Social Anxiety and Interpretation Bias: Examining Clinical and Subclinical Components in Adolescents

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Abstract

Background: This study aimed to examine whether different components of interpretation bias are clinical or dimensional features of adolescent social anxiety. The study analyzed the components of this bias at a subclinical level of SAD and compared these with a clinical sample of adolescents with SAD. *Method:* Adolescents in the age range 13 to 17 years participated. A group with SAD (n = 30) was compared with a group with subclinical SAD (n = 60), and a non-socially anxious group (n = 95). *Results:* Negative interpretation bias for social situations was found to be a dimensional aspect of social anxiety. In contrast, belief in negative interpretations of social situations appears to be a clinical feature. Contrary to expectations, endorsement of positive interpretations did not differ between the three groups. *Conclusions:* The results suggest that a screening instrument based on negative interpretations of social situations could be useful to detect adolescents at-risk of developing SAD. In a clinical setting, the belief in negative interpretations and the presence of the bias in non-social situations should also be considered.

Key Practitioner Message:

- Negative interpretations of ambiguous social situations is present at subclinical levels of social anxiety.
- Belief in negative interpretations of social situations appears to be a clinical feature of social anxiety.
- A screening instrument that assesses negative interpretations of social situations could be useful to detect adolescents at-risk of developing social anxiety disorder.

1. Introduction

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) describes Social Anxiety Disorder (SAD) as “a marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others” (p. 202). The individual is afraid of being judged negatively because of his behavior or his anxiety symptoms. SAD typically has its onset in adolescence (Klein, 2009), and has a negative impact on social functioning (Peleg, 2012; Tillfors et al., 2012). To explain the maintenance of this disorder various models have been developed. The models of Clark and Wells (1995) and Rapee and Heimberg (1997) have had great influence on subsequent research about social anxiety. By emphasizing the importance of a socially anxious person’s cognitive processes in feared situations, these models have stimulated interest in the broad area of cognitive bias. Cognitive bias refers to how socially anxious persons tend to selectively process information related to a social-evaluative situation that is perceived as threatening (Musa & Lépine, 2000). This bias occurs at different stages of information processing, namely attention, interpretation, and memory (Amir & Bomyea, 2010; Musa & Lépine, 2000; Spokas, Rodebaugh, & Heimberg, 2007).

The objective of this study was to extend our knowledge of the *interpretation* bias in adolescents with social anxiety. Castillo and Leandro (2010) defined the interpretation bias as the tendency to "systematically assign a threatening meaning to an objectively ambiguous stimulus with several possible interpretations" (p. 1105). Because social situations are generally ambiguous, recurrent negative interpretation of social situations could play a key role in the maintenance of SAD (Amir & Bomyea, 2010). In line with previous studies in adult (e.g, Amir et al., 1998; Stopa & Clark, 200) and adolescent (e.g., Miers, Blöte, Bögels, & Westenberg, 2008) samples we chose to investigate four components: negative interpretations of ambiguous situations, positive interpretations of ambiguous situations,

belief in negative interpretations, and content-specificity of the bias. Dysfunctional beliefs about social evaluation and the self, that are triggered by social situations, are central to Beck's (1976) cognitive theory of social phobia. We therefore propose that it is relevant to assess this component because a recurrent and stable belief in negative interpretations could lead to a pathological schema that is automatically activated by the feared stimuli. In addition, by measuring interpretation bias in social and non-social situations we tested the content-specificity hypothesis (Amir et al., 1998).

However, existing literature has not compared the aforementioned components at both the clinical and subclinical social anxiety levels in adolescents. Therefore, we examined, by means of a three-group comparison (i.e. a group with SAD, a group with subclinical SAD, and a non-socially anxious group) whether the different components of interpretation bias are clinical or also subclinical features of social anxiety. Knowledge about the clinical and subclinical components of interpretation bias in adolescents could be functional for both the prevention and the treatment of SAD. Adolescence is a sensitive period for brain development and this is associated with high plasticity (Fu, Du, Au, & Lau, 2013).

It is possible that all the cognitive biases, including the interpretation bias, could be successfully altered in adolescence. At the same time, an inappropriate intervention in adolescents who manifest these distortions could lead to the development of persistent mental health problems over time. Therefore, it is important to examine which components of interpretation bias are clinical and which are present at the subclinical level. These subclinical components are potentially those that should be targeted by prevention programs, in order to avert the worsening of high, but not clinical levels of social anxiety. On the other hand, clinical components should be addressed during treatment of the disorder.

The interpretation bias has been widely studied in adult populations (e.g., Amir, Foa, & Coles, 1998; Constans, Penn, Ihen, & Hope, 1999; Stopa & Clark, 2000; Vassilopoulos,

2006; Voncken, Bögels, & de Vries, 2003). These studies quite consistently show that, compared to their non-anxious peers, adults with high levels of social anxiety or a social anxiety disorder tend to endorse negative interpretations of ambiguous social situations rather than lack positive interpretations of the same situations. Moreover, the studies also support the content-specificity of the interpretation bias (Amir et al., 2008; Constans et al., 1999; Voncken et al., 2003). However, the studies are inconclusive regarding the belief in negative interpretations (Miers et al., 2008).

Research investigating interpretation bias specifically in child and preadolescent samples either diagnosed with a social anxiety disorder or with high levels of social anxiety is inconsistent. For example, studies with non-clinical samples have provided support for i) the dominance of negative interpretations rather than reduced positive interpretations in response to ambiguous social situations, and ii) the content-specificity of negative interpretations to social versus non-social situations (Vassilopoulos & Banerjee, 2008; 2011). In contrast, two studies with clinical samples found no evidence that children with SAD interpreted ambiguous social scenarios more negatively than non-anxious children (Creswell, Murray, & Cooper, 2014; In-Albon, Dubi, Rapee, & Schneider, 2009).

Miers et al. (2008) published the first study on interpretation bias in adolescents. The authors created and used the Adolescents' Interpretation and Belief Questionnaire (AIBQ) among Dutch adolescents aged between 12 and 17 years. This questionnaire includes five ambiguous social and five ambiguous non-social situations. Each situation is followed by a question asking what the explanation for the depicted scenario is. Three interpretations (positive, negative and neutral; see Section 2.2.2. for an example) are presented and respondents are asked to indicate how likely it is that each of the three interpretations would come to their mind if they were in the situation presented. In addition, after rating all three interpretations respondents choose which interpretation they believe is most correct. Hence,

the AIBQ measures the valence of the interpretations of ambiguous situations and the strength of the belief in the negative interpretations.

Miers et al. (2008) showed that adolescents with high social anxiety (n = 37) tend, in ambiguous social situations, to have with greater probability negative interpretations (i.e., a negative interpretation bias) compared to adolescents with an average level of social anxiety (n = 36). This significant anxiety-group difference was maintained after controlling for the level of negative affect. The high socially anxious adolescents did not differ significantly from their peers on positive interpretations of ambiguous social situations. Secondly, high socially anxious adolescents tend to have a stronger belief in the negative interpretations, although this effect was borderline significant (p = .08). Miers et al. (2008) also found that the bias is content-specific, that is high socially anxious adolescents were equally as likely as adolescents with average levels of social anxiety to endorse negative interpretations of non-social ambiguous situations, after controlling for negative affect. In order to evaluate these findings it is important to note that Miers et al. (2008) stated that they preferred to use an average social anxiety group (and not a non-anxious group) as control group due to the desire to have a more "normal" control group, instead of a group made of extremely non-anxious youths.

Recently, Giannini and Loscalzo (2016) found some different results in their study comparing Italian adolescents (aged between 14 and 17 years) with high and average social anxiety and using the AIBQ. These authors found evidence for both the negative bias and a lack of a positive bias (i.e., the high anxious group was less likely to endorse positive interpretations of social situations). Nevertheless, both the Italian and the Dutch studies found that interpretation bias is content-specific and an anxiety group difference on belief in negative interpretations. Taken together, these two studies support the presence of the interpretation bias in adolescents with high social anxiety.

The few studies on interpretation bias in adolescents found some gender differences. While Dutch females have significantly fewer positive interpretations, more negative interpretations and believe more in them than boys (Miers et al., 2008), Italian girls differ significantly from males only on a lesser positivity in interpretations (Giannini & Loscalzo, 2016). Finally, a third study found that English girls were significantly more likely to produce negative interpretations than boys (also in non-social ambiguous situations), and they did not differ from boys on positive interpretations and belief in negative interpretations (Gluck et al., 2014). These three studies thus highlight the need to control for gender-differences when studying interpretation bias in adolescents.

Finally, research into cognitive biases by means of a three-group comparison approach has, to the best of our knowledge, been addressed by only two studies (Kley, Tuschen-Caffier, & Heinrichs, 2012; Tuschen-Caffier, Kühl, & Bender, 2011), both conducted with children, and neither of which focused specifically on interpretation bias. These studies analysed negative self-thinking (e.g, 'I can't manage it' or 'What I will say will probably sound stupid') in relation to social-performance tasks. Tuschen-Caffier et al., (2011) evaluated the level of anxiety and negative self-thinking in children aged 8 to 12 years with SAD (n = 21), with subclinical SAD (n = 18) and without any disorder (n = 20). Their analysis showed that the subclinical and clinical SAD groups had significantly higher negative self-thinking during the speech tasks than the non-anxious control group, and the former two groups also differed significantly. In line with these results, the study by Kley et al. (2012), with participants aged between 8 and 13 years, showed that the frequency of negative self-thoughts during a role-play task increases as the level of social anxiety increases (i.e., present at a subclinical as well as clinical level). In contrast, the use of safety behaviours, self-focused attention and a lower frequency of positive self-thoughts appeared to be clinical features of SAD. In addition, analysing the State of Mind (SOM) ratio per group,

which is the ratio of positive to negative self-thoughts, and whose value indicates adaptive or maladaptive functioning (Schwartz, 1997), the SAD group appeared to be characterized by negative dialogue and the control group by positive dialogue. The group with subclinical SAD was characterized by "conflicted dialogue", that is, a relative balance between positive and negative thoughts.

1.1. The present study

The aim of this study was to investigate the interpretation bias and its four components in adolescents by means of a three-group comparison: a non-socially anxious group, a subclinical SAD group, and a group with SAD. Based on the available literature we hypothesized that: (1) negative interpretations of ambiguous social situations is a component that increases with increasing levels of social anxiety, namely that it is active also at subclinical levels of SAD (Giannini & Loscalzo, 2016; Kley et al., 2012; Miers et al., 2008; Tuschen-Caffier et al., 2011); (2) the SAD group will be significantly less likely to endorse positive interpretations of social situations (i.e. lack of positive interpretation bias) compared to the subclinical and control group, and the latter two groups will not differ. This means that an absence of positive interpretations is a clinical component (Kley et al., 2012); (3) as regards belief in the negative interpretation of social situations, we did not pose a specific hypothesis for this component as the only two studies on belief in community adolescents found different results (Giannini & Loscalzo, 2016; Miers et al., 2008) and there are no studies on a three-group comparison; and (4) the interpretation bias is content-specific, that is, neither the clinical group nor the subclinical SAD group have an interpretation bias in non-social situations (Giannini & Loscalzo, 2016; Miers et al., 2008). In addition, we hypothesized that (5) the expected difference between the non-socially anxious group and the subclinical SAD group on negative interpretations in social situations would not be explained by negative mood (Giannini & Loscalzo, 2016; Miers et al., 2008).

2. Methods

2.1. Participants

The non-socially anxious and the subclinical SAD groups were selected from a community sample of 296 adolescents (122 boys and 174 girls) aged between 13 and 17 years, with a mean age of 15.37 years (SD = 1.01) from two schools in Central Tuscany. 27.7% of students attended the first school year, 35.1% the second year and finally 37.2% the third year. Regarding the fatherland, the 83.8% of the sample consists of adolescents of Italian origin, while among others the most represented countries are Albania (6.4%), Romania (4.7%) and Morocco (1.7%).

The groups were created using the total score obtained from the scale measuring social anxiety, namely the Social Phobia Inventory (SPIN; Connor et al., 2000). We referred to the cut-off of 24 and to the average values reported for Finnish adolescents without SAD, with subclinical SAD and with SAD by Ranta et al. (2007a) to form two groups: non-socially anxious (score <16) and subclinical SAD (16-23). The first group includes 95 adolescents (48 males and 47 females), the second 60 (24 males and 36 females). We referred to the Finnish study as it is the only one to report the mean values for the two adolescent groups of our interest, and because norms about Italian adolescents are not available. In addition, a previous study on Italian community adolescents assessed by means of the SPIN showed that they have very high levels of social anxiety (Giannini & Loscalzo, 2016) considering the highest cut-off proposed for adolescents (i.e. 25; Sosic, Gieler, & Stangier, 2008; Tsai, Wang, Juang, & Fuh, 2009); hence, we thought it was appropriate to use one of the highest cut-off available in adolescent literature.

For the SAD group, with the collaboration of certified psychotherapists in Central Tuscany, 30 adolescents (16 boys and 14 girls) aged between 13 and 17 years (M = 14.63; SD = 1.40) participated. They were all of Italian origin and they were at the beginning of

treatment, more specifically in the assessment phase, as affirmed by their psychotherapists. All psychotherapists had completed a 4-year psychotherapy training, and work with an integrated model based on cognitive-behavioral, gestalt, and analytic psychotherapies. All of them are instructed to use both standardized questionnaires and psychological interview in order to make a DSM-diagnosis *within* the first five sessions. Any possible differences between psychotherapists in their treatment approach are only evident after the assessment phase.

2.2. Materials

2.2.1. Diagnostic Assessment

For the clinical group, we asked the psychotherapists to assess in their patients both the presence of SAD and the absence of other psychological disorders that would have required a comorbid diagnosis. Keeping in mind that youths with SAD often present with another anxiety disorder or low mood; we selected adolescents that the psychotherapists treated for SAD specifically and not those seeking treatment with additional diagnoses in their profile. The psychotherapists conducted the clinical interview with the instrument they habitually used in their clinical practice, however, in all cases, the SAD diagnosis was based on the DSM-5 (APA, 2013) diagnostic criteria and on standardized and validated questionnaires.

2.2.2. Adolescents' Interpretation and Belief Questionnaire (AIBQ)

This questionnaire measures interpretation bias in adolescents and was created by Miers et al. (2008). The AIBQ consists of 10 ambiguous situations, five non-social and five social; the latter are typical of school life (for example, invite classmates to a birthday party). Each situation is followed by a question that highlights the ambiguity of the scenario, wondering what the explanation could be for what happened in the scene just read. Then three

interpretations are presented, one positive (e.g. they're definitely coming, they don't need to tell me that), one negative (e.g. they don't want to come because they don't like me) and one neutral (e.g. they don't know yet if they can come or not); the task of the adolescent is to assess on a 5-point Likert scale how likely each of the interpretations would come to his mind if he were in the situation presented (1 = *does not pop up in my mind*, 3 = *might pop up in my mind*, 5 = *definitely pops up in my mind*). Finally, the three interpretations are shown again and the teenager must choose which interpretation is the most believable (the scoring for the belief question is: 1 = positive interpretation, 2 = neutral interpretation, 3 = negative interpretation). In this study, we administered the Italian version of the AIBQ (Giannini & Loscalzo, 2013; Loscalzo & Giannini, 2015).

2.2.3. *Positive and Negative Affect Schedule (PANAS)*

The PANAS (Watson, Clark, & Tellegen, 1998) consists of 20 items representing two emotional structures: positive and negative. For each factor there are 10 items (some examples are enthusiastic, proud, ashamed, upset, distressed). The participant must indicate how much he/she felt each emotion on a 5-point Likert scale, where 1 = *very slightly* or *not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, and 5 = *extremely*.

In the present study we used the Italian version (Terracciano, McCrae, & Costa, 2003), choosing as reference time "last week" because the instrument used for the assessment of social anxiety has this time period. The internal consistency of the negative affect PANAS scale, assessed with Chronbach's alpha, was .83, similar to the value reported by Terraciano et al. (2003) which was .85.

2.2.4. Social Phobia Inventory (SPIN)

The Italian translation (Pannocchia, 2010) of the Social Phobia Inventory (SPIN, Connor et al., 2000) was used for the measurement of social anxiety. This is a 17-item self-report

scale for evaluating the severity of social anxiety disorder, consisting of three subscales (Fear, Avoidance, and Physiological Arousal). Since factor analyses did not support this structure generally only the total score is used (Antony & Rowa 2008). The items describe some of the typical symptoms of the disorder (being criticized scares me, talking to strangers scares me, I avoid having to make speeches in public) and the participant must indicate on a 5-point Likert scale the extent to which he/she has been bothered by these problems in the previous week, where 0 = *not at all*, 1 = *a little bit*, 2 = *somewhat*, 3 = *very much*, 4 = *extremely*, resulting in a total score between 0 and 68. For the SPIN total score, Gori et al. (2013) reported a Cronbach's alpha of .87, while in our sample it was .91

Originally, the SPIN was created for an adult population, for which the cut-off, determined by the study of Connor et al. (2000), is 19. Some studies on adolescents suggested the SPIN as an useful measure for adolescents, with the condition of raising the cut-off to 21 (Johnson et al., 2006), 24 (Ranta et al., 2007a; Ranta et al., 2007b) or 25 (Sosic et al., 2008; Tsai et al., 2009).

2.3. Procedure

After obtaining permission to use the instruments, we created an online survey. A single document contained the personal data, followed by the Adolescents' Interpretation and Belief Questionnaire (AIBQ), the Positive and Negative Affect Schedule (PANAS) and the Social Phobia Inventory (SPIN). The participants could not skip questions, because we made all the items mandatory. They, however, could close the questionnaire before finish and then withdraw their participation at any time.

Once we obtained the authorization from the Dean of Institutes, and then the written Informed Consent from the participants and their families, we began the administration of the test on the Institutes' computers, with the collaboration of the teachers, during a regular lesson at the schools.

As regard the clinical sample, the participants completed the AIBQ (paper-and-pencil) during the psychotherapy session. The SPIN and the PANAS were not administered, because the psychotherapists assessed the diagnosis of SAD and the absence of comorbidity by means of a clinical interview and their usual questionnaires, and to avoid interfering too much with the therapy.

2.4. Data analysis

Statistical analysis was conducted using the software SPSS.20. Hypotheses 1 to 4 were tested by means of two MANOVAs, one for social situations and one for non-social situations, followed by a Bonferroni post-hoc test. We chose not to adopt a mixed design, and to separate the analysis on social and non-social situations, in order to avoid too many combinations of factors relative to the sample size. Hence, we adopted the analytical approach used both by Miers et al. (2008) and Giannini and Loscalzo (2016). In these analyses gender was included as a control variable. The studies of Giannini and Loscalzo (2016) and Miers et al. (2008) found different results on gender differences; hence, we included gender as a possible moderator. Given the existence of a significant difference on negative interpretations of social situations between the non-anxious and subclinical SAD groups we planned to run an ANCOVA with negative mood as a covariate to test hypothesis 5. Before conducting the analysis, statistical assumptions were verified.

3. Results

3.1. Subclinical/Clinical components of interpretation bias

To assess if the components of interpretation bias are clinical or subclinical features, we conducted a 3 (social anxiety group) x 2 (gender) MANOVA with negative interpretation,

positive interpretation and belief in negative interpretations in social situations, as dependent variables (see Table 1).

The multivariate test showed a statistically significant effect of both social anxiety and gender, respectively, $F(6, 354) = 12.61$, $p < .001$, partial $\eta^2 = .18$ and $F(3, 177) = 3.07$, $p = .03$, partial $\eta^2 = .05$. The interaction between the two independent variables was also significant, $F(6, 354) = 5.76$, $p < .001$, partial $\eta^2 = .09$. Subsequent ANOVAs showed that social anxiety had a significant effect on both negative interpretation, $F(2, 179) = 41.02$, $p < .001$, partial $\eta^2 = .31$, and belief in negative interpretation $F(2, 179) = 6.09$, $p = .003$, partial $\eta^2 = .06$. Social anxiety did not have a significant effect on positive interpretations, $F(2, 179) = .20$, $p = .82$, partial $\eta^2 = .002$.

To unpack the social anxiety main effect, a Bonferroni post-hoc test was performed. For negative interpretations it revealed a statistically significant difference ($p < .001$) between the SAD group and both the non-socially anxious group and the subclinical SAD group. There was also a significant difference ($p = .03$) between the non-socially anxious group and the subclinical SAD group (SAD > subclinical SAD > non-socially anxious). With regard to the belief in negative interpretations, there was a significant difference between the SAD group and both the non-socially anxious group ($p = .003$) and the subclinical SAD group ($p = 0.03$). The non-socially anxious group and the subclinical SAD group did not differ significantly (SAD > subclinical SAD, non-socially anxious; subclinical SAD = non-socially anxious).

Regarding the main effect of gender, females believed more in negative interpretations than boys, $F(1, 179) = 5.33$, $p = .02$, partial $\eta^2 = .03$. The interaction effect between social anxiety and gender showed a significant effect on positive interpretations, $F(2, 179) = 15.46$, $p < .001$, partial $\eta^2 = .15$. In particular, non-socially anxious boys and boys with subclinical

SAD were more positive than girls, while boys with SAD were less positive than girls. No other effects were significant.

3.2. Content specificity of the interpretation bias

To test the fourth hypothesis, a second 3 (social anxiety group) x 2 (gender) MANOVA was performed, with the three dependent variables relating this time to the non-social situations (see Table 2).

The multivariate test showed a statistically significant effect of social anxiety, $F(6, 354) = 12.96$, $p < .001$, partial $\eta^2 = .18$. Also, the main effect of gender, and the interaction between social anxiety and gender, were significant, respectively $F(3, 177) = 2.61$, $p = .05$, partial $\eta^2 = .04$, and $F(6, 354) = 2.42$, $p = .03$, partial $\eta^2 = .04$. Subsequent ANOVAs showed that social anxiety had a significant effect on negative interpretations, $F(2, 179) = 40.68$, $p < .001$, partial $\eta^2 = .31$, on positive interpretations $F(2, 179) = 3.86$, $p = .02$, partial $\eta^2 = .04$, and on belief in negative interpretations, $F(2, 179) = 3.35$, $p = .04$, partial $\eta^2 = .04$.

The Bonferroni post-hoc tests revealed that, as regard negative interpretations, the SAD group differed significantly ($p < .001$) from both the non-socially anxious group and the subclinical SAD group. Adolescents with SAD were more negative in their interpretations of ambiguous non-social situations than their peers (SAD > subclinical SAD, non-socially anxious; subclinical SAD = non-socially anxious). There was also a significant difference ($p = .03$) between the SAD group and the non-socially anxious group for belief in negative interpretations, with the SAD group scoring higher on this variable. Finally, for positive interpretations, the results showed that the SAD group was more positive than the non-socially anxious group ($p = .02$). The subclinical SAD group did not differ from the non-socially anxious group on any of the non-social situation variables.

Regarding gender, follow-up ANOVAs showed that males believed more in negative interpretations than females, $F(1, 179) = 4.67$, $p = .03$, partial $\eta^2 = .03$. The interaction between gender and social anxiety was significant for negative interpretations, $F(2, 179) = 3.86$, $p = .02$, partial $\eta^2 = .04$. In particular non-socially anxious boys were more negative than girls, while boys with SAD were less negative than girls; there was no difference between males and females with subclinical SAD.

3.3. Interpretation bias and negative affect

To test the fifth hypothesis, we conducted an ANCOVA with the negative scale of the PANAS as covariate, and negative interpretations in social situations as the dependent variable. The analysis showed a non-significant effect for negative affect on negative interpretations, and, as expected, a significant social anxiety effect, $F(1, 152) = 5.56$, $p = .02$, partial $\eta^2 = .04$.

4. Discussion

Our findings provide support for the notion that different components of interpretation bias are differently related to social anxiety. The results suggest that, for ambiguous social situations, negative interpretation bias is a characteristic of social anxiety present at subclinical and clinical levels of social anxiety. The findings also show that neither the adolescents with SAD nor those with subclinical SAD lack a positive bias in ambiguous social situations. That is, they do not report a lower likelihood of positive interpretations coming to mind than their non-anxious peers. In contrast, belief in negative interpretations appears to be a clinical feature. We also found that the negative interpretation bias is specific to social situations for the adolescents with subclinical SAD. In contrast, the clinical group is more negative and believes more in negative interpretations also in non-social situations.

These findings are discussed in detail in the next sections. First, regarding the *negative*

interpretation bias for social situations, the results support the hypothesis that it increases with increasing levels of social anxiety. This is evident from the means on negative interpretation of social situations by social anxiety group (Table 1) that show an increase in the degree to which negative interpretations come to mind with an increase in social anxiety level. This result is in line with and extends the findings by Tuschen-Caffier et al. (2011) and by Kley et al. (2012) who analysed negative self-thinking rather than interpretation of ambiguous social situations. It is also in line with the two interpretation bias studies in community samples whereby high-socially anxious adolescents exhibited a negative interpretation bias (Giannini & Loscalzo, 2016; Miers et al., 2008). Furthermore, this finding is compatible with Miers et al. (2013) study of social anxiety trajectories across adolescence, which suggested a linear relationship between negative interpretations and social anxiety (Miers et al., 2013).

Second, concerning the *positive interpretation bias in ambiguous social situations*, our study found that the lack of positive interpretations is neither a clinical nor a subclinical component. This is in line with Miers et al.'s (2008) findings, since they too did not find differences on positive interpretation between high and average social anxiety groups. In contrast, this is not in accordance with Giannini and Loscalzo (2016)'s findings nor with the Kley et al. (2012) study, in which the SAD group had significantly fewer positive self-related cognitions than the subclinical SAD group. Nevertheless, it is worth keeping in mind that the age of the samples and the measures of positive cognitions differed between our study and that of Kley et al. (2012). We could also speculate that social desirability could have influenced our clinical group's answers, since they filled in the AIBQ in the presence of their psychotherapist. The participants in the SAD group could have tried to be more positive in order to simulate some clinical improvements given they had already completed a few

sessions (the participants might have expected some lessening of symptoms even within the diagnostic sessions).

Third, with regard to *belief in negative interpretations of social situations*, our results showed that it is a clinical component. This is in contrast with the Italian study (Giannini & Loscalzo, 2016), in which the strongest difference between high and average social anxiety groups was on belief in negative interpretations. However, we suggest that the findings of Giannini and Loscalzo (2016) could be due to the very high level of their social anxiety group, whose SPIN score mean was 47.28 (± 7.37), far beyond the 24 cut-off. We could speculate that this group was much more similar to a clinical sample, and that hence their results actually support that belief in negative interpretations is a clinical component. On the other hand, our result appears in accordance with Miers et al. (2008), since these authors reported a marginally significant difference between their socially anxious group (but not clinical) and non-anxious group for belief in negative interpretations of social situations. However, this effect was not nearly as large as the social anxiety group difference for negative interpretations coming to mind, implying that belief in negative interpretations is less indicative of non-clinical adolescent social anxiety than the likelihood of negative interpretations coming to mind (Miers et al., 2008). Clearly, the finding that belief in negative interpretations of social situations is a clinical component needs to be replicated since both adolescent and adult literature is lacking on this topic.

Fourth, the findings relevant to the *content-specificity* of the bias are interesting. Our results, in line with Miers et al. (2008) and Giannini and Loscalzo (2016), support our hypothesis that the negative bias (as well as the positive bias) is not evident in non-social situations for the subclinical SAD group, but we did not find support for this as regard the SAD group. Indeed, we found that the clinical group also had a negative bias in non-social situations, and this group believed more in negative interpretations. More surprisingly, the

SAD group was also more positive in non-social situations. Also in this case, we suggest that social desirability might be at work. The SAD group could have presented themselves as they thought the psychotherapist viewed them: extremely negative in all daily situations, but somewhat positive in non-social situations. However, our finding of an interpretation bias for non-social situations is in line with a study by Creswell et al. (2014). In that study, clinically anxious children aged between 10 and 12 had a negative bias for non-social situations but younger children (7 - 9 years) did not. Hence, we could hypothesize that pre-adolescents and adolescents with clinical SAD have a negative interpretation bias in non-social situations.

If future studies support our findings regarding the interpretations of ambiguous social situations, this would have implications for both prevention and treatment. For prevention, a screening measure such as the AIBQ could be useful to detect adolescents at-risk to develop SAD (Loscalzo and Giannini, 2015). Indeed, this concurs with a very recent model of social anxiety disorder in which negative social-evaluative cognitions such as an interpretation bias are proposed to precede the onset of SAD (Wong & Rapee, 2016). At-risk adolescents could then receive a psychological intervention aiming to decrease the negative interpretations, for example through Cognitive Bias Modification (CBM) training (e.g. Lau et al., 2011; Salemink et al., 2014; Salemink & Wiers, 2011), and prevent the development of social anxiety to clinical levels.

In contrast, in a therapeutic setting it might be more appropriate to focus on challenging the belief in negative interpretations by reinforcing the selection of positive, or at least neutral, interpretations as the most believable option. Hence, psychotherapists could not only brainstorm multiple interpretations that could pop up in one's mind, but also consider the believability of these options in the explanation of the ambiguous situation. In this way, the youths could change their schemas and automatic thoughts activated by the feared social situations, hence developing a more adaptive schema (cfr. Beck, 1976). Moreover, if future

studies support our findings regarding the content-specificity of interpretation bias, a clinical implication could be that psychotherapists focus on negative interpretations, as current therapy suggests, but not only in ambiguous social situations. They should reduce negative interpretations and promote the selection of a positive or neutral interpretation both in social and non-social situations, to help the adolescents gain a better functionality in all the situations they could encounter in their daily lives. Hence, our study *tentatively* suggests a broadening of the cognitive restructuring component of SAD treatment. Currently, SAD is treated mainly by targeting self-focused attention and safety behaviours, by means of video and audio feedback and interrogation of the social environment (e.g. the patient is asked to take surveys in order to investigate what other people think of his/her fearful behavior), with the aim to disconfirm negative beliefs (see Clark, 2001).

Among the limitations of this research, we have used a single instrument to measure interpretation bias, which does not have an open question to stimulate a free response. Moreover, the social anxiety groups were not demographically matched other than on age and gender, as we could not ask for more demographic data about the participants of the clinical group. However, the main limitation is that we did not collect additional diagnostic information from the clinical SAD group such as their self-reported social anxiety severity (using the SPIN) to compare with the subclinical group, or their comorbidity. The latter point means that our findings cannot speak to the issue of the specificity of interpretation bias to SAD versus other anxiety disorders and depression. Finally, the subclinical SAD group did not receive a clinical interview that would have definitively ruled out the presence of SAD.

To conclude, the merit of this study is that it investigated how different components of interpretation bias are related to social anxiety in adolescents. To the best of our knowledge, this is the first study to analyze the components of this bias at a subclinical level of SAD and compare these with a clinical sample of adolescents with SAD and a non-socially anxious

group. In addition to the clinical implications, our study also deepens the theoretical understanding of the interpretation bias. The bias can be defined as composed of four components (negative interpretation, positive interpretation, belief in negative interpretations, and content-specificity). Negative interpretations of ambiguous social situations appears to be a dimensional aspect whilst belief in these interpretations a clinical feature. Finally, our study also partly challenges existing findings related to the content-specificity of the bias, highlighting the need for further research into this information processing bias in youth. We conclude by suggesting that future studies should examine the characteristics of interpretation bias along the whole continuum of social anxiety, in children and adolescents, in order to shed light on whether certain components are dimensional or non-dimensional.

Acknowledgment

Study Funding: There is no external funding to report.

Conflict of Interest: The authors have declared that they have no competing or potential conflict of interest.

Contributorship: Yura Loscalzo managed the literature search, undertook the statistical analyses and wrote the draft of the manuscript. Marco Giannini and Anne C Miers critically revised the manuscript. All authors took part in the design of the study, contributed to and approved the final manuscript.

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Table 1. Means (SDs) of the AIBQ social situations' interpretations and belief by social anxiety group and gender

AIBQ variable	Social anxiety	Gender	M(SD)	*n*
Positive interpretation	Non-socially anxious	Boys	2.91 (.64)	48
		Girls	2.52 (.61)	47
		Total	2.72 (.65)	95
	Subclinical SAD	Boys	3.04 (.62)	24
		Girls	2.44 (.64)	36
		Total	2.68 (.69)	60
	SAD	Boys	2.38 (.37)	16
		Girls	3.21 (.43)	14
		Total	2.77 (.58)	30
Negative interpretation	Non-socially anxious	Boys	2.67 (.81)	48
		Girls	2.46 (.75)	47
		Total	2.57 (.78)	95
	Subclinical SAD	Boys	2.90 (.60)	24
		Girls	2.83 (.64)	36
		Total	2.86 (.62)	60
	SAD	Boys	3.86 (.38)	16
		Girls	3.84 (.32)	14
		Total	3.85 (.34)	30

Belief in negative interpretation	Non-socially anxious	Boys	1.94 (.28)	48
		Girls	1.99 (.27)	47
		Total	1.96 (.28)	95
	Subclinical SAD	Boys	1.87 (.32)	24
		Girls	2.09 (.28)	36
		Total	2.00 (.31)	60
	SAD	Boys	2.14 (.16)	16
		Girls	2.19 (.28)	14
		Total	2.16 (.22)	30

Note. AIBQ: Adolescents' Interpretation and Belief Questionnaire

Table 2. Means (SDs) of the AIBQ non-social situations' interpretations and belief by social anxiety group and gender

AIBQ variable	Social anxiety	Gender	M(SD)	*n*
Positive interpretation	Non-socially	Boys	3.44 (.59)	48
	anxious	Girls	3.37 (.57)	47
		Total	3.41 (.58)	95
	Subclinical SAD	Boys	3.50 (.53)	24
		Girls	3.41 (.70)	36
		Total	3.45 (.63)	60
	SAD	Boys	3.71 (.28)	16
		Girls	3.76 (.32)	14
		Total	3.73 (.29)	30
Negative interpretation	Non-socially	Boys	2.94 (.62)	48
	anxious	Girls	2.67 (.69)	47
		Total	2.81 (.67)	95
	Subclinical SAD	Boys	2.97 (.53)	24
		Girls	2.93 (.70)	36
		Total	2.95 (.63)	60
	SAD	Boys	3.75 (.58)	16
		Girls	4.20 (.28)	14
		Total	3.96 (.51)	30

Belief in negative interpretation	Non-socially anxious	Boys	1.76 (.31)	48
		Girls	1.68 (.33)	47
		Total	1.72 (.32)	95
	Subclinical SAD	Boys	1.79 (.34)	24
		Girls	1.79 (.29)	36
		Total	1.80 (.31)	60
	SAD	Boys	2.01 (.35)	16
		Girls	1.76 (.19)	14
		Total	1.89 (.31)	30

Note. AIBQ: Adolescents' Interpretation and Belief Questionnaire