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Content-specific interpretation biases in clinically anxious children

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ABSTRACT

Cognitive theories of anxiety suggest that anxious children interpret negatively only those materials specifically related to the content of their anxiety. So far, there are only a few studies available that report on this postulated content-specificity of interpretation processes across different anxiety disorders in children, and most of them focused on social anxiety. Therefore, we examined interpretation bias and its content-specificity in a group of clinically anxious children between the ages of 6–12 years with various anxiety disorders, using an "ambiguous scenarios" task. Children were asked to finish scenarios that were related to either social threat, general threat, or separation threat. In total, 105 clinically anxious children, 21 control children and their mothers were assessed with the ADIS-C/P and the Spence Children's Anxiety Scale. As expected, clinically anxious children provided significantly more negative endings to the scenarios than control children. Within the clinically anxious group, specific interpretation biases were found: Interpretation of scenarios related to social threat, general threat, and separation threat were only predicted by the children's self-reported levels of social anxiety, generalized anxiety, and separation anxiety, respectively. These findings support the content-specificity hypothesis that clinically anxious children display interpretation biases that are specific to fear-relevant stimuli.

Cognitive theories of fear and anxiety emphasize the importance of cognitive processes in the onset and maintenance of anxiety disorders (e.g., Beck, Emery, & Greenberg, 1985; for a review, see; Mathews & MacLeod, 2005). According to these theories, anxious adults and children have anxiety-related schemata that direct processing resources towards threat-relevant information, resulting in cognitive biases (e.g., Williams, Watts, MacLeod, & Mathews, 1997; for a schema-based theory of childhood anxiety, see; Kendall, 1985; Kendall & Ronan, 1990). This leads to an attention bias at an early stage of information processing. At later stages of information processing, the 'anxiety schema' are thought to lead to an interpretation bias and a memory bias (Daleiden & Vasey, 1997; Muris & Field, 2008). These cognitive biases are believed to be content-specific; only stimuli that are associated with threat and fear are processed preferentially. Anxious individuals should therefore only display biased cognitions for stimuli related to their own anxiety (e.g., Beck, 1976; Beck et al., 1985). For instance, children who are socially anxious should only interpret stimuli that are related to social situations negatively, but not other ambiguous stimuli, such as stimuli related to separation anxiety.

So far, there are only a few studies available that report on this postulated content-specificity of interpretation processes in childhood anxiety. This is unfortunate because knowing more about the content-specificity of cognitive biases in children has important implications for the identification, prevention and treatment of anxiety in children. For example, if biased interpretations are indeed found to be content-specific, targeting interpretations related to the child's specific anxiety during treatment may prove to be more efficacious than focusing on restructuring negative interpretation biases in general. Several authors have indeed expressed the need for more research on content-specificity in interpretation biases in childhood anxiety in order to shed more light on the role of content-specificity in children (e.g., Muris, 2010; Stuijfzand, Creswell, Field, & Dodd, 2018). Therefore, the main goal of this study was to investigate the content-specificity of interpretation biases in a sample of clinically anxious children with various anxiety disorders.

Research with anxious children has provided evidence of interpretation biases related to fear and threat (for reviews, see Muris, 2010; Muris & Field, 2008; Weems & Watts, 2005; for a systematic meta-analysis, see Stuijfzand, Dodd, Pearcey, Creswell, & Field, 2018). Interpretation bias refers to the phenomenon that fearful individuals have

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the tendency to interpret ambiguous situations as threatening. Most studies of interpretation bias make use of variations of an "ambiguous scenario" paradigm. In this paradigm, children are asked to finish scenarios (short texts) about everyday situations. So far, most studies using ambiguous scenarios have found that anxious children show a tendency to interpret ambiguous situations in a negative way (e.g., Klein et al., 2018a, Klein et al., 2018, 2014; Bögels, Snieder, & Kindt, 2003; Creswell, Schniering, & Rapee, 2005; Dalgleish et al., 1997; Dineen & Hadwin, 2004; Muris et al., 2000; Waters, Craske, Bergman, & Treanor, 2008). Indeed, Stuijfzand et al. (2018) found a medium positive association between anxiety and interpretation bias ($d = 0.62$) in their systematic meta-analysis.

Additionally, a few studies have explored whether interpretation biases are content-specific (e.g., Creswell, Murray, & Cooper, 2014; Klein et al., 2014; Klein et al., 2018). In their meta-analysis, Stuijfzand et al. (2018) found a moderating effect of content-specificity: The relation between anxiety and interpretation bias was stronger when the materials matched the anxiety subtype under investigation. However, it should be noted that there was also a significant relationship between anxiety and interpretation bias when the materials did not match the anxiety even though this relation was weaker than when the materials did match the anxiety type. This suggests that biases in interpretation consist of both general and specific aspects. Moreover, the results of Stuijfzand et al. (2018) were mainly based on samples including children with social anxiety compared with non-anxious children and clearly more studies are needed that include different anxiety disorders in order to test for content-specificity within different anxiety disorders.

The main focus of this study was to explore interpretation bias using multiple-choice ambiguous scenarios in a group of clinically anxious children, and to explore the content-specificity of the interpretation bias within different anxiety disorders. Based on earlier studies on interpretation bias in anxious children, we hypothesized that clinically anxious children would make more negative interpretations than control children. In line with the content-specificity hypothesis and with Stuijfzand et al. (2018), we expected that clinically anxious children would display a stronger interpretation bias for scenarios related to their anxiety disorder, and not for other anxiety-related materials.

The current study aimed to examine the hypothesis that interpretation biases are content-specific for different anxiety disorders. While most studies so far have focused on social anxiety disorder only, the current study also included children with other anxiety disorders, for example, children with generalized anxiety disorder or separation anxiety disorder. This may provide evidence for differences within the clinically anxious group based on their anxiety subtype. If we were indeed able to find evidence for content-specificity of interpretation biases within different anxiety disorders, this would provide important directions for future research. For example, future studies could address the possible effect of content-specific biases to predict treatment success and relapse in clinically anxious children, which could be an important starting point for improving current treatments for anxious children. Furthermore, the current study included both clinically anxious children and control children in order to examine content specificity across clinically anxious children and non-anxious children.

1. Methods

1.1. Participants

Participants included 126 children (65 girls) between 6 and 12 years of age ($M = 9.2$, $SD = 1.7$). Children were divided into two groups, with 105 children who met criteria for a primary anxiety disorder according to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; DSM-IV; American Psychiatric Association, 2013) criteria in the clinical group, and 21 children who did not meet any anxiety disorder in the control group. The data of two clinically anxious children were excluded from the dataset, due to technical problems with the interpretation task. As a result, the data of 103 clinically anxious children (49 girls; $M = 9.3$, $SD = 1.7$) and 21 control children (16 girls; $M = 9.0$, $SD = 1.4$) were used (see Table 1 for demographic characteristics of both groups). Anxiety disorders were assessed using the "Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent Versions" (ADIS-IV-C/P; Silverman & Albano, 1996). In the clinically anxious group, 93 children (90.3%) met criteria for generalized anxiety disorder (GAD; primary disorder GAD: 60.1%), 71 children (68.9%) met criteria for social anxiety disorder (SA; primary disorder SA: 19.4%), and 45 children (43.7%) met criteria for separation anxiety disorder (SAD; primary disorder SAD: 5.8%). The mean severity rating of the primary disorder was $M = 6.6$ ($SD = 0.77$, Min = 5, Max = 8) and most children had more than one disorder (95.1%; $M = 4.1$, $SD = 1.9$, Min = 1 Max = 10). In total, 14 children (13.6%) had two disorders, 25 children (24.3%) had three disorders, and 59 children (57.3%) had 4 or more disorders. Exclusion criteria included intellectual disability and psychoses. The Ethics Review Committee of Macquarie University, Sydney, Australia, approved this study. The current study was part of a longitudinal research project and partly overlapped with another study that examined the effect of a Cognitive Bias Modification procedure on anxiety (Klein et al., 2015).

Table 1
Demographic characteristics of the clinically anxious group and the control group.

	Clinically anxious group	Control group
N	103 (49 girls)	21 (16 girls)
Two parent family	96.4%	90.5%
English as main language	96.4%	100%
Education of mother ≥ postgraduate	26.5%	47.6%
Family income ≥ AUS$ 83.200 (annually)	71.1%	85.0%

1.2. Instruments

1.2.1. Interpretation task

The interpretation task that was used in the current study is the most widely studied interpretation task currently available and is also often referred to as the "scenarios paradigm". The current task consisted of three sets of 15 multiple-choice scenarios. Each scenario contained 4 short sentences. All 45 scenarios (3 sets x 15 scenarios each) were ambiguous, such that they could be interpreted in a positive or negative way. The 15 scenarios of each set contained four categories: 5 social threat scenarios, 5 general threat scenarios, 3 separation threat scenarios and 2 scenarios that were placed into the 'other anxiety' category (e.g., fear of heights or animals). The three sets were created to ensure that the specificity of the interpretation bias did not rely on the specific scenarios that were chosen. The 45 scenarios were mostly adapted and translated into English from existing materials (Bögels et al., 2003; Creswell et al., 2005; Houtkamp, van der Molen, Salemink, de Voogd, & Klein, 2017; Klein et al., 2014, (Klein, Bakens, et al., 2018; Klein, Flokstra, et al., 2018); Muris et al., 2000; Schneider, Unnewehr, Florin, & Margraf, 2002; Van Niekerk et al., 2018). As most previous studies used one set of around 10–15 scenarios, the authors together with expert clinicians and children created 6 new scenarios. For each new scenario, it was made sure that 1) the scenario was ambiguous such that it could be interpreted in a positive or negative way, 2) the scenario matched the specific category, 3) the situation was relevant for children in this specific age range, 4) the scenario was in line with the other scenarios related to the specific category, and 5) that the ending were either positive or negative. Children were randomly assigned to one of the three sets. For each scenario, four possible endings were created; two positive endings, and two negative endings (see Table 2 for sample scenarios and possible endings). First, we added up the number of chosen negative endings across all scenarios (min = 0, max = 15).

Table 2
Sample scenarios with the four possible endings for each category of the interpretation task.

General threat scenario	
"To the beach" In a few days you will be going on holidays. You are going to the beach with your family. There is still a lot to be done. You are walking restlessly through the house …	*negative*: You are worried about what can go wrong, 'what if we forget something?' *negative*: You hope it is not going to rain. *positive*: You look forward to it, but cannot find your favorite toy. *positive*: You are so excited to go on holidays, that you cannot wait to go.
Social threat scenario	
"Birthday" Today it is your grandmother's birthday. You give your grandmother a present. Everybody is watching when grandma opens the present. Then all of a sudden someone laughs really loud …	*negative*: Everybody thinks the present is stupid. *negative*: You hope it is not your present they are laughing about. *positive*: Your uncle is making jokes with your cousin. *positive*: You have a funny present and everyone likes it.
Separation threat scenario	
"Neighbors" Your parents are away for the evening. You are eating at your neighbors'. While you are eating, you get a strange feeling in your stomach …	*negative*: You want to call your parents right away to find out whether they are okay. *negative*: You hope that your parents will get home safely. *positive*: You probably ate too fast, you drink some water. *positive*: You are excited, because you will watch your favorite TV show later on.

Next, we added up the number of chosen negative endings separately for each category. Therefore, the range of possible scores for the social threat scenarios was 0–5, the range of possible scores for the separation threat scenarios and for the 'other category' were respectively 0–3 and 0–2.

The scenarios task is most often used in studies examining the relation between anxiety and biased interpretation as it is thought to have relatively good psychometric properties. Generally, previous studies reported that this task has high inter-rater agreement (Bögels et al., 2003; Klein et al., 2014; Muris et al., 2000), a high content validity (Schneider et al., 2002) and acceptable internal consistency (Schneider et al., 2002) Internal consistency of the three different sets in the current study were comparable to previous studies (set 1: $\alpha = 0.77$; set 2: $\alpha = 0.82$; set 3: $\alpha = 0.65$).

Children were asked to read aloud the 15 scenarios that were presented on a computer screen and to imagine themselves as the central character of each scenario. For each scenario, they were asked to choose the ending that they thought would best fit the scenario. The scenarios were presented in a pseudo-randomized order, with the restriction that no more than two scenarios of the same category followed each other. During the instruction phase, the research assistant stressed that the task was not a test and that there were no right or wrong answers, but that the study was about their feelings and thoughts. All scenarios contained everyday life situations with four different options for how they could end. Children were simply asked to choose the ending that they thought would best fit the scenarios. Children were allowed to ask questions at any time and the assistant (who accompanied the child for the full duration of the task) read the scenarios out loud where children indicated that they had difficulties reading the stories.

1.2.2. Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV-C/P; Silverman & Albano, 1996)

All children and parents were interviewed separately using the ADIS-IV-C/P. Diagnoses and severity ratings (on a scale of 0–8) were assigned by graduate students in clinical psychology based on a composite parent and child report. The "or" rule was used, that is, a diagnosis was assigned when it was reported by either parent or child. Qualified clinical psychologists supervised the students. Previous work at our Clinic showed an interrater agreement of $k = 1.00$ for the overall diagnosis of anxiety disorder and between 0.68 and 0.93 for the major anxiety disorders on the ADIS-IV-C/P (see also, Rapee, Abbott, & Lyneham, 2006).

1.2.3. Spence Children's Anxiety Scale, Child and Parent Versions (SCAS-C and SCAS-P; Spence, 1998)

The SCAS-c/p was used to assess child- and mother-reported anxiety symptoms in their children. The SCAS is a self-report questionnaire that measures responses to 38 statements on a 4-point scale. A total score is computed from the 38 items (from 0 to 114). Internal consistency and retest reliability are good (Nauta et al., 2004; Spence, 1998). The measure is able to distinguish clinically anxious from non-anxious children (Nauta et al., 2004), and has adequate convergent and discriminant validity (Spence, 1998). In this study, internal consistencies were excellent (child report $\alpha = .93$; mother report $\alpha = .92$).

1.3. Procedure

Parents of anxious children contacted the Emotional Health Clinic seeking help for their child and were briefly screened over the telephone. Those whose children appeared to have anxiety-related difficulties were invited to the Clinic for a detailed assessment. Control parents contacted a research assistant in response to advertisements placed on noticeboards, newspapers, and websites. Children and their parents completed several self-report measures presented electronically. Next, the children and their parents were assessed with the ADIS-C/P and completed the SCAS. Children who met criteria for inclusion were asked to participate in the study. All children performed the interpretation task individually in a separate room at the EHC, together with their parent and a trained research assistant. The control children and their parents received 40 Australian dollars for participation in the study, the clinically anxious children received a small gift and proceeded to a treatment program.

2. Results

2.1. Descriptives

Demographics and clinical characteristics of the clinically anxious group and the control group are presented in Table 1. There was no

significant group difference in age ($p > .1$), however there were relatively more girls in the control group than in the clinically anxious group ($p = .017$). Furthermore, there were no significant differences in family income, education level of mother, the main language spoken at home, and the type of family setting the children lived in (all $p > .1$). As expected, clinically anxious children reported significantly more fear ($M = 31.9$, $SD = 16.6$) on the Spence Children's Anxiety Scale (SCAS) than control children ($M = 14.1$, $SD = 10.5$), $F(1,122) = 22.36$, $p < .001$, $\eta^2 = 0.16$. Similarly, mothers of clinically anxious children reported significantly more fear in their children ($M = 34.3$, $SD = 14.2$) than mothers of control children ($M = 7.9$, $SD = 4.1$), $F(1,120) = 67.75$, $p < .001$, $\eta^2 = 0.36$.

2.2. Clinically anxious children versus control children on interpretation

The number of negative endings chosen by the child were combined and counted across the 15 scenarios, yielding a total "negative score" with a maximum of 15. The higher the score, the more often children chose a negative ending. Gender, age, and scenario set were initially included in the computed analyses, but these variables failed to yield a significant main effect or interaction effects, so they were excluded from later analyses. The mean "negative score" on the interpretation task was 5.55 ($SD = 2.96$), for the clinically anxious children, which was significantly higher, $F(1,118) = 7.00$, $p = .009$, $\eta^2 = 0.06$, than the control children's mean score of 3.71 ($SD = 2.51$): Clinically anxious children chose the negative endings significantly more often than control children. For this medium-sized difference between the two groups and $p = .05$, the current sample size yielded power of 1-$ß = 0.67$.

2.3. Correlations between self-reported fear and the scenarios task for all children

For the total sample of 124 children, the sample size yielded excellent statistical power of 1-$ß = 0.97$ to detect medium-sized correlations ($r = 0.30$). As expected, the correlation between the mothers' reports on the SCAS-p and children's self-reports on the SCAS-c was significant $r = .59$ ($p < .001$). The different subcategories of the SCAS also correlated significantly with each other (see Table 3). Moreover, the 'negative score' of the interpretation task correlated significantly with both the SCAS-c, $r = 0.44$ ($p < .001$), and the SCAS-p, $r = .23$ ($p = .01$): Children who reported more fear on the self-report or whose mothers reported that they were more fearful, chose negative interpretations significantly more often than children with lower fear.

Next, we calculated three separate, disorder-specific negative scores by counting the number of times children chose the negative endings separately for the general threat scenarios, the social threat scenarios, and the separation threat scenarios. We calculated correlations between these three scores and the GAD-subscale, the SA-subscale and the SAD-subscale of the SCAS, separately for the SCAS-c and the SCAS-p. We found significant correlations between each category of the interpretation task and the corresponding subscales of the SCAS-c and SCAS-p. This indicates that children who, for instance, demonstrated a negative interpretation bias on the general threat scenarios of the interpretation task also reported more fear on the GAD subscale of the SCAS. In addition, all categories of the interpretation task also correlated significantly with the other subscales of the SCAS child-version and some of the categories of the interpretation task correlated significantly with the SCAS mother-version. This indicates that there is overlap between all different categories of the interpretation task and the non-corresponding subscales of the SCAS child-version and also for some categories of the interpretation task and non-corresponding subscales of the SCAS mother-version (see Table 3 for all correlations).

Table 3
Correlations between all SCAS subscales and for all interpretation task categories x SCAS subcategories, separately for the SCAS-c and the SCAS-p (N = 122).

	SCAS-c GAD	SCAS-c SA	SCAS-c SAD
SCAS-c GAD	-	.60**	.63**
SCAS-c SA	–	–	.50**
GAD-interpretation score	**.42****	.24*	.28*
SA-interpretation score	.28*	**.39****	.12
SAD-interpretation score	.32**	.23*	**.35****
	SCAS-p GAD	SCAS-p SA	SCAS-p SAD
SCAS-p GAD	-	.58**	.75**
SCAS-p SA	-	–	.51**
GAD-interpretation score	**.25***	.12	.24*
SA-interpretation score	.20*	**.31***	.12
SAD-interpretation score	.17	.04	**.25***

*$p < .05$, **$p < .001$.

2.4. Specificity of the interpretation bias for the clinically anxious children

2.4.1. Regression analysis

In order to test for content-specificity within the group of clinically anxious children, we calculated 2 (SCAS child-report/SCAS mother-report) x 3 (general threat scenarios/social threat scenarios/separation threat scenarios) regression analyses (see Table 4 for all results). We included the GAD-subscale scores, SA-subscale scores, and SAD-subscale scores from the SCAS as predictors in the first three analyses, and the GAD-subscale scores, SA-subscale scores, and SAD-subscale scores from the SCAS-p in the last three analyses. For these regression analyses with three predictors each and $p = .05$, the sample size of 103 clinically anxious children yielded excellent power of 1 - $ß = 0.99$ to detect medium sized effects ($f^2 = 0.15$).

2.4.2. SCAS-c self-report

In the first analysis, the negative score of the general threat scenarios, served as the dependent variable. The regression model was significant, $F(3,97) = 5.51$, $p = .002$, and explained 14.6% of the variance in general threat interpretation scores. The GAD-subscale was the only significant predictor in the model, indicating that only the GAD-subscale of the SCAS-c was helpful to predict general threat interpretation scores of the interpretation task.

Next, the negative score of the social threat scenarios served as the dependent variable. The regression model was significant again, $F(3,97) = 5.95$, $p = .001$, and it explained 15.5% of the variance in social threat interpretation scores. The SA-subscale score was the only significant predictor in the model. Thus, only the SA-subscale of the SCAS-c was helpful to predict the social threat interpretation scores of the interpretation task.

Finally, in the last analysis, the negative score of the separation threat scenarios served as the dependent variable. The regression model was significant again, $F(3,97) = 5.07$, $p = .003$, and it explained 13.5% of the variance in separation threat interpretation scores. The SAD-subscale score was the only significant predictor in the model, suggesting that only the SAD-subscale of the SCAS-c was helpful to predict the separation threat interpretation scores of the interpretation task.

2.4.3. SCAS-p mother-report

In the first analysis, the negative score of the general threat scenarios, served as the dependent variable. The regression model was not significant, $F(3,96) = 0.96$, $p > .1$: None of the predictors explained significant variance in general threat interpretation scores. Next, in the social threat scenarios model, the negative score of the social threat scenarios served as the dependent variable. The regression model was significant, $F(3,96) = 4.27$, $p = .007$, and it explained 9.7% of the variance in social threat interpretation scores. The SA-subscale score was the only significant predictor in the model. Finally, in the last analysis, the negative score of the separation threat scenarios served as

Table 4
Regression analyses for predicting scenarios related to general threat situation, social threat situation and separation threat situations of the interpretation task separately for child-reported anxiety and mother reported anxiety in their child on the SCAS.

		Variables	*B*	*SE B*	*β*	*t*	*p*
Child-report	General threat	**GAD-subscale**	**.021**	**.008**	**.35**	**2.75**	**.007**
		SA-subscale	.001	.007	.02	.17	.855
		SAD-subscale	.002	.007	.039	.34	.738
	Social threat	GAD-subscale	< .001	.008	.004	.03	.974
		SA-subscale	**.025**	**.008**	**.355**	**3.16**	**.002**
		SAD-subscale	.005	.008	.074	.63	.529
	Separation threat	GAD-subscale	.014	.010	.18	1.38	.170
		SA-subscale	-.013	.009	-.16	-.43	.157
		SAD-subscale	**.025**	**.010**	**.30**	**2.54**	**.013**
Mother-report	General threat	GAD-subscale	.016	.011	.20	1.42	.160
		SA-subscale	.003	.007	.047	.43	.670
		SAD-subscale	-.006	.008	-.097	−71	.482
	Social threat	GAD-subscale	.003	.012	-.034	.26	.799
		SA-subscale	**.025**	**.007**	**.360**	**3.42**	**.001**
		SAD-subscale	-.010	.009	−1.48	−1.13	.264
	Separation threat	GAD-subscale	.006	.014	.059	.43	.670
		SA-subscale	-.008	.009	-.099	-.90	.370
		SAD-subscale	.015	.011	.189	1.38	.171

SCAS = Spence Children's Anxiety Scale; GAD-subscale = Generalized Anxiety Disorder subscale of the SCAS; SA-subscale = Social Anxiety subscale of the SCAS; SAD-subscale = Separation Anxiety Disorder subscale of the SCAS.

the dependent variable. The regression model was not significant, $F(3,96) = 1.55$, $p > .1$; None of the predictors explained significant variance in separation threat interpretation scores. Thus, only the SA-subscale of the SCAS-p was helpful to predict the social threat interpretation scores of the interpretation task.

3. Discussion

The aim of the current study was to investigate whether clinically anxious children display an interpretation bias and if this bias is specific to content related to the child's anxiety disorder. As expected, clinically anxious children chose the negative endings of ambiguous scenarios significantly more often than control children. Within the clinically anxious group, specific interpretation biases were found: Interpretation of scenarios related to social threat, general threat, and separation threat was predicted only by the children's self-reported level of social anxiety, generalized anxiety, and separation anxiety, respectively. Thus, even though the biases overlapped between the different anxiety disorders, we found evidence for the biases to be content-specific. This means that the different anxiety disorder show overlap, but that they also each have unique distinct aspects that do not overlap between the different disorders. As the validity and reliability of GAD in children is often questioned (e.g., Andrews et al., 2010), it is even more remarkable that we found a specific interpretation bias related to generalized anxiety. This study thereby supports the specificity of social anxiety, generalized anxiety, and separation anxiety as relatively distinct entities of fear and is in line with a recent meta-analysis (Stuijfzand et al., 2018). Moreover, these findings support the importance of interpretation biases in anxiety (e.g., Muris, 2010) and the existence of content-specificity, namely that anxious children display interpretation biases that are specific for particular fear-relevant stimuli (Beck et al., 1985). These results are consistent with a broader body of research that has shown support for cognitive-specificity models in children and adolescents when examining automatic thoughts (e.g., Epkins, 2000; Jolly & Dykman, 1994; Schniering & Rapee, 2004). In addition, there is a notable similarity between the results of the present study and those demonstrating specificity in interpretation biases in anxious adults (e.g., Harvey, Richards, Dziadosz, & Swindell, 1993). Taken together, the data indicate likely continuity in cognitive-specificity across the course of development, in line with cognitive theories of psychopathology. It may be that patterns of cognitive functioning associated with emotional states are established at a relatively early age, and tend to continue into adolescence, and adulthood.

Although the different categories of the interpretation task correlated significantly with the corresponding subscales of the child and mother self-report, the categories of the interpretation task also correlated significantly with some of the other subscales of the self-report. This finding is in line with the findings of Stuijzand and colleagues (2018), who also found evidence of a relation between negative interpretation and anxiety when the materials did not match the specific subtype of anxiety. This could be due to the fact that the different anxiety disorders share a common concern about threat in general, such as anxiety sensitivity (for a review see, Olatunji & Wolitzky-Taylor, 2009): There is some degree of specificity, but there is also a considerable degree of commonality. For instance, the original SCAS data reported by Spence (1998) show that the subscales of the SCAS all load onto a common, higher-order factor. As a result, the correlations between the specific categories of the interpretation task and the subscales of the SCAS overlapped. Nevertheless, the only significant predictors in our regression models were the anxiety subtypes matching the content of the scenarios.

Another result that is important to discuss is the discordance between children's self-reported levels of anxiety and the mother's reported levels of child anxiety in the regression analyses. Whereas the children's self-reports showed a clear indication of the existence of content-specific interpretation biases related to the content of the anxiety of the child, according to the mother's reported anxiety in their child, only the model with social anxiety was significant. This difference is consistent with previous studies showing that agreement between parent and child informant reports is low to moderate when it comes to the severity of childhood psychopathology (e.g., De Los Reyes & Kazdin, 2005). This might especially be true for internalizing problems, where the 'problem behavior' is not always clearly visible, such as in anxiety disorders (e.g., Grills & Ollendick, 2002). Given that the interpretation biases were based on children's reports, it is not surprising that child-reported symptoms showed the stronger relationships. There is a lack of studies that provide a clear theoretical rational to explain parent/child discordance (e.g., De Los Reyes & Kazdin, 2005). Clearly, future studies are needed to shed more light on this issue.

The current study had a few limitations. First, while we found that clinically anxious children chose the negative endings of the scenarios

more often than control children, it should be noted that overall, both groups chose the positive answers more often than the negative answers. Even the mean score of 5.55 for the clinically anxious children is approximately only a third of the maximum negative score that could be obtained. It might be the case that clinically anxious children do not display very negative interpretations in all ambiguous situations. There are indeed several other studies that found similar results (e.g., Creswell et al., 2005; Muris et al., 2000). Another explanation might be that the interpretation task is based on self-report (see also Muris, 2010). The scenarios task is relatively fast, easy and reliable, but it might also be more sensitive to experimenter demand, social desirability, and limited self-awareness (e.g., Bijttebier, Vasey, & Braet, 2003). Even though every effort was made to reduce the possible influence of selection bias (e.g., by using four different options, creating three different subsets, providing a clear instruction), future studies that make use of more indirect measures to study interpretation bias may provide additional evidence towards a clearer picture of the underlying cognitive processes (e.g., In-Albon, Klein, Rinck, Becker, & Schneider, 2008).

Second, this study was limited to clinically anxious children with GAD, SA and SAD with a high co-morbidity. We therefore recommend future studies including children with other types of fears and phobias. Furthermore, a relatively high number of children in the current sample had a GAD diagnosis. It is possible that as the treatment facility where the data were collected is well known as a specialized center for anxiety problems, children with more severe anxiety problems seek treatment at this Clinic. Moreover, GAD is a relatively common anxiety disorder in youth. Third, and related to the second limitation, due to the high co-morbidity we were unfortunately not able to create subgroups based on the DSM. Alternatively, we used the continuous self-reported anxiety of the children and their mothers' reports. Follow-up studies with large samples are needed to create different sub-groups based on diagnostic criteria to further study the role of content-specificity with comorbidity between different anxiety disorders.

Fourth, the current study focused on interpretation biases related to the child's specific anxiety, but no conclusions can be drawn on the specificity of other potential biases, for instance in attention and memory processes. Future research of childhood anxiety should therefore assess the specificity of other potential biases. Fifth, we focused on the relation between content-specific interpretation biases related to trait anxiety in our study. Due to time constraints, we were unfortunately not able to include possible confounding measures, such as depression or state anxiety, or scenarios related to externalizing problems or depression to measure these aspects of content-specificity. Additionally, we also did not note in how many cases the assistant read the scenarios out loud to the children. Future studies should therefore include both possible confounding factors, more precise information about reading abilities, as well as include a broader range of scenarios to further specify the role of content-specificity in childhood anxiety disorders.

Finally, as our study was cross-sectional, we were unable to draw conclusions about a causal relation between interpretation bias and anxiety, nor can the current data examine any potential impact on treatment outcome. Therefore, it would be worthwhile for future studies to include a longitudinal design. It would be particularly interesting and important to address the content-specificity of biases for predicting treatment success and relapse probability in anxious children. If future research could indeed show that content-specific interpretation biases predict treatment success for the matching anxiety, this gives us more insight into the mechanisms underlying treatment. Furthermore, if treatment success could be explained by the reduction of a specific interpretation bias, this might help us to understand why some children do not profit from treatment. These studies will give us important directions to improve treatment for children with anxiety disorders, for example, to target specific cognitive biases during treatment.

In conclusion, we found that an interpretation task is able to differentiate between clinically anxious children and non-anxious children and that it is a useful instrument for assessing content-specific interpretation biases. Thus, there is evidence that specific fear-related interpretations may already be present at a young age. The present results support cognitive models in youth that argue for specificity of cognitive content associated with different disorders (Beck, 1976) and are consistent with current classification systems for childhood mental disorders (e.g., DSM-V, APA, 2013). Clinically, this unique insight into the presence of interpretation biases in anxiety disorders may be used to improve treatments for anxious children by targeting specific cognitive biases related to individual disorders.

Author note

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