour)" and "Als ik van streek ben, kan ik me niet meer beheersen (When I am upset, I become out of control)". Higher scores on DERS suggest increased emotion regulation problems. Gratz & Roemer (2004) found that DERS has high internal consistency with Cronbach's α=0.93. They also showed that DERS has high construct validity (ts>4.78, p<0.001) and high test-retest reliability (ρI = .88, p < .01) In addition, the impulse and strategy subscales also had good internal consistency for each subscale (for impulse α= 0.86, for strategies α= 0.88). In a study conducted on the Dutch adolescent population, it was also found that both strategy and impulse subscales showed high internal consistency (Neumann et al., 2010). Cronbach's alpha in this current study is 0.86 which shows a very good reliability. The overall score for difficulties in emotion regulation was calculated by adding each score for each item (Gratz & Roemer, 2004).

Patient Health Questionnaire-4 (PHQ-4)

PHQ-4 consists of two subscales to measure anxiety and depression. The two-item subscale for anxiety is called the Generalized Anxiety Disorder Screener (GAD-2). Youth respond to two statements "Ik voelde me nerveus, angstig of onrustig (I felt nervous, anxious or restless)" and "Ik had moeite te stoppen met piekeren (I had trouble stopping fretting)" measured on a 4-point Likert scale ranging from "Not at all" to "(Almost) Every day". Higher scores indicate higher anxiety levels. Löwe et al. (2010) conducted a study on the

generalization and validity of PHQ-4 in a population older than 14 years old. The results yielded that the scale has good internal consistency with Cronbach's α=0.82 and the GAD-2 subscale showed satisfactory internal consistency with Cronbach's α=0.75. Although PHQ-4 is a restricted scale, it measures the needed data successfully and is applicable to all age groups (Löwe et al., 2010). Cronbach's alpha in this current study is 0.85 which shows a good reliability. The overall anxiety score was calculated by adding the scores on two anxiety items.

Screen for Child Anxiety Related Emotional Disorders (SCARED)

In order to measure social anxiety levels, the social phobia subscale of the SCARED was used. The age range for SCARED is 7-19 years old which includes the age range of this study (Muris & Steernman, 2001). The subscale includes 7 statements such as "Ik ben niet graag bij onbekende mensen (I don't like to be around people I don't know well)" and "Ik voel me zenuwachtig als ik iets moet doen terwijl andere kinderen of volwassenen naar mij kijken (bijvoorbeeld bij hardop lezen, een spreekbeurt, een spel of een sport) (I feel nervous when I have to do something while other children or adults are watching me (for example, in reading aloud, a talk, a game or a sport))". The statements are measured on a 3-point Likert scale ranging from "Almost never" to "Often". Higher scores on the test suggest higher levels of social anxiety and a score of 8 or above suggests the presence of social anxiety disorder. Hale III et al. (2005) conducted a study on a Dutch population to assess the psychometric qualities of the Dutch SCARED. The results of the study showed that the social phobia subscale has high internal consistency with Cronbach's α=0.82. Cronbach's alpha in this study is 0.89 which shows an excellent reliability. The overall score for difficulties in emotion regulation was calculated by adding each score for each item.

Procedure

To recruit participants, 519 primary and secondary schools in the Netherlands were approached with information on the project via email or via organization networks. Additionally, information about the project was posted on social media and LinkedIn. Twenty schools accepted the invitation to participate in the project, 49 schools rejected it, 450 schools did not respond. In the 20 schools that accepted, information on the survey called "Vragenlijsten De Jeugd van Tegenwoordig" was distributed through the typical information channels of the school. The survey was accessible from February 2022 until the end of May 2022. Due to low response rates (in April 2022) a flyer was prepared to be distributed physically and via social media containing a QR code leading to the information and consent page of the survey. In total, 200 flyers were distributed. The survey includes information and a consent form, demographic questions, and several different questionnaires. For students aged 8 to 12, the consent form was filled out by their parents. For students aged 12 to 16, the consent form was filled out by both students' parents as well as the students. For students aged 16 to 18, the consent form was only filled out by the students. The students were informed that their answers are completely anonymous. To increase the response rate, students were informed that if they completed the entire survey, a donation of 1 Euro would be made to a charity of their choice. The order of the questionnaires in the survey were randomized in order to eliminate any order biases. The study was approved by the Ethics Committee of the Faculty of Social Sciences with registration number 21-0370.

Data Analysis

For this study, IBM SPSS Statistics version 29.0 was used to perform the statistical analysis. Before analysis of the data, assumption checks for multiple regression analysis was checked. To test whether age-defined developmental stages moderate the relation between emotion regulation and general anxiety, first a linear regression analysis was conducted between emotion regulation (independent variable) and overall anxiety levels (dependent

variable)(1). Then a multiple regression analysis was conducted between emotion regulation and social anxiety, and age-defined developmental stages (2).

To test whether age-defined developmental stages moderate the relation between emotion regulation and social anxiety (3), first a linear regression analysis was conducted between emotion regulation (independent variable) and social anxiety levels (dependent variable). Followingly, a multiple regression analysis was conducted between emotion regulation and social anxiety, and age-defined developmental stages (4). Linear regression analysis and multiple regression analysis for each hypothesis were conducted separately since this study uses dummy variables. Separate analysis and reporting of the outcomes was conducted for clarity purposes and to facilitate interpretation.

For the moderator analysis, participants were divided into three age groups based on calendar age: middle childhood (aged 8 to 12.11 years), early adolescence (aged 13 to 15 years), and late adolescence (aged 16 to 18 years). To conduct multiple regression analysis with a predictor with multiple categories, the variable for age group was coded into two dummy variables; dummy 1 represents middle childhood compared to late adolescence, dummy 2 represents early adolescence compared to late adolescence. The baseline group is the age group representing late adolescence which has the highest number of participants since this study doesn't have a control group (Field, 2013).

The level of difficulty in emotion regulation, the independent variable, was computed from the overall score for each participant on the DERS. The self-reported anxiety symptoms, the dependent variable, was computed by the total score of each participant on the GAD-2. The self-reported social anxiety symptoms, the dependent variable for the second hypothesis, was computed by the total score of each participant on the SCARED.

Results

Emotion Regulation, Anxiety and Social Anxiety

The descriptive analysis of the research variables according to age groups showed that the average of the scores on difficulties in emotion regulation and anxiety scale were lowest for middle childhood and highest for late adolescence. The average of the scores for social anxiety was highest for early adolescence and lowest for late adolescence. The means and standard deviations for the main outcome variables can be found in *Table 2*. In addition, correlation analysis between research variables except age-groups yielded a significant correlation among all variables which can be seen in *Table 3*.

Table 2

Descriptive statistics of the study variables

	All participants		Middle Childhood (*n = 47*)		Early Adolescence (*n = 48*)		Late Adolescence (*n = 71*)	
	M	SD	M	SD	M	SD	M	SD
Emotion Regulation	17.30	12.70	15.50**	12.80	17.50**	12.10	18.30**	13.10
Anxiety	3.90	1.80	3.50**	1.40	3.60**	1.20	4.40**	1.80
Social Anxiety	13.70	4.10	13.90**	3.80	14.00**	4.50	13.30**	3.90

*** Increase significant at 0.01 level*

Table 3

Correlation analysis of the study variables

	Middle Childhood		Early Adolescence		Late Adolescence	
	Anxiety	Social Anxiety	Anxiety	Social Anxiety	Anxiety	Social Anxiety
ER	0.60**	0.43**	0.44**	0.43**	0.57**	0.30*
Anxiety	-	0.37*	-	0.55**	-	0.49**

* Correlation is significant at the 0.05 level

** Correlation is significant at the 0.01 level

Preliminary Analysis

Prior to conducting and interpreting the results of the analyses, five assumptions for linear regression and multiple regression analysis were checked. In order to check linearity assumption, a matrix scatter plot was created with all the variables mentioned above (except for the moderator; age groups). Based on the scatter plot, it was concluded that the linearity assumption was met. To check if the normality assumptions was met, a P-P plot of regression standardize residuals was created which showed a clear normally distributed data. The scatter plot of regression standardized predicted value and residuals showed that the homogeneity of variances assumption was met. Multicollinearity assumption was met with VIF < 4. A Durbin-Watson test showed that the uncorrelatedness of residuals assumption was not violated with Durbin-Watson<2.5.

Emotion Regulation and General Anxiety

The first linear regression analysis shows a significant relationship between emotion regulation and anxiety with R^2 =0.287, meaning that 28.7% of the variance in anxiety is explained by emotion regulation ($F_{(1,164)}$=66.152, $p<0.001$). The regression coefficient

(B=0.076, p<0.001) indicates that a one-unit increase in difficulties in emotion regulation, results in an increase of 7.6% in anxiety regardless of age.

Moderation effect of age-defined developmental stages on the relationship between ER and general anxiety

The first multiple regression analysis testing for moderation shows that the interaction effect between emotion regulation and age-defined groups did not contribute to the variance in anxiety significantly, $F_{(2,160)} = 0.183$, $p=0.833$. The regression coefficients analysis showed that there is a statically significant difference in the main effect of age group variables on anxiety levels, see *Table 4*. Participants in the middle childhood group and the early adolescence group report significantly lower anxiety levels than participants in late adolescence group. However, there is no statistical significance for the effects of age-group on the relationship between emotion regulation and anxiety, B=0.007, p=0.981.

Table 4

Multiple Regression Model with Interaction Effect of Emotion Regulation and Age Groups on General Anxiety

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1						
	ER	.07	.01	.52	8.07	<.001
	Middlch[1]	-.71	.28	-.18	-2.52	.013
	Earlyad[2]	-.71	.28	-.18	-2.58	.011
2						
	ER	.08	.01	.57	5.85	<.001
	Middlch	-.50	.46	-.13	-1.09	.28
	Earlyad	-.54	.49	-.14	-1.11	.27
	Dummy1 x ER[3]	-.01	.02	-.07	-.56	.58
	Dummy2 x ER[4]	-.01	.02	-.06	-.43	.67

1. Middle childhood compared to late adolescence

2. Early adolescence compared to late adolescence

3,4. The interaction effect of Emotion Regulation and Age-defined Groups (Moderation)

Emotion Regulation and Social Anxiety

The second linear regression analysis showed a significant relation between emotion regulation and social anxiety with R^2 =0.127, $F(1,164)$= 24.998, $p<0.001$. In other words, emotion regulation accounts for the 12.7% of the variance in social anxiety. The regression coefficients analysis showed that with B=0.116, an increase in emotion regulation difficulties results in a 11.6% increase in social anxiety ($p<0.001$).

Moderation effect of age-defined developmental stages

The second multiple regression analysis showed there was no significance of the interaction effect between emotion regulation and age groups on the level of social anxiety, $F(2,160)$=0.723, p=0.487. The regression coefficients analysis showed that there was no statistically significant difference between main effect of the age groups on social anxiety levels which can be seen in table 5.

Table 5

Multiple Regression Model with Interaction Effect of Emotion Regulation and Age Groups on Social Anxiety

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1						
	ER	.12	.02	.37	5.10	<.001
	Middlch[1]	.99	.72	.11	1.38	.17
	Earlyad[2]	.89	.71	.09	1.15	.25
2						
	ER	.09	.035	.28	2.62	.01
	Middlch	.33	1.17	.04	.28	.78
	Earlyad	-.39	1.24	-.04	-.31	.76
	Dummy1 x ER[3]	.04	.06	.09	.67	.50
	Dummy2 x ER[4]	.07	.06	.17	1.18	.24

The relation between emotion regulation and anxiety

1. Middle childhood compared to late adolescence

2. Early adolescence compared to late adolescence

3,4. The interaction effect (Moderation)

Exploratory Analysis

In order check for any confounding effect of gender in the relationship between emotion regulation and anxiety; and between emotion regulation and social anxiety, a multiple regression analysis was conducted accounting for gender. The analysis showed that with R^2change$=0.730$, gender is responsible of a 7.3% variance in anxiety levels, $F(1,163)=18.730$, $p<0.001$. The multiple regression analysis for social anxiety showed that gender does not account for a statistically significant variance in anxiety which can be seen in *Table 6*.

Table 6

Multiple Regression Model of Emotion Regulation and Gender on Social Anxiety

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
									Change Statistics	
1	.36	.13	.13	3.80	.13	25.00	1	164	<.001	
2	.40	.16	.15	3.76	.02	4.55	1	163	.03	2.23

Model 1. Dependent variable: Social anxiety, Predictor: Emotion regulation

Model 2. Dependent variable: Social anxiety, Predictor: Emotion regulation, Gender

Since the analysis showed that gender has a statistically significant effect on the anxiety level, a multiple regression analysis was conducted to further explore a possible moderation effect of gender on the relationship between emotion regulation and overall anxiety. The multiple regression analysis showed that the interaction effect of gender and emotion regulation was not statistically significant (p=0.34).

Discussion

Previous research consistently showed that difficulties in emotion regulation strategies are related to the experience of increased levels of anxiety (Schaffer et al., 2016; Suveg & Zeman, 2004; Cracco et al., 2017; Zeman et al., 2002; McGlinchey et al., 2021), and predictive of increased levels of anxiety (Schneider et al., 2016; Klemanski et al., 2016). However, the available research didn't address the potential moderation effect of age-defined developmental stages on this relationship as far as the author is aware of. This is important, since change in emotion regulation was found not be linear but different for different developmental stages. Likewise, the prevalence of general anxiety appears stable across time, the levels of social anxiety increase when children reach adolescence (Beesdo et al., 2009; Orgiles et al., 2012). Therefore, the current study examined if a) the relation between emotion regulation and general anxiety, and b) the relation between emotion regulation and social anxiety is moderated by age-defined developmental stages in a sample of 166 Dutch youth aged 8 to 18.

First, the results show that youth who report increased difficulties in emotion regulation strategies also report increased levels of anxiety symptoms. These findings are in line with results from previous research which showed emotion regulation difficulties predicted increased anxiety levels (Schaffer et al., 2016; Suveg & Zeman, 2004; Cracco et al., 2017; Zeman et al., 2002; McGlinchey et al., 2021). Likewise, the results showed that youth who report increased difficulties in emotion regulation strategies also report increased levels of social anxiety symptoms. These results are also in line with previous research that showed the increase in emotion regulation strategies predicted increased social anxiety (Keil et al., 2017). These findings add to the previous findings and supports the importance of considering emotion regulation difficulties as a risk factor for anxiety (Schaffer et al., 2016). It should be noted that the current study is cross-sectional, therefore direction of effect is only

statistically assumed, based on theory and on previous empirical findings. Notably, a study showed that emotion regulation focused intervention was effective in decreasing anxiety symptoms and improve overall functioning in youth (Bender et al., 2012).

The results did not show significant interaction effects between age-defined developmental stages and emotion regulation on neither anxiety nor social anxiety. Thus, the hypothesis on the moderation effect of age on social anxiety was not supported whereas the hypothesis on the moderation effect of age on overall anxiety was supported. The lack of research on this moderation effect poses as an obstacle in understanding these findings. On the one hand the findings may indicate that emotion regulation problems are associated to anxiety regardless age, on the other hand it can be assumed that since emotion regulation is a developmental process, measuring the data at a single time point for each participant might not have been sufficient to show the incremental effect of age. The finding suggest that difficulties in emotion regulation and anxiety problems may co-develop. Although there was no moderation effect of a on the relationship between b and c, main effects of differences in age groups on anxiety were statistically significant. These findings support the increase in anxiety symptoms with age found by previous studies. However, a surprising finding was that different age groups did not have a significant main effect on social anxiety. With an increase in age the experience of social anxiety symptoms did not increase. These findings are contrary to research which showed that the prevalence of social phobia increases with age (Orgiles et al., 2012) which may be accounted for by differences in samples between studies and the difference between social anxiety and social phobia. The data obtained in studies on social phobia are mostly from clinical samples meaning that the participants had already been diagnosed with a specific type of anxiety whereas in this study the focus was not on establishing diagnosis but to research levels of social anxiety symptoms. Therefore, the findings of this study, which are contrary to previous research, could be explained by the fact

that the participants in this study completed the social anxiety survey regardless of a possible existing disorder, which cannot be compared with previous findings since the samples does not have the same characteristics (Orgiles et al., 2012).

Exploratory analysis showed a significant change in the effect of emotion regulation on anxiety when accounted for gender which means that boys and girls report different levels of overall anxiety symptoms. These findings are in line with previous research which showed different experienced anxiety levels by boys and girls (Bender et al., 2012; Schneider et al., 2016). However, further analysis showed that gender differences did not change the strength of the relationship between emotion regulation and anxiety. In addition, the analysis did not show a significant change in the effect of emotion regulation on social anxiety after controlling for gender. This is contrary to previous research that showed a significant main effect of gender on social anxiety levels (Keil et al., 2017). We should be careful drawing conclusions since the results might be explained by an unequal distribution of the participants among gender groups since the number of participating girls is nearly two times the number of boys.

Limitations and Strengths

Current study has four main limitations. First of all, difficulties in emotion regulation strategies were measured by using a shortened version of the DERS. Although the subscales which measures access to emotion regulation strategies and impulse control difficulties have good validity, two subscales cannot account for all types of difficulties in emotion regulation meaning the results may not be generalized for all difficulties. The other subscales measuring non acceptance of emotional responses, difficulties engaging in goal directed behaviour, lack of emotional awareness and lack of emotional clarity, could have a differential effect on anxiety symptoms. Developmental literature on milestones of emotion regulation during middle childhood and adolescence is associated with strategies noted in

these subscales. Milestones include the improvement in understanding emotional reactions and the differences in emotional expressions, and understanding consequences of their actions (Sabatier et al., 2017). Additionally, two items of the PHQ-4 questionnaire were used to measure overall anxiety. This 2-item scale might not adequately reflect overall anxiety, therefore measuring general anxiety in a more detailed screening could provide more insight and would allow better comparison with findings of previous studies.

Moreover, the cross-sectional design nature of the study cannot show a causal relationship between emotion regulation and anxiety or emotion regulation and social anxiety. Therefore, a longitudinal design would be able to show a causal relationship and the direction of the relationship. One of the strengths in this study is that the number of participants in this study addresses the limitations of small sample sizes noted in previous research on the topic (Sackle-Pammer et al., 2019). Also, the current study addresses the previous concerns regarding possible moderation effects of age and gender (Schaffer et al., 2016).

Another important limitation that should be noted is that the literature lacks research on differences in the relation between emotion regulation and, anxiety and social anxiety for different developmental stages which prevents comparing results with previous research and referring to previous results. However, this also marks a strength for this study since it is one of the few studies to analyze the relation between emotion regulation and, anxiety and social anxiety with conceptualization of age defined developmental stages as a moderator.

Implications

Future research would benefit from measuring difficulties in emotion regulation using the full version of the DERS. Also, since the age range of the questionnaire includes the target sample, the aforementioned developmental aspects of emotion regulation would support the use of the scale. Also, use of an age sensitive anxiety scale which includes general anxiety

symptoms and also different anxiety disorders would produce more confident results. Further studies should consider the use of a longitudinal design assessing developmental pathways from different types of emotion regulation to general anxiety and social anxiety. Better understanding of these might also help producing more accurate implications for clinical practices. If the direction of effect is assumed to be from ER to anxiety and given the strong association between emotion regulation and anxiety, interventions targeting managing anxiety symptoms, specifically social anxiety symptoms, could benefit from implementing an emotion regulation skills training-based preventative intervention.

In sum, this study tackles the question "What is the relation between emotion regulation and, anxiety and social anxiety?" and "Are these relations moderated by age-defined developmental stages?". The result of this study supports the importance of analyzing the emotional mechanism underlying anxiety and social anxiety with a different approach to age conceptualization. As mentioned above, further research needs to be conducted with keeping the limitations in mind to better understand these relations which can have important implications in child and adolescent psychopathology.

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References

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Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, *30*(2), 217-237.

Aldao, A., & Nolen-Hoeksema, S. (2012). When are adaptive strategies most predictive of psychopathology? *Journal of Abnormal Psychology*, *121*(1), 276.

Beesdo, K., Knappe, S., & Pine, D. S. (2009). Anxiety and anxiety disorders in children and adolescents: Developmental issues and implications for DSM-V. *The Psychiatric Clinics of North America*, *32*(3), 483–524. https://doi.org/10.1016/j.psc.2009.06.002

Bender, P. K., Reinholdt-Dunne, M. L., Esbjørn, B. H., & Pons, F. (2012). Emotion dysregulation and anxiety in children and adolescents: Gender differences. *Personality and Individual Differences*, *53*(3), 284-288.

Cracco, E., Goossens, L., & Braet, C. (2017). Emotion regulation across childhood and adolescence: Evidence for a maladaptive shift in adolescence. *European Child & Adolescent Psychiatry*, *26*, 909-921.

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. Sage.

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*, 41-54.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(3), 271-299.

Gullone, E., King, N. J., & Ollendick, T. H. (2001). Self-reported anxiety in children and adolescents: A three-year follow-up study. *The Journal of Genetic Psychology*, *162*(1), 5-19.

HALE III, W. W., Raaijmakers, Q., Muris, P., & Meeus, W. I. M. (2005). Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED) in the general adolescent population. *Journal of the American Academy of Child & Adolescent Psychiatry*, *44*(3), 283-290.

Kashani, J. H., & Orvaschel, H. (1990). A community study of anxiety in children and adolescents. *The American Journal of Psychiatry*.

Keil, V., Asbrand, J., Tuschen-Caffier, B., & Schmitz, J. (2017). Children with social anxiety and other anxiety disorders show similar deficits in habitual emotional regulation: Evidence for a transdiagnostic phenomenon. *European Child & Adolescent Psychiatry*, *26*, 749-757.

Klemanski, D. H., Curtiss, J., McLaughlin, K. A., & Nolen-Hoeksema, S. (2017). Emotion regulation and the transdiagnostic role of repetitive negative thinking in adolescents with social anxiety and depression. *Cognitive Therapy and Research*, *41*, 206-219.

Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2009). An ultra-brief screening scale for anxiety and depression: The PHQ–4. *Psychosomatics*, *50*(6), 613-621.

Last, C. G., Perrin, S., Hersen, M., & Kazdin, A. E. (1996). A prospective study of childhood anxiety disorders. *Journal of the American Academy of Child & Adolescent Psychiatry*, *35*(11), 1502-1510.

Lougheed, J. P., & Hollenstein, T. (2012). A limited repertoire of emotion regulation strategies is associated with internalizing problems in adolescence. *Social Development*, *21*(4), 704-721.

Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K., ... & Brähler, E. (2010). A 4-item measure of depression and anxiety: Validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *Journal of Affective Disorders*, *122*(1-2), 86-95.

McGlinchey, E., Kirby, K., McElroy, E., & Murphy, J. (2021). The role of emotional regulation in anxiety and depression symptom interplay and expression among adolescent females. *Journal of Psychopathology and Behavioral Assessment*, *43*(4), 854-868.

Muris, P., & Steerneman, P. (2001). The Revised version of the Screen for Child Anxiety Related Emotional Disorders (SCARED–R): First evidence for its reliability and validity in a clinical sample. *British Journal of Clinical Psychology, 40*(1), 35–44. https://doi.org/10.1348/014466501163463

Neumann, A., van Lier, P. A., Gratz, K. L., & Koot, H. M. (2010). Multidimensional assessment of emotion regulation difficulties in adolescents using the difficulties in emotion regulation scale. *Assessment*, *17*(1), 138-149.

Orgilés, M., Méndez, X., Espada, J. P., Carballo, J. L., & Piqueras, J. A. (2012). Anxiety disorder symptoms in children and adolescents: Differences by age and gender in a community sample. *Revista de Psiquiatría y Salud Mental (English Edition)*, *5*(2), 115-120.

Sabatier, C., Restrepo Cervantes, D., Moreno Torres, M., Hoyos De los Rios, O., & Palacio Sañudo, J. (2017). Emotion Regulation in Children and Adolescents: Concepts, processes and influences. *Psicología desde el Caribe*, *34*(1), 101-110.

Sackl-Pammer, P., Jahn, R., Özlü-Erkilic, Z., Pollak, E., Ohmann, S., Schwarzenberg, J., ... & Akkaya-Kalayci, T. (2019). Social anxiety disorder and emotion regulation problems in adolescents. *Child and Adolescent Psychiatry and Mental Health*, *13*, 1-12.

Sanchis-Sanchis, A., Grau, M. D., Moliner, A. R., & Morales-Murillo, C. P. (2020). Effects of age and gender in emotion regulation of children and adolescents. *Frontiers in Psychology*, *11*, 946.

Schäfer, J. Ö., Naumann, E., Holmes, E. A., Tuschen-Caffier, B., & Samson, A. C. (2017). Emotion regulation strategies in depressive and anxiety symptoms in youth: A meta-analytic review. *Journal of Youth and Adolescence*, *46*, 261-276.

Schneider, R. L., Arch, J. J., Landy, L. N., & Hankin, B. L. (2018). The longitudinal effect of emotion regulation strategies on anxiety levels in children and adolescents. *Journal of Clinical Child & Adolescent Psychology*, *47*(6), 978-991.

Suveg, C., & Zeman, J. (2004). Emotion regulation in children with anxiety disorders. *Journal of Clinical Child and Adolescent Psychology*, *33*(4), 750-759.

Vasey, M. W., Bosmans, G., & Ollendick, T. H. (2014). *The Developmental Psychopathology of Anxiety* (pp. 543-560). Springer US.

Zeman, J., Shipman, K., & Suveg, C. (2002). Anger and sadness regulation: Predictions to internalizing and externalizing symptoms in children. *Journal of Clinical Child and Adolescent psychology*, *31*(3), 393-398.