





BSc in Psychology

The Relationship between Fear of Negative Evaluation, Social Anxiety Disorder and Distress among Icelandic Undergraduate in a Virtual Reality Environment

June, 2019

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Foreword

Submitted in partial fulfillment of the requirements of the BSc Psychology degree, Reykjavik University, this thesis is presented in the style of an article for submission to a peer-reviewed journal.

Abstract

The aim in the present study was to examine the relationship between social anxiety disorder (SAD), fear of negative evaluation (FNE) and distress among students giving a presentation in front of virtual audience in a virtual reality (VR) environment. The participants (N = 81) were undergraduate students, 62 women and 19 men at Reykjavik University. They began by completing questionnaires assessing SAD, FNE and distress. It was hypothesized that students with higher levels of SAD would report higher levels of FNE, students with higher levels of SAD and FNE would report higher levels of distress, and that the relationship between SAD and distress would be mediated by FNE. Repeated measure ANOVA analyses of variance using the general linear model (GLM) supported all the hypotheses. Students with higher levels of SAD reported higher levels of FNE, students with higher levels of SAD and FNE reported higher levels of distress both during the waiting and the presentation period, and the relationship between SAD and distress was fully mediated by FNE. As far as we are aware, this is the first study to show this relationship. The findings indicate that interventions aimed at reducing FNE among individuals with high levels of SAD may be effective in reducing the impact on distress of presenting in front of an audience.

Keywords: Social Anxiety Disorder, Fear of Negative Evaluation, Distress, Virtual Reality

Útdráttur

Markmið þessarar rannsóknar var að skoða sambandið á milli félagskvíða, ótta við neikvætt mat (FNE), og kvíða, hjá háskólanemum sem héldu kynningu fyrir framan sýndarveruleikafólk í sýndarveruleika umhverfi. Þátttakendurnir (N = 81) voru nemandur, 62 konur og 19 karlar, í háskólanum í Reykjavík. Þeir byrjuðu á að svara sjálfsmatskvörðum sem spurðu um félagskvíða og FNE, og kvíða. Við ályktuðum að nemandur með hærra stig af félagskvíða myndu hafa hærra stig af FNE, nemandur með hærra stig af félagskvíða og FNE myndu hafa hærra stig af kvíða í, og sambandið á milli félagskvíða og kvíða í væri miðlað af FNE. Endurtekin mæling ANOVA ásamt línulegu líkani (GLM) staðfesti allar niðurstöðurnar. Nemandur með hærra stig af félagskvíða voru með hærra stig af FNE, nemandur með hærra stig af SAD og FNE voru með hærra stig af kvíða, bæði á meðan biðinni stóð og á meðan kynningu stóð, og sambandið á milli SAD og kvíða var miðlað að fullu af FNE. Sem best sem við vitum, er þetta fyrsta rannsókn sem sýnir slíkt samband. Þessar niðurstöður gefa til kynna að meðferðir sem miða á að minnka FNE hjá einstaklingum með há stig af félagskvíða geta haft áhrif á að draga úr áhrifum á kynningum fyrir framan áhorfendur á kvíða.

Lykilord: Félagskvíði, Ótti við neikvætt mat, Kvíði, Sýndarveruleiki

According to the Diagnostic and Statistical Manual of Mental Health 5 (DSM-5), social anxiety disorder (SAD) is a phobia that consists of the fear that other people might be paying very close attention to sufferers in social appearances and/or that they will make a fool of themselves (American Psychiatric Association, 2013). Studies have shown that at least 13% of people in the United States are diagnosed with the disorder at some time in their lives (Kessler, Chiu, Demler, & Walters, 2005; Kessler, 1994). People with SAD can experience distress and often tend to avoid social appearances where they have to interact with people. They use all kinds of safety behaviors; wear a jacket to hide their underarm sweat, put on makeup to prevent others from seeing them blush, or are always on their phone, so they do not have to talk to other people (Summers & Cogle, 2018). People who have SAD fear being negatively evaluated and behave differently to avoid the circumstances where such events can happen. According to Rapee and Heimberg (1997), people with SAD use safety behaviors such as avoidance, to avoid being negative evaluated. For example, they tend to scan their environment for cues of any negative evaluation, and they usually spot these cues immediately. Then, all their attention automatically goes to these stimuli (Rapee & Heimberg, 1997). Also, they tend to overestimate the negativity with which others might judge their performance, overestimate the probability of negative evaluations, and fear the consequences that can follow a negative evaluation (J. Wong, Gordon, & Heimberg, 2014). Furthermore, they are worried what others might think of them, worried that they may say or do something wrong, and afraid of not being approved of by others (Winton, Clark, & Edelmann, 1995a).

A number of models have been developed to identify risk factors for SAD as well as factors that maintain SAD (Heimberg, 1995a). Although these models emphasize different factors, they all consider fear of negative evaluation (FNE) as an essential factor in SAD (J. Wong et al., 2014), and it is often thought to be at the center of these models (Winton, Clark,

& Edelman, 1995b). Studies have also shown that FNE maintains SAD (Iverach Lisa, Rapee Ronald M., Wong Quincy J. J., & Lowe Robyn, 2017; Q. J. J. Wong & Rapee, 2016; Iverach & Rapee, 2014). According to a model created by Iverach et al., (2017) FNE may be the reason why people with SAD fear social situations and why it causes people with SAD to focus on internal cues. This can result in access to external cues. People with SAD may also look at themselves from the perspective of others, to see how they appear in someone else's eyes. This model has been prevalent among adults with SAD (Iverach Lisa et al., 2017). Moreover, according to this model, experience with peers is one of the most important factors when it comes to SAD. If a child undergoes negative experiences like bullying or teasing, they start to avoid situations where they can be negatively evaluated. Usually, this starts in childhood, more specifically at the beginning of elementary school. Their fear of being negative evaluated can continue to increase throughout their whole life if nothing is done to prevent that (Iverach Lisa et al., 2017).

Sapach, Carleton, Mulvogue, Weeks and Heimberg (2015) examined the difference between SAD symptoms, FNE and other concepts, such social dimension, anxiety sensitivity and uncertainty. The participants (N = 197) were Canadian, between the ages of 18 and 64, and they had all met the diagnosed criteria for SAD. They finished self-report measures online, including the Brief Fear of Negative Evaluation Scale (BFNE). The result supported their theory that FNE plays a vital part in SAD. By using post hoc test, Sapach et al. found that the relationship between SAD symptoms, social dimension and anxiety sensitivity was much lower when FNE was in the model. Out of all the concepts they examined, FNE, along with the fear of positive evaluation (FPE), showed the most significant connection with SAD. According to these results, interventions should focus on FNE, a long with FPE, in SAD treatment (Sapach, Carleton, Mulvogue, Weeks, & Heimberg, 2015).

Distress on the other hand, is an unpleasant state of mind, it is an anxiety that does not have good impact on a person. The term can consist of being tense, restless, worried, afraid and irritable and it is on the opposite pole as feeling well and being happy. Distress can cause headaches, stomachaches and dizziness. Also, some can find it hard to sleep or relax (Heimberg, 1995b). A study was done in Spain where 303 students ranging from 14 to 17 years old ($M = 15.62$, $SD = .83$) participated in a study where they had to answer a few self report scales, including the Fear of Negative Evaluation Scale (FNES), measuring FNE, and Social Avoidance and Distress Scale (SADS) which measures social avoidance and distress. Most of the participants ($N = 228$) were diagnosed with SAD. The results showed correlation for these two scales ($r = .51$) and also showed that they were significant to each other ($p < .001$). The result showed as well that these scales separated the participants who were diagnosed with SAD and those who were not (García-López, Olivares, Hidalgo, Beidel, & Turner, 2001).

The relationship between SAD, FNE, and distress is difficult to demonstrate in real-life situations. It is often hard to find a large audience and individuals with SAD who are willing to perform in front of a live audience or do something else that will increase their anxiety. This can also be expensive and time-consuming. But recently, studies have started to use virtual reality (VR) to gain further understanding of SAD. The term “virtual reality” was coined in 1987 by Jaron Lanier. It refers to a technical device that lets individuals enter a virtual environment without being there physically (Steuer, 1992). To enter this computer-generated environment, a head-mounted audio-visual display unit is worn by the user, so that they can see and hear what the computer-controlled environment has to offer (Bricken & Byrne, 1993). Studies have shown that a VR environment can induce stress (Hoffman, 2004; Klinger et al., 2005) and over the past few years, VR has been used as a method for treating all kinds of phobias or anxiety, including spider phobia, claustrophobia and acrophobia

(Carlin, Hoffman, & Weghorst, 1997; Bruce & Regenbrecht, 2009; Hodges et al., 1995). However, none of these studies examined whether FNE mediated the relationship between SAD and distress as would be hypothesized by cognitive models of anxiety. To address this limitation, the present study examined whether individuals with SAD, and FNE, would report more distress while giving a presentation to a virtual audience in a VR environment, if individuals with higher levels of SAD would report higher levels of FNE, and whether the relationship between SAD and distress while waiting to give a presentation, and while giving a presentation, would be mediated by FNE.

The overarching goals of this study were to examine the relationship between SAD, distress, and FNE, among students while they were in a VR environment, waiting to give a presentation, and while delivered a presentation, in front of a virtual audience. Thus, to determine whether the relationship between SAD and distress was mediated by FNE. Towards this end, we created a VR environment where students had to give a presentation in front of a virtual audience. To examine anticipatory distress, half of the participants had to wait for two minutes before facing the audience and delivering their presentation. It was hypothesized that: 1) Students with higher levels of SAD would report higher levels of distress, both during the waiting and presentation period; 2) Students with higher levels of SAD would report higher levels of FNE; 3) Students with higher levels of FNE would report higher levels of distress, both during the waiting and the presentation period, and; 4) The relationship between SAD and distress would be mediated by FNE.

Method

Participants

Participants (N = 81) were all Icelandic students at Reykjavik University with an age range between 19 and 35 and an average age of 22,9 years. The sample consisted of 18 males

and 63 females. Most of the participants were students in an undergraduate psychology class (N = 50), and they received course credits for their participation. The rest (N = 31) were students from other departments in RU. These remaining participants were either friends of the researcher or were recruited by an email that was sent to all students attending Reykjavik University. The study was briefly described in two undergraduate classes and in the email, and students were encouraged to attend, particularly those who felt that they suffered from SAD or felt anxious when performing in front of others. To participate in the study, the participants had to be students at Reykjavik University and speak and read fluent Icelandic.

Measures

Social Anxiety. *Social Interaction Anxiety Scale* (SIAS) is a self-report measure on a five-point Likert scale and contains 20 questions. SIAS measures stress that individuals experience around others. The scale has shown good divergent validity, high consistency (Cronbach's $\alpha = .93$), and high test-retest reliability ($r = 0.92$; (Mattick & Clarke, 1998). SIAS has been translated into Icelandic and has had good convergent ($r = .82, p < .01$) and divergent validity and high internal consistency (Cronbach's $\alpha = .94$) in a large non-clinical Icelandic population. Also, Icelandic studies have shown reliability for SIAS (Halla Ósk Ólafsdóttir, 2012). Internal consistency in the present study was high (Cronbach's $\alpha = .91$) and it demonstrated good convergent validity, as it correlates with Social Phobia Scale ($r = .742, p < .001$) and Brief Fear of Negative Evaluation Scale ($r = .657, p < .001$).

Social Phobia Scale (SPS) is also a self-report measure on a five-point Likert scale, containing 20 questions. SPS measures the fear of being judged or observed by others, while doing some kind of performing. The scale has shown good divergent validity, high internal consistency (Cronbach's $\alpha = .89$), and high test-retest reliability ($r = .93$; Mattick & Clarke, 1998). SPS has been translated into Icelandic, and studies have shown reliability and good

convergent validity ($r = 0.84, p < .01$) as well as good divergent validity in a large non-clinical Icelandic population (Halla Ósk Ólafsdóttir, 2012). Internal consistency in the present study was high (Cronbach's $\alpha = .90$), and it demonstrated good convergent validity, as it correlates with Social Interaction Anxiety Scale ($r = .742, p < .001$) and Brief Fear of Negative Evaluation Scale ($r = .682, p < .001$).

Negative Evaluation. *Brief Fear of Negative Evaluation Scale* (BFNE) is a 12-item self-report scale designed to measure FNE. The measure is on a five-point Likert scale. The scale was translated into Icelandic for this study, so it has not been standardized, and the psychometric properties are unknown. BFNE has shown good internal consistency in English (Cronbach's $\alpha = .92$) and both factorial and construct validity (Rodebaugh, Woods, Thissen, Heimberg, Chambless, & Rapee, 2004). Internal consistency in the present study was high (Cronbach's $\alpha = .93$) and it demonstrated good convergent validity, as it correlates with Social Phobia Scale ($r = .682, p < .001$) and Social Interaction Anxiety Scale ($r = .657, p < .001$).

Subjective Distress. *Subjective Units of Distress Scale* (SUDS) is a single-item self-report measure. It measures distress at a given moment (Bremner et al., 1999) such as; current moment, before walking into a virtual reality environment and while in the virtual reality environment. Scores on the scale are from 0 (no distress) to 100 (the most distress possible). SUDS was used to assess subjective feelings of anxiety.

Virtual Reality

Equipment. The head-mounted display used was an HTC Vive. The device uses two screens, one per eye, each having a resolution of 1080x1200 with a refresh rate of 90hz. The headset uses a gyroscope, an accelerometer and 70 infrared sensors to track the user's movement within the virtual environment. The tracking space of the Vive is a 4.6m by 4.6m

space in which the user can freely walk in any direction. The Vive was also fitted with Bose noise cancelling headphones because of the noise from the *Te & Kaffi* café, located next to the experimental room.

Virtual Environment. The virtual reality environment comprised a hallway and a classroom, and a door between them. The hallway was an empty corridor with a single door that lead to the classroom, with virtual characters seated at their desks. The door was in the front of the classroom and placed centrally.

A background sound played continuously while participants were in the environment. The sound was a mixture of noises commonly associated with classrooms, e.g. shuffling papers, sounds of occasional keyboard typing, and low murmurs. The sound was at a low volume so that it would not be distracting, but loud enough so that there was never a moment of complete silence.

Procedure

The study took place in a room in the center of Reykjavik University, next to the *Te & Kaffi* café. There were glass walls in the front and on the sides of the room, so we added dark curtains to prevent other people from seeing into the room. Students who participated in the study had received an email and/or an introduction in class about the study. When participants arrived for the study, they usually began by taking off their coats and then entered a smaller room that was located inside the previous room. There, the completion of questionnaires and preparation took place. We began by explaining to them that the study was anonymous and that they could cancel their participation at any time, no questions asked.

Next, they completed some of the questionnaires; SIAS, SPS, BFNE and their first SUDS (*baseline*). Then, we gave the participants more information about the study and their role in it. They were told to give an approximately three-minute-long presentation about

Reykjavik University in front of a 20-strong virtual audience. No notes or other visual aids were allowed in the VR environment. To help them prepare, the participants were handed a leaflet about Reykjavik University and told they could base their presentation on the information it contained, or on their own experience of the university. We stepped out during their preparations, and after the preparation time (two minutes), the participants entered the bigger room again.

They stepped on a green line which was located in the center of the room, in front of the back wall, and were given instructions about movement in the VR environment (e.g. where to start and how far they could move) and the participants were told if they were in the exposure group (EG) or in the wait plus exposure group (W+EG). They were then fitted with the VR headset and the Bose headset, and entered the virtual environment.

On entering the virtual environment, the participant stood in front of a door in an empty hallway. The exposure group (EG) walked straight through the open door and into a classroom with 20 virtual characters waiting to hear a short presentation on RU. The participant could walk around the front of a classroom but could not interact with any objects or characters in the room. After the presentation was completed, the participants were asked to remove the head-mounted display and thank the audience for listening, so we could know when they had finished their presentation. The wait plus exposure (W+EG) conditions were identical to the exposure, except for the following: as soon as the participants entered the environment, they were told to wait outside the door for two minutes until the class was ready. There was a clock above the door as a point of reference to see how much was left of the two-minute wait. After two minutes had passed, the door opened, and the participant could go inside and give his presentation.

After the presentation, participants completed a third and fourth SUDS measure. The third measure asked participants to assess their feelings as they stood in front of the virtual

door before they went in (*wait*). Again, this was a two-minute period for the W+EG group but a brief moment for the EG group. The fourth measure assessed their feelings as they were giving their presentation (*presentation*). Finally, we thanked our participants for taking part and informed them that they had now completed their contribution to our study.

We cleaned the VR headset and the Bose headphones after every participant, and permission for the study was obtained from the National Bioethics Committee in Iceland.

Statistical analysis

We began our examination using 2 (experimental groups: EG + wait and EG group) x 3 (experimental phase: baseline, wait and presentation). We used repeated measure ANOVA to examine whether the experimental groups differed on distress during the wait and the presentation periods. The results revealed that there was no main effect for experimental group ($F(1, 77) = .02, p = .88$) and the interaction between the group and experimental period was not significant ($F(2, 154) = .99, p = .99$). Given that the experimental groups did not differ on distress in the VR environment, the groups were combined for all subsequent analyses.

As recommended, the SIAS and SPS were combined to make a variable for SAD (Halla Ósk Ólafsdóttir, 2012). The main dependent variable was distress during the three experimental periods (i.e., baseline, during the wait and during the presentation). The main predictor variable was SAD and the mediator variable was FNE. General linear model (GLM), with experimental periods (wait and presentation) as the within subject factor and SAD as the predictor variable, was used to examine the hypothesis that students with higher levels of SAD would report higher levels of distress both during the waiting and the presentation period. Baseline distress was included as a covariate as higher levels of SAD were associated with higher levels of distress during the baseline period ($r = .48, p < .0001$).

GLM was also used to examine if FNE was associated with higher levels of distress in the VR environment. Lastly, mediation analyses were conducted, using the Hayes Process tool (Hayes, 2015) to examine the hypothesis that the relationship between SAD and distress in the VR environment would be mediated by FNE.

Results

Repeated measures analyses of variance using GLM with experimental periods (i.e., wait and presentation) as the within subject factor, SAD as the predictor variable and baseline distress as a covariate, showed that the main effect for time was significant ($F(1, 67) = 4.19, p = .044$) and the main effect for SAD was significant ($F(1, 67) = 8.17, p = .006$), indicating that SAD was associated with higher distress levels both while standing in front of the door and while giving the presentation. To show this relationship, a median split was performed on the SAD variable and the means are displayed in Figure 1, adjusting for baseline differences.

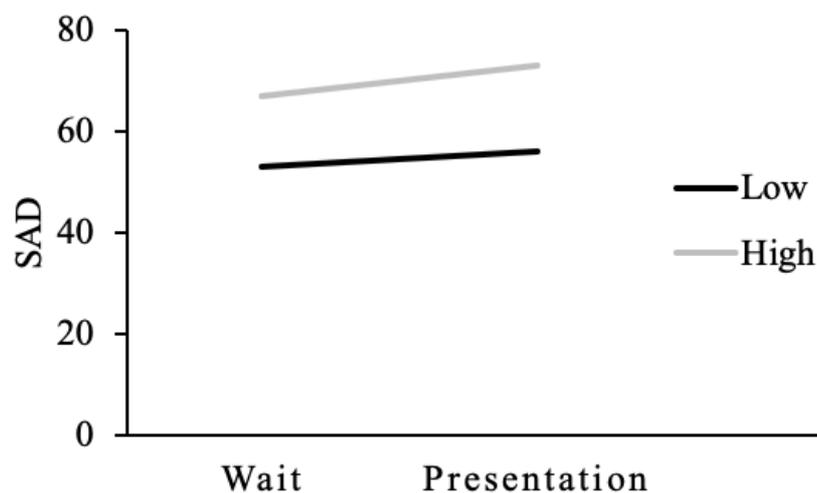


Figure 1. Distress during the experimental periods for below and above the median on SAD.

As shown in Table 1, those with higher levels of SAD had significantly higher levels of FNE and distress during baseline.

Table 1.

Correlation between SAD, FNE, and distress

	SAD	FNE
SAD		
FNE	.710**	
Distress	.480**	.398**

** = Correlation is significant ($p < .01$).

GLM with experimental periods as the within subject factor and FNE as the predictor variable and baseline distress as a covariate, showed that the main effect for distress at baseline was significant ($F(1, 54) = 9.34, p = .003$) and the main FNE was significant ($F(1, 67) = 12.85, = .001$), indicating that FNE was associated with higher distress levels in the VR environment, or during the wait and the presentation period. To show this relationship, a median split was performed on the FNE variable, and the means are displayed in Figure 2, adjusting for baseline differences.

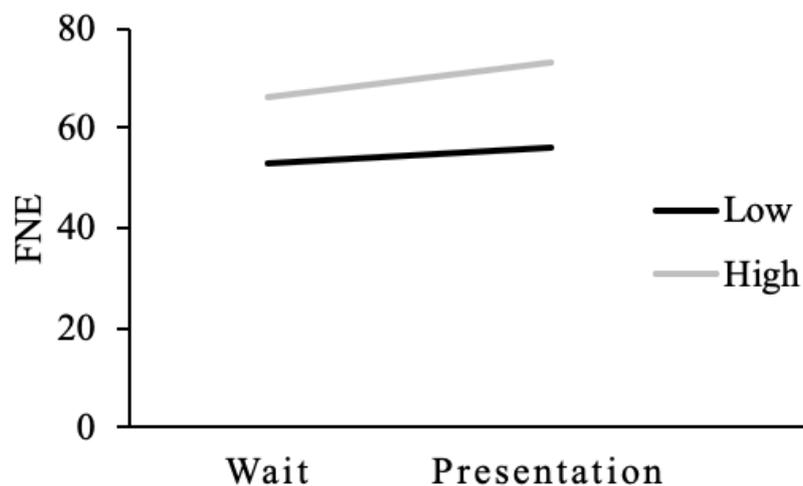


Figure 2. Distress during the experimental periods for below and above the median on FNE.

Next, we examined if the relationship between distress during the experimental periods and SAD was mediated by FNE. Two mediation models were examined, one where participants were at the wait period and one where participants were performing their presentation. As shown in Figure 3, there was a significant indirect effect of SAD and distress during the wait, $b = .27$, 95% CI [.030, .542]. The relationship between SAD and FNE was significant ($p < .001$), as well as the relationship between FNE and distress during the wait ($p < .01$). Both these relationships were positive. The direct effect was no longer significant when FNE was in the model, which implies full mediation.

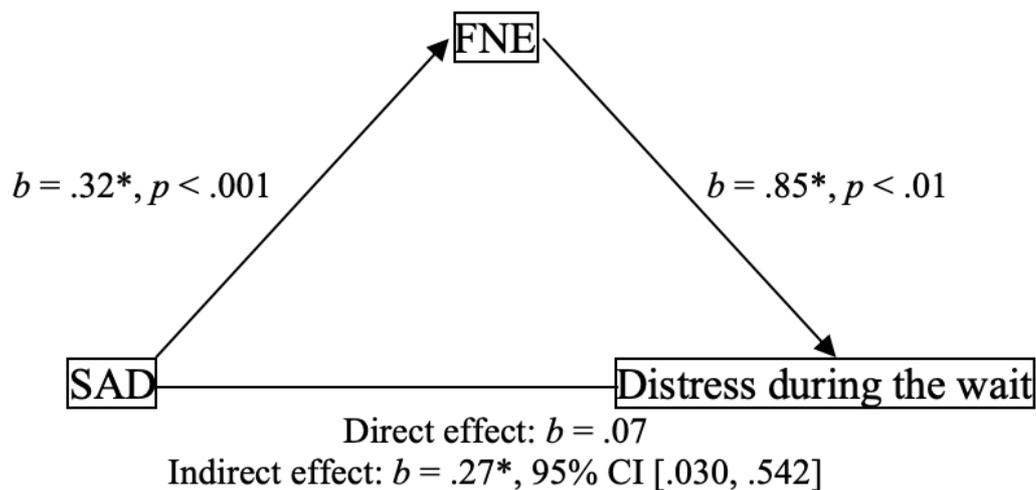


Figure 3. FNE as a mediation for the relationship between SAD and distress during the presentation.

As shown in figure 4, there was a significant indirect effect of SAD and distress during presentation, $b = .36$, 95% CI [.109, .640). The relationship between SAD and FNE was significant ($p < .001$), as well as the relationship between FNE and distress during the presentation ($p < .01$) - both these relationships were positive, as well as the direct relationship between SAD and distress during the presentation. Thus, the direct effect was no longer significant, which implied full mediation.

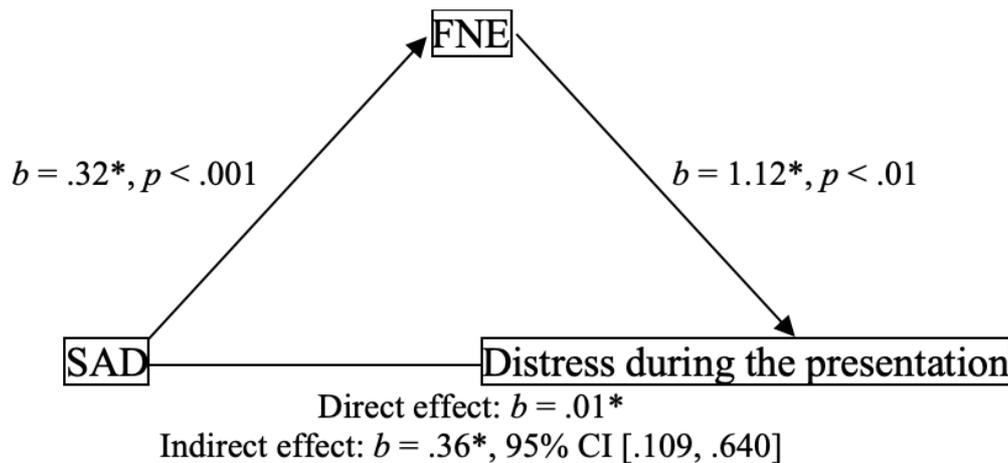


Figure 4. FNE as a mediation for the relationship between SAD and distress during the presentation.

Discussion

The overarching goals of the present study were to examine the relationship between SAD and distress among students while they delivered a presentation in front of a virtual audience in a VR environment, and to determine whether the relationship between SAD and distress was mediated by FNE. To this end, we created a VR environment where students had to give a presentation in front of a virtual audience. The main findings were that individuals with higher levels of SAD and FNE reported higher levels of distress in the VR environment than those with lower levels of SAD and FNE, and the relationship between SAD and distress was fully mediated by FNE. The findings indicate that interventions aimed at reducing FNE among individuals with high levels of SAD may be effective in reducing the impact on distress of presenting in front of an audience.

The first hypothesis was that students with higher levels of SAD would report higher levels of distress in the VR environment. Distress was assessed twice in the VR environment - while the students waited to enter the room where they would give the presentation, and during the presentation. Confirming the hypothesis, the result showed that higher levels of

SAD were associated with higher levels of distress, both during the waiting and the presentation period. These findings demonstrate that our VR environment was effective in inducing distress among socially anxious individuals and could be used in future studies to treat social anxiety disorder. They are also consistent with other studies that have shown that a VR environment can induce stress among other phobias, such as spider phobia, claustrophobia and acrophobia (Carlin, Hoffman, & Weghorst, 1997; Bruce & Regembrecht, 2009; Hodges et al., 1995).

Supporting the second hypothesis, higher levels of SAD were associated with higher levels of FNE. This is in line with previous studies. A study by Wong et al (2014) revealed that people diagnosed with SAD tend to overestimate the negativity with which others might view their performances, overestimate the probability of negative evaluation and fear the consequences that can follow a negative evaluation (J. Wong et al., 2014). Also, Wong, Gordon, and Heimberg (2014) demonstrated that FNE is an essential factor, and one of the maintaining factors, in SAD (J. Wong et al., 2014). Further, a study by Sapach, Carleton, Mulvogue, Weeks and Heimberg (2015), showed that participants who had all met the diagnoses for SAD had higher levels of FNE than participants who had not met the criteria (Sapach et al., 2015).

Also confirming our third hypothesis students with higher levels of FNE had higher levels of distress both during the waiting and the presentation period. This is partly in line with the study done in Spain where participants answered scales measuring FNE and distress. The results showed that these scales were significant to each other ($p < .001$). In current study the correlation between FNE and distress ($r = .398$) was lower than in previous study ($r = .51$), however the previous study did not use repeated measure ANOVA, therefore they can not demonstrate if the participants who had higher levels of FNE, also had higher levels of distress. Also, they also did not use the same scales measuring FNE and distress that are used

in current study (García-López et al., 2001). As far as we know, no other study has shown that relationship before, so this is the first study to demonstrate that.

The main hypothesis of the current study was that the relationship between SAD and distress would be mediated by FNE. Since previous hypotheses were supported, we examined the mediation. We carried out two mediation models, one with SAD, FNE and distress during waiting, and the other one with SAD, FNE and distress during the presentation. Both models showed that the relationship between SAD and distress was fully mediated by FNE as the relationship between SAD and distress during the waiting and the presentation periods became nonsignificant when FNE was entered into the model. These findings are consistent with cognitive models of anxiety which consider an FNE as an essential factor in SAD (J. Wong et al., 2014), and it is often thought to be at the center of these models (Heimberg, 1995b).

The present study has some weaknesses - participants were all students at Reykjavik University, and therefore it could be difficult to generalize as to what the results might be from other groups. It is possible that students in Reykjavik University with extremely high levels of SAD did not participate in the study. Moreover, it is a possibility that all participants did not understand the measures in the same way and/or did not respond with their best capacity. The present study only included FNE, but it has been shown that fear of positive evaluation has similar effects to FNE (Sapach et al., 2015), so it would be interesting as well to explore those factors together when it comes to SAD.

Despite these weaknesses, this is the first study to show that FNE is a mediator for SAD and distress. The findings indicate that interventions aimed at reducing FNE among individuals with high levels of SAD may be effective in reducing the impact on distress of presenting in front of an audience. The leading strength of this study was that every participant got the same greeting, same instruction and same time to prepare their

presentation. Also, the sample was quite diverse, although most of our participants were psychologist students, we also had students from engineering and computer science, as well as law students. Most of our participants were in their early twenties, but they ranged from 19 to 35, which is a decent range.

References

- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition). <https://doi.org/10.1176/appi.books.9780890425596>
- Bremner, J. D., Staib, L. H., Kaloupek, D., Southwick, S. M., Soufer, R., & Charney, D. S. (1999). Neural correlates of exposure to traumatic pictures and sound in Vietnam combat veterans with and without posttraumatic stress disorder: a positron emission tomography study. *Biological Psychiatry*, *45*(7), 806–816. [https://doi.org/10.1016/S0006-3223\(98\)00297-2](https://doi.org/10.1016/S0006-3223(98)00297-2)
- Bricken, M., & Byrne, C. M. (1993). Chapter 9 - Summer Students in Virtual Reality: A Pilot Study on Educational Applications of Virtual Reality Technology11© 1992 Washington Technology Center. Sponsored by the US West Foundation, the Washington Technology Center, and the Pacific Science Center. In A. Wexelblat (Ed.), *Virtual Reality* (pp. 199–217). <https://doi.org/10.1016/B978-0-12-745045-2.50019-2>
- Bruce, M., & Regenbrecht, H. (2009). A virtual reality claustrophobia therapy system - implementation and test. *2009 IEEE Virtual Reality Conference*, 179–182. <https://doi.org/10.1109/VR.2009.4811020>
- Carlin, A. S., Hoffman, H. G., & Weghorst, S. (1997). Virtual reality and tactile augmentation in the treatment of spider phobia: a case report. *Behaviour Research and Therapy*, *35*(2), 153–158. [https://doi.org/10.1016/s0005-7967\(96\)00085-x](https://doi.org/10.1016/s0005-7967(96)00085-x)
- García-López, L. J., Olivares, J., Hidalgo, M. D., Beidel, D. C., & Turner, S. M. (2001). Psychometric Properties of the Social Phobia and Anxiety Inventory, the Social Anxiety Scale for Adolescents, the Fear of Negative Evaluation Scale, and the Social Avoidance and Distress Scale in an Adolescent Spanish-Speaking Sample. *Journal of*

Psychopathology and Behavioral Assessment, 23(1), 51–59.

<https://doi.org/10.1023/A:1011043607878>

Hayes, A. F. (2015). An Index and Test of Linear Moderated Mediation. *Multivariate*

Behavioral Research, 50(1), 1–22. <https://doi.org/10.1080/00273171.2014.962683>

Heimberg, R. G. (1995a). *Social Phobia: Diagnosis, Assessment, and Treatment*. Guilford Press.

Heimberg, R. G. (1995b). *Social Phobia: Diagnosis, Assessment, and Treatment*. Guilford Press.

Hodges, L. F., Kooper, R., Meyer, T. C., Rothbaum, B. O., Opdyke, D., de Graaff, J. J., ...

North, M. M. (1995). Virtual environments for treating the fear of heights. *Computer*, 28(7), 27–34. <https://doi.org/10.1109/2.391038>

Hoffman, H., G. (2004). Virtual Reality Therapy. *Scientific American*. Retrieved from

<https://www.behavioralassociates.com/pdf/scientificamerica.pdf>

Iverach, L., & Rapee, R. M. (2014). Social anxiety disorder and stuttering: Current status and future directions. *Journal of Fluency Disorders*, 40, 69–82.

<https://doi.org/10.1016/j.jfludis.2013.08.003>

Iverach Lisa, Rapee Ronald M., Wong Quincy J. J., & Lowe Robyn. (2017). Maintenance of

Social Anxiety in Stuttering: A Cognitive-Behavioral Model. *American Journal of*

Speech-Language Pathology, 26(2), 540–556. https://doi.org/10.1044/2016_AJSLP-16-0033

Kessler, R. C. (1994). Lifetime and 12-Month Prevalence of DSM-III-R Psychiatric

Disorders in the United States: Results From the National Comorbidity Survey.

Archives of General Psychiatry, 51(1), 8.

<https://doi.org/10.1001/archpsyc.1994.03950010008002>

- Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, Severity, and Comorbidity of 12-Month DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 617–627.
<https://doi.org/10.1001/archpsyc.62.6.617>
- Klinger, E., Bouchard, S., Légeron, P., Roy, S., Lauer, F., Chemin, I., & Nugues, P. (2005). Virtual Reality Therapy Versus Cognitive Behavior Therapy for Social Phobia: A Preliminary Controlled Study. *CyberPsychology & Behavior*, *8*(1), 76–88.
<https://doi.org/10.1089/cpb.2005.8.76>
- Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy*, *36*(4), 455–470. [https://doi.org/10.1016/S0005-7967\(97\)10031-6](https://doi.org/10.1016/S0005-7967(97)10031-6)
- Ólafsdóttir, H. Ó. (n.d.). *Athugun á próffræðilegum eiginleikum og aðgreiningarhæfni Social Interaction Anxiety Scale (SIAS) og Social Phobia Scale (SPS)*. Retrieved from https://skemman.is/bitstream/1946/12111/1/LOKAVERK_Halla_11.j%C3%BAn%C3%AD.pdf
- Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*(8), 741–756.
[https://doi.org/10.1016/S0005-7967\(97\)00022-3](https://doi.org/10.1016/S0005-7967(97)00022-3)
- Rodebaugh, T. L., Holaway, R. M., & Heimberg, R. G. (2004). The treatment of social anxiety disorder. *Clinical Psychology Review*, *24*(7), 883–908.
<https://doi.org/10.1016/j.cpr.2004.07.007>
- Sapach, M. J. N. T., Carleton, R. N., Mulvogue, M. K., Weeks, J. W., & Heimberg, R. G. (2015). Cognitive Constructs and Social Anxiety Disorder: Beyond Fearing Negative Evaluation. *Cognitive Behaviour Therapy*, *44*(1), 63–73.
<https://doi.org/10.1080/16506073.2014.961539>

- Steuer, J. (1992). Defining Virtual Reality: Dimensions Determining Telepresence. *Journal of Communication*, 42(4), 73–93. <https://doi.org/10.1111/j.1460-2466.1992.tb00812.x>
- Summers, B. J., & Cogle, J. R. (2018). An experimental test of the role of appearance-related safety behaviors in body dysmorphic disorder, social anxiety, and body dissatisfaction. *Journal of Abnormal Psychology*, 127(8), 770–780. <https://doi.org/10.1037/abn0000387>
- Winton, E. C., Clark, D. M., & Edelmann, R. J. (1995a). Social anxiety, fear of negative evaluation and the detection of negative emotion in others. *Behaviour Research and Therapy*, 33(2), 193–196. [https://doi.org/10.1016/0005-7967\(94\)E0019-F](https://doi.org/10.1016/0005-7967(94)E0019-F)
- Winton, E. C., Clark, D. M., & Edelmann, R. J. (1995b). Social anxiety, fear of negative evaluation and the detection of negative emotion in others. *Behaviour Research and Therapy*, 33(2), 193–196. [https://doi.org/10.1016/0005-7967\(94\)E0019-F](https://doi.org/10.1016/0005-7967(94)E0019-F)
- Wong, J., Gordon, E. A., & Heimberg, R. G. (2014). Cognitive-Behavioral Models of Social Anxiety Disorder. In *The Wiley Blackwell Handbook of Social Anxiety Disorder* (pp. 1–23). <https://doi.org/10.1002/9781118653920.ch1>
- Wong, Q. J. J., & Rapee, R. M. (2016). The aetiology and maintenance of social anxiety disorder: A synthesis of complementary theoretical models and formulation of a new integrated model. *Journal of Affective Disorders*, 203, 84–100. <https://doi.org/10.1016/j.jad.2016.05.069>