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Ana Gallego

Acceptance and Commitment Therapy Approach to Public Speaking Anxiety



UNIVERSITY OF JYVÄSKYLÄ
FACULTY OF EDUCATION AND
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ABSTRACT

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Speaking in public is the most commonly reported fear in the general population. Further, public speaking is an important skill for students to advance in their studies and career. The present research investigated three specific aims. Study I aimed to understand the relevance of the different measures of public speaking anxiety. Thus, it investigated whether self- and observer-reported, behavioral, and physiological reactivity measures were related to one another during a speech challenge task. Study II aimed to investigate the role of psychological flexibility in relation to public speaking anxiety. More specifically, it sought to know which psychological flexibility skills were essential to self-reported public speaking anxiety and public speaking distress tolerance. Study III investigated the different effects of two brief self-as-context (hierarchical and distinction) interventions tailored from a Relational Frame Theory (RFT) perspective for public speaking anxiety. Study I included a total of 95 participants. The results revealed that self-reported public speaking anxiety predicted public speaking distress tolerance and speech performance. However, it failed to predict physiological reactivity during a speech challenge. Study II included 95 participants. The results indicated that psychological flexibility was associated with both self-reported public speaking anxiety and public speaking distress tolerance. Furthermore, openness to experiences seemed to be an important skill in relation to self-reported public speaking anxiety. However, regarding public speaking distress tolerance, skills related to behavioral awareness and valued actions were more prominent. The results of Study III ($n = 117$) suggested that both an intervention derived from hierarchical-self and an intervention derived from distinction-self decreased public speaking anxiety. The comparison group receiving exposure also showed positive changes. These results indicated that different psychological flexibility skills predicted changes in self-reported public speaking anxiety in hierarchical and distinction interventions.

Keywords: public speaking anxiety, distress tolerance, psychological flexibility, openness to experiences, defusion, physiological reactivity.

TIIVISTELMÄ (FINNISH ABSTRACT)

Gallego, Ana

Hyväksymis- ja omistautumisterapia esiintymisjännitykseen

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Esiintymisjännitys on hyvin yleinen ongelma. Arvioidaan, että noin joka kolmas opiskelija kokee esiintymisjännityksen vakavaksi ongelmaksi. Tällä tutkimuksella oli kolme tavoitetta. Tutkimuksen I tavoitteena oli ymmärtää erilaisten arviointimenetelmien toimivuutta esiintymisjännityksen mittaamisessa, ja erityisesti sitä, olivatko oma kokemus, ulkopuoliset arviot, käyttäytymismittarit ja fysiologiset reaktiivisuusmittaukset yhteydessä toisiinsa esiintymistehtävän aikana. Tutkimuksessa II selvitettiin psykologisen joustavuuden roolia esiintymistilanteeseen liittyvässä ahdistuksessa. Halusimme tietää, mitkä joustavuustaidot olivat olennaisia itseraportoidun ahdistuksen ja välttämiskäyttäytymisen kannalta. Tutkimuksessa III tutkittiin kahden lyhyen suhdekehysteoriaan pohjautuvan intervention (hierarkkisen ja erottelevan) vaikutusta esiintymistilanteessa koettuun ahdistukseen. Tutkimuksen I (n=95) tulokset osoittivat, että esiintymisahdistus ennusti välttämiskäyttäytymistä ja omaa arviota puhe-suorituksesta. Ahdistus ei kuitenkaan ennustanut fysiologista reaktiivisuutta esiintymistilanteen aikana. Tutkimuksen II (n=95) tulokset osoittivat, että psykologinen joustavuus liittyi sekä itseraportoituun esiintymisahdistukseen että välttämiskäyttäytymiseen. Erityisesti avoimuus omille tunteille ja kokemuksille vaikutti olevan keskeinen taito esiintymistilanteessa koetun ahdistuksen käsittelyssä. Esiintymistilanteeseen liittyvä välttämiskäyttäytyminen oli puolestaan yhteydessä psykologisen joustavuuden osataitoihin *tietoisuus omasta toiminnasta ja arvojen mukaiset teot*. Tutkimuksen III tulokset (n=117) viittasivat siihen, että sekä hierarkkisista että erottelevista suhdekehyksistä johdettu interventio vähensivät esiintymistilanteessa koettua ahdistusta. Myös pelkästään altistusta saanut vertailuryhmä osoitti positiivisia muutoksia. Tulokset osoittivat, että erilaiset psykologiset joustavuustaidot ennustivat muutoksia itseraportoidussa esiintymisahdistuksessa, kun interventioissa hyödynnettiin hierarkkisia ja erottelevia suhdekehkyksiä. Kun henkilöä opetettiin käsittelemään esiintymiseen liittyviä epämiellyttäviä ajatuksia ja tunteita itsestä erillisinä asioina, ahdistuksen muutosta selitti vähäisempi samaistuminen omiin ajatuksiin. Kun esiintymisahdistusta kokevaa henkilöä opetettiin käsittelemään esiintymiseen liittyviä epämiellyttäviä ajatuksia ja tunteita siten, että hän näki ne osana itseään, ahdistuksen muutosta selitti muutos halukkuudessa kokea tunteita ja ajatuksia.

Avainsanat: esiintymisjännitys, esiintymisahdistus, välttämiskäyttäytyminen, psykologinen joustavuus, fysiologinen reaktiivisuus.

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LIST OF ORIGINAL PUBLICATIONS

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- III Gallego, A., Villatte, M., McHugh, L., Penttonen, M., Muotka, J., & Lappalainen, R. (2021). The effect of hierarchical- versus distinction-self-based interventions for public speaking anxiety. *Submitted manuscript*

Taking into account the instructions given and comments made by the co-authors, the author of the present thesis participated in designing the research plan, the interventions, and data collection. Additionally, the author performed the statistical analysis and was the main author of the three publications.

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TIIVISTELMÄ (FINNISH ABSTRACT)

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YHTEENVETO (SUMMARY)

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ORIGINAL PAPERS

1 INTRODUCTION

According to most studies, people's number one fear is public speaking. Number two is death. Death is number two? Does that seem right? To the average person, that means that if they have to go to a funeral, they would be better off in the casket than giving the eulogy.

-Jerry Seinfeld

In April 1973, the *Sunday London Times* published an article (R. H. Bruskin Associates) about a survey linked to public speaking anxiety. In this survey, the researchers asked 2,543 participants to select items from a list of threatening situations. Among those interviewed, 40.6% listed public speaking as their greatest fear (see Watson, 1973), followed by heights (32%), insects and bugs (22%), financial problems (22%), deep water (21.5%), sickness (18.8), and death (18.7%). Thus, in this survey, public speaking was listed more often than death. This leads to one question: is public speaking really more feared than death? Dwyer and Davidson (2012) conducted a survey with the goal of replicating these findings. Yet, these authors did not only ask participants to pick feared situations among a list of many threatening situations, but also to rank their top three fears from the same list. As a result, 61.7% of the participants selected public speaking most often, followed by financial problems (54.8%) and death (43.2%). Meanwhile, death was most often selected as the top fear, followed by public speaking and financial problems. Therefore, public speaking is indeed a very common fear. However, as feared as it is, if the average person goes to a funeral, he/she would indeed rather read the eulogy than be in the casket.

1.1 Public speaking anxiety: Definition, symptoms, etiology, and consequences

Public speaking anxiety is one of the most prevalent forms of social phobia, also known as social anxiety disorder (SAD; Blöte et al., 2009; Heimberg et al., 1993;

Ruscio et al., 2008), and it refers to the anxiety that an individual feels when speaking or preparing to speak in front of others (Bodie, 2010). In Finland, one in three students acknowledged that speaking in public is a severe problem for them (Kunttu et al., 2017). In the United States, 61% of students reported fear of speaking in public (Dwyer & Davidson, 2012). In general, public speaking anxiety has been shown to be a very common experience among students.

According to the American Psychiatric Association (2017), those with SAD feel anxious and uncomfortable about being humiliated, rejected, embarrassed, or looked down upon in social situations. Moreover, individuals who experience public speaking anxiety usually report fear cognitions linked to embarrassing one's self, others noticing one's own physiological discomfort when speaking in public, going blank during a public speech, and/or not being able to continue speaking (Stein et al., 1994). These cognitions are also common in individuals reporting broader SAD (Clark & Wells, 1995). In addition, those with public speaking anxiety might experience physiological symptoms related to public speaking, including muscle tension, gastrointestinal discomfort, and palpitations (Harris et al., 2002). To avoid those uncomfortable symptoms, many individuals with public speaking anxiety frequently engage in avoidant behaviors (Tillfors & Furmark, 2007). These avoidant strategies might be the reason why high levels of anxiety in public speaking situations are associated with a decreased chance of continued education, work-related distress, and high unemployment rates (Aderka et al., 2012; England et al., 2012; Stein et al., 1994).

Unfortunately, it is common that those with public speaking anxiety do not undergo treatment for it (Bebbington et al., 2000). This might be problematic considering that this phobia becomes chronic when untreated (Craske, 1999). Frequently, individuals who experience public speaking anxiety acknowledge that their speech anxiety is the cause of social, educational, and professional difficulties (e.g., making it challenging to find a job or advance in their career prospects; Stein et al., 1996). Certainly, speaking in public is necessary in both college and work life, and competences in giving presentations are essential for students' success (Johnson & Szczupakiewicz, 1987). Blume et al. (2010) demonstrated that those who experience public speaking anxiety are less capable of engaging in critical thinking when talking in groups. Beyond academic and professional impairments, those with public speaking anxiety also experience poor decision making (Beatty, 1988; Beatty & Clair, 1990), loneliness (i.e., social isolation), and lower quality of life (Beidel et al., 1985). Overall, given the fundamental role public speaking anxiety plays in student and work life, it is paramount to provide treatments for it that are evidence-based and effective.

1.2 Psychological interventions for public speaking anxiety

In an early meta-analysis, Allen et al. (1989) identified three different methods to reduce public speaking anxiety. These are (1) systematic desensitization, (2) cog-

nitive modification, and (3) skills training. Systematic desensitization aims to expose individuals with public speaking anxiety so that their negative responses to public speaking situations are extinguished (Wolpe, 1958). Specifically, systematic desensitization consists of inducing a relaxed state and gradually confronting a series of anxiety-provoking situations in vivo or in imagination (i.e., exposure), followed by a state of relaxation (Head & Gross, 2008). The objective is to progressively decrease anxiety levels. With respect to cognitive modification, the aim is to modify negative beliefs (e.g., “people always laugh at me when I speak”) related to public speaking (Glogower et al., 1978). Lastly, skills training assumes that the individual does not have the skills to face speech challenges. It therefore aims to provide the necessary skills for a successful speech performance. Allen et al. (1989) concluded that all forms of treatment (i.e., systematic desensitization, cognitive modification, and skills training) are effective in reducing public speaking anxiety. As such, providing a combined or integrative treatment approach is commonly more effective than administering a single-technique treatment (Allen et al., 1989; Whitworth & Cochran, 1996). Moreover, skills training alone appeared to be the least effective method, while the most effective one combined the three techniques in the same package (Allen et al., 1989).

Similarly, a recent meta-analysis concluded that all the psychological treatments reviewed (i.e., Acceptance and Commitment Therapy (ACT); communication-orientation motivation therapy (COM); exposure group therapy (EGT); cognitive behavioral therapy with hypnosis (CBT-H); eye movement desensitization and reprocessing (EMDR); internet-delivered cognitive behavioral therapy (ICBT); virtual reality exposure therapy (VRE)), except EMDR, were effective in reducing public speaking anxiety (Priestley, 2016). Furthermore, a comparison of the effect sizes revealed that exposure-based treatments are most effective in decreasing self-reported public speaking anxiety, followed by treatments combining exposure with cognitive restructuring (CBT-H; ICBT) and treatments using cognitive restructuring alone (COM). All treatments also included elements of psycho-education or skills training, suggesting this may be an important contributor to their effects. The effect sizes for the ACT and EMDR studies could not be calculated from the data available in the publications; therefore, conclusions about these treatments are limited.

A recent meta-analysis by Ebrahimi et al. (2019) had several aims to synthesize information about psychological treatments for the fear of public speaking. First, the authors aimed to examine the overall effectiveness of psychological interventions for the fear of public speaking. Second, they meant to assess the long-term effect of psychological interventions for the fear of public speaking. Third, they strove to ascertain whether there is a difference between face-to-face and technology-delivered interventions for the fear of public speaking (i.e., computerized interventions, internet-based therapy, and VRE). Fourth, the researchers aimed to determine whether there is a difference between cognitive and/or behavioral interventions and other therapeutic frameworks, including insight therapy and visualization. Fifth, they intended to determine whether there is a difference between self-reported, behavioral, and physiological measures. Sixth,

they meant to determine if psychological interventions for the fear of public speaking have a short- or long-term effect on generalized social anxiety. And seventh, they assessed whether psychological interventions for the fear of public speaking have an effect on other outcome variables, such as depression and treatment satisfaction.

In relation to the first aim, Ebrahimi et al. (2019) found that when a psychological treatment to reduce the fear of public speaking was compared to a waiting list control group, there was a large difference in results (i.e., large effect size). When the psychological treatment was compared to an active placebo control group, there was a moderate to large effect size. These results are indicative of the robustness of the psychological treatments for public speaking anxiety. Concerning the second aim, the meta-analysis demonstrated a large effect size for the long-term effect of psychological interventions for public speaking anxiety. In particular, the treatment effects were maintained during the follow-up periods. Regarding the third aim, the results showed no difference in the effect size between face-to-face and technology-delivered intervention. Therefore, technology-delivered psychological interventions for the fear of public speaking seem to be as effective as face-to-face interventions. Consequently, individuals for whom face-to-face therapy is too threatening might benefit from accessing an internet-delivered intervention. This last finding is in line with a meta-analysis by Andrews et al. (2018), where they did not find any difference between internet-delivered and face-to-face therapies.

With regard to the fourth aim, there was no significant difference between cognitive or behavioral interventions and other interventions for the treatment of public speaking anxiety. However, the group "other" (e.g., the Lefkoe Method and EMDR, inside therapy, visualization) was very heterogeneous, so it is difficult to draw conclusions of the interventions' possible differences. In relation to the fifth aim, that is, to determine whether there is a difference between self-reported, behavioral, and physiological measures, the results showed that the effect size at post intervention was inversely correlated to the number of measures (behavioral and physiological) included in the study. Although there is not a clear explanation for this phenomenon, one possible explanation is that while self-reports assess individuals' perceptions of fear and anxiety, behavioral, physiological, and observational measures are related to overt or visible signs of anxiety and individuals' actual behavior in a public speaking situation. Additionally, different measures might reflect differences in the sensitivity of the measures themselves (i.e., some measures are more sensitive than others are). Concerning the sixth aim, the results revealed a small to moderate effect size on the reduction of generalized social anxiety when it is administered as a psychological intervention. Thus, an intervention aimed at decreasing public speaking anxiety might not only meet the target of lowering speech anxiety levels, but also result in weakening a generalized form of social anxiety.

Together, these findings provide the literature important insights. To start, the psychological treatments for public speaking anxiety have proven robustness. These treatments have also shown to be effective in the short as well as long term.

Furthermore, providing a blended or integrative treatment is generally more impactful than administering a single-technique intervention. More specifically, exposure-based treatments combined with cognitive restructuring were most effective in decreasing self-reported public speaking anxiety, followed by treatments using cognitive restructuring only. All treatments also included elements of psycho-education or skills training, suggesting this may be an important contributor to their effects. Moreover, self-reports have shown to be effective measurements to assess public speaking anxiety, followed by physiological and behavioral measures. Additionally, treatments focused on decreasing public speaking anxiety have also been proven to reduce general social anxiety.

1.3 Acceptance and commitment therapy for public speaking anxiety

Currently, the first-line treatment for public speaking anxiety is a combination of exposure (i.e., repeatedly giving speeches in front of an audience) and cognitive restructuring. The latter is a therapeutic process that aims to identify, challenge, and modify maladaptive cognitions (e.g., Beck, 1979; Wenzel, 2018), and it is commonly utilized in cognitive behavioral therapy (CBT). Furthermore, previous studies have emphasized the importance of negative self-concept in the appearance and maintenance of social anxiety disorders, such as public speaking anxiety (Hook & Valentiner, 2002). That is, those with social anxiety develop negative and inaccurate self-perceptions (e.g., “I am a bad speaker”, “I am undesirable”, “I am not good enough”; Beck & Emery, 1985; Clark & Wells, 1995; Rapee & Heimberg, 1997). Therefore, interventions that purposefully target self-concept are warranted for those reporting elevated levels of public speaking anxiety.

The current standard treatment includes a process that directly tackles negative self-concept (i.e., cognitive restructuring). However, around 25% of individuals do not respond to this treatment (Dalrymple & Herbert, 2007; Heimberg & Magee, 2014). In addition, cognitive restructuring is often criticized as a strategy that fosters “control” and thus can result in suppression and experiential avoidance (Eifert & Forsyth, 2005; Karekla, 2004; Karekla et al., 2020). In fact, Wegner conducted several studies to test the usefulness of “control strategies.” He concluded that voluntary thought suppression is counterproductive, given that it frequently leads to a “rebound effect” (Wegner, 1994; Wegner et al., 1998; Wegner & Erber, 1991; Wegner & Gold, 1995). Specifically, the invested cognitive energy to erase negative thoughts entails constant vigilance that keep them latent (Fernández & Mairal, 2017). Alternatives to cognitive restructuring are cognitive defusion and self-as-context, which spring from the ACT model (Hayes et al., 1999). ACT has its foundations in applied behavioral analysis (Hayes, 2016) and is rooted in the pragmatic philosophical wing of functional contextualism (Biglan & Hayes, 1996). Furthermore, psychological flexibility is at the core of ACT, and

it refers to the ability of being fully in contact with the present moment and persisting with or changing behavior according to one's own values (Hayes et al., 2006). Typically, psychological flexibility can be influenced by means of increasing skills in six overlapping processes (Figure 1). These are *present moment awareness*, *defusion*, *self-as-context*, *acceptance*, *values*, and *committed actions* (Hayes et al., 2006). Two of these processes that are of particular relevance to the self are defusion and self-as-context.

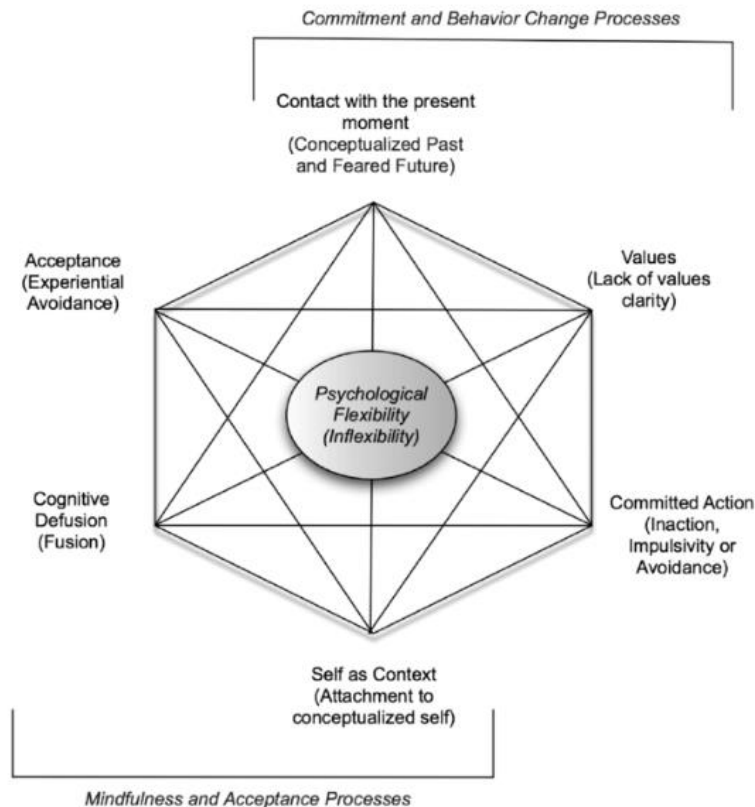


FIGURE 1 ACT processes - HEXAFLEX model.

Defusion involves undermining the negative effect of cognition by teaching individuals to find some distance from their own private events (Hayes et al., 2006). Said another way, ACT teaches clients to observe their thoughts as mere thoughts, their sensations as mere sensations, feelings as mere feelings, and memories as mere memories. Therefore, while cognitive restructuring seeks to confront negative thoughts by looking for evidence opposed to them (Beck & Beck, 2011), defusion aims to change the relationship one has with their own thoughts. More recently, a number of studies have demonstrated the efficacy of defusion with non-clinical populations (see De Young et al., 2010; Hinton & Gaynor, 2010; Hooper & McHugh, 2013; Hooper et al., 2012; Masuda et al., 2010), suggesting that it may be a plausible alternative to restructuring in the management of negative self-referential thoughts

Self-as-context is an unchanging perspective from which individuals can become aware of their experiences without becoming too attached to them (the transcendent self; Hayes et al., 2006). In contrast, the self-as-content, or conceptualized self, refers to the stories or scripts that people maintain about who they are and how they operate in the world.

Present moment awareness. Sometimes people “live in their heads” instead of being in the present moment experiencing life as it is. Rumination and worry about either the past or future are common ways in which people become caught up in their thoughts about what has happened or what they think is going to happen. ACT aims to promote an ongoing, non-judgmental contact with what is happening in the now, whether there are psychological and/or environmental events (Hayes et al., 2006). Therefore, the objective is for people to experience the world more directly so their behavior is more flexible and their actions better align with their values.

Acceptance. Acceptance is taught as an alternative to experiential avoidance. Acceptance involves the active and aware embrace of those private events occasioned by one’s history without unnecessary attempts to change their frequency or form, especially when doing so would cause psychological harm (Hayes et al., 2006). For example, anxiety patients are taught to feel anxiety as a feeling, fully and without defense, pain patients are given methods that encourage them to let go of a struggle with pain, and so on. Acceptance (and defusion) in ACT is not an end in itself. Rather, acceptance is fostered as a method of increasing values-based action (Hayes et al., 2006).

Values. Values are chosen qualities of purposive action that can never be obtained as an object but can be instantiated moment by moment. ACT uses a variety of exercises to help clients choose life directions in various domains (e.g., family, career, spirituality) while undermining verbal processes that might lead to choices based on avoidance, social compliance, or fusion (e.g., “I should value X,” “A good person would value Y,” or “My mother wants me to value Z”). In ACT, acceptance, defusion, being present, and the like are not true ends; instead, they clear the path to a more vital, values-consistent life (Hayes et al., 2006).

Committed action. Finally, ACT encourages the development of larger and larger patterns of effective action linked to chosen values. In this regard, ACT looks very much like traditional behavior therapy, and almost any behaviorally coherent behavior change method can be fitted into an ACT protocol, including exposure, skills acquisition, shaping methods, goal setting, and the like. Unlike values, which are constantly instantiated but never achieved as an object, values-consistent, concrete goals can be achieved, and ACT protocols almost always involve therapy and homework linked to short-, medium-, and long-term behavior change goals. Behavior change efforts in turn lead to contact with psychological barriers that are addressed through other ACT processes (acceptance, defusion, etc.).

Moreover, it is important to understand how these processes “work” or influence behavior, as the field has already moved to a process-based CBT involving an account of behavioral intervention and psychopathology (Hayes & Hofmann, 2018; Hayes et al., 2011, 2012).

1.3.1 ACT-based interventions for public speaking anxiety

Over 350 randomized controlled trials (RCTs) have been conducted in ACT targeting different mental-health outcomes, such as depression, chronic pain, and well-being. These RCTs have highlighted the acceptability, feasibility, and efficacy of ACT interventions. However, very little is known in relation to public speaking anxiety. For this reason, a systematic review was conducted to assess the effectiveness of ACT interventions in treating public speaking anxiety. The Embase, Medline, PsycINFO, and Web of Science databases were searched electronically for literature published between January 1987 and August 2020. A list of keywords was then created to retrieve relevant articles from these databases. These keywords covered the concepts of anxiety, public speaking anxiety, ACT, and acceptance and valued-based interventions. Consequently, the following key terms were used: 1) acceptance and commitment therapy; 2) acceptance-based treatment; 3) public speaking anxiety; 4) stage fright; and 5) anxious.

The titles and abstracts retrieved in this initial search were assessed using the inclusion and exclusion criteria below. The full texts of potentially eligible studies were retrieved. The full text articles were again reviewed against the inclusion and exclusion criteria, and a final set of articles was chosen for inclusion in the review. The inclusion criteria were 1) articles that had been peer reviewed; 2) studies that used an adult sample (18 years or older); 3) studies using at least one outcome measure designed to identify the reduction of public speaking anxiety (PSA); 4) studies including participants who were screened to confirm they had PSA; and 5) articles in English. Furthermore, peer-reviewed journal articles and dissertations were included. The review was limited to the treatment of adults with PSA and therefore excluded studies with a sample including children or adolescents; factors such as developmental stage and the impact of education may be relevant to this population's treatment, and the subject therefore deserves an exclusive investigation. Table 1 presents an overview of the studies conducted in the area of public speaking anxiety using ACT methods.

Block and Wulfert (2000) conducted a preliminary study comparing three groups: ACT, CBGT (Cognitive Behavioral Group Treatment; Hope & Heimberg, 1993), and a waiting list control group. The ACT intervention included metaphors and exercises that fostered cognitive defusion and acceptance, while CBGT shaped cognitive restructuring skills. Both active treatments included exposure methods. The results showed that participants in the CBGT group had slightly more reduced levels of anxiety than the participants in the ACT group. In relation to willingness (to perform previously avoided behaviors), ACT seemed to be slightly more beneficial than CBGT. Subsequently, Block (2003) extended this investigation by incorporating a larger sample size and 6-week instead of 4-week treatment. The results showed that while the ACT group increased their speech length compared to the waiting list control group, the CBGT group did not. However, both active groups increased willingness and decreased anxiety levels (Block, 2003).

TABLE 1 Acceptance and valued-based interventions for public speaking anxiety.

Study	Treatment conditions	N	Aim(s)	Measures	Main conclusions
Block & Wulfert (2000)	- ACT - CBGT - Waiting list control group	11	- Compare the efficacy of ACT and CBGT in social phobia treatment. - Examine if (and to what degree) different mechanisms are responsible for the changes that occur through ACT and CBGT.	SPS FNE FQ Willingness	- ACT and CBGT decreased SPS, FNE, and FQ scores, while the scores for the waiting list group were the same or increased. - ACT and CBGT increased willingness to engage in public speaking situations, while the data for the waiting list was inconsistent. - Measures of anxiety slightly favor CBGT. However, willingness scores slightly favor ACT.
Block (2003)	- ACT - CBGT - Waiting list control group	39	- Examine the efficacy of ACT and CBGT in college students with public speaking anxiety.	SIAS SPS FQ-SP FNE-S WILL QLI BPT SUDS SISST AAQ ACQ TCQ WBSI SWBS TRS	- Only the ACT intervention significantly increased the waiting list control group's speech length; that of the CBGT did not. - Both ACT and CBGT decreased anxiety and increased willingness.

Study	Treatment conditions	N	Aim(s)	Measures	Main conclusions
Goldfarb (2009)	- Cognitive restructuring - Acceptance-based cognitive intervention - Control group	45	- Compare the efficacy of CR and acceptance-based cognitive intervention on SUDS, SSAI, AAQ, and heartrate.	AAQ SSAI Heartbeat SUDS Willingness 2 nd speech	- No significant differences emerged between the control condition and two intervention conditions in any of the outcomes or process measures. - All groups reduced self-reported anxiety levels, but not heartrate variability.
England et al. (2012)	- ABE - HAB	45	- Examine the feasibility, acceptability, and efficacy of ABE compared to HAB for clinically significant PSA.	SCID PRCS SSPS-P SSPS-N STAI CGI BAT SUDS DDS PHLMS RTQ RTQ credib & severity	- The ABE treatment was more effective than the HAB treatment in helping participants achieve diagnostic remission by a 6-week follow-up. - ABE and HAB significantly improved self-reported confidence in public speaking, speech-related cognitions, and state anxiety, as well as observer-rated social skills in a behavioral speech task.

Study	Treatment conditions	N	Aim(s)	Measures	Main conclusions
Craske et al. (2014)	- CBT - ACT - Waiting list control group	87	- Compare the efficacy of CBT and ACT in social phobia (PSA) treatment. - Discover whether a subgroup of participants responds better to one of the treatments.	CSR ADIS-IV (fear and avoidance) SIAS SPS LSAS-SR QOLI	- ACT and CBT did not differ in self-reports or independent clinician and public speaking outcomes. Both active treatments were superior to the waiting list group. - CBT was better than ACT for individuals with higher EA. - There are trends for superior outcomes from CBT and inferior outcomes from ACT at the extreme ends of fear and negative evaluations.
Glassman et al. (2016)	- ABBT - tCBT	21	- Compare the efficacy of ABBT and tCBT in a clinical sample of individuals with PSA. - Examine the neurophysiological changes associated with each treatment using fNIRS.	ADIS-IV SCID-IV SUDS BAT SPS** fNIRS	- Both interventions reduced anxiety and improved speech performance. - tCBT greater reduced self-reported anxiety. - ABBT more effectively improved observer-rated performance during the speech. - ABBT treatments may free more cognitive resources in comparison to tCBT, possibly resulting in greater improvements in objectively rated behavioral performances during ABBT interventions.
Priestley (2016)	- A-B multiple baseline single case design	6	- Examine the effect of a self-help ACT intervention on public speaking anxiety.	SSPS SUDS ELS CFQ PHLMS MAAS	- All participants decreased PSA, though only two did so significantly. - Four participants saw a decrease in avoidance behavior and performed the speech challenge.
Yuen et al. (2019)	Study 1 - Video conferencing exposure, acceptance-	11	- Examine the feasibility, acceptability, and efficacy of a brief ACT intervention for public speaking anxiety administered via group video	M.I.N.I. PRCS SSPS-P SSPS-N BAT	Study 1: Large effect sizes and significant reductions in public speaking anxiety emerged between pre- to post-treatment and a 3-month follow-up. Psychological flexibility significantly improved from pre- to

Study	Treatment conditions	N	Aim(s)	Measures	Main conclusions
	and value-based intervention, between-sessions life exposure Study 2 - Video conferencing exposure, acceptance- and value-based intervention, between-sessions virtual exposure (brief review of the ACT concepts and 2-3 short speeches)	15	conferencing (without in-person contact). - Examine whether adding virtual and in vivo homework exposure adds additional benefits to the treatment administered in study 1.	SUDS AAQ-II M.I.N.I. PRCS SSPS-P SSPS-N BAT SUDS AAQ-II	post-treatment and were maintained at a 3-month follow-up. Study 2: Public speaking anxiety significantly decreased from pre-treatment to follow-up with large effect sizes. In-session video conferencing exposures evoked anxiety levels comparable or sometimes more challenging to those of between-sessions in vivo exposure. There were no significant differences in self-reported anxiety levels between the virtual exposure exercises and in vivo exposure exercises completed for homework.
Spencer et al. (2019)	- Acceptance-based intervention - CR intervention	42	- Test whether an acceptance-based and CR intervention have different effects on EA, anxiety, and distress.	SPS* LSAS* AAQ SSAI SUDS PSP	- No significant between-groups differences emerged in state anxiety, performance quality, or EA. - The acceptance-based intervention reduced EA at post-intervention while CR did not.

Study	Treatment conditions	N	Aim(s)	Measures	Main conclusions
Brandrick et al. (2020)	- Defusion - Self-affirmation - No treatment control group	63	- Compare the effect of ultra-brief defusion and positive affirmation interventions in participants with moderate public speaking anxiety.	PRPSA SUDS	- All groups reduced PRPSA levels after the intervention. No significant difference in PRPSA emerged between the groups. - All groups decreased distress levels significantly. No significant difference between the groups in the decrease of distress level occurred.

Note. SCID = Structured Clinical Interview for DSM-IV Axis I Disorders (First et al., 1996); PRCS = Personal Report of Confidence as a Speaker (Hook et al., 2008); SSPS = Self-Statements During Public Speaking (SPSS-P and SPSS-N subscales for positive and negative cognitions, respectively; Hofmann & DiBartolo, 2020); STAI = State-Trait Anxiety Inventory (Spielberger, 1983); CGI = Clinical Global Impression Scale (National Institute of Mental Health, 1985); BAT = behavioral assessment test (Hofmann et al., 2004); SUDS = Subjective Units of Discomfort Scale (Wolpe & Lazaus, 1966); DDS = Drexel Defusion Scale (Forman et al., 2008); PHLMS = Philadelphia Mindfulness Scale (Cardaciotto et al., 2008); RTQ = Reaction to Treatment Questionnaire - modified version specific to PSA (Holt & Heimberg, 1990); M.I.N.I. = Mini International Neuropsychiatry Schedule (Sheehan et al., 1998); AAQ-II = Acceptance and Action Questionnaire-II (Bond et al., 2011); ADIS-IV = Anxiety Disorders Interview Schedule for DSM-IV (Brown et al., 1994); SCID-IV Axis I Disorders = Structured Clinical Interview for DSM-IV (First et al., 1996); SPS** = Speech Performance Scale (Rapee & Lim, 1992); fNIRS = functional near-infrared spectroscopy; SPS = Social Phobia Scale (Mattick & Clarke, 1998); FNE = Fear of Negative Evaluation (Leary, 1983); FQ = Fear Questionnaire (Marks & Matthews, 1979); Willingness (Block & Wulfert, 2000); ELS = engaged living scale (Trompetter et al., 2013); MAAS = mindfulness attention awareness scale (Brown & Ryan, 2003); CFQ = cognitive fusion questionnaire (Gillanders et al., 2013); QOLI = Quality of Life Inventory (Frisch, 1994); TRS = therapist rating scale; SWBS = Spiritual Well-Being Scale (Ellison, 1983); ACT = Acceptance and Commitment Therapy; CBGT = Cognitive Behavioral Group Treatment.; ABE = Acceptance-based exposure; HAB = Habituation-based exposure; ABBT = Acceptance-based behavior treatment; tCBT = traditional cognitive behavioral therapy.

*Pre-screening

Furthermore, Goldfarb (2009) also compared the different effects of cognitive restructuring, an acceptance-based cognitive intervention and control group. All groups included exposure (i.e., a public speaking task). The results revealed no significant differences between the control group and two active interventions in any of the measures. All three groups reduced self-reported anxiety levels, but not heart rate variability. Next, England et al. (2012) investigated the different effects of two active treatments: 1) exposure with acceptance rationale (ABE) and 2) exposure with habituation rationale (HAB). The results showed that ABE was more effective than HAB in helping participants achieve diagnostic remission. Both conditions resulted in significant improvements in state anxiety, confidence in public speaking, speech-related cognitions, and observer-rated performance skills during a speech task. Additionally, facets of mindfulness and defusion moderated the treatment effect for anxiety and public-speaking-related cognitions. Craske et al. (2014) also investigated the effect of CBT, ACT, and a waiting time (for the waiting list control group) in individuals diagnosed with social phobia. In a three-arm RCT, the participants completed a 12-session intervention for CBT and ACT or a 12-week waiting period for the waiting list control group. The assessment consisted of a self-report, public speaking task, and clinician ratings. The results showed that the ACT and CBT groups were significantly more effective than the waiting list group, though there were no significant differences between them in terms of self-report and independent clinical and public speaking outcomes. Furthermore, those with higher experiential avoidance benefited more from CBT than ACT based on self-reported symptoms.

Subsequently, Glassman et al. (2016) investigated the different effects of acceptance-based behavior treatment (ABBT) and traditional cognitive behavioral therapy (tCBT). Participants in both treatment conditions engaged in eight 2-minute speech exposures. The researchers found that both interventions reduced anxiety and improved speech performance. On the one hand, tCBT resulted in a greater reduction in self-reported anxiety. On the other hand, ABBT was more effective in improving observer-rated speech performance. The authors thus concluded that ABBT might free more cognitive resources in comparison to tCBT. Priestley (2016), meanwhile, examined the effect of self-help ACT intervention on public speaking anxiety (self-reported, implicit, imagined, and in vivo outcomes). Using a multiple single case experimental design, the results reflected partial support for ACT in a self-help format to treat public speaking anxiety. ACT self-help could be recommended for those unwilling to participate in other forms of treatment. Furthermore, Yuen et al. (2019) conducted two studies related to ACT and PSA. In the first, they tested the acceptability and feasibility of a brief ACT intervention for public speaking anxiety via group video conferencing with no in-person contact. The second study aimed to examine whether adding virtual and in vivo between-sessions exposure homework added additional benefits to the treatment administered in study 1. The self-help ACT treatment resulted in significant reductions and large effect sizes in public speaking anxiety at post intervention and a 3-month follow up. Furthermore, in-session video conferencing exposures aroused similar (or even more challenging) levels of anxiety than

the between-sessions in vivo exposure. However, the in vivo and virtual between-sessions exposure resulted in similar levels of anxiety.

Then, Spencer et al. (2020) tested whether cognitive restructuring in comparison to an acceptance-based intervention had different effects on anxiety, distress, and experiential avoidance (EA). The data depicted no significant between-group differences in state anxiety, performance quality, or EA. Nevertheless, the acceptance-based treatment reduced EA at post-intervention while the cognitive restructuring condition did not. Brandrick et al. (2020) similarly aimed to investigate the different effects of an ultra-brief defusion and self-affirmation intervention. The results suggested that both active groups reduced levels of public speaking anxiety and distress. Further, no significant difference between the groups emerged in relation to public speaking anxiety and distress.

The above-mentioned studies highlight the acceptability, feasibility, and efficacy of ACT interventions for public speaking anxiety. Three of these studies compared ACT methods to those of CBT (Block & Wulfert, 2000; Glassman et al., 2016; Goldfarb, 2009). Generally, the results did not show strong evidence for the effectiveness of one approach over the other. However, acceptance-based treatments may free more cognitive resources in comparison to traditional CBT (Glassman et al., 2016). Nevertheless, these studies are preliminary, and they might be underpowered considering the numbers of participants. The studies that compared the different effects of an active treatment with a waiting list as the control group (Block & Wulfert, 2000; Block, 2003; Craske et al., 2014) showed better active group outcomes compared to the waiting list control group. However, when the control group also included exposure to the feared situation (i.e., a speech challenge task), the results did not show significant differences from the active groups (Brandrick et al., 2020; Goldfarb, 2009). In addition, previous studies have highlighted the role of defusion and mindfulness in relation to public speaking anxiety (Block & Wulfert, 2000; England et al., 2012; Goldfarb, 2009). However, none of these studies tested other aspects of psychological flexibility, such as values or committed actions. Further research is thus necessary to ascertain the impact of ACT-based interventions on PSA and what aspects of psychological flexibility are most relevant when addressing public speaking anxiety.

1.3.2 Relational frame theory analysis of defusion and self-as-context interventions

Defusion and self-as-context are overlapping ACT processes, that is, defusion involves aspects of self-as-context and vice-versa. Moreover, the words *defusion* and *self-as-context* are non-technical terms that, although clinically useful, lack the precision, scope, and depth linked to well-defined technical terms and basic principles (e.g., reinforcement, hierarchical framing; Levin et al., 2015). In search of a method that predicts and influences behavior with precision, several studies have analyzed defusion and self-as context from a Relational Frame Theory (RFT) perspective. RFT, a modern theory of language and cognition, suggests that relating is the basic unit on which language is built (Hayes et al., 2001). Relating refers to the ability to respond to one event in terms of another based on non-

arbitrary and arbitrary cues (Luciano et al., 2009). Non-arbitrary relations refer to properties that are intrinsically inherent to a stimulus (e.g., the shape and size of an object), while arbitrary relations refer to socially established cues, such as the concept of money.

The most basic way of relating things that humans learn is sameness, or coordination, and is the one upon which other, more complex relational responding are built (Hayes et al., 2001). For example, through multiple associations, an baby could learn that the word “TEDDY” and an actual teddy bear are the same, even though the word “TEDDY” and a teddy bear have no similar physical properties. Consequently, if we ask the baby where the teddy is, he might point or direct himself toward the teddy. There are many other ways of relating things other than in a relation of sameness, though. We can relate things as being *different* from each other (“I am not like you”), *opposite* (“Maria is opposite to her sister”), *comparatively* (“she is better than me”), *conditionally* (“If I don’t manage to get rid of my anxiety, I will never be able to speak during the meetings”), *temporarily* (“my coffee break is before lunch time”), in terms of *perspective taking* (“from where you are, you can see the cathedral, but from where I am, I only see a wall”), or in terms of *hierarchy* (“lettuce is a type of vegetable,” “my thoughts and feelings are parts of me”; see Table 2).

TABLE 2 Different types of framing: Cues and examples.

Relational frame	Cue	Example
Coordination framing	<i>same as</i>	I am an anxious person
Distinction framing	<i>different than</i> <i>not the same</i>	I am not brave I am not my thoughts
Opposition framing	<i>contrary</i> <i>opposite</i> <i>other than</i>	Public speaking is the opposite of a pleasurable experience
Comparison framing	<i>more than</i> <i>less than</i>	The fear of speaking in public is stronger than the fear of death
Conditional framing	<i>if..., then....</i>	If I give the presentation, I will go blank
Deictic framing		
Interpersonal	<i>I vs. you</i>	I wouldn’t be afraid in your position
Spatial	<i>here vs. there</i>	
Temporal	<i>now vs. then</i>	
Hierarchical framing	<i>part of</i> <i>includes</i>	My thoughts are only parts of me I am the context in which my thoughts and feelings unfold

Furthermore, relating can transform the psychological functions of an event. For example, imagine in a therapy session the following interaction between a therapist and client:

CLIENT: My whole body feels heavy when I imagine walking into the meeting where my boss and colleagues will be and knowing that I will have to lead the meeting. My thoughts are very fearful, in a defensive manner.

THERAPIST: But what is interesting is that there are situations where we choose to be afraid because it is fun. Like going on a rollercoaster or watching a scary movie. Can you imagine thinking of the fear you feel in public speaking the same way as you think of this kind of emotion?

Recent studies have investigated the effect of defusion and self-as-context exercises from an RFT point of view (see Table 3). In three of these studies (Gil-Luciano et al., 2017; López-López & Luciano, 2017; Luciano et al., 2011), Defusion I (i.e., deictic framing) was compared to Defusion II (i.e., deictic framing, hierarchical framing, and regulatory functions). Deictic framing involved training participants to discriminate the continuing process of noticing that “I am always here” and “all thoughts and feelings that appear are there” (i.e., I-here-now vs. my thoughts-there-then). Hierarchical framing involved participants deriving a relation of inclusion between themselves and their thoughts and feeling (e.g., “You are the captain of a boat and your thoughts are the passengers”).

TABLE 3 Studies that analyze self-as-context and defusion exercises from an RFT perspective.

Study	Aims	Design	Outcome variables	Process measures	Results
Luciano et al. (2011)	Different effects of two defusion protocols (Defusion I* and Defusion II**) on adolescents with problematic behaviors.	Quasi-experimental design with repeated measures in a between- and within-subject comparison	BASC IBI EBI VASs (utility of the protocol)	AFQ-S WAM KIMS	Defusion II < Defusion I in problematic behaviors and levels of psychological inflexibility Defusion II > Defusion I in accepting without judgment
Foody et al. (2013)	Different effects of two self-as-context exercises (hierarchical- and distinction-self-as-context) in reducing discomfort, anxiety, and stress after a distress-inducing task.	Between-groups comparison: - Distinction object - Hierarchical self	VASs: discomfort, anxiety, and stress	AAQ RQ: believability, vividness, guilt, and distraction	Hierarchical-self < Distinction self stress No difference between groups in anxiety and discomfort
Foody et al. (2015)	Effect of focusing on the self vs. an object in reducing distress, anxiety, and stress through hierarchical and distinction relations.	Between- and within-group comparison: - Distinction self - Distinction object - Hierarchical self - Hierarchical object	VASs: discomfort, anxiety, and stress	AAQ RQ: believability, vividness, guilt, and distraction	No clear differences between the hierarchical and distinction condition regarding discomfort and anxiety; however, there were some indications that the hierarchical intervention could be more beneficial when managing stress
Gil-Luciano et al. (2017)	Compare the effect of two defusion-based interventions and a control group on discomfort tolerance.	Between-group comparison: - Defusion I* - Defusion II** - Control group	DAS-21 VASs: pain (cold pressor task) and discomfort (aversive film)	AAQ-II CFQ	Defusion II (deictic, hierarchical, and regulatory functions) significantly increased pain tolerance in cold pressor and aversive film tasks in comparison to the Defusion I (deictic) and control groups

Study	Aims	Design	Outcome variables	Process measures	Results
López-López & Luciano (2017)	Effect of two defusion-based interventions in experimentally induced distress tasks with low and high attention demands.	Between-group comparison: - Defusion I* - Defusion II** - Control group	PVARP PMT PASAT-C VASs (discomfort and satisfaction)	AAQ-II CFQ	No statistically significant between-groups difference in PMT or discomfort ratings Defusion II > Defusion I and control group in the correct PASAT-C responses

Note. BASC = Behavior Assessment System for Children; IBI = Impulsive Behavior Inventory; EBI = Emotional Behavior Inventory; AFQ-S = Spanish Avoidance and Fusion Questionnaire; WAM = Willingness and Acceptance Measure; KIMS = Accepting without Judgment Scale of the Kentucky Inventory of Mindfulness Skills; AAQ = Acceptance and Action Questionnaire; RQ = believability, vividness, guilt, and distraction; DAS-21 = depression, anxiety and stress; VASs = Visual Analogue Scales; AAQ-II = Acceptance and Action Questionnaire-second edition; CFQ = cognitive fusion questionnaire; PVARP = Personal Valued Area and Regulation Pattern T – this is a compound of two parts: 1) identify a personal area in which some difficulties have been recently experienced and 2) VASs for discomfort and satisfaction; PMT = perceptual-motor task; PASAT-C = Paced Auditory Serial Addition Test- computerized version.

*Defusion I: deictic framing.

**Defusion II: deictic framing, hierarchical framing, and regulatory functions.

The regulatory functions aspect involved training a perspective that allowed the participants to make choices according to their values (e.g., “Do you want to stay fused (i.e., stuck) with your feelings and allow them to be in charge instead of you?”). The results showed that Defusion II resulted in better effects in the outcome variables compared to Defusion I.

However, in two other studies (Foody et al., 2013, 2015) that compared hierarchical-self- and distinction-self-as-context, the results were mixed and dependent on the outcome variable. Foody et al.’s protocols did not find as a clear difference between the interventions (hierarchical self vs. distinction self) as other studies (Gil-Luciano et al., 2017; López-López & Luciano, 2017; Luciano et al., 2011). This could be explained by the regulatory functions. Note that Foody’s studies included few cues to induce regulatory function (Foody et al., 2013, 2015), whereas in the other studies, these cues were more explicitly presented in the protocol (Gil-Luciano et al., 2017; López-López & Luciano, 2017; Luciano et al., 2011). Consequently, it could be hypothesized that it is insufficient to learn how to discriminate a private event as part of or different from the self if regulatory functions (i.e., values) are not explicitly trained. Future studies can test this hypothesis. In addition, it is worth mentioning that previous studies have analyzed defusion and self-as-context from an RFT perspective in relation to anxiety, but no studies have investigated these processes from an RFT perspective in relation to public speaking anxiety.

Overall, the previous literature has shown robustness in the treatment of public speaking anxiety (Allen et al., 1989; Ebrahimi et al., 2019). Furthermore, self-reports have been shown to be the most useful measurements to assess public speaking anxiety, followed by physiological and behavioral measures (Allen et al., 1989; Ebrahimi et al., 2019). However, the interrelation among these different measure types (e.g., self-report, physiological, and behavioral) has been a major concern in the public speaking anxiety literature (Bodie, 2010; Clevenger, 1959; McCroskey, 1984) and is still a concern in the modern day. Moreover, facets of mindfulness and defusion moderate the treatment effect for anxiety- and public-speaking-related cognitions (England et al., 2012). However, there is limited information related to what aspects of psychological flexibility predict or explain public speaking anxiety. Furthermore, in relation to the effectiveness of treatments for public speaking anxiety, exposure-based interventions combined with cognitive restructuring were most effective in decreasing self-reported public speaking anxiety, followed by treatments using cognitive restructuring alone (Allen et al., 1989; Ebrahimi et al., 2019). Additionally, a number of studies have compared the different effects of cognitive defusion and cognitive restructuring in relation to public speaking anxiety (see Table 1). However, the results do not show strong evidence for the effectiveness of one approach over the other (Block, 2003; Block & Wulfert, 2000; Brandrick et al., 2020; Craske et al., 2014; Glassman et al., 2016; Goldfarb, 2009; Spencer et al., 2020). On the other end, previous studies have aimed to examine defusion and self-as-context from an RFT perspective. These results indicated that a combination of deictic framing, hierarchical framing, and regulatory functions result in better effects in the outcome variables

compared to deictic framing alone (Gil-Luciano et al., 2017; López-López & Luciano, 2017; Luciano et al., 2011). However, in two other studies (Foody et al., 2013, 2015) that compared hierarchical-self- and distinction-self-as-context, the results were mixed and dependent on the outcome variable.

1.4 Research aims

Study I investigated whether different aspects of public speaking anxiety are related while performing a speech challenge task. These aspects were behavioral and physiological reactivity, self-reports, and observer reports. According to previous studies, it was predicted that self-reported public speaking anxiety and physiological reactivity during a speech challenge task would be unrelated to each other. To best of my knowledge, no study to date has found a connection between physiological reactivity and public speaking distress tolerance (i.e., speech duration). Additionally, it was expected a gap between self- and observer evaluations of speech performances. Previous research has found that socially anxious participants tend to under-rate their speech performances in comparison to observers' evaluations (Rapee & Lim, 1992).

The purpose of **Study II** was to test whether self-reported public speaking anxiety and public speaking distress tolerance (behavioral task reflecting avoidance) are related to psychological flexibility. Furthermore, this study also aimed to identify the aspects of psychological flexibility that are most relevant to include in interventions aimed at decreasing self-reported public speaking anxiety and those interventions meant to increase public speaking distress tolerance. It was expected high levels of psychological flexibility to be connected with low levels of public speaking anxiety. Further, it was predicted that openness to one's own experiences is an important factor in public speaking anxiety (Block & Wulfert, 2000; England et al., 2012). In addition, it was hypothesized that high levels of distress tolerance are associated with high levels of psychological flexibility. To the best of my knowledge, no study to date has strived to examine the aspects of psychological flexibility that are important to include in interventions that aim to increase public speaking distress tolerance.

In **Study III**, the objective was to assess whether a hierarchical-self and distinction-self-as-context intervention would be effective in influencing self-reported public speaking anxiety, psychological flexibility, distress tolerance, and physiological reactivity to different degrees. Moreover, the aim was to identify what facets of psychological flexibility predict decreases in public speaking anxiety. Based on previous research, it was expected that changes in defusion could predict decreases in self-reported public speaking anxiety (Block & Wulfert, 2000; England et al., 2012).

2 METHOD

2.1 Participants

In collaboration with the Language Centre and Department of Education at the University of Jyväskylä, participants were recruited from courses that aimed at enhancing students' communication skills. At the beginning of each course, students were informed about the study by providing them the following instructions: "We are conducting a study related to public speaking and communication skills. You can all participate. During the experiment, we will ask you to give a speech facing a video camera. Hence, your speech will be video recorded. However, you do not need to prepare anything in advance. In addition, your physiological activity (skin conductance and heartbeat) will be recorded." Then, the teacher responsible for each course sent the students an online scheduling tool through which they could sign up to participate. To compensate their involvement, the participants were either compensated with a movie ticket or a 2-hour non-attendance in the lecture they were recruited from. For ethical reasons, the experiment was conducted with all the participants who signed up. However, participants who were taking psychogenic medication were excluded from the analysis in light of the view that the physiological data would not be accurate. Students who did not fill in the personal information document were also excluded from the analysis. The Research Ethics Committee of the University of Jyväskylä approved the study design, as well as the research protocols.

In Studies I and II, a total sample of 106 undergraduate students participated in the experiment. However, 11 students were excluded from the analysis due to the intake of psychogenic medication or not filling in their personal information. This yielded a total sample of 95 participants (53% female, 47% male), of which the age range was 20–46 years old ($M = 24.61$; $SD = 4.77$). They had also studied between 1 and 8 years at the university ($M = 2.61$; $SD = 1.41$). Furthermore, some participants (8%) reported to have sought psychological help earlier

in their lives. In relation to public speaking, 55% of the participants reported that they used strategies to cope with anxiety (e.g., breathing exercises and rehearsing the presentation). Some participants (16%) reported presently practicing yoga or meditation, while 14% acknowledged their familiarity with Acceptance and Commitment Therapy (ACT) or mindfulness practices.

In **Study III**, a total of 137 participants took part in the experiment. However, those taking psychogenic medication or who did not fill in their personal background information were excluded from the analysis (20 students). This resulted in a total sample of 117 participants (53% female, 47% male). Their age ranged from 19 to 46 years old ($M = 24.48$, $SD = 4.52$). Once the participants enrolled in the experiment through the scheduling tool, they were randomly assigned to one of three groups: Hierarchical-Self ($n = 41$), Distinction-Self ($n = 37$), and Control Group ($n = 39$). There was no difference between the groups in the anxiety and psychological flexibility pre-measures (see Table 4). To complete the randomization, the website "Random Lists" was used. Accordingly, the students were assigned to one group before their participation in the experiment. Furthermore, 13 participants (11%) reported that they had sought psychological help earlier. Another 65 participants (55.6%) acknowledged that they used strategies to cope with public speaking anxiety such as breathing exercises and rehearsing the presentation. Some participants (15%) noted that they currently practice yoga or meditation. Additionally, 15% of the total sample acknowledged their familiarity with ACT or mindfulness practices.

TABLE 4 Descriptive statistics by intervention group: Minimum, maximum, and mean (standard deviation) values with 95% confidence intervals for public speaking anxiety (PRCA-PS) and psychological flexibility (CompACT).

	Minimum	Maximum	M (SD)	95% confidence interval	
				Lower	Upper
Hierarchical-Self					
PRCA-PS	12	30	20.37 (4.82)	19	21.79
CompACT	45	132	88.07 (22.11)	81.71	94.68
Distinction-Self					
PRCA-PS	13	29	21.18 (4.25)	19.74	22.55
CompACT	45	132	84.46 (20.74)	77.76	91.38
Control Group					
PRCA-PS	9	30	21.05 (5.47)	19.41	22.66
CompACT	52	126	91.79 (17.24)	86.26	97.23

2.2 Procedure

The following procedure was used in **Studies I, II, and III**. Initially, the participants read and signed an informed consent form that contained basic information related to the nature of the study, as well as the different tasks that would occur during the experiment. In addition, the participants filled in their background information. The first measurement phase included four questionnaires related to anxiety from giving a public speech (PRCA-PS), self-perception (3D-RISP), fusion with thoughts and feelings (SCFQ), and psychological flexibility (CompACT). Next, the researcher placed electrodes on the participants to measure their heartrate and skin conductance (see Figures 2A and 2B). Before leaving the participant's room, the researcher informed the participants that due to the stabilization of the physiological measures, the experiment would start in 2 minutes. This 2-minute silence was used in the physiological measures' statistical analysis as a baseline reactivity for periods when the subject was sitting quietly (e.g., during the intervention). Additionally, another baseline was recorded. For this, during another 2-minute period, the participants listened to pre-recorded audio and answered, aloud, specific questions (e.g., "*what is your name?*", "*where are you from?*", "*where were you born?*", and "*what is your favorite season of the year?*"). This question period was used as a baseline for when the participants spoke during the experiment (e.g., first and second speech). Next, the participants were instructed to give a 10-minute speech about themselves, specifically about their strengths and weaknesses. Although the participants were encouraged to speak for as long as possible even when they did not know what to say, they also had the possibility to end the speech early if they were feeling significant anxiety. Before the participants started the speech, they filled in the Visual Analog Scale (VAS) and had 3 minutes to think about what they would say during the speech. During the speech itself, the participants saw a video-recorded audience. After finishing the speech, the participants filled in the Social Performance Scale, Self-Reported Version (SPS-SR), which was used to measure their perceptions of the quality of their speech.



FIGURE 2A Electrodermal activity (EDA) electrode placement.

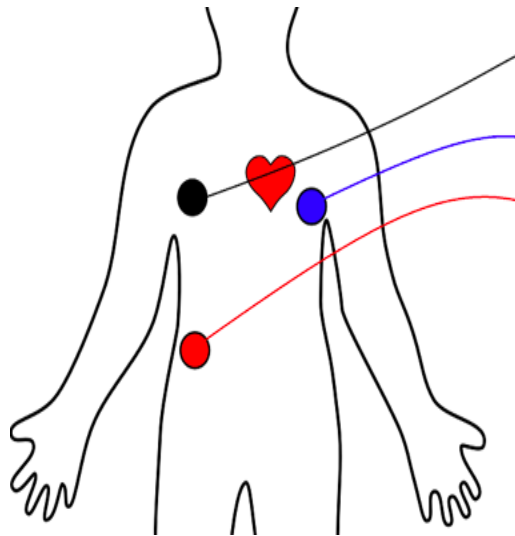


FIGURE 2B Heartrate variability (HRV) electrode placement.

In Study III, the participants were instructed to close their eyes. In this moment, they listened either to an intervention or the control condition depending on which group they were previously allocated to by the randomization. When this listening period ended, the participants were instructed to give a second speech (same instructions as the first speech, i.e., talk about their strengths and weaknesses). However, now they were invited to use the tools that were presented to them during the interventions (this was not suggested to the participants in the control group). After a 3-minute period during which they were able to plan their speeches, the participants were instructed to start the speech. When the second speech was finished, the participants filled in the same questionnaires they did at the beginning of the experiment: PRCA-PS, CompACT, 3D-RISP, and SCFQ. The recording of the physiological reactivity was stopped before the participants finished filling in the questionnaires. Figure 3 shows the full procedure.

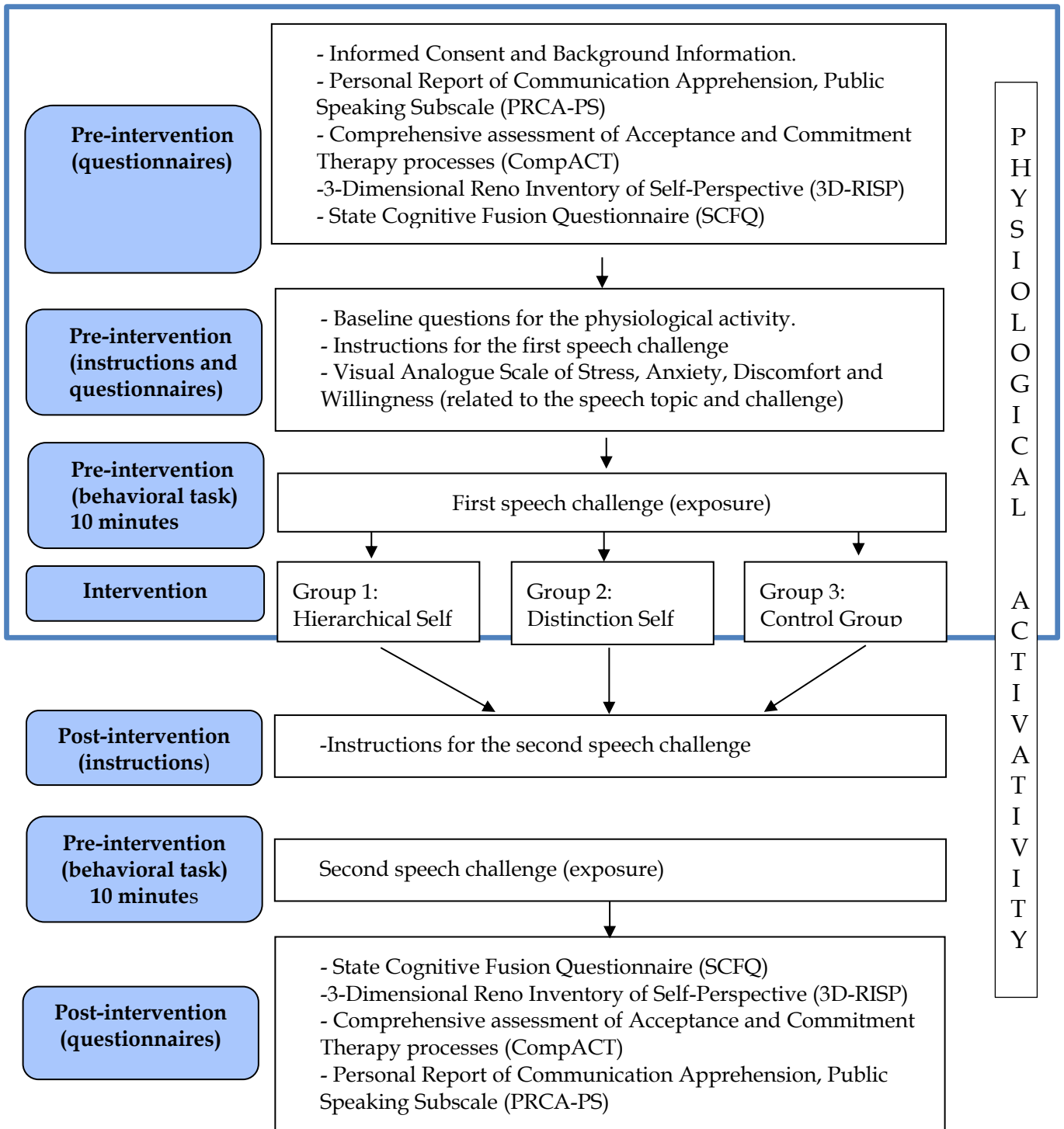


FIGURE 3 Procedure. Data framed with blue lines represents the section of the experiment that has been included in the studies I and II.

2.3 Setting and apparatus

The experiment was conducted individually at the Department of Psychology, University of Jyväskylä. The participants sat in an armchair in the middle of a sound-proof and electrically insulated room that measured 240 cm x 420 cm. In front of the participants (130 cm) was a camera (Canon LEGRIA HF G30) that recorded them throughout the experiment. Behind the camera (180 cm from the participant), there was a large TV (with a 65" screen) from which the participant saw a virtual audience during both speech periods. The video-recording camera and TV screen were placed with the purpose of eliciting anxiety in the participants. The instructions for the speeches as well as the intervention were pre-recorded and delivered through a ceiling speaker (above the participant). Behind the participant, there was a table that held an amplifier (BrainVision QuickAmp 32 EEG and 8 physiological channels) to record electrocardiogram and electrodermal activity (EDA). At the right side of the armchair (left side for those who were lefthanded), there was a pen and the questionnaires.

From an adjacent room, the researcher followed the experiment via a TV screen (Samsung 24"). This TV showed the images captured with the video-recording camera placed in front of the participants. Also in the researcher's room were three computers that were used during the trial. One of the computers (Dell 23") recorded and displayed the real-time monitoring of the participants' heartrate curve and skin conductance changes using the program Brain Vision Recorder 1.20.080. Signals above 400 Hz were filtered out from the heartrate and EDA analyses, as were heartrate signals below 0.5 Hz. The program used a sampling frequency of 1000 Hz. Another computer (Dell 23") was used to play the audio recordings that the participants heard throughout the experiment (e.g., speech instructions and intervention). The third computer (Dell 17") was used to monitor the view of the TV screen in the participant's room (i.e., during both speeches, the participant saw a virtual audience on the screen, but at other times the screen was dark). The video of the virtual audience was pre-recorded and filmed in a lecture hall, and it showed the upper body and face of the persons (audience) sitting and looking at the speaker. When recording the video, the researcher instructed the audience to keep a "poker face." Figure 4A depicts the participant's room, and Figure 4B shows the researcher's room.



FIGURE 4A Participant's room.



FIGURE 4B Researcher's room.

2.4 Measures

In addition to self-reports, other assessment tools were used in the current work, including observer reports and behavioral and physiological measures. These measures were used in different studies, as described in Table 5.

TABLE 5 Measures used in Studies I, II, and III.

Measures	Study I	Study II	Study III	Time of assessment
Self-reported measures				
Personal Report of Communication Apprehension-Public Speaking subscale (PRCA-PS), measuring public speaking anxiety	X	X	X	Studies I and II: pre-measurement Study III: pre- and post-measurements
Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT), measuring psychological flexibility; this scale is a compound of three subscales (Openness to Experiences, Behavioral Awareness, and Valued Actions)		X	X	Study II: pre-measurement Study III: pre- and post-measurements
Three Dimensional Reno Inventory of Self-Perspective (3D-RISP), measuring self-perspective skills; this scale is a compound of three subscales (Transcendent, Centered, and Entangled)		X	X	Study II: pre-measurement Study III: pre- and post-measurements
State Cognitive Fusion Questionnaire (SCFQ), measuring fusion with thoughts and feelings		X	X	Study II: pre-measurement Study III: pre- and post-measurements
Visual Analog Scales (VAS), measuring how uncomfortable, stressed, anxious, and willing the participants feel to give their speeches, as well as how uncomfortable and willing they feel to speak about the given topic			X	Study III: pre-measurement
Social Performance Scale Self-Reported Version (SPS-SR), measuring perceived speech performance from the participants themselves	X			Study I: pre-measurement
Observer-reported measure				
Social Performance Scale Other-Reported Version (SPS-OR), measuring perceived speech performance from external evaluators	X			Study I: pre-measurement
Physiological measures				
Electrodermal activity (EDA) using SCRs as an index of sympathetic nervous system activity	X		X	Study I: pre-measurement Study III: pre- and post-measurements
Heart rate variability (HRV) using RMSSD as an index of parasympathetic nervous system activity	X		X	Study I: pre-measurement Study III: pre- and post-measurements
Behavioral measure				
Public speaking distress tolerance (speech duration)	X	X	X	Studies I and II: pre-measurements Study III: pre- and post-measurements

2.4.1 Self-reported measures

The Personal Report of Communication Apprehension-Public Speaking (PRCA-PS) subscale was used to measure public speaking anxiety. Among the process variables, psychological flexibility was measured using the Comprehensive Assessment of Acceptance and Commitment Therapy processes (CompACT). Additionally, self-perspective skills (Three Dimensional Reno Inventory of Self-Perspective, 3D-RISP) and cognitive fusion (State Cognitive Fusion Questionnaire, SCFQ) were recorded. An advantage of using the CompACT and 3D-RISP scale is that they are compounds of different subscales: Openness to Experiences, Behavioral Awareness, and Valued Actions for the CompACT and Entangled, Centered, and Transcendent for the 3D-RISP. The participants' perceptions of the quality of their speeches was recorded with the Social Performance Scale Self-Reported Version (SPS-SR).

2.4.2 Observer-reported measure

Additionally, the observers' perceptions of the quality of the participants' speeches was also measured. For this, two observers were trained by an expert on how to assess the speeches' quality using the Social Performance Scale Other-Reported Version (SPS-OR).

2.4.3 Behavioral measure

The participants were instructed to give a speech about themselves and their strengths and weaknesses (behavioral assessment task). The participants had the opportunity to stop the speeches if there were feeling significant anxiety. However, the participants were otherwise instructed to continue their speech even if they were unsure of what to say next. For this reason, speech duration was interpreted as public speaking distress tolerance.

2.4.4 Physiological measures

Throughout the whole experiment, the participants' physiological reactions were assessed by recording EDA and heartrate variability (HRV). Figures 2A and 2B demonstrate how the electrodes were positioned.


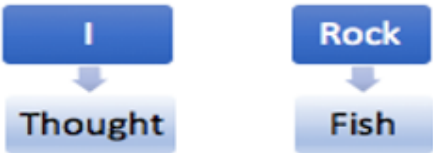
2.5 Intervention

In **Study III**, the experiment entailed three different intervention conditions, of which the participants received one depending on which group they were randomly assigned to (Hierarchical-Self, Distinction-Self, or the Control Group). Each intervention lasted 17 minutes, and they were all developed for this experiment. Both interventions were based on the ACT process "self-as-context" and

RFT principles (Hierarchical-Self and Distinction-Self). The purpose of the present protocol was to foster a transcendent and flexible sense of self, or what in the ACT model is called *self-as-context*, by changing the relationship that the participants have with their private experiences, that is, thoughts and feelings, moving from the self-as-content (i.e., the conceptualized self; fused with self-related thoughts such as “I am a bad speaker,” “I am not good enough,” “I am dumb”) to the self-as-context (i.e., the observer self that notices thoughts as just that, thoughts). Across the protocol, self-as-context was promoted via three features:

1. **Ongoing awareness of changing self-experiences:** a variety of self-experiences – thoughts, sensations, perceptions – are used to promote awareness of their constant change (e.g., “*Focus your attention on your breathing. Now, take a deep breath and notice the air as it enters your body through your nose and travels to your lungs. Once again, take a deep breath and focus your attention whenever you may feel it more vividly.*”).
2. **Awareness of continuous perspective taking:** self-experiences are noted from a particular point of view defined by time, place, and person (e.g., “*Imagine that it is possible for you to travel in time and go back to a moment when you were 5 years old. Take some time to visualize that moment. When you have it, imagine that there is a mirror in front of you in which you can observe your face, your hair, your hips, the size of your body. Can you notice the differences between your little 5-year-old body and your body as it is today?*”).
3. **Emphasis of the hierarchical vs distinction dimensions of the self:** including self-experiences as part of the hierarchical network, where the self is the container of all experiences (for the Hierarchical-Self intervention; e.g., “*Imagine that you are the container in which your thoughts unfold, as if you were an aquarium and your thoughts are fish swimming inside it*”). For the Distinction-Self intervention, self-experiences were framed as different from the self (e.g., “*Imagine that you are different than this thought and all the thoughts that are there, as a rock would be different than all the fish around it*”).

TABLE 6 Graphic explanation of the metaphors used during the intervention.

Section of the intervention	Aim	Logic behind the aim
<p>Now, focus your attention on a <u>thought you had during the speech</u>. Go over the moment you were about to start speaking and pick up the most uncomfortable thought you had.</p>	<p>Awareness of the ongoing thoughts</p>	<p>To develop a greater sense of awareness of experiences through an ongoing and reflective process that helps clients recognize that their thoughts are more various than what they generally think.</p>
<p>Imagine that you have space for this thought and all the thoughts you have, as a very large aquarium would have space for all the fish. Can you notice that the aquarium is the container in which the fish are swimming? Can you notice that you are the container of your thoughts?</p>	<p>Metaphors that enhance the hierarchical dimension of the self</p>	<p>Equivalence between two sets of relations. The "I" and the "thought" form the target, and the "aquarium" and the "fish" form the vehicle. The vehicle is the relational network responsible for the changes in the target. There is a relation of hierarchy within the vehicle, also within the target. The aim is to create a more expansive relational network where the Self is the context of all the experiences</p> 
<p>Imagine that you are different from this thought and all the thoughts that are there, as a rock would be different from all the fish around. Can you notice that the rock is different from the fish swimming around it? Can you notice that you are different from the thoughts?</p>	<p>Metaphors that enhance the distinction between the Self and the Self-experiences.</p>	<p>Equivalence between two sets of relations. The "I" and the "thought" form the target, and the "aquarium" and the "fish" form the vehicle. The vehicle is the relational network responsible for the changes in the target. There is a relation of hierarchy within the vehicle, also within the target. The aim is to create a more expansive relational network where the Self is the context of all the experiences</p> 

For this reason, the protocol contained multiple examples in which the participants had several opportunities to notice a wide variety of experiences and frame them in a distinction or hierarchical relational frame with the deictic "I." The protocol was divided into two parts. The first part (1-6) focused on neutral private events and the second part (7-11) on aversive private events. Starting with neutral private events might prevent some participants from engaging in cognitive avoidance strategies during the exposure to unpleasant sensations; as such, after the first contact with neutral sensations, the protocol focused on aversive private experiences.

2.5.1 Distinction-self intervention

Below is a detailed description of the Distinction-Self intervention as it was presented to the participants:

Please close your eyes and focus your attention on what I say. If your attention gets caught by anything that is not related to this exercise, kindly come back to my voice. Do this any time you get distracted. I will be asking you some questions. Remember that you don't need to answer them out loud, but see if you can answer them within yourself.

(1) Focus your attention on your breath¹. Now, take a deep breath and notice the air as it enters your body through your nose and travels to your lungs. Once again, take a deep breath and focus your attention whenever you may feel it more vividly. Can you *notice*² that *the breath is different than you*? Now, take a moment to notice the small gaps between the in-breath and the out-breath. Can you notice that the gaps are *different than you*? Take a moment to notice that the breath and the gaps are *different than you*. Exhale again and try to acknowledge *the breath as something different than you*. Imagine that the breath is like a fish coming and going, *different than a rock like the breath is different than you*.

(2) Now, focus your attention on your mouth. Go over the position of your tongue, whether it is touching the teeth, the palate. Notice if there is any saliva. Do not swallow for a little while and notice the sensation of your tongue surrounded by your saliva. Can you notice that *these sensations are different than you*? Do you realize that these sensations *are there and you are different than them*?

(3) Now, focus your attention on the roles you play in life. Think about the way you talk to your friends, to your teachers, and to your parents. Notice the differences in your tone of voice, your expressions, the words you choose. So, imagine that the different roles you play in life are like the different fish that are swimming *around a rock*. Imagine that the blowfish is the role you play at university, the clownfish represents you when you interact with your parents, the tang fish represents you when you are with friends, and so on. Notice that all these fish are *different than a rock*, as the roles you play in life are *different than you*. Can you notice that the different roles you play in life are *different than you*?

(4) Now, focus your attention on your body. Imagine that you have a mirror in front of you in which you can observe your face, your hair, your hips. Take some time to observe your entire body. Imagine that it is possible for you to travel in time and go back to a moment when you were 5 years old. Take some time to visualize that moment. When you have it, imagine that there is a mirror in front of you in which you can observe your face, your hair, your hips, the size of your body. Can you notice the differences between your little 5-year-old body and your body as it is today? So, focus your attention on these things that change across time. See if you can notice that they are *different than you*. Take a moment to notice these things that change are different than you.

¹ To give the participants enough time to follow the instructions, there was a short pause between sentences throughout both interventions.

² The words in italics are specific to either intervention. The other words (not in italics) are common words used in both interventions.

(5) Now, focus your attention on what you are thinking right now. Let your thoughts appear, whatever they might be. For example, if the thought that arises is that you are tired or that you have a particular thing to do after this, notice it. Allow yourself to notice all the thoughts that *are there* in this moment. As if you were *a rock and the thoughts fish swimming around it*. Take a moment to observe *the* thoughts and yourself in this way.

(6) Now, focus your attention on a specific thought that appears in this very moment. Take your time. Imagine that you are *different than the thoughts that unfold*. As if you were *a rock and the thoughts were fish swimming around it*. Repeat these words to yourself: "*there are thoughts and I am different than these thoughts.*"

(7) Now, go over your general posture and see which part of your body feels a bit uncomfortable. Maybe you are noticing discomfort in your back or neck. Choose a place and focus your attention on it. Allow yourself to notice all the discomfort that *is there* in this moment. Imagine that *the* discomfort is like a fish coming and going. Take a moment to notice any change in *the* sensation, whether the sensation is more or less intense. Do you notice it changing? Imagine also that you are a *rock*. Notice that the fish is *different than the rock*, as the discomfort is *different* than you. Repeat these words to yourself: "*there is discomfort, but I am not the discomfort.*"

(8) Now, you are going to focus your attention on a thought you had during the task. Go over the moment you were about to start the speech and pick up the most uncomfortable thought you had. Imagine that you are *different than this thought and all the thoughts that are there, as a rock would be different than all the fish around it*. Can you notice that *the rock is different than the fish swimming around it*? Can you notice that *you are different than the thoughts*?

(9) Do you remember the previous task where you were asked to pick a negative thought about yourself? Take some time to think again about that negative thought. Try to put that thought into some words. Take your time. Imagine again that you say this thought about yourself out loud. You don't have to actually do it, but imagine it. Notice that you are *different than* this thought. You are *not the thought that unfolds*. Imagine that you are *a rock* and *this* thought is a fish coming and going, swimming *around it*. See if you can observe this thought in this way.

(10) Now, change your posture and sit in a position that feels a bit uncomfortable to you. Again, focus your attention on where there is more discomfort. Take some time to feel the sensation. Imagine that you are *different than* all the sensations that *are there* in this moment. As if you were *a rock and the fish were the sensations. The rock is different than the fish, as you are different than the sensations*. Can you notice that *the rock is something different than the fish swimming around it*? Can you also notice that you are *something different than the sensations*? Now, come back to a comfortable posture.

(11) Imagine that you are about to give a talk in front of a big audience. Notice the presence of the multitude of people who are waiting for you to speak. Look at their faces. Notice the silence. Notice the rhythm of your heartbeat. Whether it becomes more or less intense. Take some time to observe whether there is any change in the speed of your heart. Do you realize that *the heartbeats*

are different than you? See if you can notice it. Focus your attention on your breath and the frequency of the inhales and exhales. Notice whether they are speeding up or slowing down. Take your time to notice if there is any change in the frequency and intensity. Do you realize that *the breath is different than you?* See if you can notice it. Imagine you *are different than* all the sensations that *have been there* today. Furthermore, imagine that *these* sensations are like fish and you are *a rock different than these sensations*. Can you imagine yourself in this way? Notice that *the rock is different than the fish, as you are different than all the sensations*. Can you notice that *the rock is different than the fish?* Can you notice that you are *different than the sensations?* Take two deep breaths, and when you are ready, you can open your eyes.

2.5.2 Hierarchical-self intervention

Below is a detailed description of the Hierarchical-Self intervention as it was presented to the participants:

Please close your eyes and focus your attention on what I say. If your attention gets caught by anything that is not related to this exercise, kindly come back to my voice. Do this any time you get distracted. I will be asking you some questions. Remember that you don't need to answer them out loud, but see if you can answer them within yourself.

(1) Focus your attention on your breath. Now, take a deep breath and notice the air as it enters your body through your nose and travels to your lungs. Once again, take a deep breath and focus your attention whenever you may feel it more vividly. Can you notice that *your breath is only a part of you?* Now, take a moment to notice the small gaps between the in-breath and out-breath. Can you notice that the gaps are *only parts of you?* Take a moment to notice that your breath and the gaps are *included in a bigger part of you*. Exhale again and try to acknowledge *your breath as a part of you*. Imagine that *your breath is like a fish coming and going, included in an aquarium like your breath is included in a bigger part of you*.

(2) Now, focus your attention on your mouth. Go over the position of your tongue, whether it is touching the teeth, the palate. Notice if there is any saliva. Do not swallow for a little while and notice the sensation of your tongue surrounded by your saliva. Can you notice that *these sensations are only parts of you?* Do you realize that *you have* these sensations and you are *bigger* than them?

(3) Now, focus your attention on the roles you play in life. Think about the way you talk to your friends, to your teachers, and to your parents. Notice the differences in your tone of voice, your expressions, the words you choose. So, imagine that the different roles you play in life are like the different fish that are swimming *in an aquarium*. Imagine that the blowfish is the role you play at university, the clownfish represents you when you interact with your parents, the tang fish represents you when you are with friends, and so on. Notice that all these fish are *part of the aquarium*, as the roles you play in life are *part of you*. Can you notice that the different roles you play in life are *part of a bigger you?*

(4) Now, focus your attention on your body. Imagine that you have a mirror in front of you in which you can observe your face, your hair, your hips. Take

some time to observe your entire body. Imagine that it is possible for you to travel in time and go back to a moment when you were 5 years old. Take some time to visualize that moment. When you have it, imagine that there is a mirror in front of you in which you can observe your face, your hair, your hips. The size of your body. Can you notice the differences between your little 5-year-old body and your body as it is today? So, focus your attention on these things that change across time. See if you can notice that they are *part of a bigger* you. Take a moment to notice these things that change belong to you.

(5) Now, focus your attention on what you are thinking right now. Let your thoughts appear, whatever they might be. For example, if the thought that arises is that you are tired or that you have a particular thing to do after this, notice it. Allow yourself to notice all the thoughts that *you are having* in this moment, as if you were *an aquarium and your thoughts fish swimming inside it*. Take a moment to observe your thoughts and yourself in this way.

(6) Now, focus your attention on a specific thought that appears in this very moment. Take your time. Imagine that you are *the container in which your thoughts unfold*, as if you were *an aquarium and your thoughts were fish swimming inside it*. Repeat these words to yourself: "*I have thoughts and I am the container of my thoughts.*"

(7) Now, go over your general posture and see which part of your body feels a bit uncomfortable. Maybe you are noticing discomfort in your back or neck. Choose a place and focus your attention on it. Allow yourself to notice all the discomfort that *you are having* in this moment. Imagine that *your* discomfort is like a fish coming and going. Take a moment to notice any change in your sensation, whether the sensation is more or less intense. Do you notice it changing? Imagine also that you are an *aquarium*. Notice that the fish is *only a part of the aquarium*, as the discomfort is *only a part of you*. Repeat these words to yourself: "*I feel discomfort, but I am bigger than my discomfort.*"

(8) Now, you are going to focus your attention on a thought you had during the task. Go over the moment you were about to start the speech and pick the most uncomfortable thought you had. Imagine that you *have space for this thought and all the thoughts you have, as a very large aquarium would have space for all the fish*. Can you notice that *the aquarium is the container in which the fish are swimming*? Can you notice that you are *the container of your thoughts*?

(9) Do you remember the previous task where you were asked to pick a negative thought about yourself? Take some time to think again about that negative thought. Try to put that thought into some words. Take your time. Imagine again that you say this thought about yourself out loud. You don't have to actually do it, but imagine it. Notice that you contain your thought. You are *the space in which your thought unfolds*. Imagine that you were *an aquarium and your thought is a fish coming and going, swimming inside it*. See if you can observe your thought in this way.

(10) Now, change your posture and sit in a position that feels a bit uncomfortable to you. Again, focus your attention on where there is more discomfort. Take some time to feel the sensation. Imagine that you are *a container of all the*

sensations that *you are having* in this moment. As if you were an *aquarium* and the *fish* were *your sensations*. The *aquarium* is the *container* of the fish, as you are the *container* of your sensations. Can you notice that the *aquarium* is the *space* in which the fish are swimming? Can you also notice that you are the space containing *your sensations*? Now, come back to a comfortable posture.

(11) Imagine that you are about to give a talk in front of a big audience. Notice the presence of the multitude of people who are waiting for you to speak. Look at their faces. Notice the silence. Notice the rhythm of your heartbeat, whether it becomes more or less intense. Take some time to observe whether there is any change in the speed of your heart. Do you realize that *your heartbeats* are *only a part of you*? See if you can notice it. Focus your attention on your breath and the frequency of the inhales and exhales. Notice whether they are speeding up or slowing down. Take your time to notice if there is any change in the frequency and intensity. Do you realize that *your breath* is *only a part of you*? See if you can notice it. Imagine you *contain* all the sensations that *you have had* today. Furthermore, imagine that your sensations are like fish and you are an *aquarium* containing these sensations. Can you imagine yourself in this way? Notice that the *aquarium* is the *container* of the fish, as you are the *container* of all your sensations. Can you notice that the *aquarium* is the *container* of the fish? Can you notice that you are the *container* of your sensations? Take two deep breaths, and when you are ready, you can open your eyes.

2.5.3 Control group

The participants in the control group heard a fragment of the book *The Lord of the Rings* by J. R. R. Tolkien. This recording lasted exactly the same time as the interventions, and it contained the same amount of words and pauses. The purpose of this group was to control for alternative explanations, such as the exposure effect and the effects of repeatedly disposing the same questionnaires (measurements' effect).

2.6 Data analysis plan

All statistical analyses included in this study were performed using IBM SPSS Statistics 24. A summary of the variables and statistical analyses used are presented in Table 7.

TABLE 7 Summary of the variables and statistical methods used in Studies I, II, and III.

	Variables	Statistical method
Study I	Self-reported public speaking anxiety Public speaking distress tolerance Physiological reactivity Self- and other-perceived performance	Correlation analysis
Study II	Self-reported public speaking anxiety Public speaking distress tolerance Psychological flexibility (Openness to Experiences, Behavioral Awareness, and Valued Actions)	Correlation analysis Regression analysis
Study III	Self-reported public speaking anxiety Public speaking distress tolerance Psychological flexibility (Openness to Experiences, Behavioral Awareness, and Valued Actions) Physiological reactivity Self-perspective skills (Transcendent, Centered, and Entangled)	ANOVA Cohen's d Regression analysis

2.6.1 Correlation

In **Study I**, a Pearson correlation analysis was performed to examine whether physiological reactivity, behavioral, self-reported, and observer-reported measures were associated with each other during a speech challenge. In **Studies I and II**, correlations between $r = 0.10$ and 0.30 were considered small, between $r = 0.31$ and 0.50 moderate, and between $r = 0.51$ and 1 high (Cohen, 1992).

In **Study II**, a Pearson correlation analysis was performed to determine whether public speaking anxiety was associated with psychological flexibility. This analysis was also performed to examine whether speech duration (a behavioral measure of public speaking distress tolerance) correlated with psychological flexibility. For variables that were not normally distributed, a Spearman correlation (a non-parametric statistical analysis) was performed. For this study, the Spearman correlation was only performed for the variable speech duration.

2.6.2 Regression analysis

In **Study II**, it was performed a regression analysis to further understand what aspects of psychological flexibility (e.g., independent variables: Openness to Experiences, Behavioral Awareness, and Valued Actions) are most relevant when tailoring interventions for public speaking anxiety (dependent variable). This type of analysis was also used to ascertain what aspects of psychological flexibility are most important for public speaking distress tolerance (dependent variable).

In **Study III**, a stepwise regression analysis was performed to determine what aspects of psychological flexibility predict changes in public speaking anxiety in the Hierarchical- and Distinction-Self-as-Context interventions. The dependent variable was self-reported public speaking anxiety (PRCA-PS), and the independent variables were the CompACT subscales (i.e., Openness to Experiences, Behavioral Awareness, and Valued Actions), 3D-RISP subscales (i.e., Centered, Entangled, and Transcendent), and the SCFQ (i.e., Cognitive Fusion).

2.6.3 ANOVA

In **Study III**, the aim was to investigate whether a brief distinction and Hierarchical Self-as-Context intervention would result in different effects on public speaking anxiety, psychological flexibility, distress tolerance, and physiological reactivity. To this end, repeated measures ANOVA (pre- and post-intervention) was performed.

2.6.4 Effect sizes

In **Study III**, the within-group effect sizes were calculated by dividing mean change by the pooled SD from the pre- and post-measurements. https://www.polyu.edu.hk/mm/effectsizefaq/effect_size_equations2.html. Between-group corrected effect sizes were calculated by subtracting the mean difference in the pre-measurements from the mean difference in the post-measurements and dividing that result by the pooled SD from the pre-measurements. Cohen (1992) suggested that effect size $d = 0.2$ is small, $d = 0.5$ medium, and 0.8 large.

3 SUMMARY OF THE RESULTS

3.1 Study I

3.1.1 Measuring public speaking anxiety: Self-reported, behavioral, and physiological measures

The main aim of Study I was to investigate whether self- and observer-reported and behavioral and physiological reactivity measures are related to each other in the context of a speech challenge (i.e., behavioral assessment task).

Among all the participants, 50% reported high levels of public speaking anxiety, 41.5% moderate levels, and only 8.5% low levels. According to our results, self-reported public speaking anxiety (PRCA-PS) was moderately and negatively associated with public speaking distress tolerance (i.e., behavioral avoidance; $r = -.31$, $p < 0.01$, $n = 95$). Furthermore, there was no significant correlation between self-reported public speaking anxiety (PRCA-PS) and the index of sympathetic nervous system activity (SCRs; $r = .16$, $n = 92$, see Figure 5), nor with HRV or the index of parasympathetic nervous system activity (RMSSD; $r = .05$, $n = 93$, see Figure 6).

Nevertheless, there was a negative and moderate correlation between self-reported public speaking anxiety and self-perceived speech performance ($r = -.42$, $p < 0.01$, $n = 95$). The former also correlated negatively and moderately with the speech performance perceived by external observers (SPS-OR; $r = -.40$, $p < 0.05$, $n = 95$). Additionally, the results showed a high positive correlation between self- and other-perceived speech performance ($r = .60$, $p < 0.01$, $n = 95$), suggesting that the better participants evaluate their own speech performance, the better it is evaluated by others. Still, a t-test indicated a significant difference between self-evaluated speech performance and speech performance evaluated by independent observers ($p < 0.01$) in favor of the observers (self-perceived performance: $M = 38.58$, $SD = 9.55$, $N = 103$; other-perceived performance: $M = 56.28$, $SD = 7.30$,

N = 43). In regard to public speaking distress tolerance (i.e., speech duration), negative correlation with skin conductance responses (SCRs; $r = -.23$, $p < 0.005$, $n = 95$) was observed. However, there was no correlation with HRV (RMSSD). In addition, the data showed no correlation between public speaking distress tolerance and self- or other-evaluated speech performance.

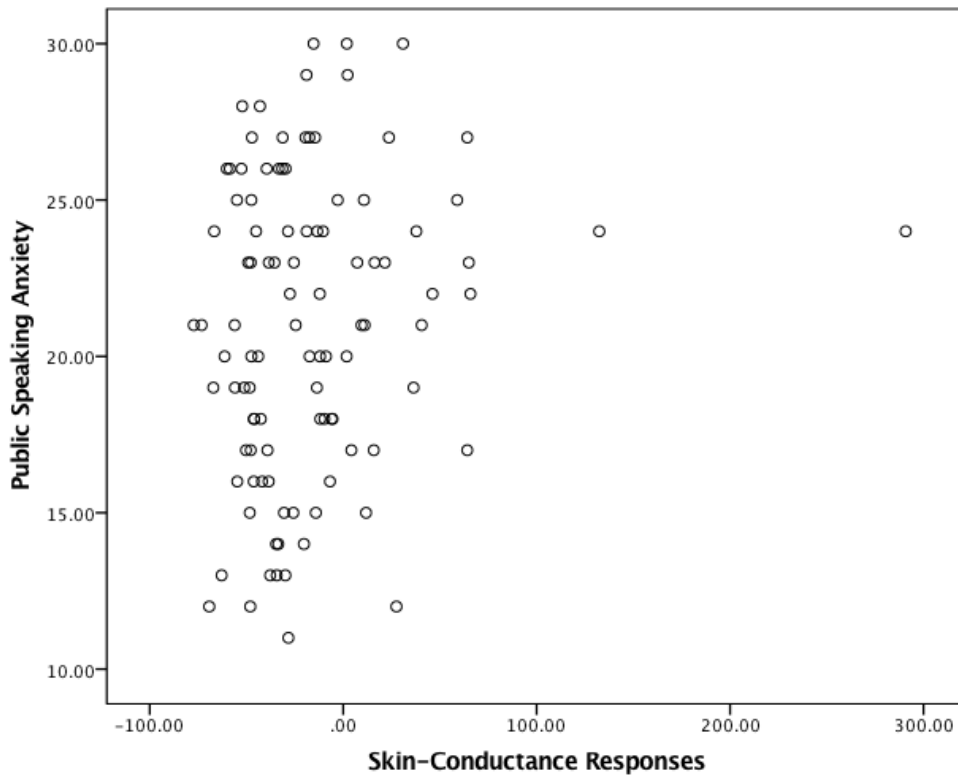


FIGURE 5 Correlation between public speaking anxiety and skin conductance responses (SCRs) at pre-intervention.

Conclusions. The results demonstrated the relationship between self-reported measure of speech anxiety and behaviorally measured speech duration (i.e., public speaking distress tolerance). That is, both the self-reported and behavioral measures were in line with each other (i.e., what participants said and did was congruent). On the other hand, the self-reported measure of speech anxiety was unrelated to the physiological measures. Therefore, physiological reactions are unlikely to depict the anxiety levels that an individual experiences and reports while giving a speech in front of others. However, the physiological reactions measured with SCRs (the index of sympathetic nervous system activity) were related to speech duration. Furthermore, it observed that participants who report low levels of public speaking anxiety are more likely to rate their speech performance more positively than participants with high levels of public speaking anxiety. Similarly, external observers rated the speeches of the participants who reported low public speaking anxiety as being of better quality than those of participants who reported high public speaking anxiety. In fact, the

results showed that the speech performance rated by the self and external observers were largely congruent (positively correlated). Even so, there was a significant gap in speech performance between self-evaluation and evaluation done by others, indicating that the participants underrated their performance compared to the observers.

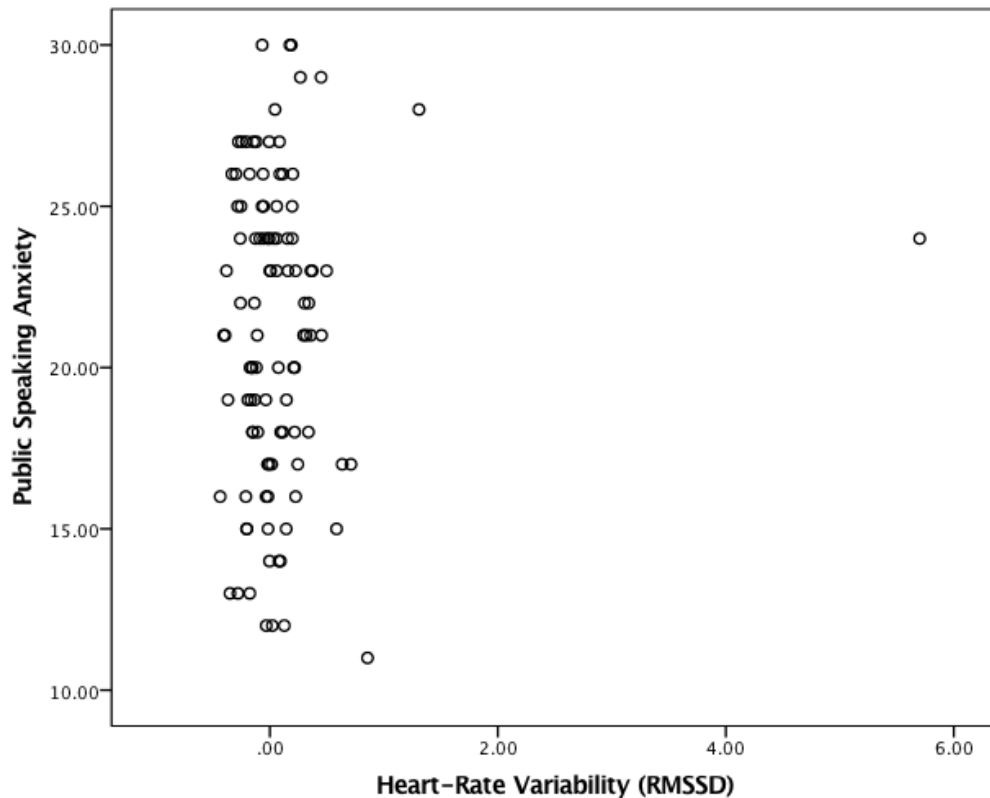


FIGURE 6 Correlation between public speaking anxiety and HRV (RMSSD) at pre-intervention.

Key findings. The findings of this study provide insights into the use of self-reported, behavioral, and physiological measures. First, these results evidenced that participants who report high levels of public speaking anxiety are more likely to give shorter speeches. This finding indicates that participants' self-reports are in accordance with their actual behavior. Thus, participants reporting high levels of public speaking anxiety are more likely to engage in avoidance behavior than participants who report low levels of speech anxiety. Second, HRV was not connected with how anxious the participants were to give a public speech nor how actively they engaged in the speech task (i.e., public speaking distress tolerance). Still, it was observed that participants who showed low levels of SCRs (sympathetic nervous system activity) engaged more actively in the speech task and gave longer speeches than participants who showed high levels of SCRs. However, SCRs were unrelated to the self-reported measure of public speaking anxiety. Hence, the current data suggests that HRV is not a good indicator of self-reported public speaking anxiety, nor a good indicator of public

speaking distress tolerance (behavioral avoidance). Additionally, although the SCR measure does not seem to be an indicator of self-reported public speaking anxiety, it could be used to depict distress tolerance level in public speaking situations. Third, the levels of public speaking anxiety experienced by the participants seem to be connected with their perceived speech performance. Thus, participants with lower public speaking anxiety are more likely to evaluate their speeches as being of a better quality than participants who report high public speaking anxiety. In the same fashion, the speeches performed by participants who report low speech anxiety are more likely to be perceived by external observers as being of higher quality.

3.2 Study II

3.2.1 Examining the relationship between public speaking anxiety, distress tolerance, and psychological flexibility

The purpose of this study was to determine whether psychological flexibility is related to public speaking anxiety. Moreover, the aim was to increase the knowledge of what aspects of psychological flexibility are critical to include in interventions that target public speaking anxiety. Additionally, the aim was to determine whether public speaking anxiety is related to public speaking distress tolerance. Furthermore, the purpose was also to learn what aspects of psychological flexibility are most relevant to include when developing interventions for distress tolerance.

The results of this study indicated that self-reported public speaking anxiety (PRCA-PS) negatively and moderately correlates with psychological flexibility (CompACT; $r = -0.41$, $p < 0.01$, $n = 95$; Figure 7A). Furthermore, self-reported public speaking anxiety correlates with Openness to Experiences (CompACT-OE; $r = -0.45$, $p < 0.01$, $n = 95$), Behavioral Awareness (CompACT-BA; $r = -0.23$, $p < 0.05$, $n = 95$), and Valued Actions (CompACT-VA; $r = -0.26$, $p < 0.05$, $n = 95$). These results can be observed in Figure 7B.

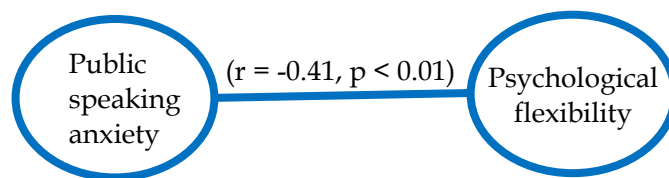


FIGURE 1A Correlation between public speaking anxiety and psychological flexibility

To determine what aspects of psychological flexibility are most relevant to public speaking anxiety, a regression analysis including the variables Openness to Experiences, Valued Action, and Behavioral Awareness was performed. As a result, only Openness to Experiences remained a significant predictor of public speaking anxiety (Std. $\beta = -0.458$, $p < 0.001$) and accounted for 20% of the total variability ($R^2 = 0.201$). For a graphical representation of these results, see Figure 7C. .

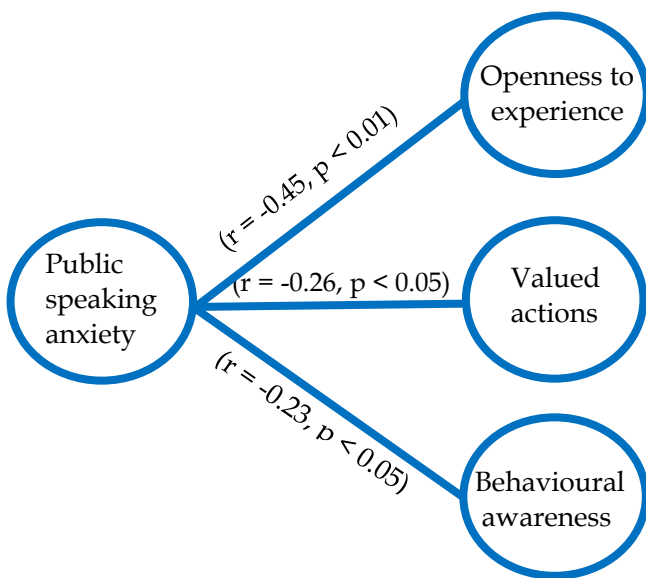


FIGURE 7B Correlation between public speaking anxiety and the different aspects of psychological flexibility.

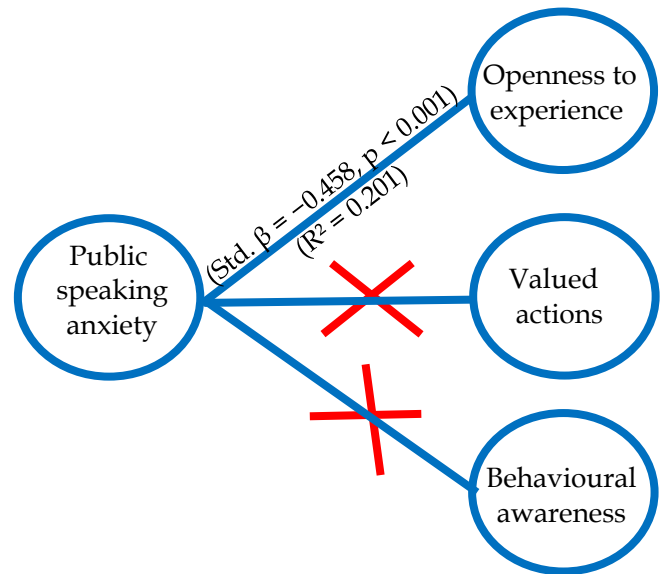


FIGURE 7C Regression analysis: Public speaking anxiety and the different aspects of psychological flexibility.

In addition, speech duration (i.e., public speaking distress tolerance) showed a small and positive correlation with psychological flexibility (CompACT; $r = 0.24$, $p < 0.05$, $n = 94$; Figure 8A)

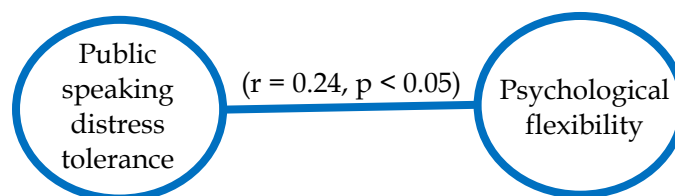


FIGURE 2A Correlation between public speaking anxiety and psychological flexibility.

Moreover, of the three CompACT subscales, only two correlated with speech duration: Valued Actions and Behavioral Awareness (CompACT-VA and CompACT-BA, respectively) (see Figure 8B). Therefore, only the variables Behavioral Awareness and Valued Actions were included in the regression analysis. In the first step, Behavioral Awareness showed to be a significant predictor (Std. $\beta = 0.275$, $p < 0.001$) that accounted for 7.6% of total variability ($R^2 = 0.076$). When Valued Actions was added to the model, the R^2 change was not significant. In the second step, the standardized β values for these two variables were not significant. It is important to acknowledge that the residual distribution was not normal. Therefore, the p values of the regression analysis for speech duration are not completely accurate. These results can be observed in Figure 8C.

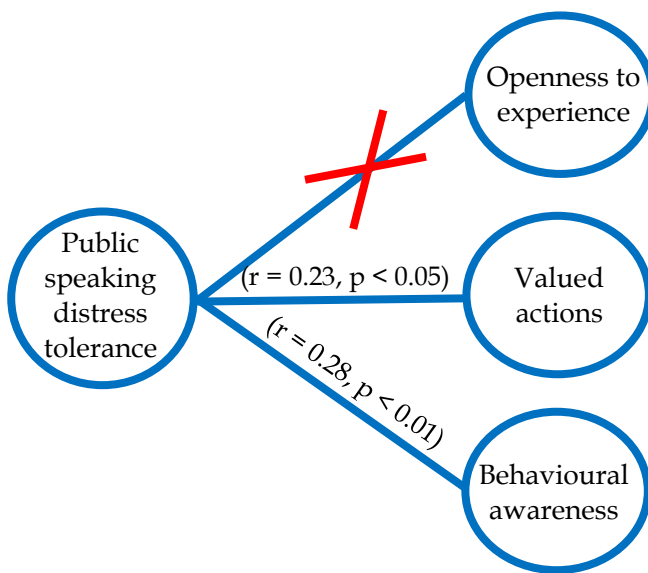


FIGURE 8B Correlation between public speaking distress tolerance and the different aspects of psychological flexibility.

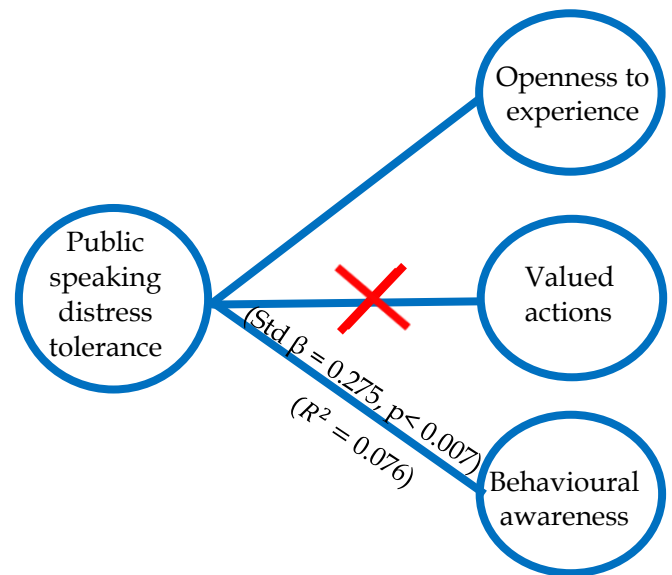


FIGURE 8C Regression analysis: Public speaking distress tolerance and the different aspects of psychological flexibility.

*The residual distribution was not normally distributed. Thus, the p values are not completely accurate. It could be possible that valued actions are also relevant.

Conclusions. According to the results, psychological flexibility is an important skill for both public speaking anxiety and public speaking distress tolerance. When looking into what aspects of psychological flexibility are most relevant to these two outcome variables, it was found that Openness to Experiences was the most important skill for public speaking anxiety, while Behavioral Awareness and Valued Actions were the most relevant skills for public speaking distress tolerance.

Key findings. Public speaking is an important skill to foster among students as they progress through education and into their careers. However, many students avoid public speaking because they lack the skills to cope with the anxiety that comes with standing in front of others to speak. For this reason, many universities offer courses that provide students a venue to learn and practice their speaking and communication skills. To advance in this direction, it is crucial to provide students tools that are effective as well as evidence-based. According to this study's results, it is advisable to train students' psychological flexibility skills, which are in turn expected to decrease their public speaking anxiety. Moreover, our results highlight that training the skill Openness to Experiences could be the most beneficial aspect of psychological flexibility to focus on in order to decrease students' public speaking anxiety. Psychological flexibility also appears to be an important skill to train when aiming to increase students' public speaking distress tolerance. However, Openness to Experiences is not a relevant aspect of psychological flexibility when aiming to increase public speaking distress tolerance. Instead, the data suggests that the training focus should be on the psychological flexibility aspects of Behavioral Awareness.

3.3 Study III

3.3.1 The effect of hierarchical-self versus distinction-self-based interventions for public speaking anxiety

The primary aim of this study was to investigate whether two self-based interventions have different effects on reducing levels of self-reported public speaking anxiety, increasing psychological flexibility, and decreasing physiological reactivity during a speech challenge task. A further aim of this study was to ascertain what aspects of psychological flexibility explain changes in self-reported public speaking anxiety in the investigated interventions (Hierarchical-Self and Distinction-Self)

Impact of the interventions. The results showed that all interventions significantly decrease PRCA-PS levels ($F[1,114] = 42.57, p < 0.001$), that is, there was a significant overall improvement over time in all the intervention groups in self-reported public speaking anxiety. On the other hand, a significant interaction effect did not emerge between time and intervention group in relation to public speaking anxiety. Regarding speech duration, there was no significant interaction or within-group changes from pre- to post-intervention in any of the three study groups. Moreover, in relation to psychological flexibility, there was a significant main effect over time ($F[1,114] = 12.48, p = 0.001$), although only the intervention groups (Hierarchical-Self and Distinction-Self) resulted in a significant increase in psychological flexibility at post-intervention, and the effect sizes were small. In addition, no significant interaction effect emerged between time and intervention groups in relation to the physiological measures (SCR and RMSSD). Still, there was a main effect over time in relation to skin conductance ($F[1,113] =$

5.61, $p = 0.020$) and HRV ($F[1,113] = 25.32$, $p < 0.001$). However, the changes from pre- to post-measurements were not significant in any of the groups.

Regression analysis. To examine what aspects of psychological flexibility account for decreases in public speaking anxiety by each intervention, a regression analysis was performed. Public speaking anxiety was computed as the dependent variable, while the subscales of the CompACT and 3D-RISP, as well as the SCFQ, were considered potential predictors. In relation to the Distinction-Self group, the results suggested that changes in being Entangled (3D-RISP-en; Std. $\beta = 0.370$, $p = 0.014$) and Centered (3D-RISP-ce; Std. $\beta = -0.386$, $p = 0.011$) are significant predictors of decreases in public speaking anxiety. Both variables collectively predicted 31% of the changes in public speaking anxiety ($R^2 = 0.316$). The skill Centered (3D-RISP-ce) accounted for 18% of the total variance, while being Entangled (3D-RISP-en) accounted for 13%. On the other hand, in the Hierarchical-Self group, changes in the variable Openness to Experiences (CompACT-OE; Std. $\beta = -0.339$, $p = 0.032$) formed a predictor of decreased public speaking anxiety and explained 12% ($R^2 = 0.115$) of decreases. In relation to the control group, none of the psychological flexibility aspects predicted decreases in public speaking anxiety.

Conclusions. According to the results, all the study groups, including the control group, had significantly decreased levels of public speaking anxiety after one single training session (from pre- to post-intervention). The session included a 17-minute intervention (the control group received no psychological skills training during this time) and two speech challenges (up to 10 minutes each), that is, all the groups engaged in repeated exposure. Therefore, given the fact that exposure is an important component in the treatment of public speaking anxiety, it is not surprising that the control group reduced their public speaking anxiety significantly at post-intervention as well. Moreover, the results indicated that different aspects of psychological flexibility might explain the decreases in self-reported public speaking anxiety in the Distinction-Self and Hierarchical-Self interventions. According to the results, defusion skills (i.e., Entangled and Centered) are significant predictors of the decreases in public speaking anxiety for the Distinction-Self intervention. However, in the Hierarchical-Self intervention, the aspects of psychological flexibility that explain the decreases in public speaking anxiety are a combination of defusion and acceptance skills.

Key findings. Defusion and self-as-context are interwoven ACT processes. Previous studies have proven their feasibility and acceptability in a number of different psychological problems, including public speaking anxiety. Furthermore, a series of studies have intended to analyze defusion and self-as-context from an RFT perspective to investigate the efficacy of interventions based on these processes. Consequently, the present study aimed to examine the different effect of Hierarchical-Self- and Distinction-Self-based interventions on public speaking anxiety. The results indicated that one single training session where participants have the chance to engage in two speech challenges (i.e., exposure up to 20 minutes) can sufficiently and significantly reduce self-reported public

speaking anxiety levels. Still, it is unclear whether adding a defusion/self-as-context intervention to a speech challenge task results in additional improvements. Namely, no significant additional effects were observed in the short term; however, they could take place in the long term. Furthermore, the results suggested that different aspects of psychological flexibility explain or predict decreases in self-reported public speaking anxiety. It is worth noting that even when both interventions resulted in similar outcomes in relation to decreasing public speaking anxiety, different processes seem to explain or predict these changes depending on whether a Hierarchical-Self or Distinction-Self intervention is delivered.

4 DISCUSSION

4.1 Conclusions

The objective of this dissertation was threefold: first, it aimed to investigate whether four elements of public speaking are connected to each other: observer reports, self-reports, actual behavior, and physiological reactivity. Second, it aimed to examine the role of psychological flexibility in self-reported public speaking anxiety and public speaking distress tolerance. Further, the purpose was to ascertain what aspects of psychological flexibility are essential predictors of public speaking anxiety and public speaking distress tolerance. Additionally, this dissertation aimed to investigate whether distinction and hierarchical self-based interventions differently affect self-reported public speaking anxiety, public speaking distress tolerance, physiological reactivity, and psychological flexibility, and to ascertain whether the mechanisms of change in these interventions are similar or different.

4.1.1 Measuring public speaking anxiety: Self-report, behavioral, and physiological measures

The results in the current work showed a negative and moderate association between self-reported public speaking anxiety and speech duration (i.e., the behavioral measure of public speaking distress tolerance). This indicates that students who report high levels of public speaking anxiety might also give shorter presentations, which could stem from an avoidance strategy. In congruence with this finding, earlier investigations have evidenced that individuals who display lower levels of distress tolerance also show a higher degree of experiential avoidance (Feldner et al., 2006; Zettle et al., 2005).

Furthermore, the results of the present research indicated that self-reported public speaking anxiety and physiological reactivity in a challenging situation

are not associated with one another. Therefore, how anxious individuals report to be during a speech challenge is unrelated to their physiological reactivity during the same event. This finding is in agreement with those observed in earlier studies. For instance, Schachter and Singer (1962) argued that high levels of physiological arousal lead to urges to understand and name sympathetic nervous system activity. The chosen name for this activity “depends on the situational cues as interpreted by previous experiences” (Schachter & Singer, 1962). As a result, these authors proposed that physiological activity or cognitive perception alone are not responsible for the emotion but rather the interplay of both. For example, an individual who thinks of him/herself as “confident” might understand physiological reactivity while speaking in public as excitement, while a person who thinks of him/herself as “insecure” and “fearful” might understand the same physiological reactivity as fear or anxiety.

According to this rationale, Behnke and Beatty (1981) indicated that speech anxiety could be partly explained by the proclivity to identify physiological arousal when speaking in front of others as anxiety. However, individuals for whom anxiety is not a proper name might interpret the same physiological reactivity as “exhilaration” or “facilitative energy” and therefore not report anxiety in public speaking situations. In line with these argumentations, Barrett (2006) proposed that emotions such as anxiety are not discrete entities; therefore, architecturally distinct circuits may not exist for them. In other words, a specific physiological signal does not depict a distinctive emotion. However, emotions do emerge through the process of categorization. Particularly, the experience of having an emotion takes place when the notion about the emotion is explained during categorization (Barrett, 2006; Quigley et al., 2021). In sum, our results, as well as those of other researchers, did not succeed in distinguishing clear unique correspondence between physiological reactivity and self-perceived public speaking anxiety. Consequently, it is not recommended to use only physiological measures to quantify public speaking anxiety. Previous meta-analyses have postulated that the effectiveness of psychological treatments can be underestimated by measuring their effects through physiological measures, though they favor the use of self-reported measures (Allen et al., 1989; Ebrahimi et al., 2019).

In addition, the data showed that high levels of self-reported public speaking anxiety predict poor performance quality, as evaluated by the participants and observers. However, the data is not informative about the underlying causes of this relationship. An earlier investigation also found state anxiety to be a significant predictor of performance quality (Menzel & Carrell, 1994). These authors highlighted that more time spent preparing the presentation leads to better speech performance. Particularly, the quality of that time spent preparing the presentation, time spent processing information cognitively, and time spent rehearsing seem to be important factors to increasing speech quality. Menzel and Carrell (1994) also indicated that high trait-anxious participants who prepare well can reduce their levels of state anxiety. As such, preparing and rehearsing the presentation seem to be important elements in both reducing self-reported public speaking anxiety and increasing performance quality.

Moreover, the results of this study showed a positive high correlation between speech performance as rated by the participants themselves and external observers. Specifically, the better the participants rate their performance, the better an external observer might rate it. However, the results demonstrated a significant gap between the self-and observer-rated speech performances. Individuals with public speaking anxiety evaluated their speeches as poorer compared to the external observers. This finding indicates that participants with public speaking anxiety underrate their speech performance in comparison to external observers. This result is consistent with previous studies (e.g., Hope, Heimberg, et al., 1995; Norton & Hope, 2001; Rapee & Lim, 1992). Furthermore, this negative bias seems to be greater among participants who report social anxiety disorder (SAD) than non-clinical individuals (Norton & Hope, 2001; Rapee & Lim, 1992).

4.1.2 Examining the relationship between public speaking anxiety, distress tolerance, and psychological flexibility

The results from the present study depicted that low levels of psychological flexibility predict high self-reported public speaking anxiety and low distress tolerance. In line with this finding, previous research has shown glimpses of the relationship between psychological flexibility and anxiety (Masuda & Tully, 2012; Tavakoli et al., 2019; Tirsch et al., 2012), as well as cognitive flexibility and generalized anxiety disorder (GAD; Hazlett-Stevens, 2001; Lee & Orsillo, 2014). These results emphasize the role of psychological flexibility in the treatment of public speaking anxiety among university students. However, future research is necessary to ascertain whether public speaking anxiety can be decreased by increasing psychological flexibility.

Furthermore, the results of this study identified Openness to Experiences as an important component of psychological flexibility for public speaking anxiety. Specifically, when building psychological interventions that aim to decrease public speaking anxiety among college students, shaping skills related to Openness to Experiences seems to be key. Openness to Experiences refers to the willingness to experience internal thoughts and feelings without trying to control or avoid them. However, Openness to Experiences seems unrelated to public speaking distress tolerance (i.e., speech duration). For the latter, Behavioral Awareness (i.e., self-as-context, mindfulness; Hayes et al., 2011) and Valued Actions (i.e., values, committed action; Hayes et al., 2011) are the most relevant aspects of psychological flexibility.

Overall, the current findings highlight the role of psychological flexibility in public speaking anxiety, identifying Openness to Experiences as an important skill to train university students to use. However, if one wants to increase public speaking distress tolerance among students, training skills related to Behavioral Awareness and Valued Actions might be more relevant.

4.1.3 The effect of a brief hierarchical-self versus distinction-self-based intervention on public speaking anxiety

Brief Hierarchical-Self and Distinction-Self interventions, as well as the related control group, reduced levels of public speaking anxiety after a 37-minute training session that consisted of a 20-minute speech challenge (two speeches lasting 10 minutes each) and 17-minute intervention. As all the groups underwent brief repeated exposure training to the feared situation, and exposure training is one of the first-line tools for public speaking anxiety, the control group can be considered an active group as well. It is also important to note that, even when no significant interaction effect was observed in self-reported public speaking anxiety, the between-group ($d = 0.28$) and within-group effect sizes ($d = 0.52$ vs. 0.22) evidenced a small additional effect for the Distinction-Self intervention in comparison to the control condition.

Although there was a significant overall improvement in psychological flexibility skills when considering all the groups as a whole, only the Hierarchical-Self and Distinction-Self interventions resulted in increased psychological flexibility; participants in the control group did not increase this skill significantly at post-intervention.

According to the results, none of the groups reduced sympathetic nervous system activity. This is in congruence with previous studies, which indicated that the effect of the interventions might be less evident when measuring changes in physiological reactivity and encouraged researchers and clinicians to use physiological measures in conjunction with self-report questionnaires and/or behavioral measures (Ebrahimi et al., 2019). In other words, it is not advisable to solely rely on physiological measures to assess public speaking anxiety, and whenever possible, self-report questionnaires should be used.

Furthermore, the results from the regression analysis highlighted that although the effects of both interventions (Distinction-Self and Hierarchical-Self) are somewhat similar, their changes might be explained by different psychological processes. More specifically, in the Distinction-Self intervention, the decrease in public speaking anxiety was explained by changes in the skills of being Centered (perspective from which a person can observe self-content flow) and being Entangled with thoughts (fusion with self-content). Meanwhile, in the Hierarchical-Self intervention, the changes in self-reported public speaking anxiety were explained by changes in Openness to Experiences, which refers to the willingness to experience thoughts and feelings without trying to control or avoid them. Consequently, it can be inferred that Distinction-Self shape skills related to self-perspective skills that result in a significant decreased in self-reported public speaking anxiety, while Hierarchical-Self shape skills closely related with acceptance.

4.2 Limitations

Although the present research offers novel and meaningful information on public speaking anxiety, it does have several limitations. In relation to **Study I**, the participants did not speak before a live audience; instead, they spoke before a video-recorded audience. Thus, this simulated situation did not register in vivo public speaking anxiety. Second, only undergraduate university students took part in this study; therefore, the findings cannot be generalized to clinical groups. However, this segment of the population was chosen due to the high occurrence of public speaking anxiety within this group. Third, only one scale was used to measure public speaking anxiety (the principal dependent variable). Nevertheless, this scale (PRCA) has been widely used in the research of speech anxiety/communication apprehension. In addition, a behavioral task was implemented to measure distress tolerance in relation to public speaking. Fourth, regarding the behavioral task, speech duration was interpreted as an index of public speaking distress tolerance. However, speech duration could possibly be influenced by other variables, including previous experience speaking in public and speech ability. Fifth, the study's design is based on correlations. Thus, additional research is needed to ascertain the causal nature of the relationship among the variables. Sixth, physiological reactivity was measured using both HRV and EDA. The lack of additional physiological measures limits our conclusions. Therefore, further research can incorporate other measures, such as cortisol levels (i.e., neuroendocrine responses), muscle activity, and respiration. Seventh, although the current study contained a sample of extremely anxious students to give the requested speech, it might have happened that many students with extremely high anxiety did not volunteer to participate in this research due to its theme. Subsequently, these results could be different if a larger portion of extremely anxious students is included in the sample. Thus, additional studies are needed to illustrate this matter.

In relation to **Study II**³, psychological flexibility was assessed using the CompACT, which is a new scale that has not been widely used. However, the CompACT has shown good validity and reliability. Additionally, the advantage of using the CompACT over the traditional questionnaire (AAQ, Acceptance and Action Questionnaire) is that it provides further information on the different aspects of psychological flexibility (i.e., Valued Actions, Openness to Experiences, and Behavioral Awareness). Potentially, this information could lead us to a better understanding of the most relevant features of psychological flexibility to consider when developing interventions for a specific disorder.

Regarding **Study III**, several limitations are worth mentioning. First, the psychological intervention that was used in the experiment only lasted 17 minutes (the whole experiment lasted 37 minutes, comprised of the 17-minute

³ Some of the limitations included in Study I are also applicable to Studies II and III. However, these were not mentioned again to avoid redundancy.

intervention and two speeches that lasted a maximum of 10 minutes each). Possibly, this treatment's length was too short for the participants to learn new psychological competencies. Second, the study's method did not include follow-up measures. It is possible that the benefits of attaining a self-as-context stand could be evidenced in the long run. Third, it could be that the task of giving a speech behind a camera is extremely distressing for individuals with public speaking anxiety. This condition could undermine their ability to attain a self-as-context stand and the benefits that arise from it. Fourth, the intervention was audio-recorded before the experiment and delivered through a speaker. All the participants received the same intervention, so they could have missed the benefits of getting a personalized treatment that teaches them to frame their own thoughts and feelings as "different from them" (distinction framing) or "part of them" (hierarchical framing). Fifth, the study design did not inform how the participants framed their experiences (i.e., thoughts, feelings sensations) when exposed to the intervention (e.g., did the participants in the Distinction-Self intervention actually frame their own experiences as different from them?). Sixth, the number of participants in each group was relatively small. Therefore, the results are somehow underpowered. I thus call for more studies that use a larger sample in each group. Seventh, the study focuses on a specific syndrome (i.e., public speaking anxiety). This classification obeys a nosology system that despite presenting advantages (e.g., common language among professionals) has been an unsuccessful strategy in psychology (Hayes et al., 2020). Another limitation of the current research involves the level of analysis. The data was analyzed nomothetically instead of ideographically. This research strategy considers all individuals "mean individuals," which is fictitious. Therefore, although the conclusions drawn from this study are insightful, they should be carefully interpreted.

4.3 Future research

Further research is needed to replicate and validate the findings derived from this study. Moreover, the present research emphasizes the role of psychological flexibility when treating public speaking anxiety in university students. However, this assumption is based on the relationship between these variables (i.e., psychological flexibility and public speaking anxiety). Therefore, I call for studies that examine whether public speaking anxiety can actually be influenced (i.e., reduced) by increasing psychological flexibility skills. Generally, the main conclusions derived from this research are based on the relationship among variables, so further research is needed to ascertain these relationships' precise causal nature. In principle, this knowledge could inform clinical practice. Additionally, instead of centering research on nomothetic strategies, I encourage researchers to utilize technology to collect data from single individuals, thus making statistical analyses possible at the individual level.

It is also worth examining single processes from an RFT perspective in laboratory settings (i.e., experimental conditions), where variables can be better

controlled. A greater comprehension of the single processes responsible for the treatment outcomes could possibly result in interventions high in precision, scope, and depth. Furthermore, future research should examine whether this study's conclusions on public speaking anxiety are extendable to social and general anxiety.

4.4 Clinical implications

This research's findings provide insights relevant for clinical settings. The data indicates that psychological flexibility is an important construct that deserves attention from clinicians addressing public speaking anxiety, whether they are involved in decreasing their clients' perceived speech anxiety or increasing distress tolerance while speaking in public. Furthermore, as the psychological flexibility aspect Openness to Experiences is the strongest predictor of self-reported public speaking anxiety, clinicians are recommended to focus on developing this skill in their clients when treating public speaking anxiety. For this, clinicians can provide metaphors and experiential exercises that aim at shaping acceptance and cognitive defusion (e.g., "yes and no," "caring exercise," "disobey on purpose," "give your mind a name and listen to it politely"; Hayes, 2019). However, Openness to Experiences was unrelated to public speaking distress tolerance (speech duration). To shape clients' public speaking-related distress tolerance, clinicians are recommended to focus on training the skills Behavioral Awareness and Valued Actions (e.g., "values writing," "mindfulness exercises"; Hayes, 2019).

Additionally, clinicians as well as researchers are encouraged to use self-reported measures to assess public speaking anxiety, as many self-reports have shown good psychometric properties. They are also easy to implement and have minimal costs. On the other hand, both clinicians and researchers are advised not to rely exclusively on physiological measures. Physiological measures inform on the levels of arousal, but arousal is not necessarily the same as anxiety. For this reason, physiological measures should be used in conjunction with self-report measurements or behavioral measures. Furthermore, SCR is related to distress tolerance/avoidance. Thus, it can be hypothesized that increasing levels of distress tolerance and decreasing avoidance result in less physiological reactivity in anxiety-provoking situations (and vice versa). In addition, since lower levels of self-reported public speaking anxiety are related to higher-quality speech performance, it could be expected that decreasing self-reported public speaking anxiety might result in increased speech performance quality. To conclude, our data proposes that self-reported public speaking anxiety predicts both avoidance behavior (speech duration) and speech performance, but not physiological reactivity while presenting.

Participants with high speech anxiety seem to be more critical of how well their performance went in relation to observers. Therefore, it might be important to train skills related to self-critical evaluations in this population. Moreover, in

terms of clinical relevance, our results suggest that one training session that includes two speech challenge tasks could be enough to reduce public speaking anxiety levels. However, our within-effect sizes indicate that a self-as-context intervention might have additional benefits.

4.5 Main conclusions

This work provides an overview of the different measures used to assess public speaking anxiety. Additionally, the current work reviewed the acceptability, feasibility, and efficacy of the interventions available for public speaking anxiety, examining more specifically interventions based on acceptance and commitment therapy (ACT). Moreover, this research examined the impact of self-as-context interventions from an RFT perspective to overcome public speaking anxiety. From the first study, it can be concluded that self-reported measures are most advisable to use when assessing public speaking anxiety, as they are reliable measures that have been associated with actual behavior (speech task). However, relying on physiological measures alone to assess public speaking anxiety is not recommended. The second study highlighted that psychological flexibility is an important skill to train in university students reporting high levels of public speaking anxiety. Furthermore, openness and willingness to experience thoughts and feelings might be the key aspect of psychological flexibility to encourage when aiming to decrease public speaking anxiety. However, if one wants to decrease avoidance behavior related to public speaking, concentrating on behavioral awareness and valued actions might be more effective. The results from the third study also suggested that adding a brief self-as-context intervention to exposure might result in additional benefits in reducing public speaking anxiety, although more studies are needed to confirm this. It is also worth noting that when delivering a distinction-self-as-context intervention to university students, the decreases in public speaking anxiety are explained by changes in self-perspective skills (centered and entangled). However, changes in openness to experiences can also predict changes in public speaking anxiety when delivering a hierarchical-self-as-context.

YHTEENVETO (SUMMARY)

Hyväksymis- ja omistautumisterapia esiintymisjännitykseen

Esiintymisjännitys on hyvin yleinen ongelma. Noin joka kolmas opiskelija Suomessa kokee esiintymisjännityksen vakavaksi ongelmaksi. Esiintymisjännityksellä voi olla kielteisiä vaikutuksia opiskeluun, uravalintoihin ja se voi myös aiheuttaa ongelmia työelämässä. Tässä väitöskirjassa selvitetään kolmen tutkimuksen avulla, miten hyväksymis- ja omistautumisterapiaa hyödyntäviä menetelmiä voidaan soveltaa esiintymisjännityksen ymmärtämiseen ja sen vähentämiseen. *Tutkimuksessa I* olimme kiinnostuneita selvittämään, ovatko esiintymisjännitykseen liittyvän ahdistuksen eri osa-alueet yhteydessä toisiinsa. Näitä osa-alueita olivat itseraportoitu ahdistus, fysiologinen reaktiivisuus, ahdistukseen liittyvä välttämiskäyttäytyminen sekä oma ja ulkopuolisten arvio esiintymisestä. Aikaisempien tutkimusten perusteella oletimme, että itseraportoidulla ahdistuneisuudella ja fysiologisella reaktiivisuudella esiintymistilanteessa ei olisi yhteyttä. Lisäksi odotimme, että itseraportoidulla ja ulkopuolisten tekemällä arvioinnilla esiintymistilanteesta ei olisi yhteyttä. Tutkimuksessa II selvitimme, olivatko itse raportoitu esiintymisahdistus ja esiintymistilanteeseen liittyvä välttämiskäyttäytyminen yhteydessä psykologiseen joustavuuteen. Lisäksi olimme kiinnostuneita tunnistamaan psykologisen joustavuuden osatekijöitä, jotka olivat voimakkaimmin yhteydessä esiintymisahdistukseen. Tätä tietoa voitaisiin hyödyntää kehitettäessä interventioita, joilla pyritään vähentämään esiintymistilanteisiin liittyvää ahdistusta ja pelkoa sekä esiintymistilanteisiin liittyvää välttämiskäyttäytymistä. Tutkimuksessa III tutkimme, ovatko suhdekehysteoriaan perustuvat interventiot tehokkaita vähentämään esiintymistilanteessa esiintyvää ahdistusta. Tutkimme erityisesti hierarkkista ja erottelevaa suhdekehystä ja niiden vaikutuksia itseraportoituun esiintymisahdistukseen, psykologiseen joustavuuteen, välttämiskäyttäytymiseen ja fysiologiseen reaktiivisuuteen. Lisäksi olimme kiinnostuneita tunnistamaan, mitkä psykologisen joustavuuden osa-alueet selittivät esiintymiseen liittyvän ahdistuksen vähenemistä.

Menetelmät, joiden avulla esiintymisjännitystä tutkittiin, on kuvattu seuraavassa kappaleessa. Aluksi tutkimusten I ja II (n=95) ja tutkimuksen III (n=117) osallistujat allekirjoittivat suostumuksen tutkimukseen ja täyttivät taustatietolomakkeen. Alkumittaus sisälsi neljä kyselylomaketta, jotka mittasivat ahdistusta esiintymistilanteissa (PRCA-PS), minäkäsitystä (3D-RISP), omiin ajatuksiin samaistumista (SCFQ) ja yleistä psykologista joustavuutta (CompACT). Seuraavaksi tutkija asetti elektrodit fysiologisia mittauksia varten sykkeen ja sympaattisen hermoston aktiivisuuden mittaamiseksi. Aluksi osallistujilta mitattiin fysiologisen toiminnan perustaso. Seuraavaksi osallistujia kehoitettiin pitämään 10 minuutin puhe omasta itsestään, erityisesti vahvuuksistaan ja heikkouksistaan. Esiintymisen aikana jatkettiin fysiologisia mittauksia saadaksemme selville, millä tavalla henkilö reagoi fysiologisesti esiintymistilanteeseen. Vaikka osallistujia kannustettiin puhumaan mahdollisimman pitkään, heillä oli myös mahdollisuus lo-

pettaa puhe silloin kun he halusivat, jos he tunsivat merkittävää ahdistusta. Ennen kuin osallistujat aloittivat puheen, he arvioivat ahdistuksen tasoa ja halukkuuttaan esiintyä. Ennen puheen pitämistä heillä oli kolme minuuttia aikaa miettiä, mitä he sanoisivat puheen aikana. Nauhoitetun esiintymistilanteen aikana osallistujat näkivät suurella näytöllä videolle tallennetun yleisön, joka kuunteli osallistujan puhetta. Puheen päätyttyä osallistujat arvioivat oman puheensa onnistumista (SPS-SR), jota käytettiin kuvaamaan heidän omaa käsitystään puheen laadusta. Tallennetun esityksen arvioivat myös ulkopuoliset arvioijat, jotta saataisiin käsitys siitä, onko toisten tekemä arvio puheen onnistumisesta yhtenevä esittäjän itsensä tekemän arvion kanssa.

Tutkimuksessa III selvitettiin kahden hyvin lyhyen suhdekehysteoriaan perustuvan intervention – hierarkkisen ja erottelevan – vaikutusta esiintymisjännitykseen. Hierarkkisessa interventiossa opetettiin, että minä olen paikka tai tila, jossa tunteita ja ajatuksia esiintyy. Erottelevassa interventiossa opetettiin tunteiden ja ajatusten olevan minusta erillään. Osallistujat kuuluivat interventiot äänitteinä, joiden pituus oli 17 minuuttia. Osallistujat jaettiin satunnaisesti joko näihin kahteen suhdekehyspohjaiseen interventioon tai vertailuryhmään, jossa he kuuluivat vastaavan pituisen äänitteen kirjasta Taru sormusten herrasta. Kun tämä kuuntelujakso päättyi, osallistujia kehoitettiin pitämään toinen puhe. Heille annettiin samat ohjeet kuin ensimmäisessä puheessa eli kertomaan vahvuuksistaan ja heikkouksistaan. Tällä kertaa heitä pyydettiin soveltamaan joko hierarkkisia tai erottelevia suhdekehyskäsitteitä, jotka opetettiin äänitteissä. Vertailuryhmälle ei annettu vastaavia ohjeita. Toisen puheen jälkeen osallistujat täyttivät samat kyselylomakkeet kuin kokeen alussa: PRCA-PS, CompACT, 3D-RISP ja SCFQ.

Tutkimuksen I tulokset osoittivat, että itseraportoitu esiintymistilanteessa koettu ahdistus ennusti esityksen pituutta ja omaa arviota esityksen onnistumisesta. Henkilöt, jotka kokivat paljon ahdistuneisuutta ennen esiintymistä, puhuivat myös lyhyemmän aikaa kuin henkilöt, jotka raportoivat vähemmän ahdistuneisuutta. Tämä viittasi siihen, että itsearviointilomakkeella mitattu ahdistus näyttäisi ennustavan myöhemmin tapahtuvaa käyttäytymistä esiintymistilanteissa. Yleisellä tasolla tämä tulos vahvistaa itsearviointilomakkeiden hyödyllisyyttä psykologisissa hoidoissa. Itseraportoitu esiintymistilanteisiin liittyvä ahdistuneisuus ei ollut yhteydessä esiintymistilanteessa mitattuihin fysiologisiin reaktioihin. Henkilöillä, jotka raportoivat paljon ahdistuneisuutta esiintymistilanteissa ei havaittu olevan niistä henkilöistä poikkeavaa fysiologista reaktiivisuutta, jotka raportoivat vähemmän ahdistuneisuutta. Tutkimuksessa havaittiin myös, että esiintymisahdistusta kokevat henkilöt aliarvioivat selviytymistään esiintymistilanteista. Ulkopuolisten tekemät arviot esiintymisestä olivat järjestelmällisesti parempia verrattuna esiintyvien omiin arvioihin.

Tutkimuksen II tulokset osoittivat, että psykologinen joustavuus oli yhteydessä sekä itseraportoituun ahdistukseen esiintymistilanteissa että esityksen pituuteen. Henkilöt, jotka raportoivat alhaisempaa psykologista joustavuutta kokivat suurempaa esiintymiseen liittyvää ahdistuneisuutta ja pitivät lyhyempiä esityksiä. Tarkasteltaessa psykologisen joustavuuden osa-alueita havaittiin, että

avoimuus omia kokemuksia kohtaan ennusti kaikkein voimakkaimmin itseraportoitua esiintymiseen liittyvää ahdistuneisuutta. Sen sijaan esiintymisen pituus, jonka voidaan katsoa kuvastavan välttämiskäyttäytymistä, oli yhteydessä muihin psykologisen joustavuuden osa-alueisiin. Esiintymistilanteisiin liittyvä välttämiskäyttäytyminen oli yhteydessä psykologisen joustavuuden osataitoihin *tietoisuus omasta toiminnasta ja arvojen mukaiset teot*. Nämä havainnot viittasivat siihen, että koettuun ahdistuneisuuteen ja toimintaan ahdistavissa tilanteissa oli vat yhteydessä erilaiset psykologisen joustavuuden taidot.

Tutkimuksen III tulokset viittasivat siihen, että sekä hierarkkiseen että erottelevaan suhdekehukseen perustuvat interventiot vähensivät esiintymiseen liittyvää ahdistuneisuutta. Myös vertailuryhmä, joka sai kaksi kertaa toistuneen esiintymisharjoittelun tai altistumisen esiintymiselle, osoitti positiivisia muutoksia. Muutokset kontrolliryhmässä olivat kuitenkin hieman pienempiä kuin ryhmässä, joihin oli lisätty suhdekehysiin perustuvaa harjoittelua. Nämä tulokset viittasivat siihen, että esiintymiseen liittyvä ahdistuneisuus voi vähentyä jopa yhden tai kahden esiintymisharjoittelun jälkeen. Tutkittaessa esiintymiseen liittyvän ahdistuneisuuden vähenemistä selittäviä muutosprosesseja, tässä tapauksessa psykologista joustavuutta, havaittiin, että vaikka esiintymisen aiheuttama ahdistuneisuus väheni merkitsevästi kaikissa kolmessa interventiossa, näitä muutoksia näytti selittävän erilaiset muutosprosessit. Erotteleviin suhdekehysiin perustuvassa interventiossa ahdistuksessa tapahtunutta muutosta selittivät muutokset minäkäsitykseen liittyvissä taidoissa. Tämä viittasi muutoksiin siinä, miten suhtaudutaan itseä koskeviin ajatuksiin. Hierarkkisessa interventiossa ahdistuksen muutoksia selittivät muutokset halukkuudessa kokea ajatuksia ja tunteita ilman välttämistä ja kontrollointia.

Kaiken kaikkiaan työ antoi lisätietoa siitä, miten ja millä menetelmillä esiintymiseen liittyvää ahdistuneisuutta ja pelkoja kannattaa arvioida ja mitata. Esiintymistilanteisiin liittyvä itsearvioitu ahdistuneisuus kyselylomakkeen avulla osoittautui hyväksi mittausmenetelmäksi. Tutkimus antoi myös lisätietoa psykologisista prosesseista, jotka selittävät esiintymiseen liittyviä ongelmia. Esiintymiseen liittyvää ahdistuneisuutta selitti se, miten avoimia uskallamme olla kokemiamme tunteita ja ajatuksia kohtaan. Mitä avoimempi tutkittava oli, sitä vähemmän hän koki ahdistuneisuutta. Esiintymiseen liittyvää välttämiskäyttäytymistä, joka ilmenee esim. siinä, miten pitkään on halukas esiintymään, selittivät tietoinen huomion suuntaaminen esiintymiseen ja esiintymisen yhdistäminen itselle merkityksellisiin asioihin. Näistä tietoinen huomion suuntaaminen oli merkittävämpi tekijä. Tutkimus antoi myös lisätietoa muutosprosesseista, jotka selittävät miksi psykologinen interventio vähentää ahdistuneisuutta. Kun esiintymis-ahdistusta kokevaa henkilöä opetettiin käsittelemään esiintymiseen liittyviä epämiellyttäviä ajatuksia ja tunteita itsestä erillisinä asioina, ahdistuksen muutosta selitti vähäisempi samaistuminen omiin ajatuksiin. Kun esiintymis-ahdistusta kokevaa henkilöä opetettiin käsittelemään esiintymiseen liittyviä epämiellyttäviä ajatuksia ja tunteita siten, että hän näki ne osana itseään, ahdistuksen muutosta selitti muutos hyväksynnässä, halukkuudessa kokea tunteita ja ajatuksia.

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ORIGINAL PAPERS

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MEASURING PUBLIC SPEAKING ANXIETY: SELF-REPORT, BEHAVIORAL AND PHYSIOLOGICAL

by

Ana Gallego, Louise McHugh, Markku Penttonen, & Raimo Lappalainen,
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Abstract

Self-reports are typically used to assess public speaking anxiety. In this study, we examined whether self-report, observer report, and behavioral and physiological reactivity were associated with each other during a speech challenge task. A total of 95 university students completed a self-report measure of public speaking anxiety before and after the speech challenge. Speech duration (i.e., behavioral measure), physiological reactivity, as well as speech performance evaluated by the participants and observers were also recorded. The results suggest that self-reported public speaking anxiety predicts speech duration, as well as speech quality, as rated by the participants themselves and observers. However, the physiological measures were not associated with self-reported anxiety during the speech task. Additionally, we observed that socially anxious participants underrate their speech performance in comparison to their observers' evaluations.

Keywords

public speaking anxiety, social anxiety, distress tolerance, speech challenge, behavioral assessment task, physiological reactivity

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Introduction

Speaking in public is the most commonly reported fear in the general population (Dwyer & Davidson, 2012; Sawyer, 2016). Public speaking anxiety is considered a social anxiety disorder and refers to the anxiety that an individual experiences when giving a speech or preparing to speak in front of others. In Finland, one in three students report that speaking in public is a severe problem for them (Kunttu et al., 2017). In the U.S., more than 61% of university students note a fear of speaking in public (Dwyer & Davidson, 2012). However, public speaking is an important skill for undergraduate students to learn and practice as they progress through their education and careers. To that end, speaking in public is a common requirement in undergraduate courses that encourages students to present their work and ideas to increase competency. For individuals who experience public speaking anxiety, speaking in public can have a negative impact on both their physical and emotional wellbeing. Public speaking anxiety symptoms can manifest in many different ways, such as bodily sensations, irrational thinking (e.g., “I’m concerned I’ll appear incompetent”), altered emotions, and avoidant behavior (Daly et al., 1997).

Self-report methods are the most commonly used measure in psychology (Paulhus & Vazire, 2009). This popularity is based on a number of advantages, including the method’s low cost and the opportunity to administer it in a mass testing session, where hundreds of variables can easily be collected at once. However, although some studies suggest that self-reports are adequate indexes of actual behaviors and attitudes (e.g., Corral-Verdugo & Figueredo, 1999), other studies suggest the opposite (e.g., Fuj et al., 1985). In the public speaking anxiety literature, self-reports are the most widely used tool to assess speech anxiety. Still, speech challenges (i.e., behavioral assessment task, BAT) are frequently used to assess avoidant behavior/distress tolerance in public speaking (Beidel et al., 1989). Physiological measures have also commonly been used to assess physiological reactivity while giving a public speech (Sawyer & Behnke, 1999). Subsequently, previous studies have explored the interrelationships among public speaking anxiety components to evaluate the validity of using different systems to assess public speaking anxiety (Bodie, 2010). In contrast, in a review of the public speaking anxiety literature, Clevenger (1959) suggests that even when different measures (e.g., cognitive, physiological, and behavioral) report high reliability, these measures are not meaningfully correlated. After approximately 30 years of research, McCroskey (1984) states that self-reports, physiological arousal indicants, and observer ratings of public speaking anxiety do not measure the same thing. In sum, since Clevenger’s (1959) statement, the concern about

whether these systems are related has been a major concern in the public speaking anxiety literature (Bodie, 2010). Yet, the interrelationship among the different measures that assess speech anxiety is not fully understood even in the present day. Furthermore, research has demonstrated that the effectiveness of psychological interventions in the reduction of social and public speaking anxiety differs depending on the measurements used to assess it (Allen, 1989; Ebrahimi et al., 2019). For instance, several studies have found that the effectiveness of interventions evaluated through self-reports is greater compared to that of physiological and behavioral measures (Heimberg et al., 1990). Therefore, this current gap in the literature could mislead both researchers and practitioners to misidentify levels of public speaking anxiety, resulting in erroneous conclusions and interpretations.

Given the fact that different measures (self-report, behavioral, and physiological) might capture different facets or skills during a speech challenge, it is important to understand how these different measures are related to each other and speech performance. Thus, we investigated whether four components of public speaking were related to each other during a speech challenge task. These components were self-report, observer report, and behavioral and physiological reactivity. Based on the previous literature, we predicted that self-reported public speaking anxiety is unrelated to physiological measures. To the best of our knowledge, there is no previous research about the connection between speech duration and physiological measures. In addition, we predicted that the speech performances evaluated by the participants and external observers are connected to each other, but that there is a significant difference in the level of evaluation between them. We expected this result since previous studies indicate that participants with social anxiety underestimate their speech performance in comparison to external observers (Rapee & Lim, 1992).

Method

Participants

The participants ($n=106$) were university students recruited from the Department of Education and the Language Centre at the University of Jyväskylä. These students were recruited from introductory courses that aimed to improve communication skills. At the start of each course, the students received the following information: “The study is related to public speaking and communication skills. You will have the possibility to give a speech in front of a camera; meanwhile, your physiological reactivity will be recorded. In addition, you will fill in some psychological questionnaires. For

this, you will not need to prepare anything beforehand.” After this, the courses’ principal teacher sent the students an online scheduling tool through which they could voluntarily sign up for the experiment. All participants were undergraduate students. For ethical reasons, we conducted the experiment with all the students that signed up. However, we excluded from the analyses participants who were taking psychogenic medication or did not fill in their personal information ($n=11$). This resulted in a final sample of 95 participants (53% female). Their ages ranged from 20 to 46 ($M=24.61$, $SD=4.77$), and the amount of years they had been studying at the university ranged from 1 to 8 ($M=2.61$, $SD=1.42$).

Procedure

The experiment was conducted individually at the Department of Psychology. In the experiment room, an individual participant sat in a chair in front of a video camera situated at eye level. Behind the camera was a 65-inch TV screen, and behind the participant there was an amplifier (BrainVision QuickAm with 32 EEG and 8 physiological channels) to record electrodermal and electrocardiogram activity. Next to the participant were the self-report questionnaires and a pen. The researcher was in an adjacent room equipped with two computers and a laptop. One of the computers was used to play the audio-recorded instructions, the other computer managed the BrainVision recorder program, and the laptop was used to play a video-recorded audience on the TV screen in front of the participant. To monitor the participants and communicate with them, there was a 23” TV screen and microphone connected to a speaker in the participant room.

The experiment consisted of six phases. First, the participants were asked to fill in their informed consent and background/personal information. Second, they completed the self-report questionnaires (for more information, see the Measures section). In addition, the recording of physiological activity (heart rate and electrodermal activity) started at this phase and continued during the following phases. Third, the participants were asked neutral questions to use as a baseline for their physiological measurements. Fourth, as a behavioral task, the participants were instructed to give an impromptu 10-minute speech about themselves, including their strengths and weaknesses, in front of the camera and video-recorded audience. Fifth, before beginning to talk, the participants were allowed 3 minutes to plan their speech. Sixth, the participants gave their speeches (Figure 1). The termination of the speech task before the end of the 10-minute period was assessed as avoidance behavior and the total amount of time (speech duration) that they spoke as distress tolerance (England et al., 2012; Gallego et al., 2020).

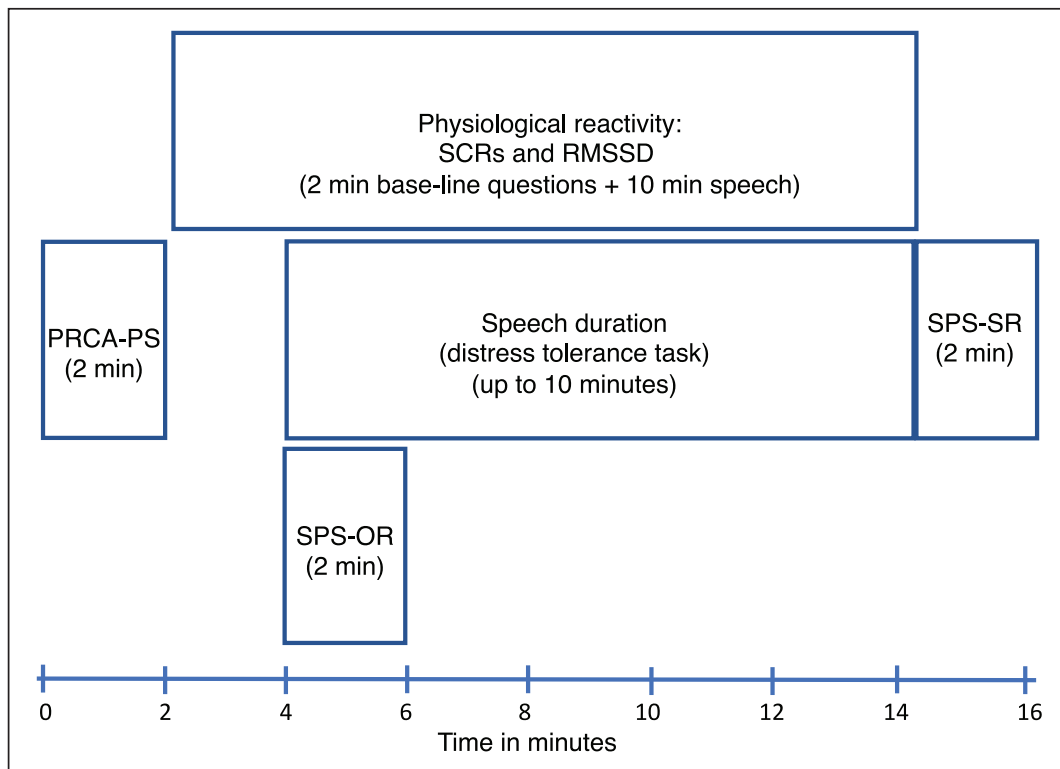


Figure 1. Procedure timeline.

Note. PRCA-PS = self-reported public speaking; SCRs = skin conductance responses; RMSSD = heart-rate variability-root mean square of successive RR interval differences; SPS-SR = self-perceived speech performance; SPS-OR = others-perceived speech performance.

Measures

Self-report measures

Personal Report of Communication Apprehension, Public Speaking Subscale (PRCA-PS). This subscale includes six items (e.g., “My thoughts become confused and jumbled when I am giving a speech”). Each item is graded on a 5-point Likert scale from 1 (*strongly agree*) to 5 (*strongly disagree*). Lower scores indicate less apprehension about speaking in public. Scores can range from 6 to 30. Moderate levels of anxiety toward speaking in public range from 13.75 to 20.75, and high levels oscillate from 20.75 to 30. The validity and reliability of this scale are well known. In a previous study, the subscale’s Cronbach’s alpha shows an excellent reliability for all items (McCroskey et al., 1985). In the present study, the PRCA-PS demonstrated good internal consistency (Cronbach’s alpha = .85; McCroskey, 1982).

Social Performance Scale Self-Reported Version (SPS-SR). After the speech challenge, the participants assessed their perceived speech performance

through the self-reported version of the SPS. This scale includes 17 items rated on a 5-point scale from 0 (*not at all*) to 4 (*very much*). Final scores range from 0 to 68, with greater scores indicating a higher-quality perceived performance. The scale's validity and reliability have been proven in previous research (Rapee & Lim, 1992; Tutino et al., 2020). In this study, the internal consistency was .88 (Cronbach's alpha; Rapee & Lim, 1992).

Visual Analog Scales (VAS). In this study, the students answered the following question: "How *uncomfortable* do you feel to give the speech?" The participants were instructed to indicate how they felt by placing an X on a printed line that ranged from 0 (*not uncomfortable at all*) to 10 (*extremely uncomfortable*). According to Boonstra et al. (2014), a score ≤ 3.8 indicates mild symptoms, between 3.9 and 5.7 moderate, and scores ≥ 5.8 severe.

Observers' evaluation

Social Performance Scale Other-Reported Version (SPS-OR). After the experiment, independent raters evaluated the video-recorded speeches. The SPS-OR was used to assess speech performance as perceived by these external evaluators. The scale consists of 17 items that gauge performance features (e.g., voice clarity, fidgeting). Each item is rated on a 5-point Likert scale. Scores can range from 0 to 68, with higher numbers indicating a better performance. Research has shown that the SPS-OR's rating is valid and reliable (Rapee & Lim, 1992; Tutino et al., 2020).

Two independent evaluators rated each video speech. During the training phase, an expert from the Language Centre of the University of Jyväskylä trained the observers to assess the speakers' performances. The expert and observers examined the SPS-OR together to have a common consensus on the items' meaning. The expert and observers also evaluated a video sample together to reach agreement on the evaluation criteria. After that, the observers evaluated another video sample to check the ratings' consistency. The videos used during the training phase were selected from the piloting period of this study and were not included in this study's analyses (i.e., the videos were only used for training purposes). The videos included in the results of this study lasted a maximum of 10 minutes. However, due to limited resources, all videos were edited to 2 minutes. We selected the first 2 minutes of each speech for two reasons. First, there was a large variation in how long the participants gave their speeches, and all the participants talked for at least 2 minutes. Therefore, that was the period with the most reliable data. Second, research has identified four characteristics or phases during public speaking events: (1) anticipation—pre-speech, (2) confrontation—the first speaking minute, (3) adaptation—the last speaking minute, and (4) release—time

between the end of the speech and 1 minute post-speech (Behnke & Carlile, 1971; Carlile et al., 1977). Both of these reasons resulted in our decision to only include the confrontation phase. After the training phase was successfully completed, the rating phase took place. The video ratings were conducted in eight rounds, and the observers reviewed the reliability of the ratings on a rounds basis. In the first 7 rounds, each reviewer rated 10 videos, 6 of which were the same to calculate reliability. In between rounds, there was a practice evaluation to help maintain reliability. During these practice evaluations, the observers independently examined the same samples and then discussed their interpretations together. The evaluations done in the practice evaluation phase were not included in the results. The Cronbach's alpha for the two observers was 0.96.

Behavioral measures

Speech challenge. The participants were requested to give an impromptu speech: "I would like to invite you to give a 10-minute speech about yourself, your strengths, and weaknesses. I hope that you can speak for as long as possible. I will let you know when the time is up. If you decide to end your speech earlier, please say out loud, 'I want to stop.' Try to continue the speech if you can, even if you're not sure what you would say next. You can stop if necessary if you are anxious and you cannot continue. Now you have 3 minutes to think about what you want to say in your speech. If you want, you can write down what you want to say." The length of the speech provided a behavioral measure of avoidance/distress tolerance. The maximum duration for the speech was 10 minutes. Prior research proposes that ending a speech prematurely can be interpreted as an attempt to escape the anxiety that arises when speaking in front of others (England et al., 2012; Gallego et al., 2020). Accordingly, speech duration represented a behavioral measure of distress tolerance.

Physiological measures. *Electrodermal activity* (EDA) was measured with two skin-conductance electrodes (Ag/AgCl, EL 507, BioPac Systems) positioned on the participants' non-dominant palm, one placed beneath the thumb and the other under the fourth and fifth digits. The participants were asked to hold that hand on the chair's armrest without moving it. Skin conductivity was registered using a galvanic skin response module (Brain Products) that determined conductivity by directing a 0.5 V voltage between the electrodes and measuring the conductivity changes with a direct current (DC) amplifier. Skin conductance was recorded in DC mode using a BrainVision QuickAmp. The signal was low-pass filtered at 400 Hz and sampled at 1,000 Hz using the BrainVision Recorder 1.20.0801 program.

Electrocardiograms were registered using three electrodes (Ag/AgCl, Ambu Neuroline 710). One of the electrodes was situated on the left shoulder, another electrode was placed beneath the clavicle on the right side, and the last electrode was placed on the left side above the bottom ribs, forming a triangle encompassing the heart. The signal was high-pass filtered at 0.5 Hz, low-pass filtered at 400 Hz, and sampled at 1,000 Hz using the QuickAmp and Recorder program.

Data analysis plan. EDA was analyzed with MATLAB R2014a using Ledalab V3.4.9 (Benedek & Kaernbach, 2010). In this regard, rapid changes in EDA (skin conductance responses, SCRs) were separated from slowly varying activity (skin conductance level, SCL). Subsequently, the mean SCR values were computed for every phase of interest, depicting sympathetic nervous system activation. Heart-rate variability (HRV) was assessed from an electrocardiogram with Kubios HRV Premium programs (www.kubios.com). At first, the programs expunged automatically possible artifacts and counted successive interbeat intervals (RR intervals). The HRV index used in this study was the square root of the mean squared differences between successive RR intervals (RMSSD). The HRV index was computed for each phase of interest.

For the statistical analyses, both RMSSD and SCRs were normalized with a 2-minute baseline phase. In this phase, the participants were asked basic questions (e.g., “What is your name?”; “Where were you born?”; “Where are you from?”; and “What is your favorite season of the year?”). Changes in physiology during the speech were calculated by computing relative changes from the baseline using the following formula: (speech–speech baseline)/speech baseline (as a percentage). The analyses were conducted with these normalized variables to give consideration to the individual variation in physiological reactivity. All statistical analyses were performed using IBM SPSS Statistics 24. The correlations between the variables were investigated using the Pearson correlation test. A small correlation ranged from $r=0.10$ to 0.30 , a moderate correlation from $r=0.31$ to 0.50 , and a high correlation from $r=0.51$ to 1 (Cohen, 1992).

Results

In relation to how anxious the participants felt giving the impromptu speech, 57% reported high levels of anxiety, 20% moderate levels, and 22% lower levels (VAS). Regarding level of public speaking anxiety, in this study, 50% of the participants recorded having high anxiety, 42% moderate anxiety, and only 9% low anxiety. In the present study, the maximum speech length was

Table 1. Descriptive Statistics.

	Minimum	Maximum	Mean (SD)	95% Confidence interval	
				Lower	Upper
PRCA-PS	11	30	20.5 (4.75)	19.56	21.54
RMSSD	-0.44	5.70	0.09 (0.64)	-0.01	0.24
SCRs	-0.77	2.91	-0.18 (0.48)	-0.27	-0.07
VASI	0	10	5.76 (2.64)	5.21	6.28
SPS-SR	14	53	39.24 (9.52)	37.16	40.96
SPS-OR	37	67	56.42 (7.5)	54.13	58.63
Speech duration	1:12	10:00	7:45 (2:53)	7:06	8:20

Note. PRCA-PS = public speaking anxiety; RMSSD = heart-rate variability-root mean square of successive RR interval differences; SCRs = skin conductance responses; VASI = how uncomfortable does it make you feel to give the speech?; SPS-SR = self-perceived speech performance; SPS-OR = others-perceived speech performance.

10 minutes, and the mean time that the participants used for the speech was 7.45 minutes ($SD=2.53$; Table 1). The results of our study show that higher levels of self-reported public speaking anxiety (PRCA-PS) correlate with shorter speech duration (i.e., behavioral task of public speaking distress tolerance). This correlation is moderate ($r=-.31$, $p<.01$, $n=95$). According to the results, there is no correlation between self-reported public speaking anxiety (PRCA-PS) and SCRs ($r=.16$, $n=92$) or HRV (RMSSD; $r=.05$, $n=93$). However, higher levels of self-reported public speaking anxiety moderately correlate with poor self-perceived speech performance (SPS-SR; $r=-.42$, $p<.01$, $n=95$). Higher levels of self-reported public speaking anxiety also moderately correlate with poorer speech performance as perceived by external observers (SPS-OR; $r=-.40$, $p<.05$, $n=95$). These results are summarized in Table 2 and Figure 2. In addition, the results show that there is a positive correlation between self- and others-perceived speech performance ($r=.60$, $p<.01$, $n=95$), indicating that the better quality in speech performance evaluated by oneself, the better others might evaluate it. Nevertheless, a t-test identified a significant difference between self-perceived speech performance and speech performance as rated by external observers ($p<.01$), favoring the latter (self-performance $M=38.58$, $SD=9.55$, $N=103$; others-performance $M=56.28$, $SD=7.30$, $N=43$; Table 3). In relation to public speaking distress tolerance (i.e., speech duration), the data depicts that higher levels of distress tolerance correlate with lower levels of skin conductance activation ($r=-.23$, $p<.005$, $n=95$). Yet, there is no correlation with HRV

Table 2. Correlations.

	RMSSD	SCRs	Speech duration	SPS-SR	SPS-OR	VASI
PRCA-PS	.06	.16	-.31**	-.42**	-.40*	.48**
RMSSD	1	.14	.01	-.13	.10	-.05
SCRs		1	-.23*	-.03	-.49**	-.03
Speech duration			1	.13	.20	-.34**
SPS-SR				1	.60**	-.55**
SPS-OR					1	-.38*
VASI						1

Note. PRCA-PS = public speaking anxiety; RMSSD = heart-rate variability-root mean square of successive RR interval differences; SCR = skin conductance; SPS-SR = self-perceived speech performance; SPS-OR = others-perceived speech performance; VASI = how uncomfortable does it make you feel to give the speech?

*The correlation is significant at the 0.05 level. **The correlation is significant at the 0.01 level.

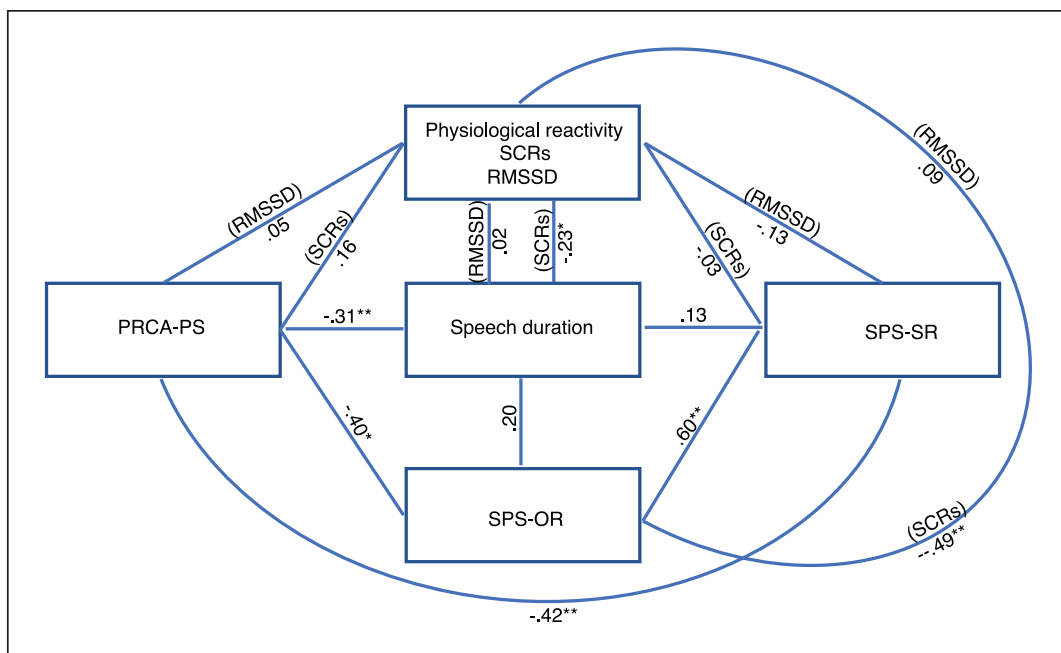


Figure 2. Correlations.

Note. PRCA-PS = self-reported public speaking anxiety; SCR = skin conductance responses; RMSSD = heart-beating-square root of the mean squared differences between RR intervals; SPS-OR = observer-evaluation of speech performance; SPS-SR = self-evaluation of speech performance; speech duration = public speaking distress tolerance.

($r=0.02$, $n=95$). Furthermore, there is no correlation between speech duration and speech performance as evaluated by the participant, nor with speech performance as evaluated by observers.

Table 3. Mean Score of Self- and Observers Ratings on Global and Specific Items on Public Speaking Performance.

Rating	SPS-OR		SPS-SR	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Specific items	42.95	3.44	31.36	6.21
Global items	13.48	4.01	7.25	4.21
Total score	56.29	7.30	38.58	9.56

Note. SPS-SR = self-perceived speech performance; SPS-OR = others-perceived speech performance.

Discussion

The present study aimed to examine the relationship between self-reported public speaking anxiety, a behavioral assessment of public speaking distress tolerance (i.e., speech duration), physiological reactivity during a speech challenge, and the quality of the speech as evaluated by both the participants and observers. The results depicted a negative and moderate correlation between speech duration and self-reported public speaking anxiety, suggesting that students who report high levels of public speaking anxiety also give shorter presentations. This may be indicative of an avoidance strategy. In line with this postulate, previous studies empirically demonstrate that individuals with higher levels of experiential avoidance have lower distress tolerance (Feldner et al., 2006; Zettle et al., 2005). Thus, our study indicates that self-reported public speaking anxiety can predict actual avoidance behavior.

The present results also showed no correlation between self-reported public speaking anxiety and physiological arousal as measured during the speech challenge. Thus, the current data indicates that physiological reactivity during presentations is unrelated to experiences or self-reported level of public speaking anxiety. These observations are in line with Schachter and Singer (1962). They argue that high physiological arousal creates urges to understand and label the activity of the sympathetic nervous system. The label that an individual chooses depends on situational cues “as interpreted by previous experiences” (Schachter & Singer, 1962). Therefore, the researchers suggested that an emotion is not fully explained by physiological arousal or cognitive perception alone, but the coaction of both. According to Behnke and Beatty (1981), public speaking anxiety can be understood, in part, as the predisposition to label the physiological arousal that arises when speaking in front of others as anxiety. Yet, for speakers for whom anxiety is not an appropriate label, they might understand physiological arousal as “exhilaration” or

“facilitative energy,” the consequence of which being that they might not report high levels of public speaking anxiety. More recently, in the theory of constructed emotions, Barrett (2006) postulates that purely physical sensations in the body do not have objective meaning. For instance, a change in heart rate is not objectively or necessarily an emotion. As a result, the effectiveness of using solely physiological reactivity measures to detect indexes of public speaking anxiety is called into question. Our study, as well as others, have been unable to identify clear unique physiological correlates to self-reported public speaking anxiety. However, if physiological measures are used in conjunction with self-reported measures of the speech anxiety trait, they might account for a high proportion of the total variance of anxious arousal (i.e., panic during a speech; Finn et al., 2009). Furthermore, meta-analyses by Allen (1989) and Ebrahimi et al. (2019) indicate that research on the effectiveness of physiological measures has demonstrated a small effect on public speaking anxiety treatment and favors the use of self-reported measures. Still, other studies have detected treatment effects in the form of reduced levels of physiological reactions, even when reductions in self-reported levels do not occur (Kircanski et al., 2012; Niles et al., 2015). Further research is needed to clarify these mixed findings.

Moreover, the distress tolerance task (speech duration) correlated with skin conductance but not heart rate. According to Barry and Sokolov (1993), arousal is more closely expressed through increases in SCL (sweating) than cardiac acceleration. This could provide an explanation of why skin conductance in the current study related to the behavioral measure of public speaking distress tolerance but not to self-reported public speaking anxiety. Additionally, it is important to note that both speech duration and SCL are objective measures independent from the participants’ subjective experiences. Furthermore, the results of this study indicated that high levels of self-reported public speaking anxiety are associated with low-quality speech performance as evaluated by both the participants themselves and external observers. In line with this finding, previous studies have demonstrated that visualization techniques (i.e., imagining giving a speech) are effective in enhancing performance, as well as reducing public speaking anxiety (Ayres & Hopf, 1992). Therefore, it can be hypothesized that using techniques meant to enhance speech performance might reduce self-perceived speech anxiety as a collateral effect.

Additionally, the results revealed a highly significant correlation between the quality of the speech performance as rated by the participants themselves and the external observers, indicating that speeches evaluated as better by the observers were also evaluated as better by the speakers themselves and vice versa. The study Daly et al. (1989) reports similar results. However, our

results also showed a significant difference between the participants' and observers' speech performance perceptions. This indicates that even when the speaker and external observers evaluated the speech performance as high, there was still a significant discrepancy between how skillful the speaker thought the speech was in comparison to the external evaluators. This indicates that the speakers underrated their speech performances in comparison to how the external observers evaluated their speeches. In line with this finding, Rapee and Lim (1992) report that socially anxious individuals show a greater discrepancy than normal controls between their speaking performance self-reports and observers' ratings. This discrepancy between the speaker's rating and that of the observers is larger for high-trait anxious speakers, as they rate their own performance more harshly than trained observers (Rapee & Lim, 1992).

There were a number of limitations to the current study. First, its design is correlational, and the results are thus based on the relationships between variables. Further research is needed to identify the exact causal nature of these relationships. Another limitation comes from the generalization of these results to a broader population. The current study was conducted with university students; as such, these findings are not directly transferable to clinical groups. Even so, this segment of the population was selected in view of the high rates of public speaking anxiety among undergraduate university students. Furthermore, in relation to the scales, only one questionnaire was used to assess self-reported public speaking anxiety. Still, the PRCA-PS is a well-documented and broadly used scale that has shown good psychometric properties. Additionally, physiological activity was only measured via HRV and EDA, which limits our conclusions on physiological reactivity. Future research could implement additional physiological measures, such as muscle activity, respiration, or neuroendocrine responses (i.e., cortisol levels). Moreover, although the current sample included a portion of students with severe/extreme levels of anxiety to give the requested impromptu speech, it is possible that many extremely anxious students did not volunteer for this study due to the nature of the topic. Consequently, the results could differ if a larger proportion of extremely anxious students is included. Accordingly, further studies are needed to clarify this issue.

In summary, the present study has a number of implications. First, according to our results as well as previous findings in the literature, it is not advisable to rely solely on physiological reactivity measures to assess public speaking anxiety. Arousal is not necessarily the same as anxiety (McCroskey, 1984). Therefore, physiological measures do not have sufficient face validity as indicators of public speaking anxiety to merit attention from researchers and practitioners concerned with this construct. On the other hand,

many self-report measures in the public speaking anxiety literature have demonstrated both good reliability and validity. As stated by McCroskey (1984), self-report measurements with good psychometric properties, when utilized for legitimate purposes, can be invaluable to practitioners and researchers assessing public speaking anxiety. Using self-report measurements with poor psychometric properties, or such measures when other instruments could be more suitable, is therefore bad praxis that practitioners and researchers should avoid (McCroskey, 1984). Second, skin conductance reactivity is related to distress tolerance/avoidance. Thus, it can be hypothesized that increasing levels of distress tolerance and decreasing avoidance result in less physiological reactivity in anxiety-provoking situations (and vice versa). Third, since lower levels of self-reported public speaking anxiety are related to better-quality speech performance, it could be expected that decreasing levels of self-reported public speaking anxiety might result in increased speech performance quality. To conclude, our data proposes that self-reported public speaking anxiety predicts both avoidance behavior (speech duration) and speech performance, but it does not predict physiological reactivity while presenting.

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II

EXAMINING THE RELATIONSHIP BETWEEN PUBLIC SPEAKING ANXIETY, DISTRESS TOLERANCE AND PSYCHOLOGICAL FLEXIBILITY

by

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Examining the relationship between public speaking anxiety, distress tolerance and psychological flexibility

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ABSTRACT

Public speaking is an important skill for university students to learn and practice as they progress through education and into their careers. However, individuals often avoid facing public speaking, as they lack the skills to cope with the anxiety that arises when speaking in front of others. The current study aimed to investigate the relationship between public speaking anxiety, distress tolerance, and psychological flexibility. A sample of 95 college students completed psychological flexibility measures and self-ratings of public speaking anxiety before and after a public speaking challenge. A behavioral index of public speaking distress tolerance (i.e., speech duration) was also recorded. The results showed that self-reported public speaking anxiety correlates significantly with a number of aspects of psychological flexibility (i.e., openness to experiences, self-perspective skills, and cognitive fusion). These findings suggest that openness to experiences is a key factor in developing interventions to cope with self-reported public speaking anxiety for undergraduate students. However, if we want to increase speech duration as a behavioral index of distress tolerance, training skills related to behavioral awareness and valued actions might be more relevant. The results are discussed in terms of their relevance to the development of public speaking interventions for university students.

1. Introduction

Public speaking anxiety refers to the anxiety that an individual experiences when giving a speech or preparing to speak in front of others (Bodie, 2010). Anxiety related to speaking in public has been reported to be associated with educational impairments (e.g., school dropouts) (Schneier et al., 1994), lower income (Stein, Walker, & Forde, 1994), and less productivity at work or unemployment (Wittchen, Fuetsch, Sonntag, Müller, & Liebowitz, 2000). Public speaking anxiety is the most common form of social phobia, also known as social anxiety disorder (Ruscio et al., 2008), which is one of the most prevalent mental disorders (Stein & Stein, 2008). Social phobia is related to high rates of depression, substance abuse, incidences of suicidal ideation (Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992), and suicide attempts (Davidson, Hughes, George, & Blazer, 1993). In Finland, one in three university students acknowledged that public speaking is a severe problem for them (Kunttu, Pesonen & Saari, 2017), while 61% of students in the United States reported a fear of public speaking (Dwyer & Davidson, 2012).

A growing body of research indicates that anxiety disorders are

associated with psychological inflexibility, including a tendency to avoid physiological arousal in panic disorders (Zvolensky & Eifert, 2001). Psychological flexibility is characterized by a non-avoiding attitude toward anxiety and defined as the ability to be fully in contact with the present moment and persist or change behavior according to one's values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Experiential avoidance, in contrast to psychological flexibility, refers to attempts to alter internal private experiences that are difficult (i.e., thoughts, feelings, and physiological sensations), even when doing so is problematic and prevents people from acting according to what they most care about (Hayes et al., 2006). One way that experiential avoidance has been measured behaviorally was to test participants' distress tolerance. Distress tolerance is the capacity to withstand unpleasant internal events (Smith et al., 2014). Typically, the act of tolerating aversive circumstances is operationalized as the time a person can be in contact with an aversive stimulus (Zvolensky, Vujanovic, Bernstein, & Leyro, 2010). Previous studies have empirically demonstrated that individuals with higher levels of self-reported experiential avoidance have lower distress tolerance (Feldner et al., 2006; Williams, 2012; Zettle et al., 2005).

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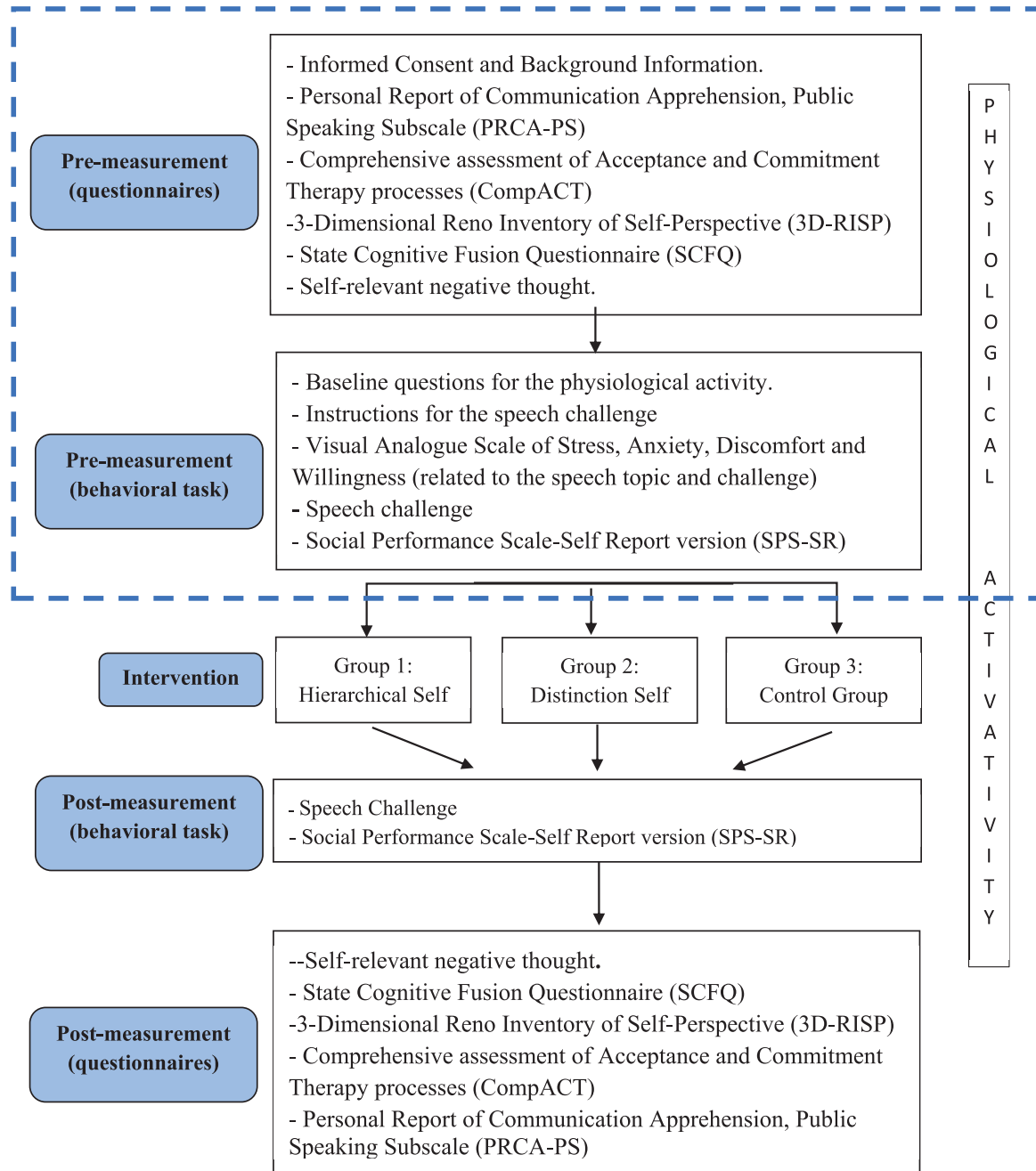


Fig. 1. Procedure. Data framed with blue lines represents the section of the experiment that has been included in this research article. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

While the effectiveness of Acceptance and Commitment Therapy (ACT) interventions in reducing public speaking anxiety has been shown, very little is known about what specific aspects of psychological flexibility are most relevant to include in these interventions. Previous studies have indicated that acceptance and defusion could be relevant aspects of psychological flexibility for public speaking anxiety (Block & Wulfert, 2000; England et al., 2012). However, these studies did not test the aspects of valued actions or behavioral awareness. Additionally, more knowledge is needed to ascertain whether the psychological processes of change are similar or different when the aim is to decrease

public speaking anxiety or increase public speaking distress tolerance. This understanding could lead to more targeted and effective treatments that help individuals who struggle with anxiety related to speaking in public. In summary, given the facts that public speaking anxiety is prevalent among university students and there is a link between psychological flexibility and anxiety disorders, the current study aimed to investigate 1) whether public speaking anxiety is associated with psychological flexibility and to determine 2) what aspects of psychological flexibility are critical for inclusion in public speaking anxiety interventions. Further, we were interested in knowing 3)

whether speech duration as a behavioral measure of public speaking distress tolerance correlates with self-reported measures of public speaking anxiety and psychological flexibility. Furthermore, we were interested in 4) what aspects of psychological flexibility are relevant in public speaking distress tolerance. We predicted that high levels of public speaking anxiety are associated with low levels of psychological flexibility. We also expected that openness to experiences is a key facet for public speaking anxiety. We expected low levels of distress tolerance to be associated with high levels of self-reported public speaking anxiety and low levels of psychological flexibility. To the best of our knowledge, there are no studies to date that have investigated what aspects of psychological flexibility are relevant when looking into public speaking distress tolerance.

2. Method

2.1. Participants

University students ($n = 106$) were recruited from the Language Center and Department of Education of the University of Jyväskylä. More specifically, the participants were recruited from courses aimed at increasing communication skills. At the beginning of each course, the students were informed about the experiment. The instructions provided were as follows: “We are recruiting participants for an experiment about public speaking and communication skills. During the study, you will be asked to give a speech in front of a camera. You do not have to prepare anything beforehand.” Then, the module coordinator sent the students an online scheduling tool where they could sign up for participation. All participants were undergraduate students. All participants who signed up were included in the study; however, those who were taking psychogenic medication or did not fill in their personal information measurements were not included in the analyses ($n = 10$). This yielded a final sample of 95 participants (50 females, 45 males) with an age range of 20–46 ($M = 24.61$, $SD = 4.77$). The amount of years they had been studying at the university ranged from 1 to 8 ($M = 2.61$, $SD = 1.42$). The participants also came from different fields of study (IT = 31, education = 19, business and economics = 17, health science = 5, languages = 6, literature and history = 4, natural science (chemistry, physics, and mathematics) = 7, social work = 4, politics = 1, and music = 1).

2.2. Procedure

The experiment was conducted individually at the Department of Psychology. The participants sat in an armchair in an experimental room that was equipped with a 65-inch TV screen, video camera, chair, pen, and the questionnaires. The researcher was in an adjacent room that was equipped with a 23-inch TV screen (through which the experimenter was able to view the participant throughout the experiment), a microphone that was connected to the speaker in the participant's room, one computer, and a laptop (the computer was used to play the audio-recorded instructions; the laptop was used to play the video-recorded audience that the participant saw on the TV screen).

First, the participants were asked to fill in the informed consent form and provide their background/personal information. Then, they proceeded to complete a self-report questionnaire (see Fig. 1). Subsequently, the participants were cycled into the behavioral task, where they were instructed to give an impromptu 10-min speech about themselves (weaknesses and strengths) in front of a camera placed at eye level. Behind the camera, there was a video-recorded audience on a 75-inch screen looking at the participant. The participants were allowed 3 min to plan their speech. The termination of the speech task before the end of a 10-min period was assessed as avoidance behavior, and the total amount of time (speech duration) that the participants spoke was assessed as public speaking distress tolerance (Kishita, Muto, Ohtsuki, & Barnes-Holmes, 2014).

2.3. Measures

The Personal Report of Communication Apprehension, Public Speaking Subscale (PRCA-PS; McCroskey, 1982) was used to measure public speaking anxiety. The PRCA-PS is a 6-item subscale (e.g., “While giving a speech, I get so nervous I forget facts I really know”). Each item is rated on a 1 (*strongly agree*) to 5 (*strongly disagree*) Likert point scale. Higher scores indicated greater apprehension toward speaking in public. The scores could range from a low of 6 to a high of 30. Moderate levels of public speaking anxiety could range from 13.75 to 20.75, while high levels ranged from 20.75 to 30. This scale was chosen because its validity and reliability are well-documented. The Cronbach's alpha reliability for all items ranges from 0.93 to 0.95 (McCroskey, Beatty, Kearney, & Plax, 1985). In the present study, the subscale showed good internal consistency (Cronbach's $\alpha = .85$).

The Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT; Francis, Dawson, & Golijani-Moghaddam, 2016) is a 23-item self-reported questionnaire that assesses psychological flexibility (e.g., “I undertake things that are meaningful to me, even when I find it hard to do so”). The scale is a compound of three subscales (openness to experiences (CompACT-OE); behavioral awareness (CompACT-BA); valued actions (CompACT-VA)) and is scored on a 7-point Likert scale that ranges from 0 (*strongly disagree*) to 6 (*strongly agree*). The scale can be measured as a whole by adding all the items, with higher scores indicating greater psychological flexibility. The Cronbach's alpha was first given as 0.91 for the overall CompACT score, 0.90 for CompACT-OE, 0.87 for CompACT-BA, and 0.90 for CompACT-VA. In this study, the Cronbach's alpha was .90 for the total score, 0.87 for CompACT-OE, 0.85 for CompACT-BA, and 0.85 for CompACT-VA.

The 3-Dimensional Reno Inventory of Self-Perspective (3D-RISP; Jeffcoat, 2015) is a 13-item self-reported questionnaire that measures the self in the ACT models of psychological flexibility and pathology (e.g., “Negative thoughts are harmful to me”). The scale is comprised of three subscales: entangled (fusion with self-content), centered (the ability to take a centered self-perspective), and transcendent (verbal awareness of the transcendent nature of that perspective). Each item is rated on a 7-point Likert scale (0 = *never*, 7 = *always*). The scores range from 13 to 91. Higher scores indicate more self-perspective, low scores deficits in self-perspective skills and pathological fusion with self-content. Previous studies have shown good internal consistency in two large samples ($\alpha = 0.86$ and $\alpha = 0.79$). In the current study, the Cronbach's alpha was .88 for the total 3D-RISP score, 0.85 for entangled, 0.83 for centered, and 0.73 for transcendent.

The State Cognitive Fusion Questionnaire (SCFQ; Bolderston et al., 2018) is the state version of the Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The SCFQ is a 7-item self-reported questionnaire that measures cognitive fusion in the present moment instead of in general. Each item (e.g., “I get so caught up in my thoughts that I am unable to do the things that I most want to do”) is rated on a 7-point Likert scale (1 = *never true*, 7 = *always true*). Higher scores reflect greater fusion and lower scores greater defusion. The scale has demonstrated an excellent internal reliability in a large sample ($\alpha = 0.95$). In the present study, the Cronbach's alpha was .78.

To assess public speaking distress tolerance (Levin, Haeger, & Smith, 2017), the participants were instructed as follows to give an impromptu speech: “I would like to invite you to give a 10-min speech about yourself, your strengths and weaknesses. I hope that you can speak for as long as possible. I will let you know when the time is up. If you decide to end your speech earlier, please say out loud, ‘I want to stop.’ Try to continue the speech if you can, even if you're not sure what you would say next. You can stop if necessary if you are anxious and you cannot continue. Now you have 3 min to think about what you want to say in your speech. If you want you can write down what you want to say.” This instruction has been commonly used in the literature (England et al., 2012; Hofmann, Moscovitch, Kim, & Taylor, 2004;

Hofmann, Newman, Ehlers, & Walton, 1995; Levin et al., 2017). The duration of the speech provided a behavioral measure of avoidance. The maximum time for the speech was 10 min. Previous studies have suggested that finishing a speech before the allotted time is over can be understood as an attempt to escape the anxiety caused by the act of giving a speech (England et al., 2012; Levin et al., 2017). Accordingly, we interpreted speech duration as a behavioral measure of public speaking distress tolerance.

2.4. Analyses

All statistical analyses were performed using IBM SPSS Statistics 24. Pearson correlations were used to test the relationship between study variables. A correlation between $r = 0.10$ – 0.30 was considered small, medium/moderate between $r = 0.31$ – 0.50 , and high between $r = 0.51$ – 1 (Cohen, 1992). For those variables that were not normally distributed, we applied a non-parametric statistical analysis (Spearman's correlation). In addition, linear regression analyses were performed to further investigate which aspects of psychological flexibility (independent variables) are most relevant to coping with self-reported public speaking anxiety (dependent variable), as well as public speaking distress tolerance (dependent variable). The *F*-test was used to examine whether the independent variable predicts the dependent variable. R^2 was used to calculate how much variance in the dependent variable can be explained by the independent variable. Additionally, *t*-tests were used to determine the significance of the predictor, and beta coefficients were used to determine the magnitude and the direction of the relationship.

3. Results

In this sample, 50% of the participants reported having a high level of public speaking anxiety, 41.5% a moderate level, and 8.5% a low level. In the general student population in Finland, 33% of students reported that speaking in public is a severe problem for them (Kunttu et al., 2017). Therefore, it seems that in our sample, there is a higher number of participants in the higher ranges of anxiety related to speaking in public. In the current study, the maximum potential length of the speech was 10 min, and the mean time that the participants used for the speech was 7.45 min ($SD = 2.53$; Table 1). This is in accordance with Hofmann et al. (1995). They used a similar task and found that participants who lacked public speaking anxiety spoke longer (9.2 min)

Table 1
Descriptive statistics.

	Minimum	Maximum	Mean (SD)	95% confidence interval	
				Lower	Upper
PRCA-PS	11	30	20.5 (4.75)	19.56	21.54
CompACT	45	132	88.13 (19.93)	84.07	92.14
CompACT-OE	15	59	34.80 (10.84)	32.72	37.03
CompACT-BA	5	30	17.43 (5.97)	16.20	18.66
CompACT-VA	19	48	35.89 (7.07)	34.51	37.31
3D-RISP	37	89	63.31 (10.82)	61.50	65.70
3D-RISP-tr	2	14	10.71 (2.44)	10.24	11.21
3D-RISP-ce	12	28	19.58 (3.55)	18.91	20.36
3D-RISP-en	15	48	33.02 (6.88)	31.86	34.60
SCFQ	7	88	26.92 (12.01)	24.35	29.03
Speech Duration	1:12	10:00	7:45 (2:53)	7:06	8:20

Note. PRCA-PS (public speaking anxiety); CompACT (psychological flexibility); CompACT-OE (Openness to Experience); CompACT-VA (Valued Action); CompACT-BA (Behavioral Awareness); 3D-RISP (self-perspective skills); 3D-RISP-tr (transcendent); 3D-RISP-ce (centered); 3D-RISP-en (entangled), SCFQ (State Cognitive Fusion Questionnaire) and Speech Duration.

compared to the participants in our study.

In relation to this study, the results showed that higher levels of public speaking anxiety (PRCA-PS) moderately correlated with lower levels of psychological flexibility (CompACT; $r = -0.41$, $p < 0.01$, $n = 95$; Table 2) and lower levels of openness to experiences (CompACT-OE; $r = -0.45$, $p < 0.01$, $n = 95$). Additionally, higher levels of public speaking anxiety (PRCA-PS) were related to lower levels of behavioral awareness (CompACT-BA; $r = -0.23$, $p < 0.05$, $n = 95$) and lower levels of valued actions (CompACT-VA; $r = -0.26$, $p < 0.05$, $n = 95$), as these correlations were small. In addition, higher levels of public speaking anxiety moderately correlated with higher levels of cognitive fusion (SCFQ; $r = 0.33$, $p < 0.01$, $n = 94$), lower levels of distress tolerance (speech duration; $r = -0.29$, $p < 0.01$, $n = 94$), and lower levels of self-perspective skills (3D-RISP; $r = -0.46$, $p < 0.01$, $n = 94$). The 3D-RISP is a compound of three subscales: transcendent, centered, and entangled. There was no significant correlation between public speaking anxiety and the transcendent subscale; however, higher levels of public speaking anxiety (PRCA-PS) moderately correlated with higher levels of entangled (3D-RISP-en; $r = 0.43$, $p < 0.01$, $n = 94$) and lower levels of centered (3D-RISP-ce; $r = -0.45$, $p < 0.01$, $n = 94$).

To further investigate what aspects of psychological flexibility are critical in public speaking anxiety interventions, we performed linear regression analyses. As an inclusion criterion, we only selected variables that significantly correlated with public speaking anxiety. We also excluded variables that highly correlated with the CompACT and its subscales (CompACT-OE, CompACT-BA, and CompACT-VA) in view of the fact that they measure the same construct. Thus, the SCFQ and the 3D-RISP and its subscales (centered, entangled, and transcendent) were excluded. Only the three CompACT subscales were included in the regression analysis given that all of them significantly correlated with self-reported public speaking anxiety. From this, only openness to experiences (CompACT-OE) remained a significant predictor of public speaking anxiety (PRCA) (Std. $\beta = -0.458$, $p < 0.001$; Table 3). This variable accounted for 20% of the total variability ($R^2 = 0.201$).

In relation to public speaking distress tolerance (i.e., speech duration), the data showed that higher levels of psychological flexibility (CompACT) correlated with lower levels of distress tolerance ($r = 0.24$, $p < 0.05$, $n = 94$), though this correlation was small. Of the three CompACT subscales, two had low significant correlations with speech duration; these were behavioral awareness and valued actions (CompACT-BA and CompACT-VA, respectively). However, openness to experiences (CompACT-OE), self-perspective skills (3D-RISP), and cognitive fusion (SCFQ) did not correlate with speech duration. These results are presented in Table 2. For this reason, only behavioral awareness and valued actions were included in the regression analysis. Behavioral awareness was a significant predictor in the first step (Std. $\beta = 0.275$, $p = 0.007$; Table 3). This variable accounted for 7.6% of total variability ($R^2 = 0.076$). When we added valued actions to the model, the R^2 change was not significant. In the second step, the standardized β values for these two variables were not significant. It is important to acknowledge that the residual distribution was not normally distributed. Therefore, the *p* values of the regression analysis for the speech duration are not completely accurate.

4. Discussion

These results indicate a negative moderate correlation between public speaking anxiety and the behavioral measure of public speaking distress tolerance (i.e., speech duration), suggesting that students who report high levels of public speaking anxiety also give shorter presentations (i.e., low distress tolerance), possibly as an avoidance strategy. In line with this, previous studies have empirically demonstrated that individuals with lower distress tolerance had higher levels of experiential avoidance (Feldner et al., 2006; Zettle et al., 2005). Moreover, in the current study, those participants whose psychological

Table 2

Correlations between public speaking anxiety (PRCA-PS), psychological flexibility (CompACT), Openness Experiences (CompACT-OE), Valued Action (CompACT-VA), Behavioral Awareness (CompACT-BA), self-perspective (3D-RISP), transcendent (3D-RISP-tr), centered (3D-RISP-ce), entangled (3D-RISP-en), Cognitive Fusion (SCFQ) and Speech Duration.

	CompACT	CompACT-OE	CompACT-VA	CompACT-BA	3D-RISP	3D-RISP-tr	3D-RISP-ce	3D-RISP-en	SCFQ	Speech Duration
PRCA-PS	-.41 ^b	-.45 ^b	-.26 ^a	-.23 ^a	-.46 ^b	-.18	-.45 ^b	.43 ^b	.33 ^b	-.29 ^b
CompACT	1	.89 ^b	.77 ^b	.80 ^b	.81 ^b	.40 ^b	.69 ^b	-.77 ^b	-.69 ^b	.24 ^a
CompACT-OE		1	.48 ^b	.59 ^b	.81 ^b	.31 ^b	.75 ^b	-.78 ^b	-.71 ^b	.15
CompACT-VA			1	.52 ^b	.61 ^b	.39 ^b	.48 ^b	-.56 ^b	-.40 ^b	.25 ^a
CompACT-BA				1	.50 ^b	.31 ^b	.38 ^b	-.48 ^b	-.52 ^b	.26 ^a
3D-RISP					1	.50 ^b	.87 ^b	-.94 ^b	-.68 ^b	.18
3D-RISP-tr						1	.29 ^b	-.29 ^b	-.21 ^a	.32 ^b
3D-RISP-ce							1	-.75 ^b	-.61 ^b	.08
3D-RISP-en								1	.69 ^b	-.17
SCFQ									1	-.02

^a The correlation is significant at the 0.05 level.

^b The correlation is significant at the 0.01 level.

flexibility was lower also had lower distress tolerance and reported higher levels of public speaking anxiety. These results highlight the role of psychological flexibility among university students when training their public speaking skills. However, further studies are needed to demonstrate whether public speaking anxiety can be changed via increased psychological flexibility skills. It needs to be observed that increasing the time of the speech may not be an important outcome per se, but rather the increase of distress tolerance, reflecting a more general skill associated with avoidance strategies.

In relation to the facets of psychological flexibility that are critical for coping with public speaking anxiety, the data showed that openness to experiences (a compound of defusion and acceptance skills) seems to be the key aspect of psychological flexibility for self-reported public speaking anxiety. Therefore, the current data highlights the usefulness of skills such as taking perspective of thoughts, feelings, and sensations (defusion) and increasing willingness to experience them without trying to control or avoid them (acceptance). However, openness to experiences was unrelated to speech duration (i.e., public speaking distress tolerance), though the latter did correlate significantly with behavioral awareness and engagement in valued actions in the CompACT. The regression analysis indicated that behavioral awareness explained approximately 8% of the variance, while when valued actions was added in the model, the *R*² change was only 1%. However, since the residual distribution was not normally distributed, the *p* values of the regression analysis for speech duration are not completely accurate; thus, it could be possible that valued actions are also relevant. Therefore, the current

findings suggest that being aware of one's own behavior and experiencing a presentation as a meaningful activity may need to be emphasized when training students to increase their distress tolerance related to public speaking. On the other hand, if the aim is to decrease self-perceived public speaking anxiety, the focus might be on training students to be open to their own experiences, that is, thoughts and feelings.

There are several limitations to the current study. First, the participants spoke in front of a video-recorded audience, not a live audience. Therefore, this situation did not capture in vivo public speaking anxiety. Another limitation surrounds the generalization of these findings to clinical groups, as only university students participated in the study. However, this cohort was selected due to the high incidence of public speaking anxiety in this population. A third limitation is related to the scales used, as only one scale was used to measure the main variable (public speaking anxiety). However, it is worth mentioning that this scale has been broadly used in the literature. Additionally, a behavioral measure of public speaking distress tolerance was incorporated. A fourth limitation concerns speech duration. We interpreted speech duration to represent a behavioral measure of public speaking distress tolerance. However, it is possible that the length of the speech was affected by other variables, such as previous experience and speech ability in general. Finally, psychological flexibility was measured with a new scale, the CompACT, which has demonstrated good psychometric properties, but has not been broadly used yet. On the other hand, the CompACT holds an advantage over the AAQ (Acceptance and Action

Table 3

Stepwise regression analysis. Role of different aspects of psychological flexibility in predicting public speaking anxiety and distress tolerance. PRCA-PS (public speaking anxiety); Speech Duration (behavioral measure of distress tolerance); CompACT-OE (Openness to Experiences); CompACT-VA (Valued Action); CompACT-BA (Behavioral Awareness).

Dependent Variables	Significant predictors (independent variables)	Std β	R ²	Adjusted R ²	R ² Change
PRCA-PS	1. Step CompACT-OE	−0.458***	0.201***	0.192	0.201***
	2. Step CompACT-VA	−0.082	0.203***	0.186	0.002
	3. Step CompACT-BA	0.083	0.207***	0.181	0.004
Speech Duration	1. Step CompACT-BA	0.212	0.076**	0.066	0.076**
	2. Step CompACT-VA	0.122	0.087*	0.067	0.011

Note: ****p* < 0.001; ***p* < 0.01; **p* < 0.05.

[1] For the regressions, only those variables (aspects of psychological flexibility) that significantly correlated (*p* < 0.05) with public speaking anxiety and the speech duration were utilized.

[2] Standardized Coefficients β are from last step.

[3] Significant *F* change is represented with * in the *R*² Change.

Questionnaire), which is the most broadly used scale in the literature to measure psychological flexibility. Given that the CompACT allows the separation of different aspects of psychological flexibility (i.e., openness to experiences, behavioral awareness, and valued actions), it could potentially direct us to know what the most relevant features of psychological flexibility to pay attention to are when developing interventions.

This study's findings comprise a number of aspects that could prove relevant in clinical implications. Given that public speaking anxiety is related to psychological flexibility, it could be expected that psychological interventions focused on increasing psychological flexibility might result in decreased public speaking anxiety and increased distress tolerance. Moreover, the psychological flexibility aspect of being open to one's own experiences seems to be relevant to the reduction of self-reported public speaking anxiety. Therefore, it might be important to design interventions that target shaping openness to one's experiences (cognitive defusion and acceptance) to help clients cope more effectively with public speaking anxiety. In addition, our behavioral measure of public speaking distress tolerance (speech duration) correlated with psychological flexibility (CompACT), as well as with the subscales of behavioral awareness and valued actions, but it did not correlate with openness to one's own experiences or cognitive defusion. Therefore, it seems that training the skill of being open to one's own thoughts and feelings could be a key factor in decreasing self-reported public speaking anxiety. However, if we want to increase speech duration as a behavioral index of distress tolerance, training skills related to behavioral awareness and valued actions might be more relevant. Thus, these results highlight the possibility that training different aspects of psychological flexibility are associated with different behavioral outcomes. In summary, the current data provided interesting insights into the relationship between public speaking anxiety, as measured by a psychometric tool, behavioral task, and psychological flexibility. Future investigations are needed to replicate and validate the conclusions that can be drawn from this study and assess whether these conclusions can be generalized to and across anxiety in general.

Ethics statement

The study plan, interventions, personal information, and informed consent were reviewed and approved by the Ethical Committee of the University of Jyväskylä (Jyväskylä, Finland) on 5.23.2017.

Declaration of competing Interest

All the authors (Ana Gallego, Louise McHugh, Matthieu Villatte, and Raimo Lappalainen) declare that they have no conflict of interest to disclose. Ana Gallego has gotten funding for conducting this research project from the Student Life, which is a unit from the University of Jyväskylä, Finland.

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III

THE EFFECT OF BRIEF HIERARCHICAL- VERSUS DISTINCTION-SELF-BASED INTERVENTIONS FOR PUBLIC SPEAKING ANXIETY: A PILOT STUDY

by

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The Effect of a brief Hierarchical- versus Distinction-Self-Based Interventions for Public
Speaking Anxiety: A pilot study

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The Effect of a brief Hierarchical- versus Distinction-Self-Based Interventions for
Public Speaking Anxiety: A pilot study

Abstract

Speaking in public is the most commonly reported fear in the general population. Negative self-perceptions seem to play an important role in the development and maintenance of social anxiety disorders, including public speaking anxiety. Therefore, the present study investigated whether two different self-based interventions (hierarchical-self and distinction-self) would result in different effects on public speaking anxiety and psychological flexibility. Using a between-subjects design, the participants (n = 117) were randomly assigned to one of three groups: Hierarchical-Self, Distinction-Self, and Control intervention groups. The primary outcome variable was self-reported public speaking anxiety. In addition, public speaking distress tolerance, physiological reactivity and psychological flexibility, self-perspective skills, and cognitive defusion were also measured. The results showed that all the interventions, including the control group, decreased self-reported public speaking anxiety after the 37 min training session. The results suggested that different psychological flexibility skills predicted the changes in the hierarchical and distinction interventions.

Keywords: social anxiety; exposure; public speaking anxiety; self-as-context; defusion

Introduction

Public speaking anxiety is a form of social phobia and one of the most common psychological problems in the United States, with a prevalence range of 20% (Pollard & Henderson, 1988) to 85% (Motley, 1995) in the general population. The current treatments for public speaking anxiety combine exposure (i.e., repeatedly confronting the fear of public speaking) with cognitive restructuring (i.e., modifying unhelpful thinking linked to emotional distress; Heimberg, 2002; Hofmann & Smits, 2008; Hope, Heimberg, Juster, & Turk, 2000; Rapee & Heimberg, 1997). Previous research has indicated that a negative self-concept plays an important role in the development and persistence of social anxiety disorders, including public speaking anxiety (Hook & Valentiner, 2002). Specifically, based on early learning experiences that become reinforced over time, individuals with social anxiety develop a number of inaccurate negative assumptions about themselves (e.g., “I am ugly,” “I am stupid,” “I am undesirable”; Beck & Emery, 1985; Clark & Wells, 1995; Rapee & Heimberg, 1997). Therefore, interventions for social anxiety sufferers that specifically target their self-concept may be useful.

A treatment approach that specifically emphasizes the development of a healthier self-concept is acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999). ACT is rooted in contextual behavioral science, a philosophically pragmatic and empirically rigorous approach to psychology. More specifically, it is connected with relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001), a modern behavior-analytic approach to language and cognition. ACT is typically described by using the psychological flexibility model (Hayes, Strosahl, & Wilson, 1999), which is comprised of six core processes. Two of these that are of particular relevance to the self are defusion and self-as-context. Defusion involves undermining the negative effects of cognition by teaching individuals to distance themselves from their

thoughts. Self-as-context is, in turn, facilitated by defusion. The former is a perspective from which individuals can become aware of their experiences without becoming too attached to them. Recent studies have investigated these two processes (defusion and self-as-context) from an RFT perspective. RFT suggests that we learn to relate (that is, relationally frame) stimuli in our environment and that this relational activity can change the psychological functions of those stimuli. Stimuli are related in a number of different ways, such as *same as* (“I am shy”), *different from* (“I am not self-confident”), and *hierarchical* (“my thoughts are only parts of me”). A type of relating that is particularly relevant to the development of self-concept is perspective or *deictic* relating. This type of relating involves discriminating perspective interpersonally (I vs. you), temporally (now vs. then), and spatially (here vs. there).

The first study in this regard (Luciano et al., 2011) investigated the differential effect of two defusion protocols (Defusion I and Defusion II) on adolescents with problematic behaviors. Defusion I involved training participants to discriminate the continuing process of noticing that “I am always here” and “All thoughts and feelings that appear are there” (i.e., deictic framing, *I-here-now* /vs./ *my thoughts-there-then*). Defusion II included deictic framing, hierarchical framing, and regulatory functions. The addition of hierarchical relations in Defusion II involved participants deriving a relation of *inclusion* between themselves and their thoughts and feelings (e.g., “You are the captain of a boat and your thoughts are the passengers”). The regulatory functions aspect of Defusion II involved training a perspective that allowed the people to choose according to their values (e.g., “Do you want to stay fused (i.e., stuck) with your feelings and allow them to be in charge instead of you?”). The results showed significant differences between the groups at a four-month follow-up. Participants in the Defusion II intervention exhibited fewer problematic

behaviors, lower levels of psychological inflexibility, and higher scores on accepting without judgment than those in the Defusion I group.

A subsequent study by Foody, Barnes-Holmes, Barnes-Holmes, and Luciano (2013) examined the differential effect of two self-as-context exercises (hierarchical self-as-context versus distinction self-as-context) with the goal of reducing the discomfort, anxiety, and stress that participants experienced after a distress-inducing task. Hierarchical self-as-context refers to verbal interactions that aim to frame the I as the context of thoughts and feelings (e.g., “You are the space/arena in which your thoughts unfold”). Distinction self-as-context refers to verbal interactions that frame the I as different from thoughts and feelings (e.g., “You are here, and your thoughts are there on a leaf floating down the stream”). The results indicated that hierarchical self-as-context was more effective in reducing stress than distinction self-as-context. However, no significant differences between the groups were observed for anxiety and discomfort.

Furthermore, Foody, Barnes-Holmes, Barnes-Holmes, Rai, and Luciano (2015) examined the effect of focusing on the self in comparison to focusing on an object in reducing distress, anxiety, and stress through hierarchical and distinction relations. The results showed no clear differences between the hierarchical and distinction condition regarding discomfort and anxiety. However, there were some indications that hierarchical intervention could be more beneficial when dealing with stress. Another study, this one by Gil-Luciano, Ruiz, Valdivia-Salas, and Suárez-Falcón (2017), compared the effect of two defusion-based interventions and a control group on discomfort tolerance. The results showed that participants in the Defusion II (deictic, hierarchical, and regulatory functions) intervention significantly increased their pain tolerance in cold pressor and aversive film tasks in comparison to the Defusion I (deictic) and control groups.

Similarly, López-López and Luciano (2017) investigated the effect of two defusion-based interventions (deictic + hierarchical + regulatory functions vs. deictic alone) and a control group in experimentally induced distress tasks with low and high attentional demands. They found no statistically significant between-group differences in the performance of the perceptual-motor task nor in the decrease of discomfort ratings. However, the main effect was found in the correct responses in the computerized Paced Auditory Serial Addition Task (PASAT-C). The improvement in correct responses in the Defusion II (deictic + hierarchical + regulatory functions) intervention was statistically higher than that of the Defusion I (deictic) and control group. The Defusion I group did not differ from the control group in relation to productivity.

In summary, these five studies investigated defusion and self-as-context from an RFT perspective. In three of the studies, deictic training combined with hierarchical and regulatory functions yielded better outcomes compared to deictic training alone (Gil-Luciano et al., 2017; López-López & Luciano, 2017; Luciano et al., 2011). In the other two studies, hierarchical and distinction training were compared, but the outcomes were mixed and dependent on the outcome variables. One of these studies demonstrated better outcomes for hierarchical over distinction training (Foody et al., 2013); however, the other study indicated no difference between these conditions regarding some of the outcome variables (discomfort and anxiety), while there was some indication of a better effect in favor of hierarchical training when the outcome variable was stress (Foody et al., 2015).

Given that earlier studies have shown mixed results when comparing hierarchical and distinction training, we aimed to determine whether brief hierarchical- and distinction-self-based interventions would have differential effects on self-reported public speaking anxiety, distress tolerance, psychological flexibility, and physiological reactivity. In addition, we were interested

in investigating what aspects of psychological flexibility predict changes in self-reported public speaking anxiety. More specifically, we wondered whether different psychological flexibility skills predicted changes in hierarchical and distinction interventions. In our previous study (hidden reference), we observed that the psychological flexibility skill of openness to experiences was the most significant predictor in self-reported public speaking anxiety. Based on these findings, we expected that changes in willingness to experience thoughts, feelings, and sensations would explain changes in self-reported public speaking anxiety.

Method

Participants

University students ($n = 137$) were recruited from the Department of Education and Language Center of the (hidden text for blind review). The participants were recruited from courses offering communication skills training. The experiment was intentionally completed before any of the courses began to prevent the courses from impacting the results of the current study. Participants who were taking psychogenic medication or who did not fill in their personal information were excluded from the study ($n = 20$). This yielded a final sample of 117 participants (55 males, 62 females) with an age range from 19 to 46 ($M = 24.48$, $SD = 4.52$). The participants were randomly allocated to one of three groups: Hierarchical-Self ($n = 41$), Distinction-Self ($n = 37$), and Control ($n = 39$). The randomization was completed using the Random Lists website.

Procedure

The experiment was conducted individually during one session that lasted 1–1.5 hours, and the testing itself took place at the Department of Psychology. The experiment comprised eight phases always presented in the same order to each participant (Figure 1). In the experimental room, the participants sat in an armchair in front of a video camera placed at eye level. Behind the camera,

a video-recorded audience was displayed on a 65-inch TV screen. Behind the participant was an amplifier (BrainVision QuickAmp 32 EEG and eight physiological channels) to record electrodermal and electrocardiogram activity. To the right side of the armchair (the left side for those who were lefthanded), there was a pen and the questionnaires. The researcher was in an adjacent room equipped with a 23-inch TV screen (which allowed the researcher to view the participant throughout the experiment), a microphone that was connected to a speaker in the participant's room, one computer, and a laptop (the computer was used to play the audio-recorded instructions; the laptop was used to play the video-recorded audience that the participant saw on the TV screen) (see Figure 1 and Picture 1).

Phase 1. Informed consent and pre-measurements. The participants signed the informed consent form and filled in their background information. Then, they answered the following questionnaires: the Personal Report of Communication Apprehension-Public Speaking (PRCA-PS), the Comprehensive Assessment of Acceptance and Commitment Therapy processes (CompACT), the Three-Dimensional Reno Inventory of Self-Perspective (3D-RISP), and the State Cognitive Fusion Questionnaire (SCFQ). These questionnaires were always presented in the same order. The physiological activity (heart-rate variability [RMSSD]) and skin conductance responses (SCRs) were recorded until the beginning of Phase 8.

Phase 2. Baseline questions. For a period of two minutes, the participants were instructed to answer a sample of "neutral" questions (e.g., "What is your name?", "Where are you from?", "Where were you born?", and "What is your favorite season of the year?"). The purpose of this phase was to obtain individual baseline data on the physiological measures (RMSSD and SCRs).

Phase 3. Preparation for the first speech challenge. Through audio-recorded instruction, the participants were instructed to give a 10-minute impromptu speech. Thereafter, they were

asked to complete visual analog scales (VAS) to rate their discomfort in completing the speech challenge. Finally, they had three minutes to plan a speech on the given topic.

Phase 4. First speech challenge. The participants delivered the speeches planned in Phase 3. See the Measures section under the subheading “Speech Challenge.”

Phase 5. Interventions. The participants listened to one of the three audio-recorded interventions, depending on the group to which they had previously been assigned (for details on randomization, see the Protocol section).

Phase 6. Instructions for the second speech challenge. The participants were instructed to complete a second speech challenge. They followed the same instructions as in the first speech challenge. The participants were explicitly invited to use the tools they had learned during the intervention phase. The participants were then given three minutes to prepare their speech.

Phase 7. Second speech challenge. The participants gave their second speech. The maximum time the speech could take was 10 minutes.

Phase 8. Post-measurements. The participants filled in the same questionnaires as in Phase 1 (PRCA-PS, CompACT, 3D-RISP, and SCFQ).

Protocol

The participants were randomly allocated to one of three groups (i.e., Hierarchical-Self, Distinction-Self, and Control). Participants across the groups gave two speeches. Thus, all three conditions included a brief repeated exposure to the challenging situation (the first and second speech challenges; see Figure 1). The purpose of both protocols (hierarchical-self and distinction-self) was to promote self-as-context; they consisted of multiple training examples wherein the participants had various opportunities to notice a wide and variable number of experiences and frame them in hierarchical vs. distinction relational frame with the deictic “I.” Each protocol was

divided into two parts. The first part focused on neutral private events and the second part on challenging private events. Starting with neutral private events was aimed at preventing some participants from engaging in cognitive avoidance strategies during exposure to unpleasant sensations.

Note that the respective materials used for the interventions in each group differed as follows. *Hierarchical-Self*: In the training examples, self-experiences were framed as part of the hierarchical network, where the self is the container of all the experiences (e.g. “Imagine that you are *the container in which your thoughts unfold*”). *Distinction-Self*: In the training examples, self-experiences were framed as different from the self (e.g. “Imagine that you are *different than this thought and all the thoughts that are there*”). *Control*: During the intervention, this group listened to an excerpt from *Lord of the Rings* of the same length and with the same number of words and pauses as the training examples in both intervention groups (Table 1).

Measures

Outcome-Variable Measures

The primary outcome of this study was self-reported public speaking anxiety, measured by the PRCA-PS (McCroskey, 1982). The PRCA-PS is comprised of six items (e.g., “Certain parts of my body feel very tense and rigid while giving a speech”). Every item is rated on a Likert-point scale that ranges from 1 (*Strongly agree*) to 5 (*Strongly disagree*). Higher scores denote greater apprehension about speaking in public. The validity and reliability of this scale are well documented (Chen, 1994; McCroskey, Beatty, Kearney, & Plax, 1985). Cronbach’s alpha for all the items ranges from .93 to .95 (McCroskey et al., 1985). In the present study, the subscale showed good internal consistency (Cronbach’s alpha = .87).

Speech challenge: The participants were instructed to give an impromptu speech with the following instructions:

I would like to invite you to give a 10-minute speech about yourself, your strengths, and your weaknesses. I would hope that you could speak for as long as possible. I will let you know when the time is over. If you decide to end your speech earlier, please say out loud, "I want to stop." Try to continue the speech if you can, even if you're not sure what you will say next. You can stop if necessary if you're anxious and you cannot continue. Now, you have three minutes to think about what you want to say in your speech. If you want, you can write down what you want to say.

The speech duration was interpreted as a measure of public-speaking distress tolerance. The maximum time for the speech was 10 minutes (600 seconds). Previous research has suggested that finishing a speech before the allotted time is over can be understood as an attempt to escape the anxiety caused by the act of giving a speech (Gallego, McHugh, Villatte, & Lappalainen, 2020; Levin, Haeger, & Smith, 2017).

Electrodermal activity (EDA) was used as an index of sympathetic nervous system activity. EDA was recorded with two skin-conductance electrodes (Ag/AgCl, EL 507; BioPac Systems) placed on the participant's non-dominant palm, one below the thumb and the other below the fourth and fifth digits. The participants were instructed to keep their arm on the armrest of the chair without moving it. The conductivity of the skin was measured using a galvanic skin response (GSR) module (Brain Products) that determined conductivity by directing a 0.5 V voltage between the electrodes and measuring the conductivity changes with a direct current (DC) amplifier. Skin conductance was recorded in DC mode with a BrainVision QuickAmp. The signal was low-pass filtered at 400 Hz and sampled at 1,000 Hz using the BrainVision Recorder 1.20.0801 program.

Electrocardiograms, measuring the electrical activity of the heart, were used as an index of the parasympathetic nervous system activity. The electrocardiograms were recorded with three electrodes (Ag/AgCl, Ambu Neuroline 710). The first electrode was placed on the left shoulder, the second electrode under the clavicle on the right side, and the third electrode on the left side above the last ribs in a way that they formed a triangle around the heart. The signal was high-pass filtered at .5 Hz, low-pass filtered at 400 Hz, and sampled at 1,000 Hz using the QuickAmp and Recorder programs.

Process-Variable Measures

The Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT; Francis, Dawson, & Golijani-Moghaddam, 2016): The CompACT is a 23-item self-report inventory that is scored on a seven-point Likert scale ranging from 0 (*Strongly disagree*) to 6 (*Strongly agree*). The CompACT assesses psychological flexibility and is a compound of three subscales: Openness to Experiences (CompACT-OE), Valued Actions (CompACT-VA), and Behavioral Awareness (CompACT-BA). The scale can be rated as a whole by summing all items; higher scores indicate greater psychological flexibility. Cronbach's alpha was .91 for the overall CompACT score, .90 for CompACT-OE, .87 for CompACT-BA, and .90 for CompACT-VA (Francis et al., 2016). In the present study, the internal consistency (Cronbach's alpha) was .92 for the overall CompACT score, .87 for CompACT-OE, .84 for CompACT-BA, and .90 for CompACT-VA.

The Three-Dimensional Reno Inventory of Self-Perspective (3D-RISP; Jeffcoat, 2015): The 3D-RISP is composed of 13 self-reported items that measure the self in relation to psychological flexibility and pathology in the ACT model. Three subscales form the 3D-RISP: entangled (3D-RISP-en), centered (3D-RISP-ce), and transcendent (3D-RISP-tr). *Entangled* refers to fusion with

self-content. *Centered* refers to the skill of taking a centered self-perspective stand. *Transcendent* refers to verbal awareness of the transcendent nature of that perspective stand. Each item (e.g., “Negative thoughts are harmful to me”) is rated on a seven-point Likert scale (0 = *Never*, 7 = *Always*). The total 3D-RISP ranges from 13 to 91, and higher scores indicate more self-perspective. Higher scores of 3D-RISP-en denote pathological fusion with self-content and deficits in self-perspective. Higher 3D-RISP-ce scores manifest higher centered self-perspective, and higher 3D-RISP-tr scores indicate greater verbal awareness of the transcendent nature of that perspective. Good internal consistency has been reported in two large samples in a previous study ($\alpha = .86$ and $\alpha = .79$; Jeffcoat, 2015). In the current study, Cronbach’s alpha was .88 for the total 3D-RISP score, .84 for entangled, .85 for centered, and .75 for transcendent.

The State Cognitive Fusion Questionnaire (SCFQ; Bolderston, Gillanders, Turner, Taylor, Ní Mhaoileoin, & Coleman, 2019): The SCFQ is the state questionnaire of the Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The SCFQ is a compound of seven self-reported items that measure fusion with thoughts and feelings in the present moment rather than in general. Each item is rated on a seven-point Likert scale (1 = *Never true*, 7 = *Always true*; e.g., “I am upset with myself for having certain thoughts”). Lower scores indicate greater defusion, and higher scores indicate greater fusion with thoughts and feelings. The scale has been shown to have excellent internal reliability in a large sample ($\alpha = .95$; Bolderston et al., 2019). In the present study, Cronbach’s alpha was .94.

Visual Analog Scales (VAS): In this study, we used VAS: four scales related to the speech challenge (“How uncomfortable, stressful, anxious, or willing do you feel to give the speech?”), and two related to the topic given for the speech challenge (“How uncomfortable or willing do you feel to speak about this topic?”). The participants were instructed to indicate how they were feeling

by placing an X on a printed line representing a range from 0 (e.g., “not uncomfortable at all”) to 10 (“extremely uncomfortable”).

Data Analysis Plan

The heart-rate variability was analyzed using an electrocardiogram with the Kubios Heart-Rate Variability Premium program. The program at first automatically removed possible artifacts and computed successive interbeat intervals (RR intervals). The heart-rate variability index used was the square root of the mean squared differences between RR intervals (RMSSD). The heart-rate variability index was calculated for each period of interest. EDA was analyzed with MATLAB R2014a using Ledalab V3.4.9 (Benedek & Kaernbach, 2010). In this method, rapid changes in EDA (skin conductance responses, or SCRs) were separated from the slowly varying activity (skin conductance level, or SCL). Then, the mean values of the SCRs were calculated for each period of interest and served as the indices of sympathetic nervous system activation. For statistical purposes, both heart-rate variability (RMSSD) and SCRs were normalized for the two-minute baseline period in which the participants were asked questions (e.g., “What is your name?”, “Where are you from?”, “Where were you born?”, and “What is your favorite season of the year?”). Changes in physiology during the speech were evaluated by computing relative changes from the baseline using the formula $(\text{speech} - \text{speech baseline})/\text{speech baseline}$. The statistical analyses were performed with these standardized variables to take into account the individual variation in physiological reactivity.

All statistical analyses were performed using IBM SPSS Statistics 24. To investigate whether the groups changed differently from pre- to post-intervention (see Figure 1), a repeated-measures ANOVA was conducted on public speaking anxiety (PRCA-PS), psychological flexibility (CompACT), self-perspective skills (3D-RISP), cognitive defusion (SCFQ), speech

duration, and physiological reactivity (skin conductance activity, electrical activity of the heart). When counting the within-group effect sizes (d), we counted first the mean value for the standard deviations (SD) in the three intervention groups at pre-measurement (combined SD). Then, the mean change from pre- to post-measurement was divided by the combined SD. Thus, we wanted to control the variation in the three intervention groups at pre-measurement when we counted the within-group effect sizes in purpose to obtain a more accurate within-group d -value. Between-group corrected effect sizes were calculated by subtracting the mean difference in the pre-measurements from the mean difference in the post-measurements and dividing that result by the pooled SD from the pre-measurements. According to Cohen (1988), an effect size of $d = 0.2$ is considered small, $d = 0.5$ medium, and $d = 0.8$ large. Additionally, we performed stepwise regression analyses to determine what aspects of psychological flexibility (independent variable: changes from pre to post in CompACT, 3D-RISP, SCFQ) predicted the decreases in self-reported public speaking anxiety (dependent variable) in the three conditions. We used F-test to assess whether the independent variable explained the dependent variable. Additionally, R^2 was calculated to assess how much variance in the dependent variable was explained by the independent variable. Furthermore, t-tests were calculated to determine the significance of the predictor, and beta values were assessed to estimate the direction and the dimension of the relationship. The power analysis suggested that in the current study we needed a sample size of 158 participants given the effect size (d) = .25, $\alpha = 0.05$, power = .80. Thus, the between-group effect size $d > .20$ was the lowest effect size of interest. Thus, our sample $n = 117$ (originally $n = 137$) was slightly underpowered.

Results

In the present study, 53% of the total sample reported high levels of public speaking anxiety, 39% moderate, and 8% reported low levels. In the general student population in (hidden text), 33% of the students acknowledged speaking in public as a severe problem for them (hidden reference). Accordingly, the segment of the population that we present in this study contained a higher number of participants in the higher ranges of anxiety related to speaking in public. Furthermore, there were no significant differences between the groups in their levels of public speaking anxiety before the interventions were applied. Moreover, the groups did not differ regarding their levels of discomfort and willingness to give the speech in relation to the topic presented for the speech. Nor did they differ in terms of how uncomfortable, stressed, anxious, or willing they felt about giving the speech at the pre-intervention phase. The descriptive statistics by groups are displayed in Table 2.

Effects of the interventions

The mean pre-and post-intervention values by group, as well as the p-values and effect sizes, are presented in Table 3. There was no significant interaction between time and the intervention groups with regard to public speaking anxiety (PRCA-PS), suggesting that the groups did not change differently from pre- to post-intervention. However, there were significant overall improvements over time ($F[1,114] = 42.57, p < 0.001$). All conditions, including the control group, showed reduced self-reported levels of public speaking anxiety at post-intervention. Regarding speech duration, our behavioral measure of public-speaking distress tolerance showed no significant interaction and no significant within-group changes from pre- to post-intervention in any of the three groups. Furthermore, no significant interaction effect between time and group

emerged for psychological flexibility (CompACT, and the subscales CompACT-OE, CompACT-BA, CompACT-VA). Although there was a significant main effect over time in CompACT ($F[1,114] = 12.48, p = 0.001$), only Hierarchical-Self and Distinction-Self groups underwent a significant increase in psychological flexibility at post-intervention. However, the effect sizes were very small. Additionally, no significant interaction effects were observed for either self-perspective skills (3D-RISP) or the subscales entangled, centered, and transcendent (3D-RISP-en, 3D-RISP-ce, and 3D-RISP-tr, respectively). There was a significant main effect over time ($F[1,114] = 18.01, p < 0.001$) for the 3D-RISP total. The within-group changes showed significant changes in all groups for the 3D-RISP total, although the effect sizes were small. Additionally, no significant interaction effect between group and time emerged for cognitive fusion (SCFQ). All three intervention groups changed significantly over time ($F[1,114] = 34.29, p < 0.001$), exhibiting falling levels of cognitive fusion with small within-group effect sizes. Also, there were no significant interaction effects from pre- to post-intervention for the physiological measures (RMSSD, SCR). All the groups experienced an increase in heart-rate variability (RMSSD) over time ($F[1,113] = 25.32, p < 0.001$). Finally, there was also a main effect over time for SCR ($F[1,113] = 5.61, p = 0.020$), but the within-group changes were not significant in any of the groups. These results can be seen in Table 3.

Predictors of change

Given the fact that all the interventions (i.e., distinction-self, hierarchical-self, and control group) resulted in decreases in public speaking anxiety, we were interested in knowing what aspects of psychological flexibility accounted for the changes in public speaking anxiety. Thus, we performed stepwise regression analysis for each group separately. Table 4 shows the regression

analysis by groups for the changes in the dependent variable (i.e., self-reported public speaking anxiety). As an inclusion criterion, we selected as potential predictors all those variables that measure aspects of psychological flexibility (CompACT-OE, CompACT-BA, CompACT-VA, SCFQ, 3D-RISP-en, 3D-RISP-ce, and 3D-RISP-tr). Thus, CompACT and RISP total scores were not included in the regression models since they correlate very highly with their subscales.

In the control group, the results showed that none of the variables was a significant predictor of the changes in public speaking anxiety. In the distinction-self group, changes in the skills of being centered (3D-RISP-ce; Std. $\beta = -0.386$, $p = 0.011$), and entangled (3D-RISP-en; Std. $\beta = 0.370$, $p = 0.014$) remained significant predictors of the changes in public speaking anxiety. These variables together accounted for 31 % of the total variability ($R^2 = 0.316$), ch-RISP-ce predicting 18%, and ch-RISP-en 13% of the variance. However, in the hierarchical-self group, only the changes in openness to experiences (CompACT-OE) remained a significant predictor for the changes in public speaking anxiety (Std. $\beta = -0.339$, $p = 0.032$). This variable accounted for 12 % of the total variability in the changes in public speaking anxiety ($R^2 = 0.115$).

Discussion

We set out to determine whether brief hierarchical- and distinction-self-based interventions would have differential effects on self-reported public speaking anxiety, distress tolerance, psychological flexibility, and physiological reactivity. Our results showed that there were no statistically significant differences between the Hierarchical-Self, Distinction-Self, and Control groups regarding changes in self-reported public speaking anxiety. Thus, the levels of public speaking anxiety of all the groups decreased after one 37-minute training session consisting of a 17-minute intervention period and two 10-minute speech tasks. These results are in line with two previous studies comparing hierarchical- and distinction-self-based interventions that show no

significant differences between the groups in relation to anxiety levels (Foody et al., 2013; Foody et al., 2015). It is also notable that all the groups, including the control group, involved two speech challenge tasks, that is, brief repeated exposure to the feared situation. Given that exposure is an established essential component of the effective treatment of social anxiety disorders (Butler, Chapman, Forman, & Beck, 2006; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014; Hofmann, 2010; Jørstad-Stein & Heimberg, 2009; Ponniah & Hollon, 2008), the Control group could be recognized as an active control group. It is worth observing that although no significant interaction effect was observed in self-reported public speaking anxiety, both between-group ($d = 0.28$) and within-group effect sizes ($d = 0.52$ vs 0.22) indicated a small additional effect for the Distinction self-intervention compared to the control condition. However, any conclusion made by this observation must be handled with caution.

Even though there were no significant interaction effects on psychological flexibility, self-perspective skills, cognitive fusion, and heart rate variability (RMSSD) the changes in these variables are worth discussing. In relation to psychological flexibility, as measured by the CompACT, the results showed that although there was an overall increase in all three groups, interestingly, only the Hierarchical-Self and Distinction-Self groups produced significant increases in psychological flexibility from pre- to post-intervention. Additionally, all three interventions increased self-perspective skills (3D-RISP) and decreased cognitive fusion (SCFQ) indicating that changes in psychological flexibility can be observed after a very brief session of training. Although, there was an overall change in the RMSSD activity from pre to post indicating increased parasympathetic nervous system activity (as an indication of relaxation) only the Hierarchical-Self and the control group increase the RMSSD activity significantly. In relation to speech duration and the skin conductance response (SCRs), none of the interventions increased levels of distress

tolerance and decrease the sympathetic nervous system activity significantly. In summary, the current study did not find clear differences between the Distinction and Hierarchical Self-based interventions on their impact on self-reported public speaking anxiety, nor on psychological flexibility.

Furthermore, the results indicated that when the distinction-self intervention was provided, the changes in the skills of being centered and entangled with thoughts (fusion with self-content) were significant predictors of the changes in self-reported public speaking anxiety. However, in the hierarchical-self group, the decreases in public speaking anxiety were explained by changes in openness to experiences (i.e., defusion and acceptance). Moreover, none of the aspects of psychological flexibility explained changes in public speaking anxiety when analyzing the control group separately. Altogether, the data from the regression analysis highlights that distinction-self intervention might shape skills related to cognitive defusion, while the hierarchical-self intervention might develop skills related to defusion and also acceptance (i.e., willingness to experience thoughts, feelings, and or sensations without trying to control or avoid them).

The following limitations must be observed. First, the intervention used in this experiment lasted 17 minutes (37 minutes, including the two speech exposures). It is possible that this intervention dosage was too short to teach the participants psychological skills. Second, the design did not include a follow-up. The benefits of learning to adopt a self-as-context perspective could manifest themselves over time. Third, the behavioral task of giving a speech in front of a camera could be too stressful for individuals who report high levels of public speaking anxiety. This situation could inhibit the benefits of learning to adopt a self-as-context stand. Fourth, the intervention was delivered in an audio-recorded format. Although this could be regarded as a strength, the participants could have missed out on the benefits of a personalized intervention to

help them better frame their thoughts and feelings in a hierarchical or distinction relation toward the self. Fifth, there is a lack of information on how the participants framed their experiences—that is, whether or not they framed their thoughts and feelings according to how the exercise was tailored (e.g., did the participants in the Hierarchical-Self intervention actually relate their thoughts hierarchically, i.e., as part of themselves, after listening to the instructions?). Confirmation of the behavior induced by the exercise is necessary to say more about the mechanisms involved in the intervention. Sixth, the results are representative of a sample of university students. The design needs to be further tested on different samples. Seventh, there was a relatively small number of participants in each intervention group; consequently, the current study was somewhat underpowered. Further studies are needed to investigate the impact of these interventions using a larger sample.

In terms of clinical relevance, our results suggest that one training session that includes two speech challenge tasks (i.e., a total of 20 minutes of exposure training) could be enough to reduce self-reported public speaking anxiety levels. It is not clear whether adding therapeutic tools such as cognitive defusion, self-as-context would have additional benefits, although we obtained some indications for that. Our data suggested that processes of change predicting or explaining changes in public speaking anxiety might be different in hierarchical and distinction-self interventions. In the distinction-self intervention, the changes were explained by changes in defusion skills, while in the hierarchical-self intervention by changes in defusion and acceptance skills. Generally, we call for more studies that investigate processes of change using experimental designs.

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Compliance with Ethical Standards

Conflict of Interest

The authors declare they have no conflict of interest

Ethical approval

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and its later amendments.

Informed Consent

Informed consent was obtained from all participants for being included in the study.

Availability of data and materials

The data that supports the findings of this study are available on reasonable request from the corresponding author [hidden name]. The data are not publicly available due to them containing information that could compromise research participants' privacy/consent.

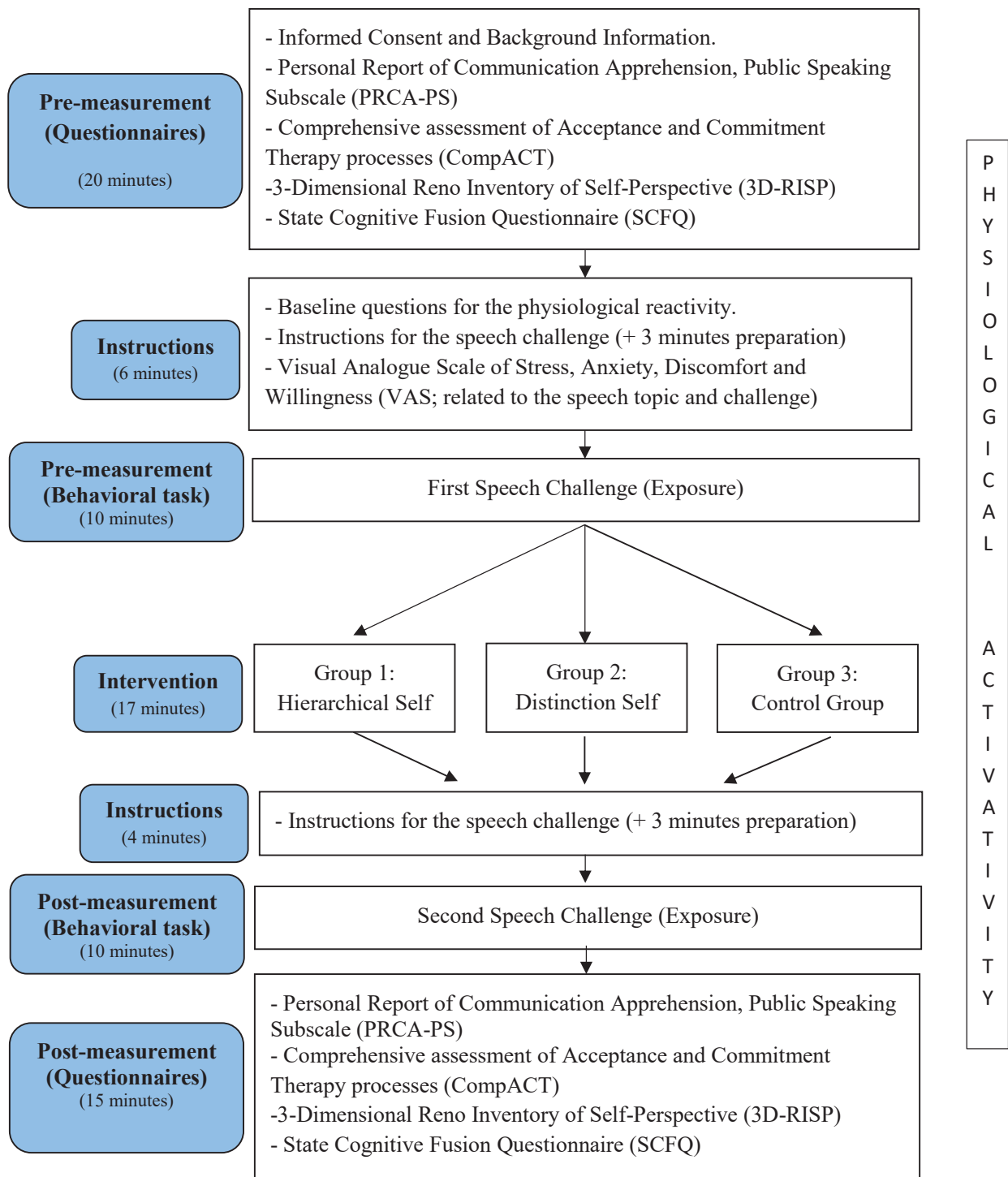


Figure 1. Procedure. * The time from pre- to post-measures was approximately 50 minutes. The physiological reactivity reflected the data from the speeches (first speech challenge, and second speech challenge), and the baseline was used to normalized.



Picture 1. Speech challenge. The participant is giving a speech in front of an audience and a video camera.

Table 1. Protocols.

Hierarchical-Self	Distinction-Self
<p><i>Part I. Neutral private experiences:</i></p>	
<p>Focus your attention on your breath...Now, take a deep breath and notice the air as it enters your body through your nose and travels to your lungs...Once again, take a deep breath...and focus your attention whenever you may feel it more vividly...*</p>	
<p>Can you notice that <i>your</i> breath is <i>only a part of you</i>? Now, take a moment to notice the small gaps between the in-breath and out-breath...**</p> <p>Can you notice that the gaps are <i>only parts of you</i>? Take a moment to notice that <i>your</i> breath and the gaps are <i>included in a bigger part of you</i> (...)</p>	<p>Can you notice that <i>the</i> breath is <i>different from you</i>? Now, take a moment to notice the small gaps between the in-breath and the out-breath...</p> <p>Can you notice that the gaps are <i>different from you</i>? Take a moment to notice that <i>the</i> breath and the gaps are <i>different from you</i> (...)</p>
<p><i>Part II. Challenging private experiences:</i></p>	
<p>Imagine that you are about to give a talk in front of a big audience...Notice the presence of the multitude of people that are waiting for you to speak...look at their faces...notice the silence...notice the rhythm of your heartbeat...whether it becomes more, or less intense...take some time to observe whether there is any change in the speed of your heart...*</p>	
<p>Do you realize that <i>your</i> heartbeats are <i>only a part of you</i>? See if you can notice it...Focus your attention on your breath and the frequency of the inhalations and exhalations...Notice whether they are speeding up or slowing down...Take your time to notice if there is any change in the frequency and intensity. Do you realize that <i>your</i> breath is <i>only a part of you</i>? See if you can notice it. Imagine you <i>contain</i> all the sensations that <i>you have had</i> today...</p> <p>Furthermore, imagine that <i>your</i> sensations are like fish and you are <i>an aquarium containing</i> these sensations. Can you imagine yourself in this way?... Notice that the <i>aquarium is the container of the fish</i>, as you are <i>the container of all your</i> sensations. Can you notice that the <i>aquarium is the container of the fish</i>? Can you notice that you are <i>the container of your</i> sensations?</p>	<p>Do you realize that <i>the</i> heartbeats are <i>different from you</i>? See if you can notice it. Focus your attention on your breath and the frequency of the inhalations and exhalations...Notice whether they are speeding up or slowing down... Take your time to notice if there is any change in the frequency and intensity. Do you realize that <i>the</i> breath is <i>different from you</i>? See if you can notice it. Imagine you <i>are different than</i> all the sensations <i>that have been there</i> today...</p> <p>Furthermore, imagine that <i>these</i> sensations are like fish and you are <i>a rock different from these</i> sensations. Can you imagine yourself in this way?... Notice that the <i>rock is different from the fish</i>, as you are <i>different from all the</i> sensations. Can you notice that the <i>rock is different from the fish</i>? Can you notice that you are <i>different from the</i> sensations?</p>

* Common section for both protocols (Hierarchical-Self and Distinction-Self)

** The *italicized* words are parts of the intervention that differentiate Hierarchical-Self from Distinction-Self.

Table 2. Descriptive statistics by intervention

Variable	Hierarchical-Self			Distinction-Self			Control Group		
	M (SD)	95% confidence interval		M (SD)	95% confidence interval		M (SD)	95% confidence interval	
		Upper	Lower		Upper	Lower		Upper	Lower
PRCA-PS	20.37 (4.82)	19	21.79	21.18 (4.25)	19.74	22.55	21.05 (5.47)	19.41	22.66
VAS 1: How uncomfortable does it make you feel to talk about this topic?	4.56 (2.64)	3.78	5.36	4.83 (2.76)	3.95	5.72	4.47 (2.79)	3.62	5.36
VAS2: How willing do you feel to speak about this topic?	4.71 (2.26)	4.05	5.39	4.81 (2.39)	4.07	5.63	4.94 (2.39)	4.17	5.75
VAS3: How uncomfortable does it make you feel to give the speech?	5.59 (2.55)	4.81	6.29	5.77 (2.68)	4.94	6.66	6.12 (2.61)	5.30	6.98
VAS4: How stressful does it make you feel to give the speech?	5.41 (2.41)	4.68	6.09	5.33 (2.36)	4.59	6.09	6.07 (2.31)	5.37	6.77
VAS5: How anxious does it make you feel to give the speech?	5.72 (2.61)	4.99	6.49	5.41 (2.43)	4.66	6.18	6.12 (2.24)	5.47	6.85
VAS6: How willing do you feel to give the speech?	3.84 (2.14)	3.20	4.55	3.92 (2.55)	3.15	4.76	4.12 (2.34)	3.38	4.88

Note: PRCA-PS (public speaking anxiety)

Table 3. Means, standard deviations, p value (between-and within-groups) and d values (between-and within-groups).

	Pre m (SD)	Post m (SD)	p_w	d_w	F (df1, df2)	p_b	d_b
PRCA-PS					2.10 (2, 114)	.13	
Hierarchical-Self	20.37 (4.82)	18.76 (4.63)	.001	.34			HC (.09)
Distinction-Self	21.18 (4.25)	18.68 (4.78)	< .001	.52			DC (.28)
Control Group	21.05 (5.47)	19.90 (5.37)	.016	.22			HD (.20)
CompACT					.98 (2, 114)	.38	
Hierarchical-Self	88.07 (22.11)	91.07 (21.59)	.008	.14			HC (.10)
Distinction-Self	84.46 (20.74)	86.89 (20.39)	.034	.12			DC (.08)
Control Group	91.80 (17.24)	92.80 (18.44)	.331	.05			HD (.03)
3D-RISP					.06 (2, 114)	.95	
Hierarchical-Self	63.88 (11.36)	65.32 (12.25)	.018	.12			HC (.03)
Distinction-Self	61.16 (11.57)	62.76 (11.79)	.025	.14			DC (.01)
Control Group	63.44 (9.83)	65.18 (10.42)	.016	.16			HD (.01)
SCFQ					.93 (2, 114)	.40	
Hierarchical-Self	25.37 (10.88)	22.22 (10.15)	.002	.31			HC (.05)
Distinction-Self	26.86 (10.87)	22.24 (10.13)	.001	.46			DC (.20)
Control Group	25.95 (8.22)	23.26 (8.19)	.001	.29			HD (.14)
Speech duration					.52 (2, 113)	.60	
Hierarchical-Self	8:17 (2:39)	7:57 (2:52)	.344	.24			HC (.27)
Distinction-Self	7:45 (2:56)	7:37 (3:10)	.652	.03			DC (.06)
Control Group	7:28 (2:57)	7:36 (2:57)	.691	.03			HD (.21)
RMSSD					.19 (2, 113)	.83	
Hierarchical-Self	0.09 (0.31)	0.29 (0.49)	.001	.40			HC (.11)
Distinction-Self	0.15 (0.97)	0.30 (0.72)	.077	.24			DC (.03)
Control Group	0.04 (0.26)	0.21 (0.35)	< .001	.39			HD (.08)
SCRs					.52 (2, 113)	.60	
Hierarchical-Self	-0.32 (0.28)	-0.27 (0.39)	.276	.12			HC (.26)
Distinction-Self	-0.07 (0.61)	0.07 (0.74)	.094	.00			DC (.02)
Control Group	-0.18 (0.40)	-0.46 (0.74)	.196	.46			HD (.22)

Note. Public speaking anxiety (PRCA-PS), psychological flexibility (CompACT), self-perspective skills (3D-RISP), cognitive fusion (SCFQ), speech duration, heart rate variability (RMSSD), and skin conductance responses (SCRs) in the groups Hierarchical-Self (n = 41), Distinction-Self (n = 37) and Control Group (n = 39). p_w = p value within group; p_b = p value of interaction between time and group; d_b = corrected between group Cohen's d effect size; d_w = Cohen's d within group effect size; HC = corrected between group Cohen's d between Hierarchical-Self and Control Group, DC = corrected between group Cohen's d between Distinction-Self and Control Group; HD = corrected between group Cohen's d between Hierarchical-Self and Distinction-Self. F = the interaction effect between time and group.

Table 4. Stepwise regression analysis. Role of the changes in the different aspects of psychological flexibility in predicting changes in public speaking anxiety. Ch-PRCA-PS (public speaking anxiety); ch-CompACT-OE (changes in Openness to Experiences); ch-RISP-en (changes in being entangled with thoughts and feelings); ch-RISP-ce (changes in being centered).

Group	Dependent Variables	Significant predictors (independent variables)	Std β	R^2	Adjusted R^2	R^2 Change
Distinction-Self						
	Ch-PRCA-PS	1. Step Ch-RISP-ce	-0.386*	0.180**	0.157	0.180**
		2. Step Ch-RISP-en	0.370*	0.316**	0.276	0.136*
Hierarchical-Self						
	Ch-PRCA-PS	1. Step Ch-CompACT-OE	-0.339*	0.115*	0.092	0.115*

Note: *** $p < .001$; ** $p < .01$; * $p < .05$.

[1] For the regressions, only those variables (aspects of psychological flexibility) that significantly correlated ($p < .05$) with public speaking anxiety.

[2] Standardized Coefficients β are from last step.

[3] Significant F change is represented with * in the R^2 Change.

Note: In the control group, none of the changes in the process variables predicts changes in public speaking anxiety.