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Review and Analysis of Successful PSA Interventions: An Applied Perspective

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ABSTRACT

Public speaking can be a fear-inducing and anxiety-provoking experience for individuals, potentially resulting in poor performance and missed educational, social, and professional opportunities. In order to provide applied practitioners with effective methodologies for the reduction of public speaking anxiety (PSA), this paper aims to systematically review and meta-analyse theoretically driven interventions that successfully reduce PSA or maintain/increased public speaking performance. Following the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines, a systematic review and meta-analysis examined articles from 1 January 2000 to 1 June 2023. Of the 1293 articles identified, 26 studies with 2253 participants met the inclusion criteria. Research was of a moderate to high methodological standard, with interventions varying in type, duration, and focus (e.g., symptom vs. source). Intervention types included exposure, cognitive modification, combined, and other strategies. Although, the overall effect of psychological interventions for PSA across 42 interventions was $g=1.17$ (95% CI = 0.88–1.45), with high heterogeneity, individual effect sizes varied greatly. While this review provides support for the efficacy of psychological interventions in reducing anxiety related to public speaking, rigorous research is warranted to examine long-term efficacy, real-world implications, self-efficacy development, and individual differences in treatment assignment. Finally, this review provides practitioners with a quick and easy guide to implementing successful interventions that reduce PSA or maintain/increase performance.

Introduction

"People fear public speaking more than death" is a phrase that has been quoted by numerous teachers, researchers, consultants, and countless textbooks ever since its first appearance in the *London Sunday Times* (see Watson, 1973, p. 9). The original research referenced found that out of 2500 Americans surveyed, 41% reported their greatest fear was speaking before a group (Speech Communication Association [SCA], 1973). In replicating this research, Dwyer and Davidson (2012) found that 61% of college students reported speaking before a group was their most common fear.

Ferreira Marinho et al. (2017) conducted a similar study where 63.9% of undergraduate students reported a fear of public speaking and 89.3% desired classes to improve public speaking skills.

Perhaps somewhat confusingly, many labels have been used to describe performance anxiety related to public speaking such as public speaking anxiety (Bodie, 2010), fear of public speaking (Blöte et al., 2009), communication apprehension (McCroskey, 1977), public speaking apprehension (Ayres & Ayres, 2003), stage fright (Jangir & Govinda, 2018), speech fright (Dwyer, 1998), and performance anxiety (Bögels et al., 2010). To avoid any further confusion, this article will use the term public speaking anxiety (PSA; Bodie, 2010). PSA describes the anxiety an individual may experience prior to or during a real or imagined public speaking situation.

Research has shown that PSA can lead to maladaptive tendencies, such as negative cognitive biases, avoidance, poor speech preparation, and dropout, resulting in missed educational, social, and professional opportunities (Bodie, 2010; Daly, 2009). In addition, several studies have found that PSA is a common characteristic of social anxiety disorder (SAD) and interventions targeting public speaking fears, would help alleviate some of these maladaptive responses (Ruscio et al., 2008).

Psychological Interventions

Over the past few decades, there has been a significant expansion in the range and availability of psychological and pharmacological interventions for the treatment of PSA. Although both approaches demonstrate efficacy in the treatment of anxiety disorders (Cuijpers et al., 2013), psychological interventions are commonly recommended as the first line of treatment. Therefore, this review focuses only on the exploration of successful psychological interventions for the treatment of PSA. Psychological interventions are interpersonal or informative activities, techniques, or strategies designed to decrease psychological symptoms, distress, or maladaptive behaviors to improve well-being (England et al., 2015). While a broad range of intervention types exists, they often contain exposure-based, cognitive-based, or combined therapies. For example, exposure-based therapies (i.e., exposure therapy) aim to provide opportunities to confront feared stimuli, cognitive-based therapies (i.e., cognitive modification) aim to alter maladaptive thought processes, and combined therapies (e.g., cognitive behavioral therapy) utilize a combination of the two. This study aimed to build upon previous research and provide a critical narrative synthesis for these three types of interventions.

Review of Recent Meta-Analyses

Recently, Ebrahimi et al. (2019) conducted a meta-analysis to examine the efficacy of psychological interventions for fear of public speaking (FoPS). Although their work provides an excellent foundation and a clear direction, their review has several limitations. First, Ebrahimi and colleagues found all interventions to be effective in reducing FoPS, however, they included studies where between group significance was not achieved (e.g., McNally et al., 2013) and studies with high attrition rates (resulting in potential attrition bias). Second, Ebrahimi et al.'s work lacked a critical narrative

synthesis of studies (e.g., intervention type and theoretical frameworks). Without a critical narrative synthesis, it is difficult for an applied practitioner to determine the variables that may have led to treatment efficacy. Third, their decision to search only four databases could have potentially missed studies of worth. Fourth, only randomized controlled trials were evaluated (potentially missing effective studies).

A related systematic review and meta-analysis by Horigome et al. (2020) examined the effects of virtual reality exposure therapies (VRET) on SAD, FoPS, and PSA. Horigome and colleagues found VRET to be an acceptable treatment option, demonstrating significant long-lasting efficacy. While their report included eight studies that focused on PSA and FoPS reduction, their analysis only concentrated on the generalized effects of interventions on SAD. The authors also excluded studies in which VRET was conducted for less than three sessions (hence, ignoring single-session interventions covered in this review).

Finally, Reeves et al. (2022) conducted a meta-analysis to investigate the efficacy of VRET and *in vivo* exposure therapies for PSA. They found that both therapies were effective with *in-vivo* marginally more efficacious. Although their results support Horigome et al. (2020) findings, there are some limitations to their research. First, they only included studies in which participants had significantly elevated clinical levels of PSA (hence, ignoring more normal populations). Second, four out of 11 studies (36%) were published between 1978 and 1997 and could be considered outdated due to advances in quality and reporting in recent years. Third, Reeves et al. also lacked a narrative synthesis (see also Ebrahimi et al., 2019).

In the present authors' view, if practitioners can easily identify effective treatments and their methodologies, they will be in a far better place to develop, deliver, and assess their own interventions moving forward. Therefore, the present study takes an alternative approach to examining this broad area of research by providing a detailed critical narrative synthesis and meta-analysis of successful interventions aimed at reducing PSA rather than unsuccessful ones. Furthermore, it will build on some of the limitations observed in Ebrahimi et al. (2019), Horigome et al. (2020), and Reeves et al. (2022) systematic reviews and meta-analyses.

Research Aims

The present study had three main aims: (1) to identify current successful psychological interventions available for the reduction of PSA; (2) to examine, compare, and assess the efficacy of successful psychological interventions against credible control groups; and (3) to provide a narrative synthesis and meta-analysis of successful interventions to aid applied practitioners in the selection and delivery of appropriate treatments.

Method

Following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA; Moher et al., 2009), a final electronic search was conducted in June 2023 using the following databases: Social Science Premium Collection, SciTech Premium Collection, Publicly Available Content, APA PsychInfo, British Nursing, Arts and Humanities, Literature Online (*via* the ProQuest platform), PubMed, Wiley, Taylor

and Francis, JSTOR, Cochrane Library, and SAGE. The first author initially read and checked all titles and abstracts against the eligibility and exclusion criteria listed below. If any information was unclear, the full-text article was screened. The following specific search terms were used to identify empirical research on psychological interventions for public speaking anxiety: ("public speaking anxiety" OR "public speaking fear" OR "fear of public speaking") AND ("intervention" OR "program*" OR "treat*" OR "measure" OR "outcome" OR "evaluation"). Full-text database searches for keywords were performed to ensure the inclusion of all relevant articles. The first author followed up the database searches with backward and forward reference searches to identify further relevant articles. Please contact the first author for the protocol of this study.

Inclusion and Exclusion Criteria

Studies included in the review were required to meet the following selection criteria: (1) psychological interventions for PSA that measured psychological change or targeted specific psychological variables; (2) written in English; (3) peer-reviewed; (4) included a control group; (5) significantly reduced the amount of anxiety experienced and/or improved/maintained performance; and (6) published since 2000. Restricting our search to the post-2000 period prevented the inclusion of outdated information and focused on the most recent and relevant studies that accurately reflect the current state of knowledge, practice, and technology. Studies were excluded from the review based on the following criteria: (1) abstract only/no full-text available; (2) lacked validated measures (e.g., no evidence of content- and/or criterion-related validity); (3) high attrition rate (40% or higher); and (4) studies that showed no significant effects (i.e., did not work) were omitted from the current review. By excluding studies with high attrition rates and studies that were not effective in reducing PSA, we are more able to provide a detailed narrative synthesis of highly effective interventions. Focussing on highly effective interventions is not uncommon. For example, Hodgkinson et al. (2021) only reviewed successful psychological resilience-based interventions that showed a reduction in recidivism or an increase in psychological health in young people who offend (rather than unsuccessful interventions). However, focussing only upon successful interventions will bias a more balanced review. Figure 1 shows the PRISMA flow chart detailing the review and selection process of papers for inclusion in the review.

Assessment of Study Quality

To assess the quality of the studies meeting the inclusion criteria in this systematic review, the first author opted to use the 16-item quality assessment tool and scoring guidance (QATSDD; Sirriyeh et al., 2012). However, as several assessment criteria were irrelevant to this review, the first author decided to omit them. As most studies did not include a pilot study, "Evidence of user involvement in design" was excluded. Further, "Good justification of analytical method selected" was removed due to the author's deciding it would not be a decisive factor in determining overall study quality.

The QATSDD contains a list of criteria for studies rated on a 4-point scale ranging from 0 (not at all) to 3 (completed). Division of the total score for each study by the maximum possible score resulted in an overall quality percentage. The first author
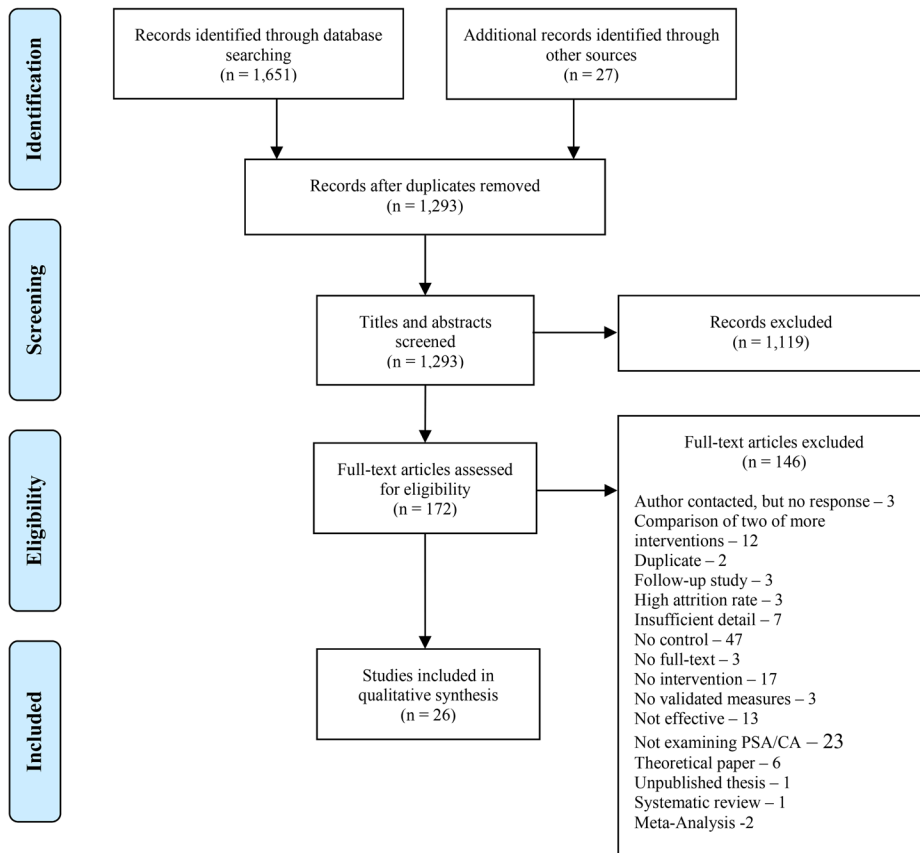
FIGURE 1. PRISMA flow chart.

performed the initial quality assessment and the second author independently assessed a random 30% of the data. Inter-rater reliability was within a 3% margin, indicating an almost perfect agreement (Landis & Koch, 1977). Where discrepancies occurred between coders, the scores were discussed before reaching a consensus.

Results

Search Result

The database search identified 1651 records. Forward and backward reference searches identified a further 27 records. After removing duplicates 1293 titles and abstracts were identified. These titles and abstracts were examined against the inclusion and exclusion criteria, resulting in 172 papers identified for full-text review. A final list of 26 articles were identified as appropriate for the review (see Table 1).

Quality Assessment

Quality assessment results ranged from 33% to 94%, with a mean score of 66% (see Table 1). Two papers scored in the very high methodological quality range (81–100%),

TABLE 1. Summary of reviewed studies.

Author, year, location	Participant information M = Male; F = Female				Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
Abrams et al. (2001) US	Sample size Total sample size n=61	Mean age (SD) 32.2 (SD = 9); Age Range 21–55	Ethnicity Missing data		STAI-S; AAS; VASs; HR	Random	45 min	2 h 15 min	Speech topics were taken from The Book of Questions (Stock, 1985) and were on a different moral dilemma. One at pretest, one at post-test. Audience of approximately six people.	62%
	Intervention 41	Missing data	Missing data							
	Control 20	Missing data	Missing data							
Amir et al. (2008) US	Sample size Total sample size n=94	Mean age (SD) Missing data	Ethnicity Missing data		STAI-T; LSAS-SR; BDI-II	Random	Missing data	Missing data	Post-test only: impromptu speech (with two minutes of preparation) on one of five topics (abortion, corporal punishment, seatbelt laws, nuclear power, or the American health system). Speeches were delivered to a video camera and lasted, on average, three minutes.	52%
	Intervention M=46; F=48	19 (SD = 1.9)	Missing data							
	Control M=22; F=25	19 (SD = 1.2)	Missing data							
Aslani et al. (2014) Iran	Sample size Total sample size n=30	Mean age (SD) Age Range 19–25	Ethnicity Missing data		PRCS; S-R Inventory	Random	7 individual sessions of 90 min each	Missing data	No public speaking component.	50%
	Intervention M=0; F=15	Missing data	Missing data							
	Control M=0; F=15	Missing data	Missing data							

(Continued)

TABLE 1. Continued.

Author, year, location	Participant information (M = Male; F = Female)			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
	Sample size	Mean age (SD)	Ethnicity						
Ayres and Ayres (2003) US	Total sample size n = 90 M = 44; F = 46 Intervention 72 Control 18	19.3 (SD - Missing data) Missing data Missing data	Missing data Missing data Missing data	PRCA; STAI	Random	15 min	1 days	Speech topics were "What I expect to get out of college" or "What I expect to do in the future." Half of the participants spoke on one topic at pretest and the other topic at post-test. Audience of three to four people.	60%
Ayres and Heuett (2000) US	Total sample size n = 50 M = 20; F = 30 Intervention 33 Control 17	19.4 (SD - Missing data) Missing data Missing data	Missing data Missing data Missing data	PRCA; STAI	Random	One-off 30-minute treatment	14 weeks	Speech topics were "What I expect to get out of college" or "What I expect to do in the future." Half of the participants spoke on one topic at pretest and the other topic at post-test. Audience of two to five people.	64%
Ayres and Schliesman (2002) US	Total sample size n = 40 M = 23; F = 17 Intervention Missing data Control Missing data	21.4 (SD - Missing data) Missing data Missing data	Missing data Missing data Missing data	PRCA; STAI	Random	20 min	1 days	Speech topics were "What I expect to get out of college" or "What I expect to do in the future." Half of the participants spoke on one topic at pretest and the other topic at post-test. Audience of two to five people.	60%

(Continued)

TABLE 1. Continued.

Author, year, location	Participant information (M = Male; F = Female)			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
Ayres, and Peterson (2000) US	Sample size Total sample size n = 136	Mean age (SD) 19.4 (SD - Missing data); Age range 18–52	Ethnicity Missing data	PRCA; STAI (5-item); WTC; SPCC	Random	1 week (however no explanation of how much time during the week)	1 weeks	Speech topics were "What I expect to get out of school" or "What I expect to do after I finish school." All treatment participants spoke on one topic pretest and the other post-test. The audience size ranged between four and eight people	48%
	Intervention Missing data	Missing data	Missing data						
	Control Missing data	Missing data	Missing data						
Ayres, Hopf, and Will (2000) US	Sample size Total sample size n = 80	Mean age (SD) 19.2 (SD - Missing data); Age Range 18–48 - *Only for pretest of 2807 not final sample	Ethnicity Missing data	The Stroop Test; PRCA; STAI	Random	20 min	1 h	Speech topics were "What I expect to get out of school" and "What I expect to do after I finish school." Half of the participants spoke on one topic at pretest and the other topic at post-test. No details of the audience were given.	57%
	Intervention 40	Missing data	Missing data						
	Control 40	Missing data	Missing data						
Azevedo et al. (2017) UK	Sample size Total sample size n = 52	Mean age (SD) 26.4 (SD = 5.7)	Ethnicity Missing data	HR; Skin conductance; STAI-Y-1; bFNE	Random	5 min	1 day	Speech topic was "the use of animals for research." Participants had five minutes to prepare a five-minute speech to an audience of three to four colleagues of the researcher. Speeches were never delivered.	43%
	Intervention M = 9; F = 16	25.9 (SD = 5.2)	Missing data						
	Control M = 11; F = 16	26.8 (SD = 6.1)	Missing data						

(Continued)

TABLE 1. Continued.

Author, year, location	Participant information M = Male; F = Female			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
	Sample size	Mean age (SD)	Ethnicity						
Brandrick et al. (2020) UK	Total sample size n = 63	25.7 (SD = 9.48); Age Range 19–56	Missing data	BAT; PRPSA; SUDs	Missing data	30 s	1 day	Post-test only. An impromptu speech on a randomly selected topic "your dream job." Audience of one researcher.	67%
	M = 17; F = 46 Intervention 42	Missing data	Missing data						
	Control 21	Missing data	Missing data						
Buttelmann and Römpke (2014) Germany	Total sample size n = 71	22.5 (SD - Missing data); Age Range 18.8–29.8	Missing data	STAI; AAS; PAS; PlantAS	Measurement scores	5 min	1 day	Post-test only. Speech topics were a) Literature ("The significance of Friedrich Schiller in Weimar Classicism"), b) Politics ("Michail Gorbatschow and his role in the Cold War"), and c) Science ("The chemical and physical background to global warming"). Topics were preselected by the experimenter in a way that excluded the preferred topic participants gave in the demographic questionnaire. Five minutes preparation was time given. Audience of a camera with a live connection to the adjacent room.	55%
	M = 6; F = 65 Intervention 53	Missing data	Missing data						
	Control 18	Missing data	Missing data						

TABLE 1. Continued.

Author, year, location	Participant information M = Male; F = Female		Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
Choi et al. (2015) US	Sample size Total sample size n = 95 M = 49; F = 46 Intervention 48 Control 47	Mean age (SD) 20 (SD = 1.61); Age Range 18–25 Missing data Missing data	Ethnicity Missing data Missing data Missing data	PRCA-24	Random	8 min	1 day	Predetermined speech topic pertinent to the university was used. Intervention group participants were given four minutes preparation, control group were given a distractor task. Both groups received the same set of predetermined notes to use in their delivery. No details of audience given.	55%
Cunningham et al. (2006) US	Sample size Total sample size n = 36 Intervention 17 Control 19	Mean age (SD) Missing data Missing data Missing data	Ethnicity Missing data Missing data Missing data	SRP; SUBSS; PRCS	Random	2–5 sessions (average 3.3) 1 hr each	Missing data	No public speaking component was administered by the researchers; however, participants did undertake one before submitting post-test scores	55%
Dincer et al. (2020) Turkey	Sample size Total sample size n = 78 Intervention 51 Control 25	Mean age (SD) Missing data Missing data Missing data	Ethnicity Missing data Missing data Missing data	SUDs; STAI-TX1; STAI-TX 2; SAS	Random	20 min	1 day	Post-test only. Speech topic was "Prevention of chronic diseases within the scope of chronic diseases course." No details on preparation or duration of speeches. Audience was of the general public, but no other details were given.	79%

TABLE 1. Continued.

Author, year, location	Participant information (M = Male; F = Female)			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
	Sample size	Mean age (SD)	Ethnicity						
Dwyer (2000) US	Total sample size n = 331	Age Range 17–52	Missing data	PRCA-24	Self-Selection	3 weeks	15 weeks	No public speaking component.	55%
	Intervention 202	Missing data	Missing data						
	Control 129	Missing data	Missing data						
Finn et al. (2009) US	Total sample size n = 140	Mean age (SD) 19.08 (SD = 1.4); Age Range 18–29	Ethnicity Missing data	PRCA-24; A-STAI	Cluster Randomized	Missing data	Up to 15–17 weeks (1 US semester)	Informative speech at pretest; persuasive speech at post-test. Each speech lasted five minutes. Audience of 20–25 peers and the course instructor.	64%
	M = 60; F = 80 Intervention Missing data	Missing data	Missing data						
	Control Missing data	Missing data	Missing data						
Fitch et al. (2011) US	Total sample size n = 67	Mean age (SD) Missing data	Ethnicity Missing data	PRPSA; CAI State	Self-selection	Until SUDS rating was significantly reduced, or 20 min had passed	1 day	Both pre-and post-test speeches were given but no information about the topic, duration, or audience was given.	55%
	Intervention 14	Missing data	Missing data						
	Control 53	Missing data	Missing data						

(Continued)

TABLE 1. Continued.

Author, year, location	Participant information M = Male; F = Female			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
Heuett and Heuett (2011) US	Sample size Total sample size n = 80 M = 33; F = 47 Intervention 80 Control 40	Mean age (SD) 20.1 (SD - Missing data); Age Range 18–26 Missing data Missing data	Ethnicity Missing data Missing data Missing data	PRCA; STAI; WTC; SPCC	Random	10–20 min	1 week	Impromptu speech topics were "What I expect to get out of college" and "What I expect to do after college." Half of the participants spoke on one topic at pretest and the other topic at post-test. No details of audience given.	52%
Heuett et al. (2003) US	Sample size Total sample size n = 72 Intervention 60 Control 12	Mean age (SD) 20.8 (SD - Missing data) Missing data Missing data	Ethnicity Missing data Missing data Missing data	PRCA; STAI; WTC; SPCC; PCS	Paired comparison score	20–40 min	1 day	Impromptu speech topics were "What I expect to get out of college" and "What I expect to do after college." Half of the participants spoke on one topic at pretest and the other topic at post-test. No details of audience were given.	64%
Jackson et al. (2017) Australia	Sample size Total sample size n = 230 Intervention M = 50; F = 52 Control M = 60; F = 68	Mean age (SD) 20.14 (SD = 2.72) 20.41 (SD = 3.23) 19.92 (SD = 2.22)	Ethnicity Missing data Missing data Missing data	BFI-10; Perceived threat; Task importance; Social anxiety; Task-related anxiety; Self-efficacy, SAS-2; Interpretation of anxiety; Impact of message; SPSS	Cluster Randomized	2 weeks	2 weeks	No details of speech topics or preparation time were given. Each person presented for approximately eight minutes (as part of a 30-minute group presentation). Audience of approximately 20 classmates.	83%

(Continued)

TABLE 1. Continued.

Author, year, location	Participant information M = Male; F = Female			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
Jangir and Govinda (2018) India	Sample size *Total sample size n = 40* Intervention *Missing data* Control *Missing data*	Mean age (SD) *Missing data* *Missing data* *Missing data*	Ethnicity *Missing data* *Missing data* *Missing data*	PRPSA; RSE; SUDs	Missing data	6 weeks	6 weeks	No public speaking component.	29%
Lin et al. (2019) Singapore	Sample size *Total sample size n = 50* Intervention *M = 8; F = 17* Control *M = 5; F = 20*	Mean age (SD) *25.6 (SD = 3.96)* *24.2 (SD = 3.23)* *27 (SD = 4.19)*	Ethnicity *84% Chinese; 16% Other* *80% Chinese; 20% Other* *88% Chinese; 12% Other*	LSAS; PSAS; FNE-B; SSPS	Random	4 weekly sessions, each lasting approximately 60 min.	10 weeks	No public speaking component.	62%
Pribyl et al. (2001) Japan	Sample size *Total sample size n = 111* Intervention *M = 3; F = 22* Control *M = 24; F = 62*	Mean age (SD) *Missing data* *Missing data* *Missing data*	Ethnicity *Missing data* *Missing data* *Missing data*	PRPSA	Self-selection	45 h	1 year	No public speaking component.	43%

(Continued)

TABLE 1. Continued.

Author, year, location	Sample size	Participant information M=Male; F=Female Mean age (SD)	Ethnicity	Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
Reeves et al. (2021) UK	Total sample size n=51 Intervention M=2; F=31 Control M=1; F=17	26 (SD = 7.53) (1) 27.40 (SD=9.25); (2) 26.60 (SD=6.79) 24.17 (SD = 6.53)	98% White; 2% Black Missing data Missing data	PSAS; LSAS-SR; FNE-B; IPQ	Random	Missing data	4 weeks	Intervention group only. Pre- and post-test. Two minutes to prepare a speech on between one and three speech topics taking from a list of five controversial topics (e.g., nuclear power, Brexit, death penalty). Speeches lasted between four and fifteen minutes but were advised they could stop at any time. Audience of one researcher	69%
Tillfors et al. (2011) Sweden	Total sample size n=19 Intervention 10 Control 9	16.5 (SD = 1.6); Age Range 15–21 Missing data Missing data	Missing data Missing data Missing data	SPSQ-C; LSAS-SR; BAI; MADRS-S; QOLI	Random	9 weeks	9 weeks+follow-up 1 year	No public speaking component.	64%

(Continued)

TABLE 1. Continued.

Author, year, location	Participant information			Psychological measures utilized	Treatment Assignment	Duration of Treatment(s)	Duration of Study	Description of Public Speaking Format	Quality score (0–100%)
	Sample size	Mean age (SD) M = Male; F = Female	Ethnicity						
Wallach et al. (2009) Israel	Total sample size n = 88 Intervention M = 11; F = 47 Control M = 9; F = 21	Missing data (1) 28.18 (SD = 7.97); (2) 28.59 (SD = 8.08) 25.29 (SD = 2.62)	Missing data Missing data Missing data	LSAS; SSPS; FNE; Behavioral Task	Random	12 h	12 weeks	Post-test only. Participants presented a 10-minute talk (standing and without notes) on a topic of their choice. Audience of four to five members of staff.	55%

A-STAI: A-State version of the State-Trait Anxiety Inventory (Spielberger et al., 1970); AAS: Audience Anxiousness Scale (Leary, 1983a); ANB: Alternate Nostril Breathing (Kamath et al., 2017); BAI: Beck Anxiety Inventory (Beck et al., 1988); BAT: Behavioral Assessment Test (Clark et al., 1997), BFI-10: Brief version of the Big Five Inventory (Rammstedt & John, 2007); bFNE: Brief Fear of Negative Evaluation Questionnaire (Leary, 1983b); CAI State: Communication Anxiety Inventory Form State (Booth-Butterfield & Gould, 1986); FNE: Fear of Negative Evaluation Scale (Watson & Friend, 1969); FQ: Fear Questionnaire (Marks & Mathews, 1979); HR: Heart Rate; The Igroup Presence Questionnaire (IPQ) (Schubert et al., 2001); LSAS: Liebowitz Social Anxiety Scale (Liebowitz, 1987); LSAS-SR: Liebowitz Social Anxiety Scale self-report (Baker et al., 2002); MADRS-S: Montgomery–Åsberg Depression Rating Scale (Svanborg & Åsberg, 1994); PAS: Pet Attitude Scale (Templer et al., 1981); PCS: Paired Comparison Survey (Heuett et al., 2003); PlantAS: Plant Attitude Scale (Buttelmann & Römpke, 2014); PRCA: The Personal Report of Communication Apprehension (McCroskey, 1997); PRCA-24: The Personal Report of Communication Apprehension (Levine & McCroskey, 1990); PRCS: Personal Report of Confidence as a Speaker (Paul, 1966); PRPSA: The Personal Report of Public Speaking Anxiety (McCroskey, 1970); PSAS: Public Speaking Anxiety Scale (Bartholomay & Houlihan, 2016); QOLI: Quality of Life Inventory (Frisch et al., 1992); RSE: Rosenberg Self-Esteem Scale (Rosenberg, 1965); SAS: Speech Anxiety Scale (Yaman and Suroglu Sofu (2013); SAS-2: Sport Anxiety Scale-2 (Smith et al., 2006); SII: Survey of Imagined Interactions (Honeycutt, 2010); SPCC: The Self-Perceived Communication Competence scale (McCroskey & McCroskey, 1988); SPS: Social Phobia Scale (Mattick & Clarke, 1998); SPSQ-C: Social Phobia Screening Questionnaire for Children & adolescents (Gren-Landell et al., 2009); S-R Inventory – Stimulus-Response Inventory (Endler et al., 1962); SRP: Self-rated Performance (Cunningham et al., 2006); SSPS: Self-Statements during Public Speaking scale (Hofmann & Dibartolo, 2000); Stroop Test (Mandeville et al., 1994); STAI: The State Trait Anxiety Inventory (Spielberger et al., 1970); STAI-S: The State form of the State-Trait Anxiety Inventory (Spielberger, 1983); STAI-Y1: State-Trait Anxiety Inventory (Spielberger et al., 1970); SUBSS: Subjective Units of Bothersome Sensations Scale (Cunningham et al., 2006); SUDS: Subjective Unit of Distress Scale (Wolpe, 1969); VAMS: Visual Analogue Mood Scale (Norris, 1971); VASs: Visual Analogue Scales (Abrams et al., 2001); WTC: The Willingness to Communicate Scale (McCroskey & Richmond, 1991).

18 scored high (61–80%), six moderate (41–60%), and one low (21–40%). Overall, the studies scored highly in terms of theoretical framework, study objectives, and method of analysis. The lowest scoring item was *"Evidence of sample size considered"* which was only achieved in three studies (11.5%). No paper achieved a "complete" score for *"Representative sample of target group of a reasonable size."*

Country of Origin

This review found that 14 studies originated from the US, three from the UK, and one each from India, Japan, Israel, Sweden, Iran, Germany, Australia, Singapore, and Turkey (see Table 1, Column 1).

Settings

Twenty of the studies were based in universities. One study was set in a high school (Tillfors et al., 2011), one examined social drinkers in the Minneapolis/Saint Paul metro area (Abrams et al., 2001), one focused on Toastmaster groups near a large metropolitan western city (Cunningham et al., 2006), and three failed to say where they were set (Azevedo et al., 2017; Lin et al., 2019; Wallach et al., 2009)

Population

A total of 2253 participants, with 1093 intervention participants and 844 control participants took part across the 26 studies. Four studies failed to report a breakdown of participants between the intervention and control groups, resulting in missing data on 317 participants. Sixteen studies included data on both genders of which 515 were male and 916 females. One study contained female-only participants ($n = 30$; Aslani et al., 2014), and nine studies failed to report a gender split, leading to missing data regarding gender for 823 participants. Across all studies, age ranged from 15 to 56 years. Twenty-five studies focused solely on an adult population, while one study examined young people aged between 15 and 21 years (Tillfors et al., 2011). Only five studies reported the ages of both the intervention and control groups. The average age was 24.38 years ($SD = 3.33$) and 23.60 years ($SD = 3.31$) for the intervention and control groups respectively. Five studies failed to report any data related to participant age (see Table 1, Column 2).

Ethnicity

Of the 26 studies included in this review, only two recorded any information on participant ethnicity (Lin et al., 2019, 84% Chinese and 16% Other; Reeves et al., 2021, 98% White and 2% Black).

Treatment Assignment

Of the studies identified, 17 randomly assigned participants to intervention and control groups, three used self-selection methods, two cluster randomization, two measurement scores, and two studies had missing data (see Table 1, Column 4).

Public Speaking Component

Only 11 studies featured a public speaking component at both the pre-and post-test, and nine studies utilized the post-test only. The remaining six studies did not feature any public speaking elements (Aslani et al., 2014; Dwyer, 2000; Jangir & Govinda, 2018; Lin et al., 2019; Pribyl et al., 2001; Tillfors et al., 2011). Topics, formats, and audience sizes varied from study to study (see Intervention Type and Efficacy section).

Pre- and Post-Measures

All studies in this review utilized pre- and post-self-report measures. However, five studies included additional measurements alongside self-report anxiety. For example, one study used a Stroop Test (Ayres et al., 2000), two studies used heart rate monitoring (Abrams et al., 2001; Azevedo et al., 2017), one skin conductance (Azevedo et al., 2017), one employed observer ratings (Wallach et al., 2009), and one used both an attention bias assessment task and observer ratings (Amir et al., 2008). Of the self-report measures used, eight used both the Personal Report of Communication Apprehension (PRCA; McCroskey, 1982) and the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970), two used PRCA only, and five used the STAI only (see Table 1, Column 3).

Intervention Duration

Across the 26 studies, the shortest treatment lasted 30 s (Brandrick et al., 2021), whereas the longest took 45 h to complete over the course of a year (Pribyl et al., 2001; see Table 1, Column 5).

Intervention Type and Efficacy

Intervention type, content, delivery, and efficacy varied greatly across the 26 studies. First, we discuss studies that utilized exposure-based strategies (e.g., treatments that offer participants opportunities to confront their fear of public speaking). Second, we report studies that used cognitive modification strategies (i.e., treatments that aim to alter maladaptive thought processes). Third, we review studies that used a combination of both strategies, and the fourth section reports on studies that use a range of alternative strategies. Studies were categorized based on the theoretical framework provided in their respective papers. If no theoretical framework was provided, the present authors compared the treatment design with similar treatments and reached a consensus on which category would be most appropriate. Finally, we conduct a meta-analysis to compare the effect sizes of studies with sufficient data.

Exposure-Based Interventions

Ayres and Heuett (2000) examined the effects of performance visualization on reducing communication apprehension (CA). Intervention group received a 30-minute performance visualization treatment which involved relaxation, watching a videotape of a

speaker, imagining the speaker on-demand, and then imagining themselves as the speaker. After post-test speeches were delivered (14 weeks later), the intervention group depicted themselves as more positive, vivid, in control, and reported significantly lower state and trait CA compared to placebo and control groups.

Ayres and Ayres (2003) explored the impact of visualization therapies (i.e., visualization scripts and drawings) on reducing PSA. The script-only group followed a visualization script. The drawings-only group looked at a set of sketches that illustrated an individual going through the events outlined in the visualization script. Individuals in the combined script and drawings group listened to the visualization script and followed a set of drawings. The Placebo group read material on general communication processes and the control group was left to their own devices for 15 min. After a post-test speech, results showed that while all visualization conditions reported a statistically significant reduction in PSA when compared to placebo and control conditions, the combined script and drawings condition was the most effective. Further, individuals in the combined text and drawings group envisioned themselves as speakers having more control and being more positive compared to other conditions.

Heuett and Heuett (2011) investigated the use of virtual reality therapy (VRT) to reduce self-reported measures of PSA compared to a visualization and control group. Participants in the VRT condition wore a head-mounted display (which also transmitted the sound of their own voice), which enabled them to enter a computer-generated version of an auditorium. Visualization participants watched a videotape guiding them through their treatment (see Ayres et al., 1993). While both treatments significantly reduced trait and state CA and increased self-perceived communication competence (SPCC) compared with the control group after post-test speeches, only the VRT condition reported a significant increase in willingness to communicate (WTC). Furthermore, VRT was significantly more effective at reducing trait and state CA, increasing SPCC and WTC when compared to the visualization-only group.

The final study to use a visualization strategy investigated the effects of imagined interactions and rehearsal on speaking performance (Choi et al., 2015). Participants in the intervention group listened to a 4-min training session that included the definition, benefits, examples, and procedural steps of imagined interactions (see Edwards et al., 1988). Rehearsal techniques included repetition and imagining the successful outcome of a speech (i.e., positive audience reaction and feedback). After completing the one-off training session, the intervention group were given four minutes to read over and prepare a speech on a predetermined topic. The control group were given a distractor task to ensure that no rehearsal took place before delivering their speech. After the post-test speech, the intervention group had significantly fewer silent pauses and a significantly shorter duration of combined disfluencies than the control group. However, there was no significant difference in vocalized pauses between groups.

Reeves et al. (2021) explored whether 360° video content influences virtual reality exposure therapy (VRET) outcomes. Participants were split into 360°Audience, 360°Empty, and control groups. Both intervention groups received VRET weekly for four weeks. The 360°Audience participants were gradually exposed to increased room and audience size, and the 360°Empty condition to increased room size only. The control group received no treatment and only completed the outcome measures online, weekly. Post-test scores for the groups were completed after the final public speaking

task from the intervention groups. Results concluded that both 360°Audience and 360°Empty demonstrated a statistically significant reduction in PSA compared to the control group (no significant differences occurred between 360°Audience and 360°Empty groups). Results were maintained at the 10-week follow-up.

Ayres and Schliesman (2002) examined whether paradoxical intention could reduce stress and the likelihood of unwanted behaviors occurring. According to Frankl (1969), suppressing an undesirable behavior can increase stress and the likelihood of the unwanted behavior occurring. Thus, when a person focuses on increasing an undesirable behavior, this source of stress is theoretically eliminated. The intervention group was asked to identify the factors that bothered them regarding public speaking before exaggerating and focusing on them in a practice setting. The visualization group were told to relax and listen to a script that helped them envision a positive speaking experience. Placebo group participants read material on great speeches while control group participants were left to their own devices for 20 min. Results after a post-test speech concluded that both paradoxical intention and visualization groups reported significantly lower trait and state CA compared to placebo and control groups.

Ayres et al. (2000) investigated whether systematic desensitization would reduce CA in the context of a Solomon Four-Group Design (two control groups and two intervention groups). Systematic desensitization is a behavioral technique in which individuals are gradually exposed to anxiety-provoking stimuli while simultaneously being engaged in a relaxation exercise. Intervention groups were exposed to a videotaped version of systematic desensitization by Ayres et al. (1993). After a post-test speech, results found that systematic desensitization produced a significant reduction in state and trait CA compared to control groups.

The penultimate study in this section investigated the extent to which exposure therapy to an audience led to a decline in PSA (Finn et al., 2009). Exposure therapy (such as systematic desensitization) repeatedly exposes an individual to a feared stimulus in a safe environment. The intervention group participated in a multiple-exposure speaking assignment, where each participant delivered the same presentation three times in a row to a different set of classmates. Between each presentation, participants had approximately five minutes to make any changes they deemed necessary to improve their performance. Control group participants completed alternative assignments requiring no public speaking. Results after a post-test speech indicated that the intervention condition experienced a significant reduction in state anxiety when compared to the control group.

The final exposure-based intervention examined the feasibility of arousal feedback-based exposure therapy to alleviate social anxiety symptoms in adults (Lin et al., 2019). The intervention group completed four weekly sessions and performed three types of tasks per session: a psychoeducation component, eight brief arousal games, and six arousal feedback-based speech tasks. The psychoeducation component highlighted maladaptive thoughts and behaviors associated with high-arousal social situations. The brief arousal game provided real-time feedback and allowed participants to gain an awareness and management of their arousal levels. The arousal feedback-based speech task had participants deliver 6×2-min speeches to a virtual audience. During the intervention period, stress manipulation also increased (i.e., larger audience size, negative facial expressions, attire, and difficulty of speech topic and type). Prior to

delivery (except in the case of the impromptu speech), participants were given three minutes to prepare. Participants were given weekly tasks to complete (e.g., they were tested on key takeaways and asked to identify their social anxiety concerns). Results indicated that arousal feedback-based exposure therapy was more successful in reducing anxiety related to public speaking when compared to the wait-list control group. Although results were maintained over a follow-up 5-week period, no pre-and post-public speaking tests were used.

Cognitive Modification Strategies

The first study to utilize a cognitive modification strategy investigated whether communication-orientation motivation (COM) therapy could be used to reduce public speaking apprehension (Ayres et al., 2000). Participants were randomly assigned to COM therapy, systematic desensitization, placebo, or control groups. Participants in the COM therapy condition were asked to read Motley's (1995) book *Overcoming Your Fear of Public Speaking: A Proven Method*. The book aimed to help a person view public speaking from a communication orientation, as opposed to a performance orientation. Participants assigned to the systematic desensitization condition worked through a videotaped version of systematic desensitization therapy (see Ayres et al., 1993). The placebo group read a review of the *World's Great Speeches* (Peterson, 1965) which was of equal length. The control group did not receive any treatment. Results after a post-test speech revealed a significant reduction in CA and a significant increase in SPCC in the COM therapy and systematic desensitization groups compared to the placebo and control groups. However, no difference between the intervention groups was reported, and no treatment condition improved willingness to communicate (WTC) scores.

Cunningham et al. (2006) examined the use of The Lefkoe Method (TLM) to eliminate the fear of public speaking. TLM is based on the premise that anxiety is typically caused by specific beliefs through previous public speaking conditioning and experiences. First, participants identified an undesirable pattern of behavior or feelings that was a reasonable interpretation of a similar previous situation. These undesirable patterns of behavior or feelings can be reduced by helping participants to realize that the current stimulus never produced the emotion (i.e., it is only a by-product produced by the meaning they gave to a previous similar situation). The wait-list control group received no treatment until after post-test. Results indicated that after a post-test speech, participants in the TLM group showed significant decreases in fear, anxiety, and subjective units of bothersome sensations scale scores. Significant increases were observed in satisfaction, confidence as a speaker, and relaxation scores when compared to the wait-list control group.

Another study investigated the effect of a single-session attention modification program on the response to a public speaking challenge in socially anxious individuals (Amir et al., 2008). Both intervention and control participants underwent 60 trials of a face dot-probe detection task. Each trial began with participants staring at a fixation cross in the center of the screen for 500 ms. Immediately afterwards, two faces of the same individual (one neutral, one disgust) appeared on the screen for 500 ms. Subsequently, a probe (either the letter E or F) appeared in the location of one of the

two faces, and participants had to determine which letter they saw as quickly and as accurately as possible. In the intervention group, the probe always replaced the neutral face, whereas in the control group, the probe replaced the neutral and disgusted faces at equal frequencies. After a public speaking component at post-test, results concluded that intervention participants showed significantly less attentional bias to threat along with lower levels of anxiety compared to control participants.

The next study examined the effectiveness of eye movement desensitization and reprocessing (EMDR) therapy on PSA in university students (Aslani et al., 2014). EMDR therapy includes both systematic desensitization and cognitive reprocessing. In each session, the intervention group imagined a stressful situation, such as trauma (e.g., a car accident) and followed lateral movements of the therapist's finger. This process continued until either the patient expressed that the annoyance of the image had been reduced or approximately one minute had passed. During a state of deep relaxation, participants were asked to cognitively restructure the traumatic event and relieve their symptoms. Each participant then followed the movement of the therapist's fingers again while sharing all the negative thoughts in their mind. As they did so, participants were encouraged to think about positive thoughts such as "I can handle this issue." This would replace the original negative beliefs with positive ones. The results revealed that EMDR therapy led to a significant increase in perceived confidence as a speaker and a reduction in physiological symptoms when compared to the control group; however, no public speaking component was used in this study.

Jackson et al. (2017) investigated the effectiveness of inoculation training where an individual could be inoculated from an impending psychological threat much in the same way that a person's immune system can be inoculated against a virus. Both intervention and control groups received a generic one-paragraph information sheet containing details about the activity, assessment, and implications of their performance. The intervention group also received forewarnings regarding the anxiety they may experience, counterarguments, paired refutations targeting common preconceptions, and anxiety-inducing concerns specifically related to public speaking. Results indicated that the intervention group who received the inoculation message before their upcoming presentation, reported significantly lower pre-task anxiety, lower somatic anxiety, and viewed their nerves in a less debilitating light compared to those in the control group.

The final study to implement a cognitive modification strategy examined the efficacy of an ultra-brief cognitive defusion intervention on the reduction of PSA (Brandrick et al., 2021). Cognitive defusion is one of the six core processes in acceptance and commitment therapy (Hayes et al., 1999). Each participant was asked to write down a negative self-evaluative phrase regarding their personal perceptions about public speaking (e.g., "I'm going to make a mistake and look like a fool") before being assigned to either defusion, positive self-affirmation, or control condition. Defusion participants reduced their self-evaluative negative phrase into a single (e.g., fool) before executing a word repetition task where they would repeat their chosen word aloud at their fastest speed for a period of 30 s (reducing its harmful impact as the meaning of the word becomes less salient). Participants in the positive self-affirmation group were taught to recognize their negative self-evaluative phrase as dysfunctional before cognitively reframing it into a positive rational thought (e.g., "I will probably do okay on this task"). Participants in the control condition counted backward from 100 as

fast as possible. Results indicated that after completion of an impromptu speech task, participants in the defusion condition showed a significant reduction in PSA and subjective unit of distress scale compared to participants in the positive self-affirmation and control conditions.

Combined Strategies

Five studies implemented a combination of exposure and cognitive modification strategies to reduce PSA. The first study taught students to self-manage communication apprehension (CA) by self-selecting treatments (Dwyer, 2000). While all participants undertook a 15-week fundamentals of public speaking course, the intervention group were introduced to the multidimensional model (MM) for managing speech anxiety for the first 3 weeks, where the control group completed chapters in a traditional public speaking textbook. Participants were encouraged to focus on the treatment applicable to mastering their biggest source of anxiety before working their way down a list of treatments for their anxieties. Results concluded that although both groups reported significant reductions in CA levels, participants in the MM condition showed a significantly greater reduction in CA levels compared to the control group. However, no public speaking component was used in this study.

To treat the source of an individual's public speaking apprehension (e.g. affective, behavioral, or cognitive), Heuett et al. (2003) divided participants into single (either visualization, systematic desensitization, or skills training) or multiple (combination of the three) treatment conditions. All groups watched tapes guiding them through their respective treatments (see Ayres et al., 1993). The placebo group viewed a videotape of great speeches of the past, and the control group received no treatment. Results indicated that systematic desensitization was most effective at reducing trait CA for affective sources of anxiety, whereas multiple treatments were most effective at reducing trait CA for cognitive and behavioral sources. Regarding WTC, visualization was most effective for affective sources, systematic desensitization for behavioral sources, and skills training for cognitive sources.

The next study examined whether virtual reality cognitive behavior therapy (VRCBT) could be used as an alternative to cognitive behavior therapy (CBT) to reduce PSA (Wallach et al., 2009). The behavioral component of CBT provides the necessary exposure to feared stimuli (i.e., public speaking), while the cognitive component aims to challenge an individuals' maladaptive thought patterns regarding the situation (e.g., this situation is not dangerous). Both VRCBT and CBT followed similar procedures with the initial session, introducing the therapy, determining participants' anxiety reactions, building an anxiety hierarchy, devising a treatment contract, rationale, and assigning homework. The wait-list control group completed only the pre-and post-test questionnaires. Results after a post-test speech concluded that both the VRCBT and the CBT conditions were more effective in significantly reducing PSA when compared to the wait-list control group. No significant differences were reported between VRCBT and CBT conditions.

Tillfors et al. (2011) utilized a multi-session treatment to investigate the effectiveness of internet-based CBT in treating high school students with social anxiety disorder (SAD) and public speaking fears. As face-to-face therapy can sometimes be perceived

as anxiety-provoking, Tillfors et al. decided to use internet-based CBT. Participants in the intervention group received a self-help manual containing nine modules, each consisting of information, exercises, and essay questions. Participants had to complete weekly homework assignments before the next module could be accessed. The average number of modules finished was 2.9 out of a maximum of nine modules. Even though this number was low, results illustrated that intervention group participants reported significant reductions in social and general anxiety when compared to the control group. Effects were maintained at 1-year follow-up.

The final study to utilize a combination strategy investigated the efficacy of behavior modification techniques for students to reduce public speaking (Jangir & Govinda, 2018). The authors used behaviorism as their theoretical framework, which posits that habits are learned through classical conditioning. Further, through behavior modification (e.g., reinforcement, punishment, or extinction) habits can be learned or unlearned. Over six weeks, the intervention group received five interventions consisting of "developing alternative emotional responses to threat," "establishing dialogues with the audience in a graded manner (e.g., audiences that increased with size)," "purposeful faltering while speaking," "practising in front of a mirror," and "reducing breathing rates." Compared to the control group, the intervention group reported significantly reduced PRPSA and subjective unit of distress scale (SUDS) scores, along with increased self-esteem. However, no public speaking component was used in this study.

Other Strategies

Several studies used alternative strategies to exposure and cognitive modification (or a combination of both) to reduce the effects of anxiety on public speaking performance. The first study explored the pharmacological and expectancy effects of alcohol on social anxiety in individuals with social phobia (Abrams et al., 2001). As alcohol can directly affect the central nervous system, a stress-response dampening effect can occur, leading to an individual experiencing relief from anxiety symptoms. Each participant consumed two drinks (either two alcoholic drinks, two placebo drinks, or two non-alcoholic drinks). Results after post-test speeches concluded that while individuals in the alcohol condition showed a significant reduction in performance anxiety (i.e., the anxiety experienced during the public speaking situation) compared to placebo and control groups, alcohol consumption had no significant effect on any measure of anticipatory anxiety (i.e., the anxiety experienced prior to the public speaking situation).

Pribyl et al. (2001) investigated the effectiveness of a skills-based program in reducing PSA. Participants in the intervention condition underwent skills training and were taught in both seminar and one-to-one formats how to prepare, practice, deliver, and reflect on a presentation. All presentations delivered during the course were videotaped to allow students to review their past performances. The control group only completed pre-and post-test questionnaires. Results indicated that participants who received skills training reported significantly lower PSA scores in general when compared to the control group. However, no public speaking component was assessed pre- or post-test in either group.

Fitch et al. (2011) investigated the efficacy of primordial energy activation and transcendence (PEAT) in reducing CA related to public speaking. While this study utilized mixed methods, this review will focus on the quantitative results of the study.

The intervention group were exposed to the basic PEAT protocol (see Slavinski, 2005), which consisted of several techniques, such as acupressure, visualization, bilateral stimulation, and deep breathing. However, it is unclear whether all techniques were used on each participant. No details were provided describing what the control group did. After delivering their post-test speech, results concluded that intervention condition participants showed a significant reduction in CA compared with the control condition.

Buttelmann and Römpke (2014) investigated the anxiety-reducing effects of pre-speech distractors such as animals and plants. After a 5-min speech preparation period, participants were instructed to engage with either a dog, a fish, or a plant (distraction tasks). Participants in the control condition were asked to wait for five minutes. Results concluded that while all intervention conditions showed a significant reduction in anxiety, only the dog intervention had significantly lower levels of anxiety than the control group.

A further study examined the calming effect of a wearable doppel device during the anticipation of public speaking (Azevedo et al., 2017). Participants were assigned to either an intervention group (doppel-active) or a control group (doppel-inactive), where the doppel delivered a discrete heartbeat-like vibration. The doppel was set to vibrate at a frequency 20% slower than the participant's heartbeat (as measured at rest). After pretest measurements were taken, the doppel devices were all turned on (but switched off after 10 s in the control condition). At pretest, both intervention and control groups displayed comparable levels of arousal (skin conductance) and state anxiety. At post-test (five minutes after the speech preparation task had been given), participants in the intervention group showed significantly reduced arousal and state anxiety compared to the control group.

The final study in this section investigated the effects of breathing therapy and emotional freedom techniques (EFT) on PSA (Dincer et al., 2022). Those assigned to the breathing therapy condition were guided through three stages: (1) muscular relaxation, (2) deep breathing, and (3) a visualization exercise including positive affirmation. Throughout the breathing therapy stages, relaxing music with sounds of nature were used to maintain participant concentration and focus. Participants assigned to the EFT condition underwent an EFT tapping technique split into two stages. The first stage (preparation stage), determined the main problem causing anxiety, assessed the level of anxiety experienced, and participants repeated a positive affirmation (i.e., "I forgive myself; I accept myself; and I love myself despite my fear of…") three times. The second stage (tapping series) had participants tap eleven parts of their body using two fingers while repeating the affirmation statement seven times for each body part (Craig, 2008). The control group completed only the pre- and post-test measures. Post-test speaking anxiety scores for both breathing therapy and EFT conditions were found to be significantly lower than those of the control group. No differences in post-test scores between the breathing therapy and EFT conditions were reported.

Meta-Analysis

Statistical Analysis

To determine the effects of psychological interventions on PSA, effect sizes illustrating post-test differences between the intervention and control groups were calculated using

Hedges' *g*. Although there are a number of ways to conduct a meta-analysis (Harrer et al., 2021), we followed the recommendations of Cuijpers et al. (2017) and used post-test differences in our analysis to overcome the potential limitations of using pre-post effect sizes (e.g., biased outcomes). Following the recommendation of Hedges and Olkin (1985), Hedge's *g* was chosen over Cohen's *d* to account for small sample bias in population effect sizes. Cohen (1988) suggests that effect sizes can be interpreted as small (*g* = .2), medium (*g* = .5) and large (*g* = .8). If more than one outcome measure was used to assess intervention efficacy, relevant measures were pooled to provide a singular average effect size (Borenstein et al., 2009). Heterogeneity of effect sizes was assessed by calculating the *p*-value, I^2 statistic, and the prediction interval (PI). Borenstein et al. (2009) posit that the *p*-value determines if the effect size vary at all, the I^2 statistic illustrates what proportion of the variance in observed effects is real (i.e., not due to sampling error), and the prediction interval (PI) reveals how much the effect size varies. I^2 values of 25%, 50%, and 75% equate to low, moderate, and high variance respectively (Higgins et al., 2003). All analyses were conducted using SPSS (Version 29), and a random-effects meta-analysis model was utilized due to the variance in intervention type. Publication bias was assessed by visual inspection of funnel plots (see Figure 2) and Egger's intercept test (Egger et al., 1997).

Figure 3 provides a summary of the 21 studies included in the present meta-analysis including 42 interventions. Five studies (Amir et al., 2008; Buttelmann & Römpke, 2014; Dincer et al., 2022; Finn et al., 2009; and Fitch et al., 2011) were excluded due to a lack of data available. The overall effect of psychological interventions on PSA was *g* = 1.17 (95% CI = .87–1.47), with high heterogeneity (I^2 = 88% PI = −0.50–2.84), which was found to be significant (*p* < .01). Cunningham et al. (2006) TLM was the most effective study observed in this meta-analysis (*g* = 5.15, CI = 3.75–6.55, *p* < .001), while Choi et al. (2015) II training only was the least effective (*g* = −0.19, CI = −0.58–.20, *p* = .34).

Further analyses were conducted to determine subgroup differences. The 42 interventions were grouped based on the type of intervention used (cognitive, exposure, combined, or other). As per our systematic review, interventions were categorized based on their theoretical framework. If no theoretical framework was provided, the
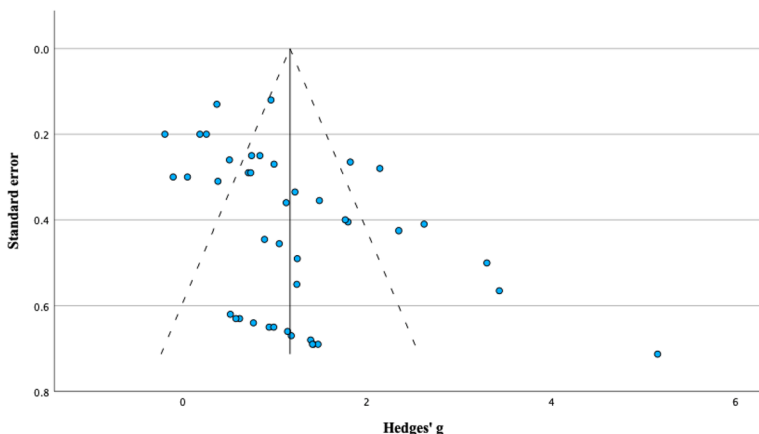

FIGURE 2. Funnel plot of the standardized effect sizes of psychological interventions.

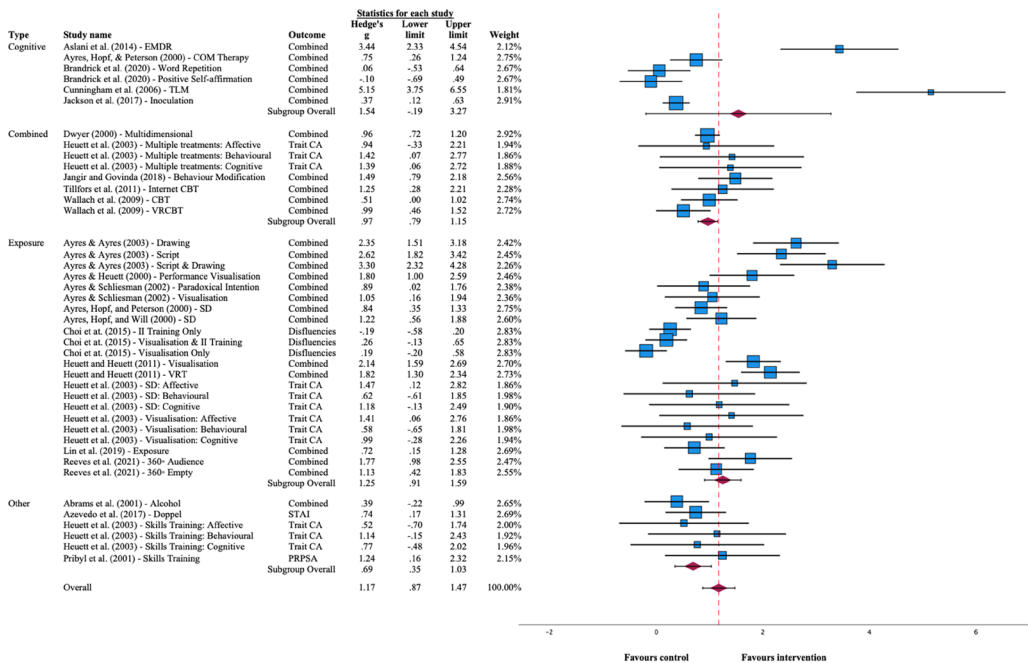| Type	Study name	Outcome	Hedge's g	Lower limit	Upper limit	Weight
Cognitive	Aslani et al. (2014) - EMDR	Combined	3.44	2.33	4.54	2.12%
	Ayres, Hopf, & Peterson (2000) - COM Therapy	Combined	.75	.26	1.24	2.75%
	Brandrick et al. (2020) - Word Repetition	Combined	.06	-.53	.64	2.67%
	Brandrick et al. (2020) - Positive Self-affirmation	Combined	-.10	-.69	.49	2.67%
	Cunningham et al. (2006) - TLM	Combined	5.15	3.75	6.55	1.81%
	Jackson et al. (2017) - Inoculation	Combined	.37	.12	.63	2.91%
		Subgroup Overall	1.54	-.19	3.27	
Combined	Dwyer (2000) - Multidimensional	Combined	.96	.72	1.20	2.92%
	Heuett et al. (2003) - Multiple treatments: Affective	Trait CA	.94	-.33	2.21	1.94%
	Heuett et al. (2003) - Multiple treatments: Behavioural	Trait CA	1.42	.07	2.77	1.86%
	Heuett et al. (2003) - Multiple treatments: Cognitive	Trait CA	1.39	.06	2.72	1.88%
	Jangir and Govinda (2018) - Behaviour Modification	Combined	1.49	.79	2.18	2.56%
	Tillfors et al. (2011) - Internet CBT	Combined	1.25	.28	2.21	2.28%
	Wallach et al. (2009) - CBT	Combined	.51	.00	1.02	2.74%
	Wallach et al. (2009) - VRCBT	Combined	.99	.46	1.52	2.72%
		Subgroup Overall	.97	.79	1.15	
Exposure	Ayres & Ayres (2003) - Drawing	Combined	2.35	1.51	3.18	2.42%
	Ayres & Ayres (2003) - Script	Combined	2.62	1.82	3.42	2.45%
	Ayres & Ayres (2003) - Script & Drawing	Combined	3.30	2.32	4.28	2.46%
	Ayres & Heuett (2000) - Performance Visualisation	Combined	1.80	1.00	2.59	2.46%
	Ayres & Schliesman (2002) - Paradoxical Intention	Combined	.89	.02	1.76	2.38%
	Ayres & Schliesman (2002) - Visualisation	Combined	1.05	.16	1.94	2.36%
	Ayres, Hopf, and Peterson (2000) - SD	Combined	.84	.35	1.33	2.75%
	Ayres, Hopf, and Will (2000) - SD	Combined	1.22	.56	1.88	2.60%
	Choi et al. (2015) - II Training Only	Disfluencies	-.19	-.58	.20	2.83%
	Choi et al. (2015) - Visualisation & II Training	Disfluencies	.26	-.13	.65	2.83%
	Choi et al. (2015) - Visualisation Only	Disfluencies	.19	-.20	.58	2.83%
	Heuett and Heuett (2011) - Visualisation	Combined	2.14	1.59	2.69	2.70%
	Heuett and Heuett (2011) - VRT	Combined	1.82	1.30	2.34	2.73%
	Heuett et al. (2003) - SD: Affective	Trait CA	1.47	.12	2.82	1.86%
	Heuett et al. (2003) - SD: Behavioural	Trait CA	.62	-.61	1.85	1.98%
	Heuett et al. (2003) - SD: Cognitive	Trait CA	1.18	-.13	2.49	1.90%
	Heuett et al. (2003) - Visualisation: Affective	Trait CA	1.41	.06	2.76	1.86%
	Heuett et al. (2003) - Visualisation: Behavioural	Trait CA	.58	-.65	1.81	1.98%
	Heuett et al. (2003) - Visualisation: Cognitive	Trait CA	.99	-.28	2.26	1.94%
	Lin et al. (2019) - Exposure	Combined	.72	.15	1.28	2.69%
	Reeves et al. (2021) - 360 Audience	Combined	1.77	.98	2.55	2.47%
	Reeves et al. (2021) - 360 Empty	Combined	1.13	.42	1.83	2.55%
		Subgroup Overall	1.25	.91	1.59	
Other	Abrams et al. (2001) - Alcohol	Combined	.39	-.22	.99	2.65%
	Azevedo et al. (2017) - Doppel	STAI	.74	.17	1.31	2.69%
	Heuett et al. (2003) - Skills Training: Affective	Trait CA	.52	-.70	1.74	2.00%
	Heuett et al. (2003) - Skills Training: Behavioural	Trait CA	1.14	-.15	2.43	1.92%
	Heuett et al. (2003) - Skills Training: Cognitive	Trait CA	.77	-.48	2.02	1.96%
	Pribyl et al. (2001) - Skills Training	PRPSA	1.24	.16	2.32	2.15%
		Subgroup Overall	.69	.35	1.03	
	Overall		1.17	.87	1.47	100.00%

FIGURE 3. Forest plot of standardized effect sizes of psychological interventions compared to control conditions.

present authors compared the treatment design with similar treatments and reached a consensus on which category would be most appropriate. Although numerous alternative subgroup analyses could have been conducted, we opted to focus on what would have the most practical relevance to applied practitioners. Among the six interventions that implemented cognitive-based strategies, Cunningham et al. (2006) TLM was the most effective ($g = 5.15$, CI = 3.75–6.55, $p < .001$) and Brandrick et al. (2021) positive self-affirmation was the least effective ($g = -1.00$, CI = −0.69–.49, $p = .74$). The overall effect of cognitive-based interventions on PSA was $g = 1.54$ (95% CI = −0.19–3.27); however, these results were not significant ($p = .07$). Of the 22 interventions utilizing exposure-based strategies, Ayres and Ayres (2003) script and drawing group was most effective ($g = 3.30$, CI = 2.32–4.28, $p < .001$) and Choi et al. (2015) II training only group was least effective ($g = -0.19$, CI = −0.58–.20, $p = .34$). The overall effect of exposure-based interventions on PSA was $g = 1.25$ (95% CI = .91–1.59), which was found to be significant ($p < .01$). Of the eight interventions utilizing combined strategies, Jangir and Govinda (2018) behavior modification was most effective ($g = 1.49$, CI = .79–2.18, $p < .001$) and Wallach et al. (2009) CBT was least effective ($g = .51$, CI = .00–1.02, $p \leq .05$). The overall effect of combined interventions on PSA was $g = .97$ (95% CI = .09–.79), which was found to be significant ($p < .01$). Finally, for the six studies that implemented other strategies, Pribyl et al. (2001) skill training was most effective ($g = 1.24$, CI = .16–2.32, $p < .05$), while Abrams et al. (2001) alcohol group was the least effective ($g = .39$, CI = −0.22–.99, $p = .21$). The overall effect of other interventions on PSA was $g = 1.17$ (95% CI = .87–1.47), which was found to be significant ($p < .01$).

To identify any potential outliers (i.e., extremely small or large effects), intervention confidence intervals were compared against the confidence interval of the pooled effect, along with a visual inspection of the funnel plot. This resulted in 10 potential outliers that did not overlap with 95% of the pooled effect size. Five interventions from two studies had extremely small effects (Brandrick et al., 2021; Choi et al., 2015) and five interventions from three studies had extremely large effects (Aslani et al., 2014; Ayres & Ayres, 2003; Cunningham et al., 2006). Upon visual inspection of the histograms and boxplots, Cunningham et al. (2006) was identified as an extreme outlier. A subsequent sensitivity analysis was conducted to determine the influence of this study on biasing the pooled effect size. By omitting Cunningham et al. (2006), the overall effect of psychological interventions on PSA was $g = 1.08$ (95% CI = .83–1.34), with high heterogeneity ($I^2 = 84\%$ PI = −0.33–2.49) that was significant ($p < .01$). The influence of this extreme outlier on biasing the pooled effect size was minimal; therefore, the authors decided to continue using all the studies in this meta-analysis. Although visual inspection of the funnel plot indicated asymmetry (and potential publication bias), Egger's test resulted in a p-value of .39, indicating no publication bias.

Discussion

21 studies, consisting of 42 interventions were included in the meta-analysis. This included 18 studies and 26 interventions omitted from previous meta-analyses (i.e., Ebrahimi et al., 2019; Horigome et al., 2020; Reeves et al., 2022). On average, public speaking anxiety interventions reduced PSA by 1.17 standard deviations compared to control groups (CI = .87–1.47). Z-value for testing the null hypothesis ($g = 0.0$) was 8.01 ($p < .001$), thus rejecting the null hypothesis. While this analysis reported an overall positive effect size, when testing for subgroup differences, no significant subgroup effect for cognitive-based interventions was observed ($p = .07$). The limited number of interventions in this subgroup, along with one which reported a negative effect size (Brandrick et al., 2021—Positive Self-Affirmation; $g = −0.01$) may have hindered the ability to detect significant effects.

Examining individual psychological interventions, effect sizes ranged between −0.19 (i.e., Choi et al., 2015—II Training Only) and 5.15 (i.e., Cunningham et al., 2006—TLM). The variability in effect sizes between psychological interventions may have been due to sample size, measurement error, or both. Some studies (e.g. Brandrick et al., 2021) incorporated highly reliable outcome measures, but their relatively small sample sizes may have contributed to their small effect sizes. Other studies (e.g., Jackson et al., 2017) who had large sample sizes, may have found their choice of measures to be a contributing factor to their smaller effect sizes. For studies that reported very large effect sizes (e.g., Cunningham et al., 2006), their results may have been overestimated because of the study design used. For example, the public speaking component of Cunningham et al. (2006) study was not administered by the researchers, but by the participants themselves. With no information regarding the topic, duration, or audience, it is difficult to replicate the conditions of this study or to determine if each participant experienced the same conditions, threatening internal validity. Furthermore, between- and within-session habituation could have occurred (and acted as a confounding variable)

as participants in both groups continued to attend their Toastmaster sessions during the study and had opportunities to speak; however, no details were given on this aspect.

In summary, although there was large variability in study efficacy, our meta-analysis provides additional evidence supporting the efficacy of PSA interventions, as observed in the meta-analyses by Ebrahimi et al. (2019), Horigome et al. (2020), and Reeves et al. (2022).

General Discussion

The purpose of the current review was to provide the reader with a deeper understanding of what constitutes successful PSA interventions. This study systematically reviewed and meta-analysed all relevant psychological interventions over the past 20 years that successfully reduced PSA. A total of 26 studies met the inclusion criteria for this review. Treatments varied in type (e.g., cognitive modification, exposure therapy, combination, or other strategies), duration (e.g., single session to longer-term multi-session), and either focused on symptomatic treatment or aimed to target the source of a person's anxiety. Applied and theoretical applications are discussed in this section, along with limitations and future directions.

Single-Session Versus Multi-Session Interventions

When targeting anxiety-related symptoms, single-session treatments, such as the doppel device (Azevedo et al., 2017), EFT (Dincer et al., 2022), alcohol (Abrams et al., 2001), or the use of dogs, fish, and plants (Buttelmann & Römpke, 2014) were most effective. In applied settings, if practitioners are seeking to implement short-term relief interventions, these "one-shot" symptom-reducing interventions may be the most applicable. Although immediate relief is advantageous, the long-term effects remain unclear, as the root causes of the anxiety response remain unaddressed. Paradoxically, some strategies may even cause long-term harm (e.g., the use of alcohol).

Conversely, when more time is available, multi-session interventions targeting the source of a person's anxiety may be the most appropriate. These interventions typically followed one theoretical viewpoint and adopted an appropriate intervention (e.g., cognitive modification for cognitive biases). However, in most cases, a one-size-fits-all approach was used (hence ignoring individual differences and needs). Although effective, multi-session interventions require a longer commitment from participants and typically involve a trained specialist for administration.

Exposure to Feared Stimuli

In some studies, actual exposure to feared stimuli, such as public speaking, was a key part of treatment efficacy and effectiveness. Exposure to feared stimuli provided opportunities to test cognitive modifications in a practice setting, allowing extinction learning to occur (a gradual decrease in a person's fearful response). Exposure to feared stimuli (i.e., public speaking) occurred with the person either imagining the experience (e.g., Ayres & Ayres, 2003) or being directly exposed to it (e.g., Finn et al., 2009). While most articles in this review used traditional exposure to public speaking, some explored the use of virtual reality exposure therapy (VRET) as an alternative option (e.g., Reeves

et al., 2021). VR could be equally as effective as traditional *in vivo* exposure by reducing the cognitive strain on a person to imagine the environment (benefitting those individuals who have difficulty creating images), allowing participants to experience hard-to-recreate situations (e.g., an audience of 1000 people), taking individual differences into account (e.g., targeting specific public speaking fears), and be adjusted very quickly (see also Horigome et al., 2020; Reeves et al., 2022). However, the authors note that practitioners may find it difficult to acquire the equipment needed for VRET.

Cognitive Modification

Many interventions in this review utilized variations of cognitive therapies to allow participants to identify and replace maladaptive thought processes with more realistic and balanced alternatives. Interventions attempted to either alter the person's perceptions of the situation (e.g., COM therapy, Ayres et al., 2000), determine and deal with the source of a person's anxiety (e.g., TLM, Cunningham et al., 2006), or reduce the saliency of threats (e.g., EDMR, Aslani et al., 2014). One proactive approach to anxiety treatment was to inoculate participants against the impending psychological threat of public speaking (Jackson et al., 2017). Cognitive therapies are widely available, can be delivered in group or individual settings, administered by a trained specialist or through self-study, and can be used alongside behavioral therapy (e.g., CBT).

Theoretical Implications

Across the 26 studies included in this review, various theoretical frameworks were used to justify the chosen interventions. For example, a cognitive-behavioral framework (emphasising the role of negative thought patterns and avoidance behaviors) was seen in CBT studies (e.g., Tillfors et al., 2011), while Reeves et al. (2021) used Foa and Kozak (1986) emotional processing theory and Craske et al. (2014) inhibitory learning model as their theoretical framework. Alongside traditional frameworks, some studies included alternative theories. For example, Jackson et al. (2017) based their work on inoculation theory (McGuire, 1964) which posits that an individual could be inoculated from an impending psychological threat much in the same way that a person's immune system can be inoculated against a virus (Compton et al., 2016). The variation in theoretical frameworks highlights the complexity of PSA and that one size does not fit all when it comes to treatment.

During the review process, we noticed a lack of differentiation between the concepts of fear and anxiety, with no study highlighting their distinctions. Some studies aimed to reduce either a person's anxiety or fear related to public speaking, whereas others used the terms interchangeably (e.g., employed a questionnaire measuring anxiety to assess fear). Although research would indicate that PSA and FoPS are related constructs, research has also shown that they are in fact distinct entities and should be treated as such. In doing so, confusion both from theoretical and applied perspectives should abate. One theory that does theoretically separate fear from anxiety is Gray and McNaughton (2000) revised Reinforced Sensitivity Theory (rRST). According to these authors, three distinct neuropsychological systems of emotion and motivation exist. These are called the fight-flight-freeze system (FFFS), behavioral inhibition system

(BIS), and behavioral approach system (BAS). The FFFS and BIS are concerned with aversive stimuli and constitute the defensive system, while the BAS mediates reactions to all appetitive stimuli and generates anticipatory pleasure (Corr & Cooper, 2016).

The FFFS is associated with fear and activates avoidance/escape behaviors. Its purpose is to reduce the discrepancy between the immediate threat(s) and the desired state of safety (Corr & Cooper, 2016). Flight and active avoidance occur when threatening stimuli must be avoided. However, in situations where escape is more difficult, fight or freeze behaviors may occur. Regarding public speaking, FFFS activation may occur when an individual perceives the distance from the threat to be minimal (e.g., they are standing on stage about to speak). This results in an urge to remove oneself from the situation (i.e., flight behavior). However, when escape is not possible, they may freeze, potentially resulting in a social performance catastrophe (see Strahan & Conger, 1999).

The BIS is responsible for the resolution of goal conflicts associated with anxiety and is typically activated when threatening stimuli must be approached (e.g., a verbal presentation). Goal conflicts can occur from both between and within motivational systems (i.e., BAS vs. FFFS, BAS vs. BAS, FFFS vs. FFFS). To resolve concurrent goal conflicts, BIS activation results in the inhibition of conflicting behaviors, engagement of risk assessment processes, and the scanning of memory and the environment (Corr & Cooper, 2016). Furthermore, Corr and Cooper (2016) proposed there to be an optimal level of BIS activation, where excessive activation leads to risk aversion and generalized anxiety, whereas too little leads to risk proneness. Once the BIS is activated, it continues to exert control over the individual until reappraisal shifts to BAS or FFFS dominance. This occurs by increasing the saliency of threatening stimuli (*via* recursive loops) until either the perception of danger has sufficiently increased (FFFS dominance), or the perception of danger has diminished (BAS dominance).

We theorize that public speaking anxiety (PSA) occurs when there is BIS activation, whereas fear of public speaking (FoPS) occurs when there is only FFFS activation. For example, when a person encounters a public speaking situation, one or more threatening stimuli will activate the FFFS (i.e., everyone watching, forgetting words), eliciting fear. If the same situation activates the BAS due to a potential motivating reward from speaking, (e.g., grade, job offer, or social status), then BIS activation will occur, resulting in anxiety instead. In certain instances, when there is no BAS activation (i.e., no motivation to move toward the threatening stimuli), only the FFFS will activate. Further, BIS activation can also occur when two equally threatening stimuli are present, causing avoidance-avoidance goal conflicts. Future research should establish a clear distinction between the constructs of fear and anxiety, and whether the intervention aims to reduce fear, anxiety, or both.

Limitations and Future Directions of PSA Interventions

Several limitations of current research are worth discussing. First, the public speaking component was a significant limitation observed in many of the studies included in this review. Only 42% of studies used a public speaking component pre-and post-intervention. Although some studies found that self-reported anxiety significantly decreased (illustrating intervention efficacy) without an assessment of speaking performance (pre- and post-test), it is difficult to determine real-world implications of the research. Future studies should incorporate a public speaking component pre-and post-intervention.

Another limitation concerned the use of the Personal Report of Communication Apprehension (PRCA; McCroskey, 1997) in determining treatment efficacy, as 38% of studies used it either as a sole measure or in conjunction with others. The PRCA is a four-factor measure with only one dimension (six items) assessing anxiety related to public speaking. Studies included in this review either only used the public speaking dimension or used the PRCA in its entirety (see Table 1, Column 3). When used in its entirety, researchers may have reported intervention efficacy (as there was an overall improvement in PRCA scores). However, without a dimension breakdown, scores related to public speaking may not have improved at all. Future research should consider reexamining the construct validity of the PRCA to avoid such confounds.

McCroskey (2005) suggested using the Personal Report of Public Speaking Anxiety (PRPSA; McCroskey, 1970) instead of the PRCA. As all 34 items on the PRPSA focus directly on PSA, this psychological measure seems to be reliable in ascertaining the efficacy and effectiveness of a PSA intervention. Future research may even employ multiple psychological self-report measures of anxiety (e.g., one to determine levels of social anxiety and a second to determine levels of PSA) to make clearer distinctions between individuals who suffer from performance-only anxiety and those who suffer from generalized social anxiety disorder. This distinction would allow researchers to understand the effect of interventions on overall SAD as well as domain-specific PSA, and to determine whether an individual or a group setting would be more beneficial for an individual's treatment. However, the sole use of self-reported anxiety assessments to assess intervention efficacy is a limitation. Future research could consider other assessment types (e.g., heart rate reactivity, observer ratings) to further assess intervention efficacy.

Another limitation observed was the failure to provide sufficient detail on the exposure elements of interventions. Without such details, the influence of confounding variables on treatment efficacy remains unknown. In addition, due to the lack of data, accurate study replication becomes more difficult. Future research should provide sufficient detail on exposure elements used and how they have tried to minimize the influence of anxiety-reducing behaviors (e.g., safety behaviors). Furthermore, for those individuals with high levels of PSA (and potentially low self-efficacy), *in vivo* exposure may be too overwhelming. Therefore, individuals may benefit from a graded exposure, mastering *in vitro* exposure first, then proceeding to VRET (for a mild version of *in vivo* exposure), before advancing to traditional *in vivo* exposure (which can be graded as well). In addition, research implementing VRET should explore the use of Lin et al. (2019) arousal feedback-based system to increase exposure efficacy.

There was a general lack of long-term effectiveness assessed, with only three out of 26 studies conducting some form of follow-up (Lin et al., 2019; Reeves et al., 2021; Tillfors et al., 2011). Without examining the efficacy of interventions over time, it is difficult to determine whether participants continued with the gains they made or regressed to previous levels of anxiety. A general limitations of applied interventions is that the intervention generally stops after the study has been conducted. Hence, unless the participant is fully autonomous at carrying on with the psychological skills taught to them from the intervention then they will forget about them and revert back to what they were before the intervention. Furthermore, we argue that researchers have an ethical obligation to ensure that participants are confident enough to continue using the skills learned after the intervention has been completed, otherwise any intervention's long-term efficacy is at risk.

The use of follow-up measures (both self-reporting and public speaking events) taken at several time points (e.g., 1-month, 3-months, and 6-months post-test) would allow for the determination of the duration and durability of intervention effectiveness with potential "top up" sessions to maintain effectiveness.

A "one-size-fits-all" approach was used in 92% of the studies, where all participants were given the same intervention. Due to the complexity of PSA, such approaches may be counterproductive, as treatments lack effective targeting. Although two studies (Dwyer, 2000; Heuett et al., 2003) did consider the idiosyncratic nature of anxiety upon intervention design, they are not without limitations. First, if an individual has limited introspection, self-selection of treatment may not be effective when compared to a trained specialist. Second, Heuett et al. (2003) study contained four participants per treatment condition which may be too small to adequately detect significant individual effects. Therefore, future research should explore the benefits of grouping individuals based on the intensity and sources of PSA before delivering appropriate interventions.

Future research may benefit from incorporating the theoretical implications from earlier and utilizing a three-pronged intervention approach. Researchers could focus on increasing cognitive control (through cognitive therapies, e.g., Amir et al., 2008), reducing threat saliency (*via* exposure therapies, e.g., Ayres & Schliesman, 2002), and increasing self-efficacy (*via* repeated successful exposures to the specific stressors; Bandura, 1997). In addition, several cognitive therapies included in this review could easily be combined to provide a "package" of treatments. This "package" could target a wide array of cognitive biases to reduce selective attention to threat (Amir et al., 2008), increase psychological flexibility (Brandrick et al., 2021), increase the personal view of the speaker (Ayres & Ayres, 2003), and shift from a performance-oriented perspective of public speaking to a communication-oriented perspective (Ayres et al., 2000).

Limitations of This Review

This review is not without its own limitations. The authors were unable to access the APA PsychNet database or the following articles—Harris et al. (2002), Lister et al. (2010), and Lopez et al. (2014). Furthermore, five studies had to be omitted from the meta-analysis due to a lack of reported results. We attempted to contact the first authors of these studies; however, no responses were received. Next, this review was not pre-registered, which introduces a potential risk of outcome reporting bias. Although standard systematic review procedures were followed, pre-registration would have enhanced transparency, reduced bias, and improved reproducibility. Future reviews on this topic should prioritize pre-registration to address these concerns. Finally, by focusing only on effective/successful interventions, our review became biased, especially from a meta-analysis viewpoint.

Conclusion

To conclude, key findings showed that while intervention type varied greatly, interventions containing cognitive modification and exposure therapy were most common. The most effective cognitive modification intervention was the Lefkoe Method

(Cunningham et al., 2006) and the most effective exposure intervention was Script and Drawing (Ayres & Ayres, 2003). Cognitive modification challenges maladaptive thoughts, whereas exposure therapies allow for incremental exposure to threatening stimuli, which may acclimatize people to these environments. A good range of theoretical underpinnings drove the vast majority of interventions. However, theoretical limitations remain when differentiating between anxiety and fear. While some symptomatic treatments were highly effective in providing immediate short-term relief, the long-term implications remain at risk unless researchers/practitioners ensure that the individual is able to autonomously maintain the psychological strategies taught to them post intervention.

In terms of future directions, there is a clear need to better consider the approaches used to generate meaningful exposure to real-world public speaking situations. The use of individualized treatment approaches (as opposed to one size fits all), the development of self-efficacy, defining fear from anxiety, and the determination of long-term efficacy and effectiveness should also be explored. However, any intervention must allow the participant to practice the psychological skills they have learned in multiple carefully constructed pressurized environments (e.g., Bell et al., 2013). It is only here that the use of psychological resources will become autonomous.

Disclosure Statement

Author Notes

Alexander M. McWilliam is the Managing Director of Improv4Business, where he applies over 17 years of coaching experience to enhance clients' presentation and public speaking skills through an innovative integration of psychological principles, acting methodologies, and improvisational techniques. He earned his PhD in Sport Psychology from Bangor University, focusing his research on public speaking anxiety and performance under pressure. Dr. McWilliam's work uniquely bridges the gap between theoretical research and practical application, empowering individuals to communicate confidently in high-stakes environments.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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