

MAIN

The role of interpretation biases and safety behaviours in social anxiety: an intensive longitudinal study

Ángel Prieto-Fidalgo  and Esther Calvete 

Faculty of Health Sciences, Department of Psychology, University of Deusto, Bilbao, Spain

Corresponding author: Ángel Prieto-Fidalgo; Email: a.prieto@deusto.es

(Received 30 August 2022; revised 5 July 2023; accepted 10 July 2023; first published online 30 August 2023)

Abstract

Background: Interpretation bias and safety behaviours (Safe-B) have been proposed as factors perpetuating social anxiety (SA). However, longitudinal research on how they contribute to SA in everyday life is scarce.

Aim: The aim was to examine whether interpretation bias predicts daily Safe-B and SA. A mediated moderation was hypothesized, where the relationship between daily social stressors and Safe-B would be moderated by interpretation bias, and Safe-B, in turn, would mediate the association between stressors and SA levels. In addition, it was hypothesized that prior levels of SA would predict higher Safe-B use, especially in co-occurrence with stressors.

Method: An intensive longitudinal design was employed, with 138 vocational training students (51% men, mean age 20.15 years). They completed initial measures of SA and interpretation bias and 7-day diaries with measures of social stressors, Safe-B, and SA. They reported SA levels two months later.

Results: Both stressors and interpretation bias in ambiguous situations predicted Safe-B, which in turn predicted daily SA levels. However, neither interpretation bias nor Safe-B predicted SA levels at the follow-up, and interpretation bias did not moderate the association between stressors and daily SA. In addition, the relationship between stressors and Safe-B was stronger in people with higher initial SA levels.

Conclusions: The results suggest that Safe-B are a mechanism through which earlier SA levels and interpretation bias contribute to higher SA levels in daily life.

Keywords: Cognitive vulnerability; Intensive longitudinal design; Interpretation bias; Safety behaviours; Social anxiety

Introduction

Social anxiety (SA) is characterized by ‘a marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others’ (DSM-V-TR; American Psychiatric Association, 2022). SA is a psychological problem that can cause a marked deterioration in social functioning (Halls *et al.*, 2015). The prevalence rates of SA are high, especially in young people, who often encounter social stressors in both academic and social contexts (de Lijster *et al.*, 2018). Specifically, between 27 and 36% of adolescents and young people reported high levels of SA (Jefferies and Ungar, 2020; Mekuria *et al.*, 2017).

Cognitions play an important role in the initiation and maintenance of SA (Ledley and Heimberg, 2006; Spence and Rapee, 2016). In fact, the theoretical model of SA holds that cognitive biases are frequent in people with SA (Clark and Wells, 1995; Heimberg *et al.*, 2014). When people with SA are exposed to a social event, various types of cognitive vulnerabilities, such as interpretation bias, could lead to a more negative interpretation of social stressors and thus increase the probability of reacting with high levels of SA.

Interpretation bias as cognitive vulnerability to social anxiety

Interpretation bias is one of the cognitive vulnerabilities that has been the focus in several SA models (Clark and Wells, 1995; Heimberg *et al.*, 2014). It has been described as ‘a tendency to interpret ambiguous information in a consistent manner, which is usually threatening or negative’ (Schoth and Liossi, 2017, p. 1). Thus, in an ambiguous situation, such as being observed by someone at a party, a person with interpretation bias would tend to interpret the situation negatively. Possibly, the individual could think that people around them are evaluating or speaking in a harmful manner about him or her.

Interpretation bias contributes to experiencing ambiguous situations as negative, mildly negative, or catastrophic (Stopa and Clark, 2000). They have mainly been evaluated using two well-differentiated approaches. The first method is based on the evaluation of the interpretations that the participants make about ambiguous faces (Gutiérrez-García and Calvo, 2017; Gutiérrez-García *et al.*, 2019; Maoz *et al.*, 2016).

Generally, several images of faces with different ambiguity levels and different emotions are created. These images are all presented to participants and rated by them. In general, studies using this method have indicated a greater tendency towards interpretation bias with ambiguous faces in people with SA. The second method is based on the imagination of ambiguous social scenarios, where participants are asked about what kinds of interpretations they would make in those situations (Miers *et al.*, 2008; Miers *et al.*, 2020). These types of studies have shown that negative interpretations are more frequent in people with high levels of SA. In fact, a meta-analysis that included a total of 44 studies with both methodologies found a large effect size ($g = 0.83$) in the relationship between interpretation bias and SA (Chen *et al.*, 2020).

According to several theoretical models (Clark and Wells, 1995; Heimberg *et al.*, 2014), it is expected that individuals with a greater tendency towards interpretation bias will experience higher levels of SA when faced with a social stressor. In fact, interventions based on reducing interpretation bias reduce SA levels in response to social stressors (Hoppitt *et al.*, 2014). However, although both social stressors (Auerbach *et al.*, 2012) and interpretation bias in ambiguous situations (Chen *et al.*, 2019) predict higher levels of SA, no studies have examined whether interpretation bias moderates the association between social stressors and SA symptoms.

The role of safety behaviours in social anxiety

Safety behaviours (Safe-B) are a relevant maladaptive strategy in the anxiety context (Salkovskis, 1991). According to several models of SA, when faced with a negative evaluation of a social stressor, people with SA who do not escape or avoid the situation tend to engage in Safe-B (Clark and Wells, 1995; Heimberg *et al.*, 2014; Rapee and Heimberg, 1997). These have been described as the attempts made by people with anxiety to prevent or avoid the adverse outcomes of the threat (Piccirillo *et al.*, 2016). For example, with the aim of reducing their anxiety level or the likelihood of being evaluated by others, individuals with social anxiety tend to engage in certain behaviours, such as avoiding looking into the eyes of others or talking as little as possible.

Many studies have demonstrated the relationship between Safe-B and SA (e.g. Chiu *et al.*, 2021; Kocovski *et al.*, 2016; Moscovitch *et al.*, 2013). Individuals with SA employ Safe-B intending to momentarily reduce the anticipated negative consequences in the social scenario – mainly the perception of anxiety and negative evaluation (McManus *et al.*, 2008). However, performing Safe-B could perpetuate SA for several reasons. First, engaging in Safe-B would make it difficult to obtain evidence to disconfirm the effect caused by the social situation, nor would it allow the extinction of the anxiogenic response itself (McManus *et al.*, 2008; van Uijen *et al.*, 2018). In addition, the person with SA would attribute the prevention of the feared outcome to their own Safe-B (Piccirillo *et al.*, 2016).

However, although Safe-B and interpretation bias have been found to be related to SA, the nature of the relationship between Safe-B and interpretation bias with respect to SA in social

scenarios remains to be elucidated. Both the tendency towards negative thoughts and Safe-B seem to independently predict SA levels (Chiu *et al.*, 2021). A cross-sectional study found that the association between interpretation bias in ambiguous scenarios and SA could be explained by Safe-B (Prieto-Fidalgo *et al.*, 2022a). Other cross-sectional studies have found that cognitive biases could explain the relationship between Safe-B and SA (Korte *et al.*, 2015; Viana and Gratz, 2012).

However, the cross-sectional methodology applied in the latter studies did not allow establishing the direction of the relationships. A recent longitudinal study suggested an indirect relationship between interpretation bias measured with a computerized task and SA through Safe-B (Prieto-Fidalgo and Calvete, 2023). In that study, interpretation bias did not explain the indirect relationship between Safe-B and SA.

Although longitudinal studies that have examined whether Safe-B mediate the predictive association between interpretation bias and SA are scarce, this hypothesis has been evaluated for other negative cognitive styles. For example, in a longitudinal study involving evaluation through diaries, Safe-B were found to mediate the relationship between self-portrayal and SA (Moscovitch *et al.*, 2013). Another longitudinal study showed that the lack of perceived anxiety control led to a greater number of Safe-B, which in turn led to higher levels of anticipatory anxiety before a talk (Carnahan *et al.*, 2020).

Current study

Current theoretical models of SA maintain that interpretation bias and Safe-B play a relevant role in the development and maintenance of SA (Leigh and Clark, 2018). However, there is a significant gap in understanding of the mechanisms involved, partly due to the scarcity of longitudinal studies. The first question addressed by this study was whether Safe-B acts as a mediating mechanism between interpretation bias and social stressors, on the one hand, and SA, on the other. The second question was whether interpretation bias moderates the association between stressors and SA. Finally, we examined whether prior levels of SA would predict higher Safe-B use, especially in co-occurrence with stressors.

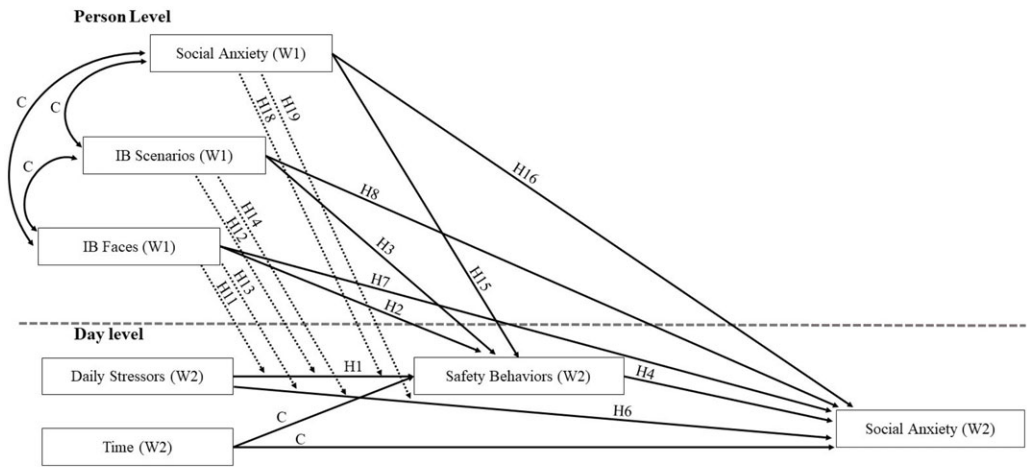
To examine these questions, an intensive longitudinal design was utilized. Intensive longitudinal methods involve sufficient repeated measurements to permit the characterization of the change process for each subject (Bolger and Laurenceau, 2013). This method makes it possible to focus on daily events and to make conclusions about within-subject and between-subject hypotheses. One of the fundamental benefits of this method is that it enables the assessment of thoughts and behaviours in a natural context (Bolger and Laurenceau, 2013).

The proposed hypotheses are displayed in Fig. 1. Regarding the first question, previous studies indicate that people with high levels of SA perform Safe-B to a greater extent than those with low levels (Kocovski *et al.*, 2016; Leigh *et al.*, 2021), Safe-B contribute to maintaining SA (Clark and Wells, 1995; Leigh and Clark, 2018), and the association between interpretation bias and SA can be explained by Safe-B (Prieto-Fidalgo and Calvete, 2023). Therefore, we expected that daily social stressors (H1) and interpretation bias (H2 and H3) would be associated with daily Safe-B and that Safe-B, in turn, would be associated with daily SA (H4) and SA at the follow-up (H5).

Additionally, we expected that stressors would be associated directly with daily SA (H6), and interpretation bias would predict directly daily SA (H7 and H8) and SA at the follow-up (H9 and H10).

Regarding the second question, we examined the role of two modalities of interpretation bias (faces interpretations and scenarios interpretation). As predicted by theoretical models of SA, individuals with cognitive biases would be prone to more SA when experiencing social stressors (Clark and Wells, 1995; Heimberg *et al.*, 2014). Thus, we hypothesized that face and scenario interpretations would increase the relationship between daily social stressors and daily Safe-B (H11 and H12) as well as between daily social stressors and daily SA (H13 and H14).

1A Daily SA Model



1B Follow-Up SA Model

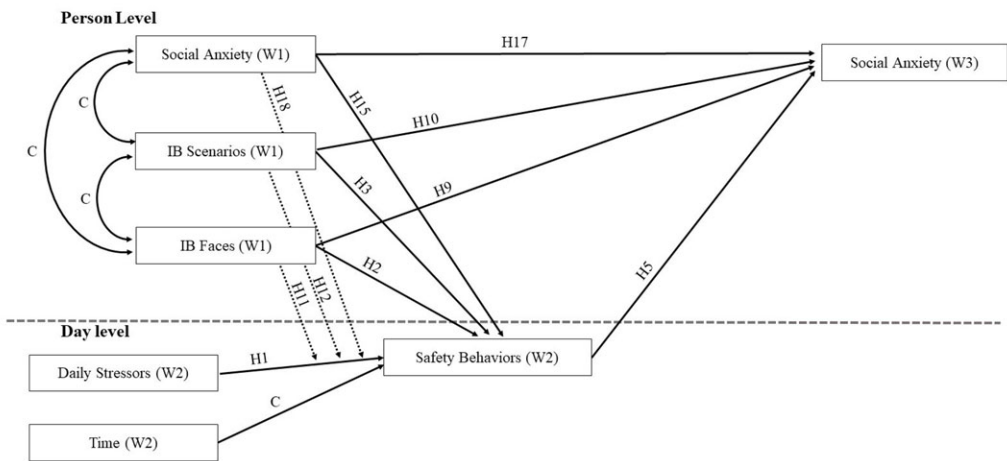


Figure 1. The hypothetical multi-level structural equation models to be tested. The dotted lines represent moderation paths. Paths marked as ‘c’ are included as control paths.

Finally, regarding the third question, given that levels of SA can play a determining role in daily experiences, we expected that initial SA would predict both daily Safe-B (H15) and SA at the daily level (H16) and at follow-up (H17). Moreover, we hypothesized that initial SA levels would increase the association between daily social stressors and Safe-B (H18) and daily SA (H19).

Method

Participants

The participants in this study were a subsample of a larger sample ($n = 842$) of vocational training students. They were invited to participate in a 7-day daily assessment, and 322 were interested in participating. Among these, balancing gender and SA level (see ‘Design and

procedure' section below), 150 students were selected. Twelve participants did not respond at least five times (days), and their data were discarded. Thus, 138 vocational training students participated, with a mean age of 20.15 years ($SD = 2.5$). About half of the students (49%) were women ($n = 67$). Of the 139 students who completed the diaries, 116 answered a follow-up measure. The larger sample was also used in two measures validation studies (Prieto-Fidalgo *et al.*, 2022a; Prieto-Fidalgo *et al.*, 2022b) and a longitudinal study (Prieto-Fidalgo and Calvete, 2023). However, the 7-day daily assessment data were not employed in any of the above studies.

Design and procedure

An intensive longitudinal design (Bolger and Laurenceau, 2013) was arranged in three steps: first, an initial measure was collected; second, a 7-day daily assessment was carried out; and, third, a 2-month follow-up assessment was conducted. Nine vocational centres in Bizkaia (Spain) agreed to collaborate in the study, giving access to the participants.

In order to collect the initial data, the researchers visited the education centres. After being informed about the study procedure, including the 7-day daily assessment, the participants answered the battery of scales using Qualtrics® on a computer. At the end of the survey, the participants expressed their interest in collaborating in the 7-day daily assessment. In this step, the participants were asked to provide their mobile phone number and email address so they could be sent the daily assessment. This information was saved in a different database, where a key was used to associate the phone number and email address with the raw data. In order to maintain privacy, this key was deleted after the selection process explained below.

One hundred and fifty participants were selected, considering the sex and SA levels of the initial measures. Specifically, balancing sex, participants with the lowest and highest levels of SA were selected. All the participants with the lowest levels of SA reported a SA score below 37 points and, except for seven participants, all participants with the highest levels of SA reported a SA score over 44 points. These are, respectively, the cut-offs recommended by the Spanish version of the SAS-A (Olivares *et al.*, 2005) to identify 'non-socially anxious' (<37) individuals and to detect SA (>44). Thus, although the sample was not clinical, the sample used reported scores consistent with those obtained in clinical samples.

The survey was developed in a mobile-responsive way to improve the user experience when answering questions. A platform developed for this purpose sent an automatic message through WhatsApp at 6 p.m. daily. If the participant did not answer, a reminder was sent at 9 p.m. If a participant had not answered the seven diaries on the seventh day, one or two extra reminders were sent for the next two days. Therefore, all participants who answered at least five diaries completed them within the 9-day deadline. Specifically, 87% of the participants completed seven diaries on seven consecutive days. The rest of the participants needed one or two extra days. Except for three participants who completed diaries for the minimum number of days required for the data analysis (five diaries), the rest answered for seven days. Participants who completed at least five diaries were rewarded with a voucher worth 5 euros for an online sales company.

The data collection process guaranteed the privacy of the participants' data. The platform, which managed the message sending, generated a personalized link with a private token. When the participants finished answering the questions in Qualtrics® they were returned to our platform, which automatically marked the daily diary as completed. This system allowed tracing of the number of responses by each participant without directly associating the participant's identification data with the responses to the diaries. The answers of the initial measures and diaries were linked using a code only known by the participants.

Two months after collecting the diaries, a group of psychologist researchers returned to the centres that participated in the study. The objective was to collect data for the follow-up from participants who had previously collaborated. Specifically, participants answered the SA measure (Olivares *et al.*, 2005).

Measures

Initial measure (person-level, Wave 1)

SA was measured with the Spanish version (Olivares *et al.*, 2005) of the Social Anxiety Scale for Adolescents (SAS-A; La Greca and Lopez, 1998). This scale consists of four distracting items (e.g. 'I like to play sports') and 18 items that measure SA (e.g. 'I am ashamed to be surrounded by people I do not know'). The statements are rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*all the time*) in relation to the last month. The Cronbach's alpha coefficient was .96 for the initial measure (Wave 1). This measure was also employed for the follow-up (Wave 3, Cronbach's alpha = .96). The mean of items was used.

Interpretation bias in ambiguous social scenarios was measured with the Spanish version of the Adolescents' Interpretation Bias Questionnaire 2.0 (AIBQ 2.0; Miers *et al.*, 2020; Spanish version: Prieto-Fidalgo *et al.*, 2022a). The AIBQ 2.0 describes three types of ambiguous situations: five non-social situations (e.g. 'You have received bad marks for your last few tests. Why has this happened?'), five offline situations (e.g. 'You have just given a presentation in front of your class and afterwards no-one asks a question. Why doesn't anyone ask a question?'), and seven online situations (e.g. 'You post a photo of a tasty dish that you have made on Instagram. After an hour, one of your followers responds, "What dish is that?"'). A question related to each situation is presented (e.g. 'What is meant by this response?') with a neutral interpretation (e.g. 'It was nearly lunch, so everybody wanted to leave'), a negative interpretation (e.g. 'They did not think my presentation was interesting'), and a positive one (e.g. 'They thought what I said was very clear, and did not need to ask anything'). The participants were instructed to imagine the situation and to rate the probability that each interpretation would pop into their mind on a 5-point scale ranging from 1 (*does not pop in my mind*) to 5 (*definitely pops up in my mind*). Considering that interpretation bias is defined as a negative or threatening perception and only negative interpretations differentiate participants with low and high SA (Miers *et al.*, 2008), the data on negative interpretation were taken into account (Miers *et al.*, 2008). Because the online and offline dimensions of the scale are highly correlated, only an overall measure with these two components was used. Cronbach's alpha coefficient was .89. The mean of items was used.

The Ambiguous Faces Interpretation Task was used to assess the interpretation bias of ambiguous faces (Prieto-Fidalgo *et al.*, 2022b). This task consists of images of eight models (four men and four women) from the Chicago Face Database (Ma *et al.*, 2015). The task includes nine images of each model, so there are 72 images of real faces that express emotions of anger or happiness with different levels of ambiguity. Half of the images were created from the transformation of several intermediate images between a happy face and a neutral one. The other half combines intermediate images between an angry face and a neutral one (see section S1 in Supplementary material). The task consists of presenting a (+) signal for 500 ms followed by the presentation of one of the images (see section S2 in Supplementary material). The participants had to answer as quickly as possible whether the face seemed positive (pressing 'P' on the keyboard) or negative (pressing 'N' on the keyboard). Following the findings of Prieto-Fidalgo *et al.* (2022b), the index of the number of ambiguous faces marked as negative was used. The ambiguous faces are composed of the most ambiguous faces images; specifically, levels 4, 5 and 6 (see section S1 in Supplementary material; $n = 24$).

Daily assessment (day-level, Wave 2)

Social stressors were assessed using an ad hoc measure. Following the categories of social situations proposed by the Social Anxiety Questionnaire for Adults (CISO-A; Caballo *et al.*, 2006), five everyday social stressors were defined: (a) public speaking or interaction with an authority (e.g. teacher); (b) sense of not having a sufficient ability to manage social situations; (c) having to express annoyance, anger or displeasure; (d) interaction with another person with sexual or romantic meaning; and (e) interaction with strangers. The participants were asked if any of the above-mentioned socially stressful situations had occurred throughout each day (e.g. 'Have you

had to speak or act in public or with any authority?’). In order to facilitate the understanding of the question, some examples were given for each social stressor (e.g. ‘Teacher asked me something in class, speaking in class or a meeting, speaking in public, talking to a teacher or superior’). In this study, the daily frequency of social stressors was considered.

To assess Safe-B, the items from the Spanish version of the Social Phobia Safety Behaviors Scale (SPSBS; Pinto-Gouveia *et al.*, 2003; Prieto-Fidalgo *et al.*, 2022a) were adapted to a daily assessment methodology. The original version of SPSBS is composed of 17 statements. Because some of the items of the original version reflected similar reactions to a social situation, it was possible to construct a reduced list of 11 Safe-B. For example, items 4, 5, 6, 7 and 8, which refer to avoiding attracting attention, were included as a single item (‘Avoid being in a place or doing something that attracts attention’), and items 12, 13 and 16, which represent behaviours through which individuals try to mask their nervousness, were also grouped into one item (‘Trying to pretend that I’m comfortable’). The participants were asked about which Safe-B they engaged in.

Perceived SA was measured with a single item: ‘Indicate the degree to which today you have felt anxious in relationships with other people or in situations where you have been observed and/or evaluated (including situations through the internet or social networks)’. The response ranged from 0 (*no anxiety*) to 100 (*very high anxiety*).

Data analysis

The analysis was carried out with multi-level structural equation models (MSEM; Sadikaj *et al.*, 2021). To test the hypotheses, two different models were estimated, with the only difference being that in the first model, the outcome was the daily SA (level 1; Fig. 1A), and in the second model the outcome was the level of SA at the 2-month follow-up (level 2; Fig. 1B).

At level 1 (day level), the daily SA predictor model included the association between daily stressors, daily Safe-B, and daily SA. At level 2 (person level), the model included the initial interpretation bias and initial SA measures predicting daily Safe-B and daily SA. In addition, the initial interpretation bias and initial SA were included as moderators of the relationship, on one hand, between stressors and Safe-B, and on the other hand, between stressors and SA. Moreover, the response day (time) was included at the day level to correct for the influence of time.

The predictor model for SA at follow-up (Fig. 1B) was similar to the model with SA in diaries, except that the outcome was SA assessed 2 months after completion of the diaries (level 2). For a similar procedure, see Seo *et al.* (2022). The two models were performed with Mplus 8.2 (Muthén and Muthén, 2021) using robust maximum likelihood estimation (MLR).

Results

Descriptive data and correlations between study variables are shown in Table 1. Higher levels of interpretation bias in ambiguous scenarios and with ambiguous faces were significantly and positively associated with higher levels of SA in the initial stage, in diaries and at follow-up. Safe-B in diaries were also significantly associated with higher interpretation bias in ambiguous scenarios, interpretation bias with ambiguous faces, daily SA, and initial SA levels. In addition, Safe-B in diaries were also associated with a higher level of SA at follow-up. The number of stressors was significantly and positively associated with the number of Safe-B performed and SA experienced on the same day. The time variable, which indicates the day on which the response is given, was only negatively and significantly associated with the number of Safe-B performed.

Daily social anxiety model

The intraclass correlations of the daily SA model for Safe-B ($ICC = 0.61$) and SA ($ICC = .59$) showed sufficient intra- and inter-subject variability to justify the suitability of the day-level analysis.

Table 1. Descriptive analysis and correlation matrix between day-level and person-level variables

	1	2	3	4	5	6	7	8	9
1. SA (W1)	1								
2. IB Scenarios (W1)	.69***	1							
3. IB Faces (W1)	.18*	.28***	1						
4. Stressors (W2)	.14***	.15***	.04	1					
5. Safe-B (W2)	.34***	.36***	.13***	.37***	1				
6. Time (W2)	-.00	-.00	.00	.03	-.10**	1			
7. SA (W2)	.44***	.41***	.13***	.31***	.52***	-.04	1		
8. SA (W3)	.86***	.66***	.23*	-.01	.10**	-.00	.50***	1	
9. Age	.02	.06	.03	.13***	.04	.00	.02	.05	1
<i>M</i>	2.48	2.47	12.71	1.93	2.32	2.99	31.04	2.62	20.15
<i>SD</i>	0.92	0.85	5.31	1.41	2.06	2.00	29.08	0.86	2.54
Range	1–4.9	1–4.9	0–24	0–6	0–11	0–6	0–100	1–4.9	16–28
<i>n</i>	138	138	138	138	138	138	138	116	138
Daily reports <i>n</i>	—	—	—	967	967	967	967	—	—

Note. SA = social anxiety; IB Scenarios = interpretation bias of ambiguous scenarios measured with AIBQ 2.0; IB Faces = interpretation of ambiguous faces measured with Ambiguous Faces Interpretation Task; Safe-B = safety behaviors; Stressors = number of social stressors experimented; W1 = wave 1 or person-level initial measure; W2 = daily level or diaries; W3 = measure at follow-up. **p* < .05; ***p* < .01; ****p* < .001.

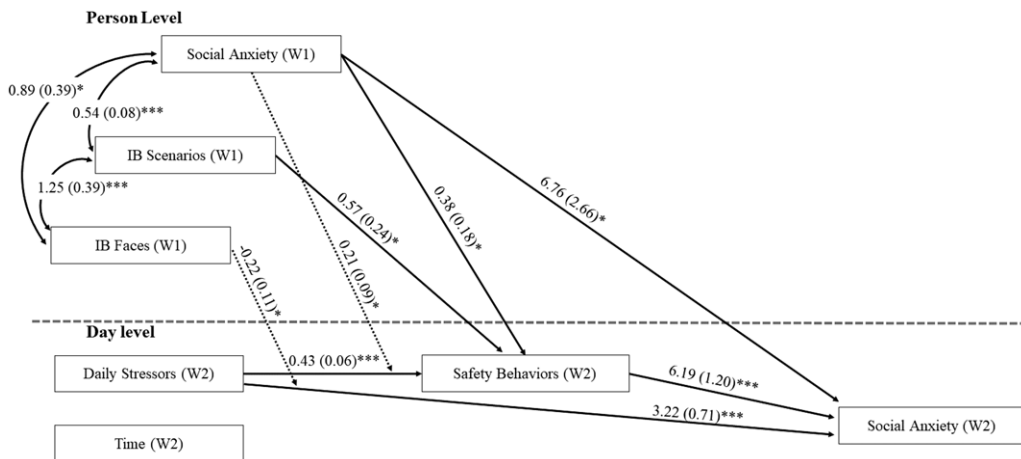


Figure 2. Path diagram of the model with social anxiety at the daily level. IB Scenarios, interpretation bias of ambiguous scenarios measured with AIBQ 2.0; IB Faces, interpretation of ambiguous faces measured with Ambiguous Faces Interpretation Task; Stressors, number of social stressors experimented; W1, wave 1 or person-level initial measures; W2, daily level or diaries. Only significant paths were represented. The dotted lines represent moderation paths. **p* < .05; ****p* < .001.

In relation to the first objective, as shown in Fig. 2, the model results indicate that daily social stressors significantly and positively predicted daily Safe-B (H1) and daily SA (H6). In addition, initial interpretation bias in ambiguous scenarios predicts more Safe-B (H3) but not more daily SA (H8). Nevertheless, the interpretation bias measured with ambiguous faces did not predict more Safe-B (H2) or daily SA (H7). In relation to the mediational hypotheses, more initial interpretation bias in ambiguous social scenarios predicted a high frequency of Safe-B (H3), and a higher frequency of Safe-B was associated with a higher level of SA (H4). As expected, the indirect path between interpretation bias in ambiguous scenarios and SA via Safe-B was found to be statistically significant (section S3 in Supplementary material). These data supported the hypothesis of the mediational role of Safe-B between interpretation bias in ambiguous scenarios and experienced SA.

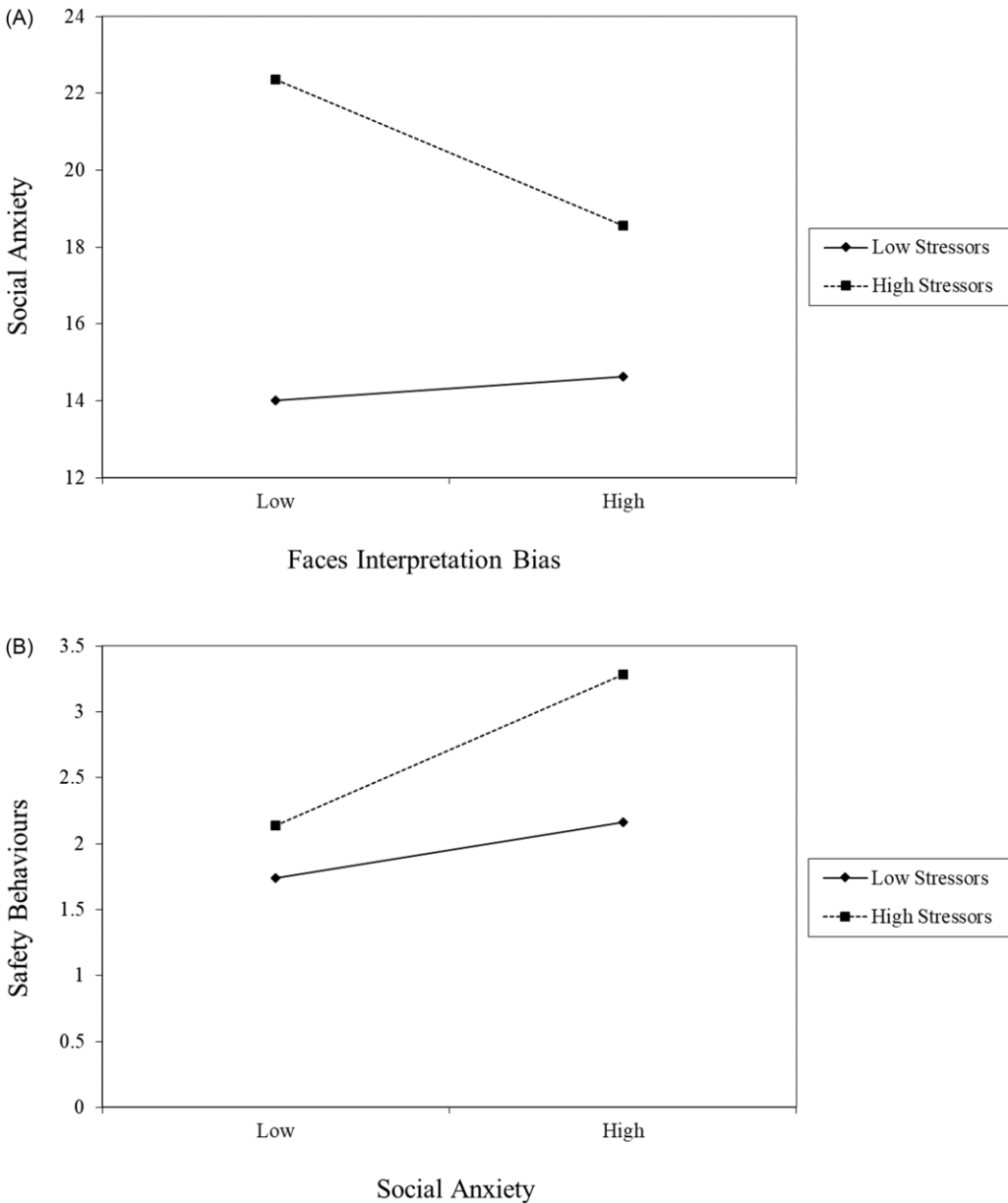


Figure 3. Moderation effects of model 1. A, moderation of the initial level of faces interpretation bias between social stressors and social anxiety at a daily level; B, moderation of the initial level of social anxiety between social stressors and safety behaviours at a daily level.

Regarding the second objective, according to the moderation of interpretation bias, none of the interpretation bias measures moderated the relationship between daily social stressors and Safe-B (H11 and H12). However, interpretation bias measured with ambiguous faces (H13) but not with ambiguous scenarios (H14) significantly moderates the relation between stressors and daily SA. Although the moderation was in the opposite direction of what was expected (Fig. 3A), the slope between the bias and SA was not significant when the participants experienced a high frequency (+1SD) of social stressors ($B(134) = -0.36, t = -1.24, p = .22$) or a low frequency (-1SD) of social stressors ($B(134) = 0.06, t = 0.24, p = .81$). Thus the data do not show a clear relationship

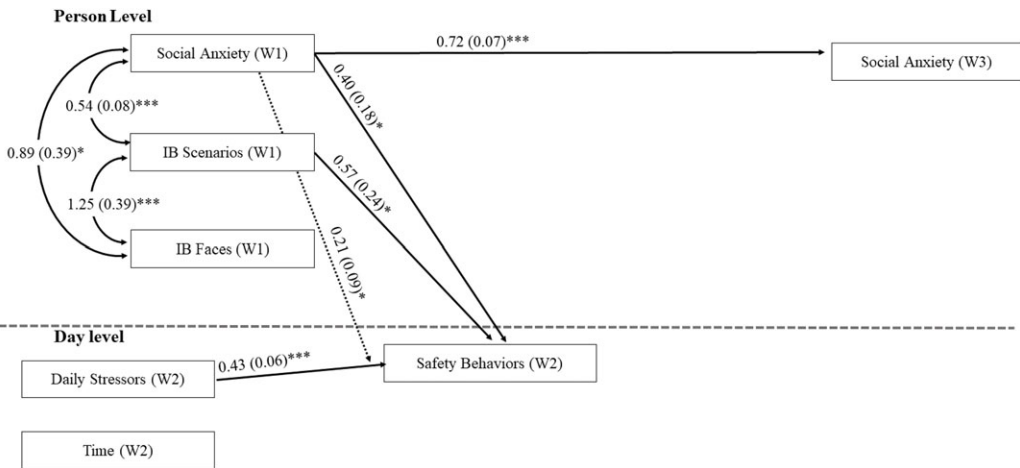


Figure 4. Path diagram of the mediational model with social anxiety follow-up. IB Scenarios, interpretation bias of ambiguous scenarios measured with AIBQ 2.0; IB Faces, interpretation bias of ambiguous faces measured with Ambiguous Faces Interpretation Task; Stressors, number of social stressors experimented; W1, wave 1 or person-level initial measure; W2, daily level or diaries; W3, wave 3 or person-level follow-up. Only significant paths were represented. The dotted line represents moderation path. * $p < .05$; *** $p < .001$.

between interpretation bias measured with ambiguous faces and SA. In sum, the data do not support the main hypothesis that bias would enhance the effect of stressors on Safe-B or daily SA. Rather, both social stressors and interpretation bias in ambiguous scenarios would independently explain the performance of Safe-B.

The third objective was to examine whether initial SA predicted Safe-B and whether SA moderated the relationship between social stressors and Safe-B. Initial SA significantly predicts daily Safe-B (H15) and daily SA (H16). Furthermore, initial SA moderates the relationship between daily stressors and Safe-B (H18) but not the relationship between daily stressors and daily SA (H19). Thus, the initial SA explained the number of Safe-B performed independently and in interaction with the stressors.

Figure 3B shows the form of this interaction. Specifically, SA in the initial stage was more associated with performing Safe-B when the participants experienced a high frequency (+1SD) of social stressors ($B(134) = 0.63$, $t = 4.32$, $p < .001$) compared with when they experienced a low frequency (-1SD) of social stressors ($B(134) = 0.23$, $t = 21.30$, $p < .001$). Additionally, Safe-B also mediated the associations between daily social stressors and initial SA, on the one hand, and daily SA, on the other hand (section S3 in Supplementary material).

Although interpretation bias with ambiguous faces did not predict Safe-B or SA levels, interpretation bias with ambiguous faces co-varied positively and significantly with interpretation bias using ambiguous scenarios and prior SA levels. Finally, the passage of days did not explain the variation in the number of Safe-B performed or the perceived SA. Therefore, as expected in a temporal record of 7 days, no evolution was found in the Safe-B or SA.

Follow-up social anxiety model

In the model with SA in the follow-up, the outcome of daily anxiety level was replaced by an SA measure assessed 2 months after collecting the diaries. Most of the results found in the previous model were systematically replicated in this one (Fig. 4). The main difference from the previous model was that in the present model only initial SA predicted the SA levels 2 months after collecting the data from the diaries (H17). Therefore, as Safe-B did not predict the SA levels

at follow-up (H5), the indirect paths underlying the relationship of interpretation bias and SA through Safe-B were not statistically significant (section S4 in Supplementary materials).

Discussion

SA constitutes a psychological problem of great relevance due to its magnitude and the negative consequences for the people who experience it. This study attempted to provide answers to some of the existing knowledge gaps regarding the mechanisms involved in daily SA experiences and focused on two vulnerability factors: Safe-B and interpretation bias. To examine the relationships between initial levels of interpretation bias, diary level of Safe-B, and diary level of SA, an intensive longitudinal design was utilized.

The first objective was to assess whether Safe-B mediated the association between interpretation bias and SA. As expected, daily social stressors and initial interpretation bias were associated with more Safe-B, and daily Safe-B were associated with higher SA levels. Thus, consistent with the proposed hypothesis, the results showed that the relationship between interpretation bias in ambiguous scenarios and daily SA was explained by Safe-B. This indirect relationship was found in a cross-sectional study when interpretation bias was measured in ambiguous scenarios (Prieto-Fidalgo *et al.*, 2022a) and in a longitudinal study when it was measured with ambiguous faces (Prieto-Fidalgo and Calvete, 2023). In fact, the data are in line with Clark and Wells' cognitive model for SA (Clark and Wells, 1995; Leigh and Clark, 2018), which proposes that in the face of a social stressor, negative social cognitions lead to the performance of Safe-B, and the increase in Safe-B leads to an increase in the somatic and cognitive symptoms of SA. Although apparently this mediation has not been previously analysed with intensive longitudinal methodologies (diary assessment), the results are consistent with the above mentioned studies (Prieto-Fidalgo and Calvete, 2023) and with cross-sectional studies which find that both interpretation bias (Beard and Amir, 2010; Chen *et al.*, 2019) and the performance of Safe-B are associated with experiencing higher levels of SA (Hoffart *et al.*, 2009). In relation to the direct association between interpretation bias and SA, despite the literature showing that interpretation bias predicts SA directly (Chen *et al.*, 2019), the present data demonstrate that this relationship is only explained through Safe-B.

The results regarding the interpretation bias with ambiguous face measurements were not as expected. The task did not predict the number of Safe-B performed or the level of daily SA. These results are consistent with those obtained by Chen *et al.* (2019), who found that interpretation bias with ambiguous faces did not predict higher levels of SA. However, the data from this study indicate that this measure is cross-sectionally correlated with the interpretation bias in ambiguous scenarios and, as in other studies (Chen *et al.*, 2020; Maoz *et al.*, 2016), with SA levels at follow-up. In interpreting the results, it must be considered that interpretation bias related to ambiguous faces, compared with interpretation bias in ambiguous scenarios, had a significantly weaker relationship with SA. This has been found in other studies, which despite arguing that the use of visual stimuli could be more ecological (Heuer *et al.*, 2010), found that the association between interpretation bias and SA is greater when verbal stimuli are used (scenarios, words, sentences, or vignettes) than when visual stimuli are used (Chen *et al.*, 2020; Hirsch *et al.*, 2016). Thus, coupled with the fact that the interpretation bias with ambiguous faces co-varied with the interpretation bias in ambiguous scenarios, the construct underlying the interpretation bias could have materialized through the interpretation bias in ambiguous scenarios.

In congruence with the theoretical models (Clark and Wells, 1995; Leigh and Clark, 2018), the data also indicate that social stressors lead to the performance of Safe-B, which in turn results in higher levels of SA. In this case, daily stressors also directly predict SA. That is, the effect of daily stressors on daily SA can be explained directly and through Safe-B. Prior to this study, other investigations have found a direct relationship between daily stressors and SA (Auerbach *et al.*, 2012).

The results with respect to the second objective discussed above refer to the prediction of daily SA. Performing Safe-B during the days of the daily study did not predict SA levels 2 months after completing the diaries. In fact, the level of SA was only predicted by the initial level of SA itself. This idea contradicts the current literature, which maintains that both interpretation bias (Beard and Amir, 2010) and Safe-B (Gangemi *et al.*, 2012; Leigh *et al.*, 2021; Piccirillo *et al.*, 2016) are fundamental factors in the maintenance of SA. This may partly be due to the high stability level of SA found in the sample between initial measure and follow-up ($r = .86$). The low variation in SA levels would not allow the identification of other mechanisms that could explain the change in SA. Another possible cause of the differences between daily and follow-up SA models could be the use of different instruments – a single item for daily assessment and a validated psychometric instrument for the follow-up.

The second objective was to assess whether interpretation bias moderates the association between stressors and Safe-B and stressors and SA – daily and at a subsequent follow-up. Regarding Safe-B, neither interpretation bias in ambiguous scenarios nor interpretation bias with ambiguous faces moderated the association between social stressors and Safe-B. Regarding SA, although interpretation bias in ambiguous faces significantly moderated the association between social stressors and SA, the association between interpretation bias in ambiguous faces and SA was not significant in any case. Consequently, this result does not allow us to draw solid conclusions. Thus, future studies should study this effect in more detail. In addition, interpretation bias in ambiguous scenarios did not moderate the relationship between stressors and SA. The results align with previous studies examining the moderating role of other cognitive vulnerabilities for SA. For example, in the specific case of early maladaptive schemas, except for the schema of dependency, the results indicated that schemas did not moderate the effect of stressors on the prediction of SA (Calvete *et al.*, 2015; Cámara and Calvete, 2012).

The third objective was to examine the influence of previous SA levels on the prediction of daily Safe-B and SA. Indeed, previous SA levels moderated the effect of daily stressors on Safe-B. The results showed that the initial SA level predicted greater use of Safe-B, especially with the co-occurrence of social stressors. Specifically, the relationship between stressors and Safe-B was stronger among participants with higher levels of SA. These data are consistent with other studies that have found that people with SA are more sensitive to social stressors. For example, in a study involving diaries, Farmer and Kashdan (2015) found that the diagnosis of SA moderated the relationship between negative social events and the experience of negative emotions. Another study using an experimental methodology also showed greater sensitivity to social stressors in people with high levels of SA (Goldin *et al.*, 2009).

Moreover, it was found that Safe-B mediated the described moderation relationship between initial SA and social stressors and the daily SA level. In this way, the current study contributes to revealing one of the mechanisms that could be involved and underlines the role of Safe-B in the maintenance of SA. Individuals with higher SA levels use more daily Safe-B, especially when social stressors occur. Furthermore, both stressors and Safe-B increase daily SA levels.

The results of this study must be interpreted in light of its limitations. First, only model 2 (Follow-Up SA Model) is fully longitudinal. Thus, the indirect relationship between interpretation bias and SA through Safe-B should be viewed with caution.

Second, as it was necessary for the diaries to be designed to be answered in a few minutes, SA was evaluated using a single item. Although numerous studies corroborate the validity of evaluation using a single item (Turon *et al.*, 2019), the measure's reliability may have been compromised. Also, in relation to the diary assessment measures, specifically with the Safe-B measure, each Safe-B was only counted once, even if participants carry out more than once in a day. Third, similarly, the number of variables measured in the diaries was limited. According to the theoretical models, post-event processing is a relevant variable not included in the model that could influence the relationships analysed, especially the relationship with SA at follow-up (Blackie and Kocovski, 2018; Gavric *et al.*, 2017; Heimberg *et al.*, 2014). Thus, SA might increase

only when the post-event processing tends to be negative. However, although more than 900 diaries were collected, the statistical power for person-level relationships ($n = 116$) is notably lower. Thus, the absence of significant prediction of SA at follow-up should be taken with caution. Fourth, although half of the sample reported SA levels comparable to the characteristics of clinical samples (Olivares *et al.*, 2005), the sample does not necessarily represent a clinical sample. Future studies could increase the number of participants, use a clinical sample, improve the model by including other relevant variables, and use a multi-item measure to measure SA to overcome these limitations.

The data collection through diaries for 7 days and the longitudinal nature of the design enable conclusions to be drawn regarding the daily relationships between interpretation bias, stressors, Safe-B and SA. The results highlight the importance of Safe-B as a maintainer of daily SA. Its use not only contributes to people with high levels of SA experiencing anxiety in daily life, mainly when social stressors occur, but also mediates the effect of interpretation bias in ambiguous scenarios. These results may have clinical implications and suggest that interventions should include Safe-B reduction. This is consistent with the evidence regarding the efficacy of Safe-B-based interventions (Schmidt *et al.*, 2012; Schreiber *et al.*, 2015). The results regarding interpretation bias also suggest that they should be modified, as has been addressed in various SA interventions (Naim *et al.*, 2018). Even so, without further studies to corroborate the results, the interpretation bias analysed does not seem to moderate the relationship between the experience of social stressors and Safe-B or SA symptoms.

Hence, social stressors and interpretation bias in ambiguous scenarios would independently lead to the performance of Safe-B.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S135246582300358>

Data availability statement. The data that support the findings of this study are available from the corresponding author, A.P.-F., upon reasonable request.

Acknowledgements. None.

Author contributions. **Ángel Prieto-Fidalgo:** Conceptualization (equal), Data curation (lead), Formal analysis (lead), Funding acquisition (equal), Investigation (equal), Methodology (equal), Project administration (lead), Resources (equal), Software (equal), Supervision (supporting), Validation (supporting), Writing – original draft (lead), Writing – review & editing (supporting); **Esther Calvete:** Conceptualization (equal), Data curation (supporting), Formal analysis (supporting), Funding acquisition (equal), Investigation (equal), Methodology (equal), Project administration (equal), Resources (lead), Software (lead), Supervision (equal), Validation (equal), Visualization (equal), Writing – original draft (supporting), Writing – review & editing (lead).

Financial support. This research was supported by a grant from the Basque Government (PRE-2019-1-0034) to the first author.

Competing interests. We have no known competing interests to disclose.

Ethical standards. The research has conformed to the Declaration of Helsinki and the Ethics Committee of University of Deusto (reference no. ETK-4/20-21) approved the procedure of this study. For minors, an active consent from the parents was required to complete the daily assessment. All participants were informed of the tasks they were about to perform, and they consented to participate.

References

- American Psychiatric Association** (2022). *Diagnostic and Statistical Manual of Mental Disorders* (5th edn, text rev). American Psychiatric Association Publishing. <https://doi.org/10.1176/appi.books.9780890425787>
- Auerbach, R. P., Richardt, S., Kertz, S., & Eberhart, N. K.** (2012). Cognitive vulnerability, stress generation, and anxiety: symptom clusters and gender differences. *International Journal of Cognitive Therapy*, 5, 50–66. <https://doi.org/10.1521/ijct.2012.5.1.50>

- Beard, C., & Amir, N. (2010). Negative interpretation bias mediates the effect of social anxiety on state anxiety. *Cognitive Therapy and Research*, 34, 292–296. <https://doi.org/10.1007/s10608-009-9258-6>
- Blackie, R. A., & Kocovski, N. L. (2018). Forgive and let go: effect of self-compassion on post-event processing in social anxiety. *Mindfulness*, 9, 654–663. <https://doi.org/10.1007/s12671-017-0808-9>
- Bolger, N., & Laurenceau, J.-P. (2013). *Intensive Longitudinal Methods: An Introduction to Diary and Experience Sampling Research*. Guilford Press.
- Caballo, V. E., López-Gollonet, C., Salazar, I. C., Martínez Arias, R., & Ramírez-Uclés, I. (2006). Un nuevo instrumento para la evaluación de la ansiedad/fobia social: El “Cuestionario de Interacción Social para Adultos” (CISO-A) [A new instrument for the assessment of social anxiety/phobia: the ‘Questionnaire of Social Interaction for Adults’ (CISO-A)]. *Psicología Conductual*, 14, 165–181. https://www.behavioralpsycho.com/wp-content/uploads/2020/04/05.Caballo_15-1oa-1.pdf
- Calvete, E., Orue, I., & Hankin, B. L. (2015). A longitudinal test of the vulnerability- stress model with early maladaptive schemas for depressive and social anxiety symptoms in adolescents. *Journal of Psychopathology and Behavioral Assessment*, 37, 85–99. <https://doi.org/10.1007/s10862-014-9438-x>
- Cámara, M., & Calvete, E. (2012). Early maladaptive schemas as moderators of the impact of stressful events on anxiety and depression in university students. *Journal of Psychopathology and Behavioral Assessment*, 34, 58–68. <https://doi.org/10.1007/s10862-011-9261-6>
- Carnahan, N. D., Carter, M. M., & Herr, N. R. (2020). Perpetuating factors of social anxiety: a serial mediation model. *Behavioural and Cognitive Psychotherapy*, 48, 304–314. <https://doi.org/10.1017/S1352465819000638>
- Chen, J., Milne, K., Dayman, J., & Kemps, E. (2019). Interpretation bias and social anxiety: does interpretation bias mediate the relationship between trait social anxiety and state anxiety responses? *Cognition and Emotion*, 33, 630–645. <https://doi.org/10.1080/02699931.2018.1476323>
- Chen, J., Short, M., & Kemps, E. (2020). Interpretation bias in social anxiety: a systematic review and meta-analysis. *Journal of Affective Disorders*, 276, 1119–1130. <https://doi.org/10.1016/j.jad.2020.07.121>
- Chiu, K., Clark, D. M., & Leigh, E. (2021). Cognitive predictors of adolescent social anxiety. *Behaviour Research and Therapy*, 137, 103801. <https://doi.org/10.1016/j.brat.2020.103801>
- Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In *Social Phobia: Diagnosis, Assessment, and Treatment*. New York: Guilford Press.
- de Lijster, J. M., Dieleman, G. C., Utens, E. M. W. J., Dierckx, B., Wierenga, M., Verhulst, F. C., & Legerstee, J. S. (2018). Social and academic functioning in adolescents with anxiety disorders: a systematic review. *Journal of Affective Disorders*, 230, 108–117. <https://doi.org/10.1016/j.jad.2018.01.008>
- Farmer, A. S., & Kashdan, T. B. (2015). Stress sensitivity and stress generation in social anxiety disorder: a temporal process approach. *Journal of Abnormal Psychology*, 124, 102–114. <https://doi.org/10.1037/abn0000036>
- Gangemi, A., Mancini, F., & van den Hout, M. (2012). Behavior as information: ‘If I avoid, then there must be a danger’. *Journal of Behavior Therapy and Experimental Psychiatry*, 43, 1032–1038. <https://doi.org/10.1016/j.jbtep.2012.04.005>
- Gavric, D., Moscovitch, D. A., Rowa, K., & McCabe, R. E. (2017). Post-event processing in social anxiety disorder: examining the mediating roles of positive metacognitive beliefs and perceptions of performance. *Behaviour Research and Therapy*, 91, 1–12. <https://doi.org/10.1016/j.brat.2017.01.002>
- Goldin, P. R., Manber, T., Hakimi, S., Canli, T., & Gross, J. J. (2009). Neural bases of social anxiety disorder. *Archives of General Psychiatry*, 66, 170–180. <https://doi.org/10.1001/archgenpsychiatry.2008.525>
- Gutiérrez-García, A., & Calvo, M. G. (2017). Social anxiety and threat-related interpretation of dynamic facial expressions: sensitivity and response bias. *Personality and Individual Differences*, 107, 10–16. <https://doi.org/10.1016/j.paid.2016.11.025>
- Gutiérrez-García, A., Fernández-Martín, A., Del Líbano, M., & Calvo, M. G. (2019). Selective gaze direction and interpretation of facial expressions in social anxiety. *Personality and Individual Differences*, 147, 297–305. <https://doi.org/10.1016/j.paid.2019.04.034>
- Halls, G., Cooper, P. J., & Creswell, C. (2015). Social communication deficits: specific associations with social anxiety disorder. *Journal of Affective Disorders*, 172, 38–42. <https://doi.org/10.1016/j.jad.2014.09.040>
- Heimberg, R. G., Brozovich, F. A., & Rapee, R. M. (2014). A cognitive-behavioral model of social anxiety disorder. In Hofmann S. G., & DiBartolo, P. M. (eds), *Social Anxiety* (pp. 705–728). Elsevier. <https://doi.org/10.1016/B978-0-12-394427-6.00024-8>
- Heuer, K., Lange, W. G., Isaac, L., Rinck, M., & Becker, E. S. (2010). Morphed emotional faces: emotion detection and misinterpretation in social anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*, 41, 418–425. <https://doi.org/10.1016/j.jbtep.2010.04.005>
- Hirsch, C. R., Meeten, F., Krahe, C., & Reeder, C. (2016). Resolving ambiguity in emotional disorders: the nature and role of interpretation biases. *Annual Review of Clinical Psychology*, 12, 281–305. <https://doi.org/10.1146/annurev-clinpsy-021815-093436>
- Hoffart, A., Borge, F.-M., Sexton, H., & Clark, D. M. (2009). Change processes in residential cognitive and interpersonal psychotherapy for social phobia: a process- outcome study. *Behavior Therapy*, 40, 10–22. <https://doi.org/10.1016/j.beth.2007.12.003>

- Hoppitt, L., Illingworth, J. L., MacLeod, C., Hampshire, A., Dunn, B. D., & Mackintosh, B. (2014). Modifying social anxiety related to a real-life stressor using online Cognitive Bias Modification for interpretation. *Behaviour Research and Therapy*, 52, 45–52. <https://doi.org/10.1016/j.brat.2013.10.008>
- Jefferies, P., & Ungar, M. (2020). Social anxiety in young people: a prevalence study in seven countries. *PLOS One*, 15, e0239133. <https://doi.org/10.1371/journal.pone.0239133>
- Kocovski, N. L., MacKenzie, M. B., Albiani, J. J., Battista, S. R., Noel, S., Fleming, J. E., & Antony, M. M. (2016). Safety behaviors and social anxiety: an examination of the Social Phobia Safety Behaviours Scale. *Journal of Psychopathology and Behavioral Assessment*, 38, 87–100. <https://doi.org/10.1007/s10862-015-9498-6>
- Korte, K. J., Unruh, A. S., Oglesby, M. E., & Schmidt, N. B. (2015). Safety aid use and social anxiety symptoms: the mediating role of perceived control. *Psychiatry Research*, 228, 510–515. <https://doi.org/10.1016/j.psychres.2015.06.006>
- La Greca, A. M., & Lopez, N. (1998). Social anxiety among adolescents: linkages with peer relations and friendships. *Journal of Abnormal Child Psychology*, 26, 83–94. <https://doi.org/10.1023/A:1022684520514>
- Ledley, D. R., & Heimberg, R. G. (2006). Cognitive vulnerability to social anxiety. *Journal of Social and Clinical Psychology*, 25, 755–778. <https://doi.org/10.1521/jscp.2006.25.7.755>
- Leigh, E., Chiu, K., & Clark, D. M. (2021). Self-focused attention and safety behaviours maintain social anxiety in adolescents: an experimental study. *PLOS One*, 16, e0247703. <https://doi.org/10.1371/journal.pone.0247703>
- Leigh, E., & Clark, D. M. (2018). Understanding social anxiety disorder in adolescents and improving treatment outcomes: applying the Cognitive Model of Clark and Wells (1995). *Clinical Child and Family Psychology Review*, 21, 388–414. <https://doi.org/10.1007/s10567-018-0258-5>
- Ma, D. S., Correll, J., & Wittenbrink, B. (2015). The Chicago Face Database: a free stimulus set of faces and norming data. *Behavior Research Methods*, 47, 1122–1135. <https://doi.org/10.3758/s13428-014-0532-5>
- Maoz, K., Eldar, S., Stoddard, J., Pine, D. S., Leibenluft, E., & Bar-Haim, Y. (2016). Angry-Happy interpretations of ambiguous faces in social anxiety disorder. *Psychiatry Research*, 241, 122–127. <https://doi.org/10.1016/j.psychres.2016.04.100>
- McManus, F., Sacadura, C., & Clark, D. M. (2008). Why social anxiety persists: an experimental investigation of the role of safety behaviours as a maintaining factor. *Journal of Behavior Therapy and Experimental Psychiatry*, 39, 147–161. <https://doi.org/10.1016/j.jbtep.2006.12.002>
- Mekuria, K., Mulat, H., Derajew, H., Mekonen, T., Fekadu, W., Belete, A., Yimer, S., Legas, G., Menberu, M., Getnet, A., & Kibret, S. (2017). High magnitude of social anxiety disorder in school adolescents. *Psychiatry Journal*, 2017, 1–5. <https://doi.org/10.1155/2017/5643136>
- Miers, A. C., Blöte, A. W., Bögels, S. M., & Westenberg, P. M. (2008). Interpretation bias and social anxiety in adolescents. *Journal of Anxiety Disorders*, 22, 1462–1471. <https://doi.org/10.1016/j.janxdis.2008.02.010>
- Miers, A. C., Sumter, S. R., Clark, D. M., & Leigh, E. (2020). Interpretation bias in online and offline social environments and associations with social anxiety, peer victimization, and avoidance behavior. *Cognitive Therapy and Research*, 44, 820–833. <https://doi.org/10.1007/s10608-020-10097-1>
- Moscovitch, D. A., Rowa, K., Paulitzki, J. R., Ierullo, M. D., Chiang, B., Antony, M. M., & McCabe, R. E. (2013). Self-portrayal concerns and their relation to safety behaviors and negative affect in social anxiety disorder. *Behaviour Research and Therapy*, 51, 476–486. <https://doi.org/10.1016/j.brat.2013.05.002>
- Muthén, L. K., & Muthén, B. O. (2021). *Mplus User's Guide* (8th ed.). Muthén & Muthén.
- Naim, R., Kivity, Y., Bar-Haim, Y., & Huppert, J. D. (2018). Attention and interpretation bias modification treatment for social anxiety disorder: a randomized clinical trial of efficacy and synergy. *Journal of Behavior Therapy and Experimental Psychiatry*, 59, 19–30. <https://doi.org/10.1016/j.jbtep.2017.10.006>
- Olivares, J., Ruiz, J., Hidalgo, M. D., García-López, L. J., Rosa, A. I., & Piqueras, J. A. (2005). Social Anxiety Scale for Adolescents (SAS-A): psychometric properties in a Spanish-speaking population. *International Journal of Clinical and Health Psychology*, 5, 85–97. <https://www.redalyc.org/articulo.oa?id=33701005>
- Piccirillo, M. L., Taylor Dryman, M., & Heimberg, R. G. (2016). Safety behaviors in adults with social anxiety: review and future directions. *Behavior Therapy*, 47, 675–687. <https://doi.org/10.1016/j.beth.2015.11.005>
- Pinto-Gouveia, J., Cunha, M. I., & do Cu Salvador, M. (2003). Assessment of social phobia by self-report questionnaires: the social interaction and performance anxiety and Avoidance Scale and the Social Phobia Safety Behaviours Scale. *Behavioural and Cognitive Psychotherapy*, 31, 291–311. <https://doi.org/10.1017/S1352465803003059>
- Prieto-Fidalgo, Á., & Calvete, E. (2023). Bidirectional relationships between interpretation biases, safety behaviors, and social anxiety. *Current Psychology*, 0123456789. <https://doi.org/10.1007/s12144-023-04461-z>
- Prieto-Fidalgo, Á, Miers, A. C., & Calvete, E. (2022a). *Interpretation Biases in Social Scenarios and Social Anxiety: The Role of Safety Behaviors* [unpublished manuscript]. Department of Psychology, University of Deusto.
- Prieto-Fidalgo, Á, Mueller, S. C., & Calvete, E. (2022b). *Reliability of an Interpretation Bias Task of Ambiguous Faces and its Relationship with Social Anxiety, Depression, and Looming Maladaptive Style* [unpublished manuscript]. Department of Psychology, University of Deusto.
- Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, 35, 741–756. [https://doi.org/10.1016/S0005-7967\(97\)00022-3](https://doi.org/10.1016/S0005-7967(97)00022-3)

- Sadikaj, G., Wright, A. G. C., Dunkley, D. M., Zuroff, D. C. & Moskowitz, D. S. (2021). Multilevel structural equation modeling for intensive longitudinal data: a practical guide for personality researchers. In J. F. Rauthmann (ed), *The handbook of personality dynamics and processes* (pp. 855–885). Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-813995-0.00033-9>
- Salkovskis, P. M. (1991). The importance of behaviour in the maintenance of anxiety and panic: a cognitive account. *Behavioural Psychotherapy*, 19, 6–19. <https://doi.org/10.1017/S0141347300011472>
- Schmidt, N. B., Buckner, J. D., Pusser, A., Woolaway-Bickel, K., Preston, J. L., & Norr, A. (2012). Randomized controlled trial of false safety behavior elimination therapy: a unified cognitive behavioral treatment for anxiety psychopathology. *Behavior Therapy*, 43, 518–532. <https://doi.org/10.1016/j.beth.2012.02.004>
- Schoth, D. E., & Liossi, C. (2017). A systematic review of experimental paradigms for exploring biased interpretation of ambiguous information with emotional and neutral associations. *Frontiers in Psychology*, 171, 1–20. <https://doi.org/10.3389/fpsyg.2017.00171>
- Schreiber, F., Heimlich, C., Schweitzer, C., & Stangier, U. (2015). Cognitive therapy for social anxiety disorder: the impact of the ‘Self-Focused Attention and Safety Behaviours Experiment’ on the course of treatment. *Behavioural and Cognitive Psychotherapy*, 43, 158–166. <https://doi.org/10.1017/S1352465813000672>
- Seo, E., Lee, H., Jamieson, J., Reis, H., Josephs, R., Beevers, C. & Yeager, D. (2022). Trait attributions and threat appraisals explain why an entity theory of personality predicts greater internalizing symptoms during adolescence. *Development and Psychopathology*, 34(3), 1104–1114. <https://doi.org/10.1017/S0954579420001832>
- Spence, S. H., & Rapee, R. M. (2016). The etiology of social anxiety disorder: an evidence-based model. *Behaviour Research and Therapy*, 86, 50–67. <https://doi.org/10.1016/j.brat.2016.06.007>
- Stopa, L., & Clark, D. M. (2000). Social phobia and interpretation of social events. *Behaviour Research and Therapy*, 38, 273–283. [https://doi.org/10.1016/S0005-7967\(99\)00043-1](https://doi.org/10.1016/S0005-7967(99)00043-1)
- Turon, H., Carey, M., Boyes, A., Hobden, B., Dilworth, S., & Sanson-Fisher, R. (2019). Agreement between a single-item measure of anxiety and depression and the Hospital Anxiety and Depression Scale: a cross-sectional study. *PLOS One*, 14, e0210111. <https://doi.org/10.1371/journal.pone.0210111>
- van Uijen, S. L., Dalmaijer, E. S., van den Hout, M. A., & Engelhard, I. M. (2018). Do safety behaviors preserve threat expectancy? *Journal of Experimental Psychopathology*, 9, 1–14. <https://doi.org/10.1177/2043808718804430>
- Viana, A. G., & Gratz, K. L. (2012). The role of anxiety sensitivity, behavioral inhibition, and cognitive biases in anxiety symptoms: structural equation modeling of direct and indirect pathways. *Journal of Clinical Psychology*, 68, 1122–1141. <https://doi.org/10.1002/jclp.21890>

Cite this article: Prieto-Fidalgo Á and Calvete E (2024). The role of interpretation biases and safety behaviours in social anxiety: an intensive longitudinal study. *Behavioural and Cognitive Psychotherapy* 52, 49–64. <https://doi.org/10.1017/S1352465823000358>