

Development and initial validation of the Visual Social Anxiety Scale (VSAS): Could a picture be worth a thousand words?

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ABSTRACT

Accurate assessment is crucial for determining appropriate therapeutic interventions for social anxiety and conducting sound clinical research. While self-report measures of social anxiety are widely used in both research and clinical settings, they have several drawbacks inherent to their textual nature. Here, we describe the development and initial validation of the Visual Social Anxiety Scale (VSAS), a novel picture-based self-report measure of social anxiety, based on the well-established widely-used Liebowitz Social Anxiety Scale (LSAS). Specifically, the 24 items of the LSAS were used as the basis for social situations to be included in the VSAS. First, pictures to serve as VSAS items were selected using a rigorous two-phase process (four pilot studies; $n = 225$). Next, reliability (internal consistency, test-retest) and validity (convergent, discriminant) were explored with new participants ($n = 304$) who completed the VSAS and a battery of additional self-report questionnaires, delivered in a random order. The VSAS was completed again a month later ($n = 260/304$). The VSAS showed high internal consistency and test-retest reliability, and good convergent and discriminant validities. VSAS correlations with convergent measures were significantly greater than its correlations with discriminant measures. Thus, the VSAS shows initial promise as a novel picture-based self-report measure of social anxiety.

1. Introduction

Social anxiety disorder (SAD) is characterized by intense and persistent fear and avoidance elicited by a wide range of social- or performance-related situations (American Psychiatric Association, 2013; Fehm et al., 2005), including participating in group activities, interacting one-on-one, performing in front of others, and being observed while engaging in various daily activities. It is a highly prevalent psychiatric disorder, with a lifetime prevalence rate of 4-to-13 % (Leichsenring & Leweke, 2017; Mennin et al., 2002; Stein et al., 2017), and is often chronic and debilitating (Baker et al., 2002; Rapee & Heimberg, 1997; Stein et al., 1996), negatively impacting social, occupational, and academic functioning (Stein & Stein, 2008; Wittchen & Fehm, 2003).

Accurate assessment of psychopathology is crucial for determining appropriate therapeutic interventions and conducting sound clinical research (Furmark, 2002; Herbert et al., 2014; National Academies of Sciences, Engineering, and Medicine, 2015; Hope et al., 2019; Möller, 2000). Clinician-rated scales are considered by some to be more valid and reliable tools for achieving these goals, especially in psychiatric

settings (Herbert et al., 2014; Möller, 2000; Trull et al., 2001). In SAD, the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) is one of the most well-established and commonly-used clinician-rated scales (Baer & Blais, 2010; British Psychological Society, 2013; Mennin et al., 2002; Rytwinski et al., 2009). Specifically, it assesses both fear and avoidance related to 24 potentially anxiety-provoking social situations, such as eating or drinking in public, socializing at social events, speaking to authority figures, or giving a speech. The clinician-rated LSAS has been shown to have high internal consistency and test-retest reliability, as well as strong convergent and discriminative validities (Baker et al., 2002; Fresco et al., 2001; Heimberg et al., 1999). Akin to other clinician-rated scales, however, delivery of the LSAS requires professional expertise, training, and time and effort, potentially limiting its wide-scale administration (Baker et al., 2002; Dawes et al., 1989; Uher et al., 2012). Interpersonal interaction with the assessing clinician may trigger a respondent's fear of being negatively evaluated, a fear inherent in SAD, which may distort responses (Mennin et al., 2002; Olfson et al., 2000; Soykan et al., 2003).

Self-report questionnaires provide a useful alternative to clinician-administered measures. Self-report measures require less clinician

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time and effort to administer (Herbert et al., 2014), enabling efficient collection of data (Demetriou et al., 2015). This can facilitate repeated administration to evaluate the longitudinal course of symptoms and treatment effects (Herbert et al., 2010). In SAD, self-reports are less likely to induce state anxiety during assessment, as they obviate the need to interact with an authority figure (i.e., the assessor). Indeed, numerous self-report measures of social anxiety have been developed over the years (for reviews see Cox & Swinson, 1995; McNeil et al., 1995). Among the most widely used are the self-report version of the LSAS (LSAS-SR; Liebowitz, 1987), and the Social Phobia Inventory (SPIN; Connor et al., 2000), both recording respondents' ratings (e.g., of anxiety, avoidance, discomfort) pertaining to a specific time frame (e.g., two weeks) with regard to common day-to-day social situations.¹

Though extant self-report measures of SAD are widely used in both research and clinical settings, they also have some drawbacks, both common to self-reports in general and specifically related to assessing social anxiety. First, written questionnaires may have poor validity in responders with low literacy levels, as they depend on the ability to read and comprehend both instructions and items (McHugh & Behar, 2009; Weiner et al., 2004). Second, even in highly educated samples, wording effects (i.e., subtle aspects of question wording, format, or context) may lead respondents to idiosyncratic interpretations and responses (Holleman, 1999; Schuman & Presser, 1996; Schwarz, 1999). Third, translations of scales are inevitably imperfect, due to linguistic and cultural variations (Beaton et al., 2000; Caballo et al., 2010, 2012; Peña, 2007; Sperber et al., 1994; Wiesinger et al., 1999), which is an increasingly important concern given the growth of international research collaboration (Beaton et al., 2000; Demetriou et al., 2015; Guillemin et al., 1993; Sperber et al., 1994) and research on cross-cultural differences in psychopathology (Krueger et al., 2003; Lee et al., 2006; Leong, Okazaki, & Tak, 2003; Stein et al., 2017; Kleinman & Good, 1985). In the LSAS-SR, for example, "trying to pick up someone" (item 21), an idiom signifying an attempt to approach someone with romantic or sexual intent, may not have a perfectly equivalent colloquial term in some languages.² Finally, using self-report questionnaires poses the risk of wide variability in interpretation of questions (Demetriou et al., 2015; Tourangeau, 1984). To use the previous example, the term "trying to pick up someone" could be misinterpreted as lifting the other person (as in "please pick up the package from the ground") or as coming and getting the other person (as in "I need to pick up my son from school"). This is especially crucial in social anxiety scales, as items on the LSAS and other self-report scales describe real-world social situations that participants first need to subjectively visualize before responding. To use another example, the social situation of "participating in small groups" can be interpreted as participating in a group of three, six, or more people, and "participating" may be interpreted to mean simply being in a group, or actively speaking up in the group. Similarly, the social situation "working while being observed" may be understood as being observed by one's own life-partner, coworkers, or boss. These different interpretations would result in responders actually rating different situations. Relatedly, this variability in respondents' perceptions of described situations may be further magnified for those social situations they ordinarily do not experience, and therefore are asked to imagine (how they would feel) in order to rate.

Use of visual representations of situations, rather than written descriptions, in a self-report instrument for social anxiety could address the

above limitations. Pictures facilitate quick and efficient sorting, understanding, and communicating vast amounts of information (Dewan, 2015; Geise & Baden, 2015; Hibbing & Rankin-Erickson, 2003; Li & Xie, 2020). Importantly, items to be rated in self-report measures of social anxiety are particularly well suited to visual representation because they usually describe external real-world social situations (e.g., "telephoning in public"; "eating in public places") unlike self-reports of other psychopathologies, whose items describe more abstract and subjective affective states and/or cognitions (e.g., depressed mood, feelings of guilt, anhedonia etc.), in the assessment of depression (Patient Health Questionnaire-9 [PHQ-9]; Kroenke et al., 2001).

Here, we present the development and initial validation of the Visual Social Anxiety Scale (VSAS), a novel picture-based self-report scale of social anxiety, based on the well-established and widely-used LSAS (National Collaborating Centre for Mental Health, 2013). Specifically, the 24 items of the LSAS were used as the basis for social situations to be included as items on the VSAS. We first describe the construction of the VSAS, and then present its psychometric properties in terms of reliability (internal consistency and test-retest) and validity (convergent and discriminant). We also provide exploratory analysis of the scale's factor structure. Participants completed the VSAS along with a battery of additional self-report questionnaires, delivered in a random order, with the VSAS completed again a month later.

2. Method

2.1. Development and construction of the visual social anxiety scale (VSAS)

The LSAS, one of the most well-established and commonly-used clinician-rated scale of social anxiety (Baer & Blais, 2010; National Collaborating Centre for Mental Health, 2013; Mennin et al., 2002; Rytwinski et al., 2009), represents a wide range of relevant social situations to be rated by respondents in terms of experienced anxiety and ensuing avoidance related to each social situation (Liebowitz, 1987). Hence, the 24 items of the LSAS were used as the basis for social situations to be included as items on the VSAS. Final pictures serving as VSAS items were selected in two sequential, yet independent, phases, described next.

2.1.1. Phase 1 – initial picture selection

For each textual item of the LSAS, three photographs were chosen as candidates for further validation as a corresponding visual item on the VSAS. Pictures were either taken from accessible internet image databases³ or staged and photographed specifically for the purpose of the present study. Next, three versions of an initial questionnaire were constructed, such that each version included one of the three candidate pictures representing each VSAS item, for a total of 24 pictures in each version (3 versions X 24 items = 72 pictures in total). Thus, each unique picture appeared in only one of the three versions.

In Pilot study 1, 30 participants (19 women; *Age* = 29.7 years, *SD* = 8.71, *Range* = 19–55; all White) from Tel-Aviv University were recruited for the project through fliers posted on campus. Upon providing some basic personal and demographic information and signing informed consent, participants were asked to complete the initial item-selection questionnaire, with no additional requirements or questionnaires. Each of the three versions of the initial item-selection questionnaire was delivered to 10 different participants. In Part 1 of the questionnaire, the 24 pictures were presented sequentially and participants were asked to describe, using free text, the situation they thought was illustrated in

¹ There are, of course, additional reliable and valid self-report measures of social anxiety, such as the Social Phobia Scale (SPS) and the Social Interaction Anxiety Scale (SIAS; Brown et al., 1997; Mattick & Clarke, 1998), which are also often used to assess social anxiety in clinical and research settings.

² While we are not aware of a specific language in which there is *no* term for approaching someone with a romantic or sexual intent, this example is merely provided to exemplify difficulties related to translation of textual terms, especially colloquial ones.

³ Internet image databases such as Pixabay (<https://pixabay.com>) and Unsplash (<https://unsplash.com>) grant an irrevocable, nonexclusive, worldwide copyright license to download, copy, modify, distribute, perform, and use photos from them completely for free, including for commercial purposes.

each picture (see Fig. 1a for an example). Three independent assessors then rated the degree to which each free text answer was indeed reflective of the original LSAS textual item the picture was intended to depict, on a scale ranging from 1 (not reflective at all) to 5 (very reflective). An average score of the three assessors served as the score of each textual answer of each participant. The final score per picture was derived by averaging the scores of the 10 participants for that picture. In Part 2, the same 24 pictures were sequentially presented for a second time to the same participants. Here, for each picture, participants were required to choose one of four presented statements that they thought best described it, with one of the statements being the original textual item of the LSAS upon which the picture was originally based (see Fig. 1b for an example). Each picture was scored by counting the number of respondents who chose the correct statement (the original LSAS item), for a score ranging from 0 (none of the participants) to 10 (all 10 participants chose the correct statement). Only pictures scoring above average on both sections (> 3.0 on Part 1 and > 5.0 on Part 2) were deemed suitable for further examination (see Phase 2 below). Pictures not meeting this criterion were replaced, taking into account the feedback given during the first administration. In total 18 pictures (out of 72 pictures) were substituted. We then conducted a second pilot study (Pilot study 2), in which we repeated Pilot study 1, as described above, among a new sample of 31 participants (22 women; $Mage = 30.19$ years, $SD = 10.15$, Range = 20–54; all White) with the new pictures. No pictures met criteria for exclusion following Pilot study 2. Finally, the two highest rated pictures (of the three presented) per social situation were included for further validation in Phase 2.

2.1.2. Phase 2 – final picture selection

Eighty individuals (42 women, $Mage = 38.1$ years, $SD = 15.45$, Range = 18–71; all White) participated in Pilot study 3. Here, each textual item of the LSAS was presented alongside the two pictorial options chosen following Phase 1. Participants were asked to choose the picture that in their opinion best describes the presented textual social situation. Participants could also indicate that none of the two options describes the textual social situation well enough. The picture that scored highest of the two (chosen by more participants) was selected as the final picture to be included in the VSAS, providing it received $> 50\%$ of total votes cast (out of all votes, including those that rejected both pictures). All of the highest-scoring pictures met this criterion. As in Pilot studies 1 and 2 described above, no additional requirements or questionnaires were delivered to participants. Finally, to validate these selections, we conducted a fourth pilot study (Pilot study 4), repeating Pilot 3 among an additional sample of 84 new participants (55 women, $Mage = 32.00$ years, $SD = 12.00$, Range = 18–71; all White). Results replicated those of Pilot study 3. Thus, at the end of Phase 2, the final 24 pictures were chosen for the VSAS.

2.1.3. Final structure of the VSAS

The instructions for completing the VSAS were based on those of the established and widely-used Hebrew version of the LSAS-SR (Levin, Marom, Gur, Wechter, & Hermesh, 2002), slightly modified to ensure simple wording: “In the following questionnaire you will see different pictures, one after the other, each showing a situation from everyday life. Look closely at each picture, and then please answer two questions about it. For the first question please rate the degree to which the situation makes you anxious or fearful. For the second question please rate how often you avoid the depicted situation. To answer each question, simply move the cursor to the place that best describes your answer” (see Fig. 2).

Each VSAS item was scored using two separate Visual Analog Scales ranging from 0 to 100, the first assessing anxiety/fear of the visualized social situation, and the second the frequency of avoidance of the pictured social situation. Thus, overall, the VSAS included 24 pictures and 48 corresponding visual analog scales/items (24 fear and 24 avoidance scales/items). We chose to use visual analog scales for several reasons. First, they enable simple and rapid administration (Abend et al.,

2014; Rossi & Pourtois, 2012). Second, scoring items continuously enhances scale sensitivity compared to Likert scales (Di Benedetto et al., 2008; Grant et al., 1999; Singer & Jr, 1998). And, finally, as the VSAS is a visual scale we also wanted the rating scale to be visual. Indeed, visual analog scales have been widely used to assess a variety of subjective feelings and states (Bijur et al., 2001; de Boer et al., 2004; Gift, 1989; McCormack et al., 1988; Rossi & Pourtois, 2012), demonstrating good validity and reliability (e.g., Bijur et al., 2001; Leung et al., 2004). Here, the anxiety/fear visual analog scale was anchored with *None* (0) on the left side, and *Severe* (100) on the right anchor. Anchors of the avoidance visual analog scale were *Never* (0) and *Always* (100), respectively. Scores were measured in millimeters from the left anchor of the scale to the subject’s mark, such that scores ranged between 0 and 100. Total scores for anxiety/fear and avoidance subscales were calculated by averaging the 24 single visual analog scales, for a score ranging between 0 and 100 for each subscale. The VSAS total score (i.e., based upon all 48 visual analog scales) was then computed by averaging the two subscale scores, for a total score of 0–100.

2.1.4. Administration of the VSAS

In the present study we used a computerized administration of the VSAS (see Fig. 2). Specifically, each VSAS item (i.e., the visualized social situation) was displayed in color on the computer monitor, followed by the two computerized visual analog scales, with the visual analog scale’s slider positioned at the left side anchor (i.e., the minimum anchor). A small window showing the numerical score corresponding to the anchor’s current position (e.g., zero at the starting position) appeared above each scale. As participants moved the slider along the scale, the corresponding numerical score changed accordingly.⁴

2.2. Initial validation of the visual social anxiety scale (VSAS)

2.2.1. Participants

Participants were 304 adults of an Israeli internet-based panel (Midgam Project; <https://www.midgampanel.com/>), constituting a representative sample of Hebrew-speaking Israeli society in terms of geographical location, ethnic origin, level of religiosity, educational level and socio-economic status. The final sample consisted of 46.70 % women. Mean age of participants was 44.04 years ($SD = 16.47$): 95 (31 %) participants were in the 18–31 age range; 63 (21 %) in the 32–45 age range; 76 (25 %) in the 46–59 age range; and 70 (23 %) in the 60–74 age range. Mean years of education was 13.92 ($SD = 2.05$). None of the participants had taken part in any of the four pilot studies described above. See Table 1 for a full description of the sample’s demographic characteristics.

All participants provided informed consent and received a small fee for completing the study. The study protocol was approved by the Research Ethics Council of Tel-Aviv University.

2.2.2. Additional measures

2.2.2.1. The Liebowitz Social Anxiety Scale – self report (LSAS-SR).

The LSAS-SR (Liebowitz, 1987) lists 24 socially relevant situations. Each situation is rated in relation to the previous week, on two separate scales ranging 0–3, that is, level of fear and level of avoidance provoked by the described situation. Item scores are summed for a score ranging from 0 to 72 per scale, and a total score ranging from 0 to 144. The LSAS has strong psychometric properties, including high internal consistency and test-retest reliability, and strong convergent and discriminative

⁴ We would like to note that the VSAS can be easily administered as a traditional ‘paper-and-pencil’ questionnaire, whereby each item is presented as a printed picture and visual analog scales, with scores measured in millimeters from the left anchor of the scale to the subject’s pen mark (Di Benedetto et al., 2008; Leung et al., 2004).

(a) What situation do you think the following picture describes?



(b) What situation do you think the following picture describes best?



- Taking a test
- Participating in class
- Practicing writing an essay
- None of the above

Fig. 1. An illustration of a single item on the initial item-selection questionnaire used in Phase 1 of the initial item selection process (a = Part 1; b = Part 2).



How anxious or fearful do you feel in the situation shown?



How often do you avoid the situation shown?

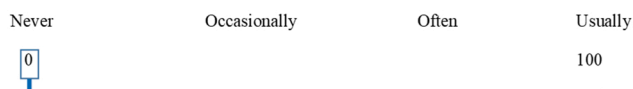


Fig. 2. An illustration of a single item on the VSAS and its two visual analog scales (fear, avoidance).

validities (e.g., Baker et al., 2002; Fresco et al., 2001; Heimberg et al., 1999). In the present study we used the established Hebrew translation of the LSAS which also demonstrates high test–retest reliability, internal consistency, and discriminant validity, as well as convergent and divergent validity, and a high treatment sensitivity (Levin et al., 2002). Internal consistency in the present sample of the fear and avoidance subscales were $\alpha = 0.95$ and $\alpha = 0.93$, respectively, and 0.97 for the LSAS total score.

2.2.2.2. *The Social Phobia Inventory (SPIN)*. The SPIN (Connor et al., 2000) is a 17-item instrument that assesses the presence and severity of

Table 1

Additional demographic characteristics of the sample (N = 304).

	N	Frequency (%)
<i>Marital Status</i>		
Single	115	37.83
Married	158	51.97
Divorce/separated	28	9.1
Widowed	3	0.99
<i>Religious Identification</i>		
Secular	212	66.45
Religious	92	30.26
<i>Income</i>		
No income (unemployed)	1	0.33
Below average	144	47.37
Average	73	24.01
Above average	44	14.47
Not willing to answer	42	13.82
<i>Education Level</i>		
Less than high school	29	9.54
High school graduate	63	20.72
Associate Degree	73	24.01
Bachelor's degree	85	27.96
Master's degree	49	16.12
Doctoral degree	5	1.64

social anxiety over the preceding week, including levels of fear, avoidance and physiological symptoms. Items are rated on a 5-point scale ranging from 0 (“not at all”) to 4 (“a great deal”), for an overall score ranging between 0 and 68. The SPIN has good test-retest reliability and adequate internal consistency (Antony et al., 2006; Connor et al., 2000). In the present study we used the Hebrew translation of the SPIN, which has been widely used in previous research, showing excellent reliability (Bronfman et al., 2018; Kivity et al., 2021; Lazarov, Pine, & Bar-Haim, 2017; Lazarov et al., 2018; Shalom et al., 2015). Internal consistency in the present sample was $\alpha = 0.95$.

2.2.2.3. The Self-Statements during Public Speaking Scale (SSPS). The SPSS (Hofmann & DiBartolo, 2000) is a 10-item self-report scale assessing negative self-statements (SSPS-N) and positive self-statements (SSPS-P) related specifically to public speaking. The SPSS has been shown to have high internal consistency measures, good test-retest reliability, and sound convergent and discriminant validity (Hofmann & DiBartolo, 2000). As no study to date has used this measure in Hebrew we translated and back translated the SSPS to Hebrew. Internal consistency in the present sample was $\alpha = 0.79$ for the positive subscale, and $\alpha = 0.90$ for the negative subscale, which is similar to what has been reported for the general population when using the English version of the scale ($\alpha = 0.75$ and $\alpha = 0.86$, respectively; Hofmann & DiBartolo, 2000).

2.2.2.4. The Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 (Kroenke et al., 2001) is a 9-item self-report questionnaire evaluating symptoms of major depressive disorder (MDD) according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). Each item on the PHQ-9 corresponds to one of the nine symptoms of depression, and is rated in relation to its prevalence during the previous two weeks. Responses range from "Not at all" (0) to "Nearly every day" (3) for a total score ranging from 0 to 27. The PHQ-9 has good validity, test-retest reliability, and internal consistency (e.g., Kroenke et al., 2001). The Hebrew version of the PHQ-9 has been shown to have adequate internal consistency, good test-retest reliability, and acceptable construct validity among the Hebrew-speaking general population (Yona, Weisman, Gottlieb, Lin, & Masharawi, 2021). Internal consistency in the present sample was $\alpha = 0.91$.

2.2.2.5. The Generalized Anxiety Disorder (GAD-7). The GAD-7 (Spitzer et al., 2006) is a 7-item self-report questionnaire designed to assess the prevalence of various anxiety-related symptoms during the previous two weeks. Each item is rated on a 4-point scale ranging from 0 (never) to 3 (nearly every day), for a total score ranging between 0 and 21. The GAD-7 is well-established psychometrically and is commonly used to assess generalized anxiety (Löwe et al., 2008; Plummer et al., 2016; Spitzer et al., 2006). While we are aware of no studies to date that have specifically explored the psychometric properties of the Hebrew version of the GAD-7, it is widely used in both clinical and research settings, showing adequate psychometric properties (e.g., Aloush et al., 2021; Geller et al., 2019; Oryan et al., 2021; Sami et al., 2018; Yirmiya et al., 2021). Internal consistency in the present sample was $\alpha = 0.92$, which is similar to what has been reported in previous studies using the Hebrew version of the GAD-7, in which internal consistency ranged between 0.80 and 0.90.

2.2.3. Data analysis

The reliability of the VSAS and its two subscales was assessed by calculating internal consistency (computed separately for each administration of the VSAS) and test-retest reliability. Internal consistency was computed for total score of the VSAS, and for the fear and avoidance subscales, using Cronbach alpha (α). Test-retest reliability for these three measures was evaluated using Pearson correlations. We also computed Spearman's Rank correlation coefficients to verify that the test-retest results were not driven by specific outliers.

Convergent validity was assessed by correlating the total and subscale VSAS scores with the corresponding scores on the LSAS-SR, and the total score of the SPIN, using Pearson correlations. In addition, following the study of Baker et al. (2002) when establishing psychometric properties of the LSAS-SR, we also computed the Pearson correlations of the VSAS with the negative and positive self-statements scales of the Self-Statements during Public Speaking Scale (SSPS; Hofmann & DiBartolo, 2000), a scale assessing the SAD-related construct of fear of public speaking. Discriminant validity was assessed by computing the correlations between the VSAS and the self-report measures of

depression and general anxiety, namely, the PHQ-9 (Kroenke et al., 2001), and the GAD-7 (Spitzer et al., 2006), respectively.

To provide preliminary evidence as to the scale's factor structure, we used an exploratory factor analysis (EFA). Following current best practices (e.g., Elfström & Ahlen, 2022; Donohue et al., 2021; Worthington & Whittaker, 2006; Costello & Osborne, 2005), we used a maximum likelihood factoring method, and an oblique rotation (the promax rotation) to interpret the results. While oblique methods allow the factors to correlate, in social sciences some correlation among factors is to be expected, since behavior is rarely separated into independently functioning units (Costello & Osborne, 2005). Prior to applying the EFA, necessary assumptions were confirmed using the Barlett sphericity test, and the Kaiser-Meyer-Olkin measure of sampling adequacy (Howard, 2016; Tabachnick & Fidell, 2007). To explore the reliability of emergent factors, Cronbach's alpha was calculated for items constructing each emergent factor.

2.2.4. General procedure

Participants were contacted via email and asked to participate in a short study entailing answering several questionnaires. Consenting participants received a link to the Qualtrics website (<http://telaviv.eu.qualtrics.com>). The initial landing page consisted of general instructions informing participants of the nature of the study, and that a second session would be held a month later. Next, participants completed the VSAS and the additional measures (i.e., LSAS-SR, SPIN, SSPS, PHQ-9, and GAD-7). Order of measure administration was randomized across participants to eliminate potential order effects. The VSAS was completed a second time (i.e., the retest administration) four weeks following the first administration. Out of the original 304 participants, 260 also completed the re-test administration of the VSAS. Across both administrations, the VSAS took about 15 min to complete ($M = 15.34$ min, $SD = 10.61$).

3. Results

3.1. Data availability

The data that support the findings of this study, as well as the 24 VSAS single items, are openly available in Open Science Foundation (OSF) at https://osf.io/tajn6/?view_only=da6cd75f10834303af87d87d08895ae8.

3.2. Descriptive statistics

Descriptive statistics of the VSAS and additional measures used in the study (i.e., LSAS-SR, SPIN, SSPS, GAD-7, and PHQ-9) are presented in Table 2. Out of the entire sample, 36 participants (12 %) had a LSAS score of at least 75, indicating social anxiety disorder based on the Hebrew version of the LSAS (Levin et al., 2002). Correlation coefficients between the VSAS and the different measures are presented in Table 3.

3.3. Internal consistency

Internal consistency for the VSAS full scale was excellent. $\alpha = .98$. Similar figures were also noted for its two subscales, $\alpha = 0.96$ and $\alpha = 0.95$ for the fear and avoidance subscales, respectively. Internal consistency of the re-test administration remained high, with $\alpha = 0.98$ $\alpha = 0.96$ and $\alpha = 0.95$ for the VSAS total score, fear subscale, and avoidance subscale, respectively.

3.4. Test-retest reliability

The 4-week test-retest reliability was high for the total score of the VSAS, $r = 0.80$, $p < 0.001$ and for the fear and avoidance subscales, $r = 0.79$, $p < .001$, and $r = 0.80$, $p < .001$, respectively (see Fig. 3). Using the Spearman's Rank correlation coefficient, the 4-week test-retest

Table 2
Descriptive statistics for the Visual Social Anxiety Scale (VSAS), its subscales, and additional measures used in the study.

	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>Instrument range</i>
<i>VSAS (test)</i>				
Fear Subscale	18.72	18.66	0.04–92.50	0–100
Avoidance subscale	23.70	20.65	0.04–95.17	0–100
Total score	21.21	18.99	0.04–93.83	0–100
<i>VSAS (retest)</i>				
Fear Subscale	22.02	19.18	0.04–96.88	0–100
Avoidance subscale	27.56	20.94	0.04–96.83	0–100
Total score	24.79	19.32	0.04–96.85	0–100
<i>LSAS-SR</i>				
Fear subscale	18.24	14.66	0–68	0–72
Avoidance subscale	20.66	13.94	0–67	0–72
Total score	38.90	27.40	0–135	0–144
<i>SPIN</i>	18.49	14.85	0–67	0–68
<i>SSPS</i>				
Negative	5.90	5.96	0–25	0–25
Positive	15.03	5.64	0–25	0–25
<i>PHQ-9</i>	7.84	6.40	0–27	0–27
<i>GAD-7</i>	5.51	5.03	0–21	0–21

Note. VSAS = Visual social anxiety scale; LSAS-SR = Liebowitz social anxiety scale-self report; SPIN = Social phobia inventory; SSPS = Self-statements during public speaking; PHQ-9 = Patient health questionnaire-9; GAD-7 = Generalized anxiety disorder.

reliability for all three measures remained significant, namely, the VSAS total score, $r = 0.79$, the fear subscale, $r = 0.77$, and the avoidance subscale, $r = 0.79$, all $ps < .001$.

3.5. Convergent and discriminant validity

The VSAS and its two subscales were strongly correlated with the corresponding indices of the LSAS-SR, with correlations ranging from 0.70 to 0.76 (all p 's < 0.001 See Fig. 4). Strong correlations, albeit lower, also emerged between the VSAS, and its subscales, and the SPIN, ranging from 0.59 to 0.63 (all p 's < 0.001). Replicating the results of Baker et al. (2002) for the LSAS, the VSAS was moderately positively correlated with the negative self-statements scale of the SSPS, ranging from 0.47 to 0.49 (all p 's < 0.001 , and weakly negatively correlated with the positive self-statements scale, ranging from -0.22 to -0.25 (all p 's < 0.001). Examining the associations of the VSAS and its two subscales with depression and anxiety measures revealed moderate associations with the PHQ-9, ranging from 0.51 to 0.54, and with the GAD-7, ranging from 0.45 to 0.54 (all p 's < 0.001). To further explore

Table 3
Validation analyses correlations (N = 304).

	VSAS Fear subscale	VSAS Avoidance subscale	VSAS Total score	LSAS-SR Fear Subscale	LSAS-SR Avoidance Subscale	LSAS-SR Total score	SPIN	SSPS Negative	SSPS Positive	PHQ-9	GAD-7
<i>VSAS</i>											
Fear subscale	–										
Avoidance subscale	0.87*	–									
Total score	0.96*	0.97*	–								
<i>LSAS-SR</i>											
Fear subscale	0.75*	0.69*	0.74*	–							
Avoidance subscale	0.66*	0.70*	0.70*	0.84*	–						
Total score	0.73*	0.73*	0.76*	0.96*	0.96*	–					
<i>SPIN</i>											
	0.62*	0.59*	0.63*	0.78*	0.74*	0.79*	–				
<i>SSPS</i>											
Negative	0.49*	0.47*	0.49*	0.64*	0.59*	0.64*	0.67*	–			
Positive	-0.25*	-0.22*	-0.25*	-0.32*	-0.31*	-0.33*	-0.28*	-0.33*	–		
<i>PHQ-9</i>	0.54*	0.51*	0.54*	0.64*	0.59*	0.64*	0.62*	0.56*	-0.17*	–	
<i>GAD-7</i>	0.55*	0.46*	0.52*	0.59*	0.54*	0.59*	0.58*	0.48*	-0.17*	0.76*	–

Note. VSAS = Visual social anxiety scale; LSAS-SR = Liebowitz social anxiety scale-self report; SPIN = Social phobia inventory; SSPS = Self-statements during public speaking; PHQ-9 = Patient health questionnaire-9; GAD-7 = Generalized anxiety disorder. * = $p < .001$.

the correlations of the VSAS with convergent vs. discriminant measures, we conducted a dependent samples correlations analysis (i.e., testing the difference between two correlated correlations) by converting each correlation coefficient into a z-score using Fisher's r -to- z transformation and computing an asymptotic covariance of the estimates (Steiger, 1980), which are then used in an asymptotic z-test (Lee & Preacher, 2013). Results indicated that the correlation between the VSAS and the LSAS-SR was significantly higher than the VSAS correlations with the PHQ-9 and GAD-7 ($Z = 6.58, p < 0.001$; $Z = 6.74, p < .001$; respectively). This was also true for the VSAS correlation with the SPIN, compared to the its correlation with the PHQ-9, $Z = 2.33, p = .01$, and GAD-7, $Z = 2.71, p = .003$.

3.6. Exploratory factor analysis (EFA)

EFA results are described Table 4 and visualized in Fig. 5. The EFA scree plot (Costello & Osborne, 2005; Donohue et al., 2021; Worthington & Whittaker, 2006) of the VSAS data (i.e., VSAS single items, 48 items in total – 24 fear and 24 avoidance items) suggested a four-factor solution for the data. An examination of alternative solutions (i.e., parallel analysis; Worthington & Whittaker, 2006) reaffirmed that the four-factor solution provided the best fit, accounting for 57.8 % of the total variance (see Table S1). Specifically, using the four-factor solution, 39 items (81 % of the 48 VSAS items) loaded strongly (> 0.40 ; Elfström & Ahlen, 2022; Worthington & Whittaker, 2006) on one of the factors, and hence were retained, with two items loading strongly on two factors (i.e., cross-loading). Of these two, one item was retained because its two loadings showed a difference of more than .10, a common practice in EFA (Howard, 2016), ensuring that retained items load quite highly on one factor while only marginally loading on the other. In total, eight items (five fear and three avoidance items; see bottom of Table 4) out of the 48 VSAS items were not retained (16.6 %). All four factors demonstrated excellent internal consistency (all Cronbach's Alpha coefficients $> .92$; see Table S2).

4. Discussion

This study describes the development and initial validation of the VSAS, a novel picture-based self-report scale of social anxiety, based on the well-established and widely-used LSAS (National Collaborating Centre for Mental Health, 2013). Specifically, textual items from the LSAS, describing social and performance situations, were visualized/represented by pictures that were then tested for suitability to be included as VSAS items. Final pictures for each item were selected based

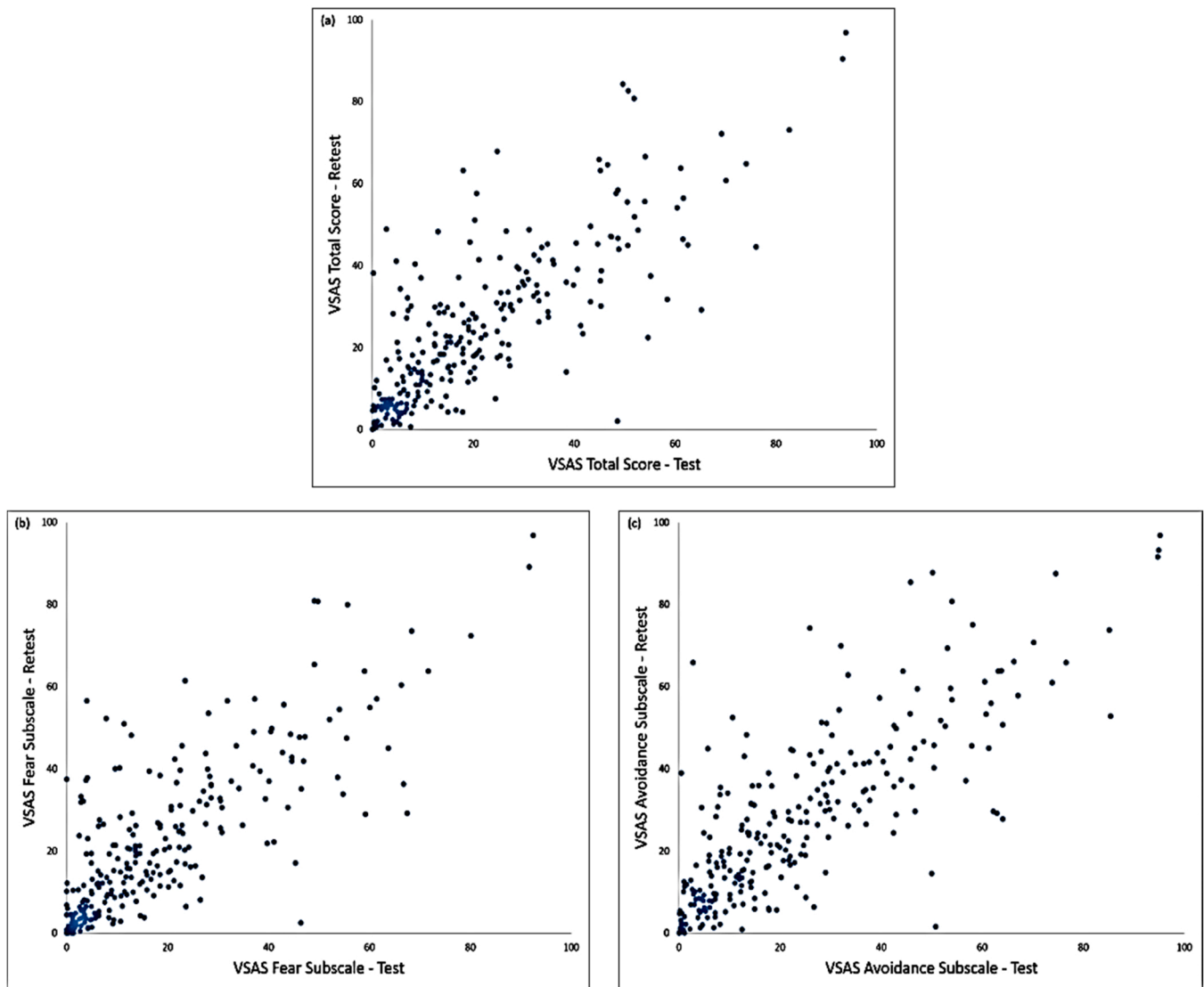


Fig. 3. Test-retest scatter plots (Session 1 on the X axis; Session 2 on the Y axis) for (a) VSAS total score; (b) VSAS fear subscale; and (c) VSAS avoidance subscale. VSAS = Visual Social Anxiety Scale.

upon a comprehensive two-phase process incorporating judgments of clinicians and unselected participants ($n = 225$ in total). Next, a new sample of 304 unselected participants completed the VSAS, as well as additional self-report questionnaires of social anxiety, general anxiety, and depression. Two-hundred and sixty of these participants also completed the VSAS a second time a month later.

The VSAS total score, and both the fear and avoidance subscales scores, showed excellent internal consistency and high test-retest reliability. These three scores were found to be strongly correlated with the corresponding indices of the LSAS-SR, with the VSAS total score also exhibiting high correlations with the SPIN. These results provide preliminary support for the convergent validity of this scale. Additionally, replicating the findings of Baker et al. (2002) for the LSAS-SR, the VSAS total score was positively correlated with the negative subscale of the SSPS, and negatively correlated with the positive subscale of the SSPS, a measure of performance social anxiety. Exploring discriminant validity, the VSAS was found to be moderately correlated with self-report measures of depression and GAD, two conditions highly co-morbid with SAD (Ingram et al., 2001; Mennin et al., 2000), echoing the associations previously found for other self-report measures of social anxiety, such as the LSAS-SR (Baker et al., 2002), the SPIN (Connor et al., 2000), and the Social Anxiety Questionnaire (SAQ-A30; Caballo et al., 2012). Finally,

the correlations of the VSAS with the convergent measures were significantly greater than its correlations with the discriminant measures.

While providing encouraging results with regard to the reliability and validity of the VSAS, our EFA analysis did not result in a clear fear and avoidance two-factor structure, as was initially conceptualized by Liebowitz (1987) when introducing the LSAS, but rather in a four-factor structure. While factors 1 and 2 did include exclusively avoidance (Factor 1) or fear (Factor 2) items, it seems that Factor 3 and 4 were more thematic, with Factor 3 including VSAS items/pictures that depict participating in small group activities, and Factor 4 incorporating VSAS items/pictures that depict speaking in front of others. Yet, the EFA also yielded eight items (four fear items three avoidance items) that did not load on to any factor. These results are not surprising, considering that prior research on the factor structure of the LSAS itself, the scale upon which the VSAS is based, has yielded varying numbers and types of factors (e.g., Baker et al., 2002; Beard et al., 2011; Oakman et al., 2003; Perugi et al., 2001; Safren et al., 1999; Slavkin et al., 1990; Sugawara et al., 2012). Still, despite these inconsistent findings for the factor structure of the LSAS, its total score has been found reliable and clinically useful (e.g., Baker et al., 2002; Fresco et al., 2001; Heimberg et al., 1999).

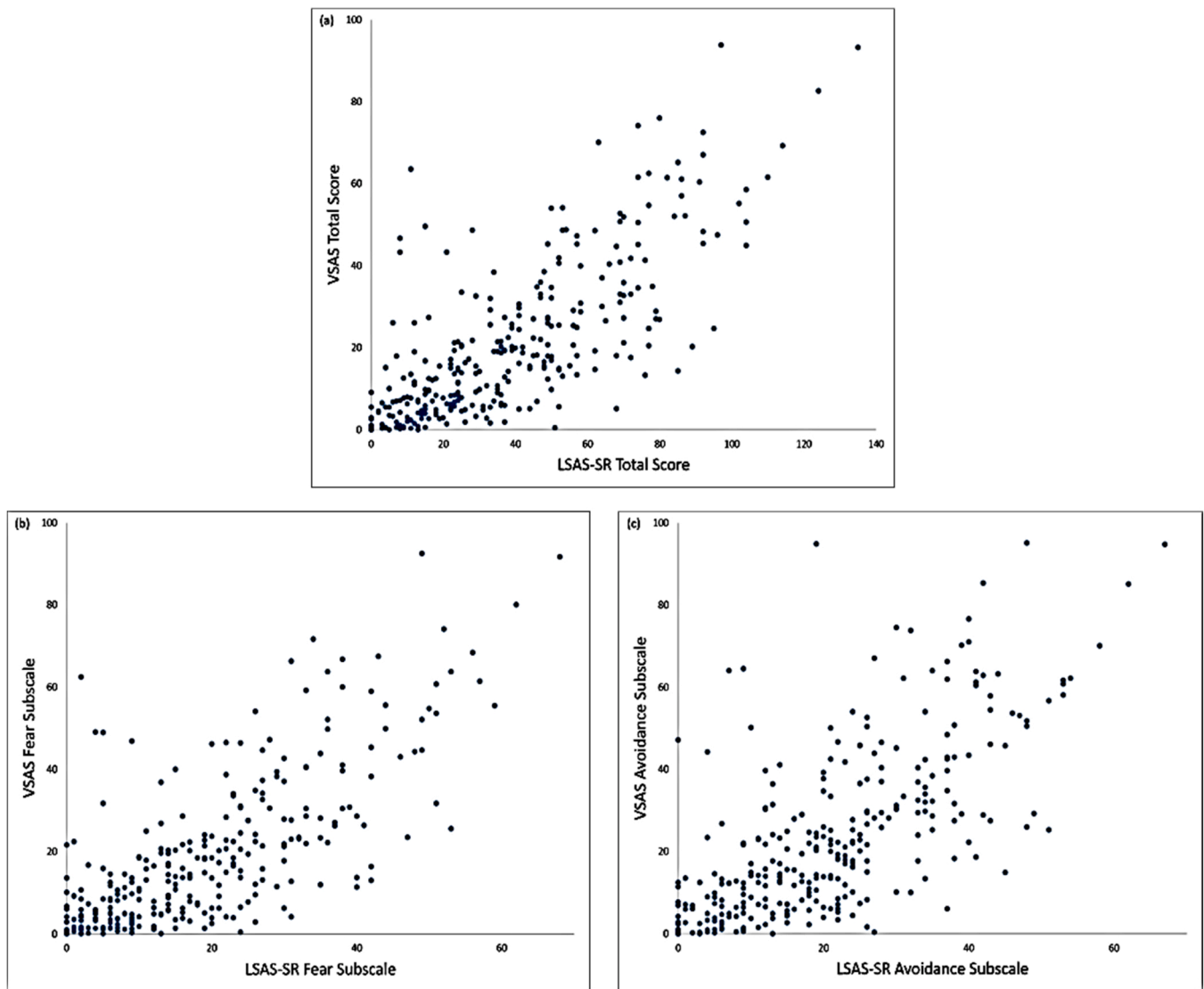


Fig. 4. VSAS-to-LSAS-SR scatter plots for (a) total score; (b) fear subscale; and (c) avoidance subscale. VSAS = Visual Social Anxiety Scale; LSAS-SR = Liebowitz Social Anxiety Scale-Self Report.

The use of pictures in the VSAS addresses some of the drawbacks characterizing current textual self-report measures of social anxiety. First, the VSAS can be used to assess social anxiety in communities with low literacy (McHugh & Behar, 2009; Weiner et al., 2004), as it minimizes the need of respondents to read multiple textual items. Relatedly, it may be more easily used across different countries/regions taking part in multinational and/or multilingual research projects, as it has the potential of minimizing methodological difficulties of translation related to linguistic differences between samples (Beaton et al., 2000; Caballo et al., 2010, 2012; Peña, 2007; Sperber et al., 1994; Wiesinger et al., 1999). Still, as the present sample was relatively a homogeneous one, future research should examine this suggestion more directly. Third, the use of visual items may be helpful in avoiding the pitfalls of wording effects associated with textual information, reducing the extent to which responses are influenced by the specific phrasing of presented questions/items (Holleman, 1999; Schuman & Presser, 1996; Schwarz, 1999). Finally, as items on the VSAS are represented by specific scenes rather than left to be pictured or imagined by the participant, it narrows the potential variance in participants' comprehension and interpretation of textual content (Demetriou et al., 2015; Tourangeau, 1984).

In addition to addressing these drawbacks of textual self-reports of

social anxiety, the VSAS may also have more general advantages that visual representations hold over verbal information when encountering an object/situation, describing it, or explaining it to another person (Mitchell, 1995). Verbal (or textual) descriptions cannot convey an actual experience with the same immediacy as a single picture. Intentional and effortful processing is needed to transform abstract verbal information to a corresponding mental image (Mueller et al., 2010; Paivio & Csapo, 1973). Conversely, pictorial information has been shown to require considerably fewer cognitive resources, as it reduces the ambiguity pertaining to the meaning of the textual content (Mueller et al., 2010), and to activate unconscious, unintentional processing of the visualized information, increasing the clarity and precision of information processing (Roskos-Ewoldsen & Fazio, 1992). From this standpoint, each pictorial item on the VSAS can be conceptualized as a vivid realistic visual-concretization of an otherwise open-to-interpretation abstract idea. Accurate assessment of one's affective reaction to social situations must begin with an accurate comprehension of the situation. Hence, the old maxim "A picture is worth a thousand words" is pragmatically manifested in the VSAS. In other areas of health care, visual-based assessments have been widely adopted to complement or replace text response options using illustrated

Table 4
Exploratory factor analysis – Factor loadings.

	F1	F2	F3	F4
VSAS 11. Talking with people you don't know very well (Avoidance)	.75			
VSAS 23. Giving a party (Avoidance)	.74			
VSAS 7. Going to a party (Avoidance)	.66			
VSAS 22. Returning goods to a store (Avoidance)	.65			
VSAS 4. Drinking with others in public places (Avoidance)	.65			
VSAS 2. Participating in small groups (Avoidance)	.64			
VSAS 24. Resisting a high-pressure salesperson (Avoidance)	.58			
VSAS 12. Meeting strangers (Avoidance)	.58			
VSAS 10. Calling someone you don't know very well (Avoidance)	.55			
VSAS 19. Looking at people you don't know very well in the eyes (Avoidance)	.54			
VSAS 18. Expressing a disagreement or disapproval. (Avoidance)	.54			
VSAS 8. Working while being observed (Avoidance)	.50			
VSAS 3. Eating in public places (Avoidance)	.48			
VSAS 21. Trying to pick up someone (Avoidance)	.44			
VSAS 1. Telephoning in public (Avoidance)	.44			
VSAS 17. Taking a test (Avoidance)	.42			
VSAS 10. Calling someone you don't know very well (Fear)		.75		
VSAS 19. Looking at people you don't know very well in the eyes (Fear)		.64		
VSAS 9. Writing while being observed (Fear)		.64		
VSAS 17. Taking a test (Fear)		.62		
VSAS 21. Trying to pick up someone (Fear)		.62		
VSAS 8. Working while being observed (Fear)		.62		
VSAS 3. Eating in public places (Fear)		.56		
VSAS 18. Expressing a disagreement or disapproval. (Fear)		.55		
VSAS 22. Returning goods to a store (Fear)		.50		
VSAS 5. Talking to people in authority (Fear)		.47		
VSAS 11. Talking with people you don't know very well (Fear)		.47		
VSAS 24. Resisting a high-pressure salesperson (Fear)		.42		
VSAS 15. Being the center of attention (Fear)			.90	
VSAS 14. Entering a room when others are already seated (Fear)			.78	
VSAS 15. Being the center of attention (Avoidance)	.44		.68	
VSAS 14. Entering a room when others are already seated (Avoidance)			.62	
VSAS 2. Participating in small groups (Fear)			.45	
VSAS 4. Drinking with others in public places (Fear)			.43	
VSAS 20. Giving a report to a group (Avoidance)				.87
VSAS 20. Giving a report to a group (Fear)				.87
VSAS 6. Acting, performing, or giving a talk in front of an audience (Fear)				.73
VSAS 6. Acting, performing, or giving a talk in front of an audience (Avoidance)				.72
VSAS 16. Speaking up at a meeting (Avoidance)				.53
VSAS 16. Speaking up at a meeting (Fear)				.51
VSAS 12. Meeting strangers (Fear)		.43	.46	
VSAS 1. Telephoning in public (Fear)				
VSAS 7. Going to a party (Fear)				
VSAS 13. Urinating in a public bathroom (Fear)				
VSAS 23. Giving a party (Fear)				
VSAS 5. Talking to people in authority (Avoidance)				
VSAS 9. Writing while being observed (Avoidance)				
VSAS 13. Urinating in a public bathroom (Avoidance)				

Notes: Text in italics reflects items that were not retained – either not loading strongly on any of the four factors or loading on two factors with a difference < .10.

instruments, such as emotional face response scales to assess pain (Chambers et al., 1999; Elfering & Grebner, 2010; Hox et al., 2012; Kunin, 1955, 1998; De Leeuw et al., 2004; Reynolds & Johnson, 2011).

The VSAS in its current form also has some potential limitations that need to be addressed in future research. First, the specificity of pictured items may constrain the ability of respondents to more freely conceptualize the depicted social situation in a way that is most relevant to

their own past experiences.⁵ Relatedly, the instructions of the VSAS do not explicitly advise respondents with which person in each picture they should identify with when providing their ratings (i.e., where to "insert" themselves in each presented picture). This may lead, at least in some cases, to respondents identifying with different people within a specific picture. Future research could examine this issue by explicitly asking participants to indicate with which person did they identify when providing their ratings or by providing specific instruction about whom to identify with. Third, the pictorial items of the VSAS are all adult-oriented, with all individuals appearing in the different pictures being young adults. For participants who are middle-aged and older, some pictures may depict situations dissimilar from those commonly encountered in their everyday lives, potentially limiting validity of the VSAS for this age group. However, as stated earlier, the mean age of the current sample was 44.04 (range 18–78), which suggests that our findings supporting validity of the VSAS apply to older age groups. This could be addressed more directly in future research by exploring the relevance of each picture to these age groups. Similarly, the current version of the VSAS may be also less suited for younger age groups, as the construct of social anxiety in youth is qualitatively different than that of adults, necessitating a marked and persistent social/performance fear of negative evaluation in relation to peers (American Psychiatric Association, 2013; Caballo et al., 2016; Detweiler et al., 2014). While the VSAS is not intended for individuals under 18 years of age, future research may wish to adapt the VSAS to younger age groups based on textual items of current psychometrically sound self-rating instruments of social anxiety in children and adolescents (Beidel et al., 1995; Bir-maher et al., 1999; La Greca & Lopez, 1998; March et al., 1999; Masia-Warner et al., 2003; Muris & Steerneman, 2001), visualizing relevant situations such as interaction with peers or participating in class. Importantly, picture-based assessment tools may be more engaging for younger age groups, compared with more traditional textual questionnaires (Harter & Pike, 1984; Maćkiewicz & Ciecuch, 2016), overcoming some inherent obstacles such as lower reading skills. Fourth, while not including a specific time frame may have some advantages (e.g., reducing the need to imagine un-encountered situations and limiting the effects of recall biases; Krans et al., 2014; Amir et al., 2003; Amir et al., 2000; Liang et al., 2011), it may also increase the variability in respondents' ratings as participants may base their ratings variously on their near or far past, making the VSAS less suited for outcome assessment or other longitudinal purposes. Future research could examine the temporal sensitivity of the VSAS by adding a specified time frame to the scale's general instructions. Finally, akin to other self-report measures of social anxiety, the VSAS is limited in several aspects compared with the clinician-delivered LSAS. Specifically, only in-person assessors can challenge real-time inconsistencies in ratings of any given situation, such as when a respondent rates no anxiety but extensive avoidance of a given situation. Also, clinicians can clarify different items, reducing variability related to individuals' idiosyncratic interpretations of to-be-rated situations. For example, clarifying that "entering a room when others are seated" (item 14 on the LSAS) means a "small group, and nobody has to move seats for you" (Liebowitz, 1987).

Several limitations of the present study should also be acknowledged. First, although our results are based on a large, representative sample of the [Israeli] general population, we did not include a clinical

⁵ Of note, this limitation is especially relevant for the VSAS item 21 (corresponding to LSAS item *trying to pick up someone*) which could be heterosexually biased unless providing several alternatives for this picture, which we did not do in the present study. Relatedly, as we did not assess the sexual orientation of our participants we could not explore this issue further. While our sample was a representative sample of the Israeli society, we can only assume a normative representation of different sexual orientations within our sample. Additional research is still needed to refine and address this and other lingering limitations.

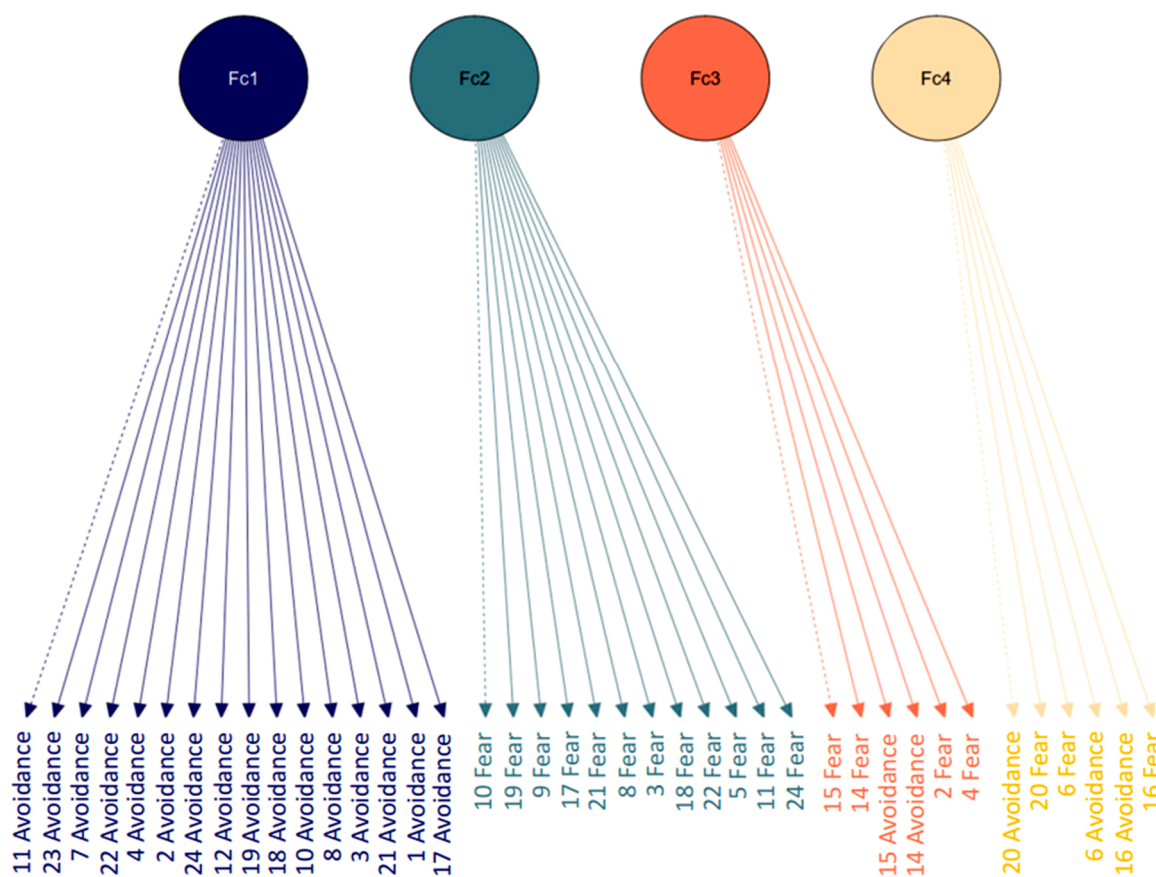


Fig. 5. EFA tree diagram. Different colors represent different latent factors and their associated VSAS items. Dotted edges represent the node (i.e., VSAS item) with the highest loading on its latent factor. Fc = Factor; EFA = Exploratory Factor Analysis; VSAS = Visual Social Anxiety Scale.

sample of patients with SAD. While results show a high correlation between the LSAS-SR and the VSAS scores (both total scores and fear and avoidance scores), future research should attempt to replicate the current one including patients with SAD, to extend present findings and establish clinical cutoff scores. Relatedly, as mentioned above, future research could also examine the sensitivity of the VSAS to changes in symptoms over time, such as during or following treatment, possibly by adding a specified time frame. Second, convergent validity of the VSAS was assessed via the administration of the LSAS-SR and SPIN (see Baker et al., 2002 for a similar approach). While both are considered acceptable assessment tools for social anxiety, there are additional reliable and valid self-report scales which are also commonly used in the field, including, among others, the SPS and the SIAS (Brown et al., 1997; Mattick & Clarke, 1998). Future research could further examine the VSAS in light of these and other social anxiety measures. Finally, the VSAS was constructed and validated using a homogeneous sample of White Hebrew-speaking Israeli participants. Additional research in varied communities is now needed to examine the generalizability of obtained results across different cultures, nationalities and ethnicities.

Despite the above-noted limitations, our findings indicate that the VSAS is a promising complementary new instrument to assess social anxiety, which can be used when clinician-rated measures are not possible and textual-based measures are difficult to administer. It is easy and straightforward to administer, requiring no special expertise, and taking about 15 min to complete. Furthermore, we believe that the shift from textual to pictorial information, as exemplified by the VSAS, resonates nicely with the rapidly-growing changes in the way information is conveyed, consumed, and represented in the world today. The increasing use of digital devices such as smart-phones, computers, and tablets, and social media platforms of interpersonal communication is driving an ever-growing international trend toward the visual over the

textual (Li & Xie, 2020; Mirzoeff, 1999; Smith et al., 2021). People use Emojis to express themselves and post photos and videos on social platforms such as Snapchat or Instagram to communicate, using images to convey a whole story in a moment. As visual content is largely replacing written content across various channels (Li & Xie, 2020), we believe that the media we use as mental health professionals are also ripe for innovation.

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Data Availability

The data that support the findings of this study, as well as the 24 VSAS single items, are openly available in Open Science Foundation (OSF) at https://osf.io/tajn6/?view_only=da6cd75f10834303af87d87d08895ae8.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.janxdis.2022.102589](https://doi.org/10.1016/j.janxdis.2022.102589).

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