Identifying Analogue Samples of Individuals with Clinically Significant Social Anxiety: Updating and Combining Cutoff Scores on the Social Phobia Inventory and Sheehan Disability Scale

by

Sophie Kudryk

A thesis

presented to the University Of Waterloo

in fulfilment of the

thesis requirement for the degree of

Master of Arts

in

Psychology

Waterloo, Ontario, Canada, 2024

Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contributions

This thesis represents an expanded version of one manuscript that was written for publication with Sophie Kudryk serving as the lead author under the supervision of Dr. David Moscovitch. Link to the published article in Psychological Assessment: https://doi.org/10.1037/pas0001328.

According to CRediT, contributions consisted of the following categories. Conceptualization: Dr. David Moscovitch (lead), Sophie Kudryk, Jolie Ho, Joshua Budge (equal). Data curation: Sophie Kudryk and Joshua Budge (equal). Formal analysis: Sophie Kudryk (lead) and Jolie Ho (supporting). Funding acquisition: Dr. David Moscovitch, Insight grant from the Social Sciences and Humanities Research Council (lead). Investigation: Jolie Ho and Joshua Budge (equal). Methodology: Dr. David Moscovitch and Sophie Kudryk (equal), Jolie Ho and Joshua Budge (supporting). Project administration: Sophie Kudryk (lead) and Dr. David Moscovitch (supporting). Resources: Dr. David Moscovitch (lead). Supervision: Dr. David Moscovitch (lead) and Sophie Kudryk (supporting). Visualization: Sophie Kudryk (lead). Writing – original draft: Sophie Kudryk (lead). Writing – review & editing: Sophie Kudryk and Dr. David Moscovitch (equal), Jolie Ho and Joshua Budge (supporting).

Abstract

The use of analogue samples, as opposed to clinical groups, is common in mental health research, including research on social anxiety disorder (SAD). Recent observational and statistical evidence has raised doubts about the validity of current methods for establishing analogue samples of individuals with clinically significant social anxiety. Here, we used data from large community samples of clinical and non-clinical participants to determine new cutoff scores of 34 on the Social Phobia Inventory (SPIN), a validated self-report measure of social anxiety symptoms, and a new cutoff score of 11 on the Sheehan Disability Scale (SDS), a validated self-report measure of social anxiety symptom-related impairment. We then examined whether using these newly determined cutoff scores alone or in combination improves the identification of individuals who have SAD from those who do not, revealing intriguing trade-offs in sensitivity and specificity and clear recommendations for the use of the new cutoff scores in combination with one another to facilitate future research. Finally, we compared the effects of our new cutoff scores with the original cutoff scores currently used in research on social anxiety by extracting analogue samples of participants with high social anxiety from historical data on seven large groups of undergraduate Psychology research participants from the University of Waterloo spanning the past five years (2018–2023). We observed that the new combined cutoff scores identified markedly fewer students as having high social anxiety, lending credibility to their validity and utility. We also observed a striking increase in levels of social anxiety symptoms in the undergraduate population from before to after the COVID-19 pandemic. Of note, most participants were under 30 and identified as Caucasian or Asian women, indicating that future research is needed to examine whether our findings generalize to diverse populations. Implications and future directions for social anxiety research are discussed.

Acknowledgements

I would like to thank my supervisor, Dr. David Moscovitch, for his endless support and mentorship throughout my Master's degree and research endeavours more broadly. His enthusiasm and guidance have served as a source of motivation and inspiration, allowing for valuable collaborations and for personal and academic growth. Additionally, I want to acknowledge the effort and expertise contributed by my thesis readers, Dr. Jonathan Oakman and Dr. Uzma Rehman. Importantly, I would like to thank my co-authors, Jolie Ho and Joshua Budge, for their hard work and dedication throughout the process of writing this study for publication. I would also like to acknowledge Vanja Vidovic and Van Bui for their contributions to this study in the initial stages of development, as well as the current and past members of the Anxiety Studies Research Team of the University of Waterloo Centre for Mental Health Research and Treatment for their work in data collection throughout the years. I am continually grateful for my lab members and cohort for their friendship, encouragement, and inspiration. Lastly, I want to share my appreciation for the constant support shown by my family and friends; I could not do any of this without you.

Table of Contents

List of Figures

List of Tables

Introduction

Social Anxiety Disorder (SAD) is a disabling disorder characterized by a fear of negative evaluation by others (American Psychiatric Association [APA], 2013), which is fueled by negative perceptions of the self as being socially undesirable (Clark & Wells, 1995; Moscovitch, 2009; Rapee & Heimberg, 1997). According to past epidemiological studies, SAD has an annual prevalence rate between 2.4–7.1% (Kessler et al., 2005; Ruscio et al., 2008; Stein & Kean, 2000; Stein et al., 2017), which was determined using diagnostic interview data, as is typical in mental health research. Although semi-structured diagnostic interviewing represents the gold standard method for determining a participant's diagnostic status, such interviews are laborious, time-consuming, and expensive, and their use in clinical research is not always practical or possible. As such, many clinical researchers depend on *analogue* samples of participants who are selected from the population based on predetermined cutoff scores on validated self-report symptom measures. Such cutoff scores define the threshold value an individual must meet on the symptom measure to be categorized into a specific group of participants whose symptom characteristics are meant to resemble those of the clinical population of interest. For example, a cutoff score could be used to create a *high social anxiety* group which is meant to resemble a group with SAD. Self-report measures are an efficient and low-cost alternative to diagnostic interviewing when determining analogue samples (Chang & Krosnick, 2009; Nayak & Narayan, 2019); their utility, however, critically depends on the validity and reliability of the cutoff scores themselves.

In recent years, accumulating observational and statistical evidence has cast doubt on the validity and utility of common cutoff scores upon which researchers have traditionally relied to select analogue samples of individuals with high social anxiety. To this end, social anxiety researchers across the globe have observed a significant increase in the proportion of analogue

participants whose scores exceed the established cutoff scores on several relevant self-report symptom measures of social anxiety. For example, Jefferies and Ungar (2020) surveyed large samples of young adults aged 16–29 from a diverse group of seven countries—Brazil, China, Indonesia, Russia, Thailand, the United States, and Vietnam—and reported that 36% of respondents overall met the predetermined cutoff score for SAD on a commonly used symptom measure of SAD (i.e., the Social Interaction Anxiety Scale [SIAS]; Mattick & Clarke, 1998). The very high proportion of participants whose social anxiety symptom levels exceeded the pre-determined cutoff score mirrors similar recent observations in our own lab (as noted below), which used another common yet distinct measure of social anxiety (i.e., the Social Phobia Inventory [SPIN]; Connor et al., 2000). This high proportion of undergraduate students with elevated self-reported social anxiety symptoms raises critical questions and concerns about the current validity of traditionally established cutoff scores across multiple measures along with their utility for research that relies on the accurate categorization of analogue groups of participants with high social anxiety. In the present study, we propose a solution to the problem of inflated prevalence rates of social anxiety that are observed when using traditional cutoff scores on self-report measures, with the aim of assisting researchers to identify and recruit more valid analogue social anxiety samples.

Cognitive Behavioural Models of Social Anxiety

Analogue samples of individuals with high social anxiety are meant to resemble groups of individuals who have a diagnosis of SAD. SAD is marked by fears that one's actions or symptoms of anxiety will be negatively judged by others in social situations such as when meeting new people, having conversations, being observed, or performing (APA, 2013). According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5), these

social situations must almost always bring on anxiety, such that they are either avoided or faced with excessive and intense fear that is disproportionate to the actual situation. The fears must also be present for 6 months or more and cause "clinically significant distress or impairment" (p. 230) to warrant a diagnosis (APA, 2013). While these criteria are necessary to warrant a diagnosis of SAD, there are several cognitive behavioural models of social anxiety that have expanded on the criteria to further explain the etiology and maintenance of the disorder.

Clark and Wells (1995) proposed that negative self-beliefs held by those with social anxiety lead to negatively biased information processing (e.g., attention, perception, memory encoding). They further articulated that these negative self-beliefs are maintained by four interconnected cognitive processes: safety behaviours, self-focused attention, negative social cognitions, and pre- and post-event processing. First, safety behaviours are a strategy used to cope with anxiety felt in anticipation of a social event. Within the context of social anxiety, safety behaviours can often be fruitfully conceptualized as self-concealment strategies that are used to prevent judgement from others of feared self-attributes during social events (Moscovitch et al., 2013). The use of safety behaviours can limit the availability of disconfirming evidence of negative beliefs, or even "backfire" by distancing the self from others and/or increasing the probability of appearing awkward, thus eliciting negative evaluation (e.g., Clark & Wells, 1995; McManus et al., 2008; Plasencia et al., 2011; Rowa et al., 2015).

Second, self-focused attention is the process of focusing one's attention on one's own behaviour, feelings, thoughts, and physical sensations (e.g., blushing, trembling) during anxiety inducing social situations. Self-focused attention increases awareness of negative self-relevant information and enhances interoceptive awareness (Spurr & Stopa, 2002). By filtering available social information through a negative lens, self-focused attention contributes to biased self-

perceptions and beliefs, enhances feelings of anxiety in feared situations, and leads to increased use of safety behaviours (Clark & Wells, 1995; McManus et al., 2008).

Third, due to self-focused attention and safety behaviour use, Clark and Wells (1995) proposed that individuals with social anxiety do perform more poorly in social situations and are thus subject to increased negative social evaluation. Evidence suggests that while perceived social deficits are present in social anxiety (e.g., Hofmann, 2007), actual social deficits may be more context specific (Tonge et al., 2020; Voncken & Bögels, 2008).

Finally, pre- and post-event processing involve ruminating on the details of events, anxious feelings, negative self-beliefs, and past failures either following specific social experiences or when anticipating future social experiences (Clark & Wells, 1995). This type of pre- and post-event rumination has been shown to bias self-perceptions and memories of social experiences (Brozovich & Heimberg, 2011; Cody & Teachman, 2010; Zou & Abbott, 2012). Together, these processes and behaviours contribute to the negative self-beliefs that underly SAD.

Rapee and Heimberg (1997) proposed a similar cognitive model as the Clark & Wells (1995) model to explain the underlying mechanisms of social anxiety. They argued that, when faced with a social situation, individuals with social anxiety create a negatively distorted mental image of the self that is based on long-term memory, internal cues (e.g., pounding heart), and external cues (e.g., others' tone of voice). Indeed, research suggests that distorted self-images are linked to early negative social memories that occurred around the onset of symptoms (Hackmann et al., 1998, 2000). Rapee and Heimberg (1997) also proposed that the negative self-image is continuously updated during social situations due to engagement in self-monitoring, which may inhibit individuals' ability to naturally respond to social cues and respond effectively to social

demands as they arise during social encounters. These mental images are also compared to overestimated social standards, eliciting an inflated perception of the likelihood of negative evaluation and overestimation of the potentially catastrophic consequences of such evaluation, a dynamic emphasized as well by Hofmann (2007) as being central to the vicious cycle of social anxiety.

Hofmann (2007) expanded on existing cognitive models of social anxiety by more clearly articulating challenges in identifying attainable social goals, as well as holding high social standards for which socially anxious individuals feel they cannot live up to because of perceived social skill deficits and a perceived lack of control of social anxiety symptoms. Hofmann (2007) agreed with past models that post-event processing, self-monitoring, negative self-perceptions, and safety behaviours contribute to the maintenance of SAD.

Moscovitch (2009) further proposed that the core fear, or feared stimulus, in SAD can be conceptualized as perceived self-attribute flaws in social competence, physical appearance, or signs of anxiety such as blushing or trembling (see Moscovitch & Huyder, 2011), with criticism or rejection as the feared consequence of revealing such flaws to critical others in social situations.

Diagnosing SAD through Clinical Interviewing

As reflected in the complexity of its interacting cognitive processes, accurately capturing the experiences of those with SAD, including the nature of presenting symptoms as well as associated distress and life impairment, is not straightforward and requires a comprehensive clinical interview paired with supplemental information such as self-report questionnaires and informant reports. Clinical interviewing can be used to decide on and confer a diagnosis that informs future treatment. In contrast, it can also be used for research purposes in which the

diagnosis would be used to classify participants into a clinical group who have a diagnosis, such as SAD.

Diagnostic interviewing includes administering a semi-structured interview such as the Mini-International Neuropsychiatric Interview (MINI; Sheehan, 2014), which aims to assist clinicians or researchers in making diagnoses based on criteria from the DSM-5 (APA, 2013) or the International Statistical Classification of Diseases and Related Health Problems (11th ed.; ICD-11; World Health Organization, 2019). The MINI can take up to 2 hours to complete and must be administered by a trained professional, student, or researcher. Interviewees are asked a series of questions regarding specific symptoms of various disorders (e.g., "Do you fear these social situations so much that you avoid them, or suffer through them, or need a companion to face them?" [p. 14; Sheehan, 2014]). Further questions are asked about symptom frequency, intensity, duration, and onset, as well as prompts to provide examples of one's experiences. The interviewer must decide whether the participants' symptoms are more consistent with a diagnosis of SAD than with another diagnostic category that may share overlapping features with SAD (e.g., panic disorder, agoraphobia, generalized anxiety disorder, body dysmorphic disorder, eating disorder, depression, etc.). In addition to making a differential diagnosis, the interviewer must also establish whether there is a sufficient degree of subjective distress and life impairment to warrant a clinical diagnosis. Although diagnostic interviewing represents the most valid and reliable method for determining diagnoses (Sheehan, 2014; Sheehan et al., 1998), it is not always possible to administer diagnostic interviews during the research process due to time and resource constraints. As a result, researchers commonly use self-report measures and predetermined cutoff scores to identify and recruit analogue samples from the population for research studies on individuals with high social anxiety, from which they draw inferences about the nature of SAD.

Analogue Samples in Clinical Research

While analogue samples may not be perfect substitutes for clinical samples, they are often necessary and provide efficiency and savings on financial resources (Chang & Krosnick, 2009; Nayak & Narayan, 2019). Analogue samples also allow for large samples to be recruited with convenience (Abramowitz et al., 2014), which assists in achieving more complex experimental designs. Results from studies using analogue samples often serve as justification for conducting future research on clinical samples and for investing the necessary resources to do so.

Importantly, the use of analogue samples in research, and the generalization of research findings from analogue samples to clinical groups, operate under the assumption that clinical disorders are not discrete categories but are instead continuous or dimensional constructs, such that clinical disorders could be considered the upper range of severity on a given continuous construct (Furmark, 2002; Merikangas et al., 2002). By studying analogue samples, information is being provided on the range of the dimension that links subclinical to clinical populations (Abramowitz et al., 2014). It follows that self-report symptom measures capture a range of severity of symptoms, which can then be used to delineate clinically significant from non-clinically significant experiences of a given disorder based on cutoff scores.

Evidence for the dimensional model of SAD is supported by the heterogeneity and individual differences observed in symptom expression across individuals with a diagnosis of SAD (e.g., Hyett & McEvoy, 2018; Moscovitch, 2009). Additionally, when the criteria for SAD were analyzed using taxometric analyses, Ruscio (2010) found evidence for a dimensional latent structure of SAD, instead of a categorical latent structure, suggesting social anxiety is a continuous construct where SAD and avoidant personality disorder can be represented on the

extreme high end of the continuum. The dimensional diagnosis of lifetime SAD was also better able to predict outcomes such as comorbidity with mood disorders, suicidality, and treatment seeking behaviour (Ruscio, 2010). Similarly, fears of social evaluation, which is a central cognitive feature of SAD (Clark & Wells, 1995; Hofmann, 2007; Moscovitch, 2009; Rapee & Heimberg, 1997), has also been found to have a dimensional latent structure (Weeks et al., 2009).

The cognitive models of social anxiety described above provide further support for a dimensional conceptualization of SAD such that the negative self-beliefs at the heart of the disorder may be biased by varying degrees of severity (Fowler et al., 2006; Moscovitch & Huyder, 2011). Propensities for engaging in self-focused attention, safety behaviours, or post-event processing may also exist on a continuum as is evidenced by the methods of measurement for these processes and behaviours (Cuming et al., 2009; Spurr & Stopa, 2002; Wong, 2015). Thus, conceptualizing SAD as a continuous or dimensional construct assists in the justification of the use of analogue samples in research on SAD because this understanding demonstrates that differences between analogue and clinical samples are quantitative but not qualitative; in other words, people with higher levels of SAD symptoms are not inherently different than people with lower levels, in contrast to what a categorical disease model would suggest (Enns et al., 2001). The use of analogue samples is also commonly demonstrated in research on other clinical disorders such as major depressive disorder (Enns et al., 2001; Ruscio & Ruscio, 2002) and obsessive-compulsive disorder (Abramowitz et al., 2014). Nonetheless, a categorical approach to diagnosing is still dominant in both clinical and research practices for SAD. Thus, identifying analogue groups of participants in a valid and reliable manner using self-report scales is an

essential endeavour to support research on social anxiety when diagnostic interviewing is not feasible.

Identifying Analogue Samples Using Self-Report Measures

Determining Cutoff Scores

There are challenges with classifying participants into analogue groups, which include determining cutoff values or thresholds that can reliably classify participants. Cutoff scores on self-report measures are primarily determined by assessing the sensitivity and specificity of a measure using Receiving Operating Characteristic (ROC) curves and analyses. ROC curves can provide information on the accuracy of a continuous measure for identifying individuals belonging to a clinical group (e.g., SAD diagnosis) versus a control group (e.g., no SAD diagnosis; Carleton et al., 2010). Specifically, an ROC graph plots the sensitivity (i.e., the true positive rate) and 1-specificity (i.e., the false positive rate) over all possible cutoff scores on a measure (Fluss et al., 2005). Sensitivity and specificity can then be balanced, based on the needs of a study, to determine the optimal cutoff score for the measure. For example, a certain diagnostic test may require a low false positive rate due to more risky treatments, while another diagnostic test that may require a low false negative rate due to the high risks of missing a diagnosis. The overall predictive accuracy, or diagnostic performance, of a measure is provided by the Area Under the ROC Curve (AUC; Mossman & Somoza, 1991). The AUC ranges from 0.5 (chance performance, which would be represented by a diagonal line) to 1.0 (perfect performance) and indicates the likelihood that, if one person from each group is chosen at random, the person in the clinical group will score higher on the measure than the person in the nonclinical group, if a higher score indicates greater symptomology (Hand, 2012; Mossman & Somoza, 1991).

Measures and Cutoff Scores Assessing Social Anxiety Symptoms

Cutoff scores on self-report symptom measures of social anxiety such as the SPIN (Connor et al., 2000) are common when determining analogue samples in social anxiety research (e.g., Herbert et al., 2014). Besides the SPIN, there are many well validated and commonly used self-report measures that assess social anxiety (for review, see Wong et al., 2016). Specific examples include the Social Phobia and Anxiety Inventory (SPAI; Turner et al., 1989), the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), the Social Phobia Scale (SPS; Mattick & Clarke, 1998), and the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987). The SIAS and SPS were developed in conjunction with one another such that the SIAS measures fears surrounding interactions with others, whereas the SPS assesses anxiety more specifically in the context of being observed by others. The SPIN, in contrast, contains three subscales that assess fear, avoidance, and physiological arousal, which can also be summed into a total score.

Despite the variety of self-report measures that assess social anxiety, this study will focus on the SPIN. Specifically, the SPIN includes items such as "being embarrassed or looking stupid are among my worst fears," "I avoid speaking to anyone in authority," and "sweating in front of people causes me distress" to assess the level of fear, avoidance, and physiological arousal experienced during social situations (Connor et al., 2000). Participants are asked how much each problem has bothered them during the past week, and responses range from 0 (*not at all*) to 4 (*extremely*). The SPIN comprises 17 items, which means that total scores can range from 0–68. Psychometric properties of the SPIN are strong, with internal consistency ranging between 0.82–0.95 across various samples as well as satisfactory convergent, divergent, and discriminative validity (for an overview, see Mörtberg & Jansson Fröjmark, 2019).

Research by Connor et al. (2000) established a cutoff score of 19 for categorizing an analogue sample of participants with symptoms of SAD based on the SPIN, while subsequent research groups have recommended the use of a higher cutoff score of 30 to capture more severe symptoms more likely to resemble SAD (e.g., Moscovitch et al., 2011; Moser et al., 2008). Mean scores on the SPIN can vary widely depending on the sample. For example, Shaughnessy et al. (2017) reported a mean score (SD) of 20.87 (15.92) on the SPIN for an adult community sample recruited through Amazon's Mechanical Turk from the United States. Silva-Rocha et al. (2019) reported a mean score (SD) of 10.7 (7.9) on the SPIN for a group of athletes from Brazil. Connor et al. (2000) reported a mean score (SD) of 12.1(9.3) in healthy volunteers and a mean score (SD) of 41.1 (10.2) in individuals with a social phobia diagnosis. At University of Waterloo, in the first four months of 2023 the mean score (SD) of all undergraduates (n = 1665) who were included in the Psychology participant research pool was 32.70 (14.81). Thus, applying the most stringent SPIN cutoff score of 30 to select an analogue sample of participants with high social anxiety symptoms from our pool would have resulted in the inclusion of 60% of our undergraduate student population into this sample, an unreasonably high proportion of individuals that far exceeds the true estimated annual prevalence rate for SAD in the population, which is between 2.4–7.1% (Kessler et al., 2005; Ruscio et al., 2008; Stein & Kean, 2000; Stein et al., 2017).

Impairment Due to Social Anxiety Symptoms

We propose that administering a measure of social anxiety symptoms, in combination with a measure of distress and impairment due to those symptoms, could assist researchers in determining more valid criteria for selecting analogue samples of participants with high social anxiety from the population. The SPIN allows researchers to capture a measure of the fear,

avoidance, and physiological arousal experienced during social situations. It does not, however, provide a measure of how much these symptoms impair the individual in different domains of their life, which is important to consider when determining a clinical diagnosis. Indeed, a clinical disorder has been defined in terms of its harmful dysfunction (APA, 2013; Wakefield, 1992), for which the nature of the dysfunction that leads to symptoms may be specific to a given disorder, but the associated distress and life impairment may be similar across disorders. It follows that clinical diagnoses lack rigid boundaries (Joyce-Beaulieu & Sulkowski, 2016) and different types of disorders often lead to similar experiences of impairment in multiple domains. Antony et al. (1998) found that illness intrusiveness was similar between individuals with SAD, panic disorder, and obsessive-compulsive disorder, and that those with SAD experienced similar or more severe perceived intrusiveness compared to those with other chronic illnesses such as multiple sclerosis or rheumatoid arthritis. However, those with SAD experienced more impairment specific to social relationships and self-expression when compared to those with panic disorder and obsessive-compulsive disorder. SAD alone has also been associated with functional impairment (such as in social life and work/school domains), along with lower life satisfaction, over and above common comorbidities such as major depressive disorder and other anxiety disorders (Aderka et al., 2012; Stein & Kean, 2000).

Functional impairment can be measured by assessing how symptoms interfere with or limit functioning in various life domains (Stein & Kean, 2000). To this end, the Sheehan Disability Scale (SDS; Sheehan, 1983) is a three-item measure that assesses symptom-related distress and impairment across the domains of work/school, social life, and family life/home responsibilities. Past research has illustrated that the SDS has strong construct validity, internal reliability, and criterion-related validity (Hambrick et al., 2004; Leon et al., 1997). One past

study reported that a cutoff score of 5 on the SDS indicated a higher risk of impairment due to clinical symptoms (Leon et al., 1997). This cutoff score was not assessed in relation to SAD and was instead established based on symptoms related to alcohol and drug dependence, generalized anxiety disorder, major depressive disorder, obsessive-compulsive disorder, and panic disorder. SDS mean scores in samples of individuals with SAD have ranged from 17.1 to 19.2 (Aderka et al., 2012; Sheehan & Sheehan, 2008), and 11.5 in a nonclinical undergraduate sample (Bui & Moscovitch, 2024), suggesting that an SDS cutoff score of 5 may be too low to accurately differentiate individuals with clinical levels of impairment due to social anxiety from those without.

Evidently, there is a need to establish a cutoff score on the SDS in socially anxious individuals more specifically. Furthermore, to improve the selection of accurate analogue samples of high socially anxious individuals from the population, it may be fruitful to pair a social anxiety symptom measure such as the SPIN with a measure of functional impairment such as the SDS to take into account how the symptoms are impacting the participant's life. This process may better reflect how a clinician would ask questions during a diagnostic interview to better understand how symptoms impact a person's life to inform a potential diagnosis, which would aid in establishing more accurate analogue samples of high social anxiety.

Study Aims and Hypotheses

The present study had three overarching aims. First, we analyzed SPIN and SDS scores from a large sample of community participants consisting of individuals both with and without an established diagnosis of SAD. Specifically, we completed Receiving Operating Characteristic (ROC) analyses to establish updated optimal cutoff scores and determine whether the optimal cutoff scores would differ when distinguishing between SAD and a non-clinical control group, on one hand, and between SAD and a clinical control group, on the other. We expected that the optimal cutoff score would be higher on both the SPIN and SDS when distinguishing between SAD and a clinical control group than between SAD and a non-clinical control group.

Second, we aimed to determine the best combination of cutoff scores to predict group membership from the SPIN and the SDS by conducting logistic regression analyses with SAD diagnosis as the outcome variable on these same community participants. Specifically, we wished to examine whether using these newly determined cutoff scores (based on the ROC analyses), alone or in combination, improves the accurate identification of individuals who likely have SAD from those who do not. We predicted that using predetermined cutoff scores on both the SPIN and the SDS in combination with one another would provide the highest odds of an accurate SAD diagnosis, and result in a sample with the highest proportion of participants who likely have SAD compared to the other cutoff score combinations; in other words, we hypothesized that adopting the use of the new cutoff scores in combination would improve the likelihood of including individuals who are likely to have SAD while excluding those without SAD when identifying analogue samples of participants with high social anxiety from the population.

Third, we aimed to examine whether the updated cutoff scores gleaned from these first two sets of analyses would lower the proportion of undergraduate participants selected for membership in analogue samples of individuals with high social anxiety. To this end, we applied the old and new cutoff scores, both alone and in combination, to seven samples of undergraduate students from the University of Waterloo across time from the years 2018 through 2023 (excluding samples from the 2020–2021 COVID-19 social isolation period). Descriptive statistics are presented regarding the frequency of undergraduates who met the various cutoff score combinations across time. We predicted that using the newly determined cutoff scores would materially reduce the proportion of students meeting the threshold for being identified as having high social anxiety, especially when both the SPIN and the SDS are used in combination with one another. Finally, we predicted that the proportion of undergraduate participants meeting the threshold for high social anxiety would be higher for post-pandemic than pre-pandemic samples, reflecting the possibility of an increase in the prevalence of social anxiety in the population due to the COVID-19 pandemic (see Kindred & Bates, 2023).

Method

Participants

This study relied on secondary data analyses that we conducted on eight distinct participant samples that had been collected previously for other research purposes. The eight samples consisted of one large community sample and seven large undergraduate samples, described below. All secondary analyses were approved by the Human Research Ethics Board at the University of Waterloo.

The community sample (n = 941) consisted of three subgroups (see Table 1 for full sample characteristics). Subgroup one (n = 313) included non-clinical control participants with no clinical diagnoses, subgroup two (n = 199) included clinical control participants with a principal diagnosis other than SAD and no secondary SAD diagnosis, and subgroup three (n = 429) included participants with a principal diagnosis of SAD. Participants in the community sample were recruited from Kitchener-Waterloo and surrounding region through the years 2014 to 2023 via online and flyer ads soliciting research participation from individuals self-identifying as having difficulties with anxiety, or as having no such difficulties. Potentially eligible participants were screened for inclusion in this sample first with a short online self-report survey based on an adapted version of the Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1998; Sheehan, 2014), then interviewed briefly by a trained research coordinator using a phone screen that is also based on an adapted version of the MINI. If potentially eligible participants endorsed symptoms of any anxiety-related disorder during the phone screen, they completed a full MINI assessment with a trained graduate student either in-person or virtually, which took up to 2 hours. The MINI was supplemented by clinician-rated symptom checklists from the Anxiety Disorders Interview Schedule for DSM-5 (Brown & Barlow, 2014) to assist

interviewers in assessing the functional impairment and clinical severity associated with endorsed symptoms for specific diagnoses. The results of the MINI assessment were shared in weekly intake meetings with other clinical psychology graduate students and two licensed clinical psychologists. Group discussion based on the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria was used to arrive at diagnostic consensus for each case. Most clinical participants were diagnosed according to DSM-5 criteria (n = 821), with the remainder diagnosed according to DSM-IV criteria (n = 120). Participants were excluded from participation if they endorsed significant suicidality, psychosis, mania, or an active substance use disorder. Participants were included in the non-clinical control group if they did not endorse any symptoms during the online screener survey. Participants were included in the clinical control group if they met clinical criteria for a principal diagnosis of a disorder other than SAD. Participants were included in the SAD group if they met criteria for a principal diagnosis of SAD. Community sample participants were remunerated for their participation with a $40 Amazon gift card.

Table 1

Characteristics of Community Sample

Demographic Information	Total	Subgroups		
		Non-Clinical Control	Clinical Control	Social Anxiety Disorder
N	941	313	199	429
Gender				
Woman	680	222	149	309
Man	245	91	49	105
Nonbinary	8	0	1	7
Transman	4	0	0	4
Transwoman	2	0	0	2
Race/Ethnicity				
Caucasian	574	186	124	264
South Asian	102	32	23	47
East Asian	88	41	14	33
Latin American	21	10	3	8
Southeast Asian	14	5	1	8
Black	14	5	2	7
Middle Eastern	11	4	2	5
Indigenous	9	1	3	5
West Indian	6	2	1	3
Other specified	46	9	13	24
M_{age} (*SD*)	28.65 (11.52)	28.34 (11.21)	30.35 (12.46)	28.08 (11.24)
$M_{years\ of\ Education}$ (*SD*)	15.36 (2.9)	15.58 (2.48)	15.54 (2.40)	15.12 (3.33)
Diagnosis			Principal Diagnosis	Secondary/Co-Principal Diagnosis
MDD			38	78
PDD			38	113
GAD			79	166
OCD			61	83
Panic disorder			42	52
Agoraphobia			35	46
PTSD			8	20

Note. MDD = major depressive disorder; PDD = persistent depressive disorder; GAD = generalized anxiety disorder; OCD = obsessive compulsive disorder; PTSD = post-traumatic stress disorder. Diagnoses were based on either DSM-IV or DSM-5 criteria.

The seven undergraduate student samples consisted of students who were enrolled in at least one psychology course and completed a survey of self-report questionnaires for partial course credit at the start of term in the Psychology research participation pool at the University of Waterloo. See Table 2 for student sample characteristics. Student samples included in the present study were collected in fall 2018 (n = 2184), winter 2019 (n = 2046), fall 2019 (n = 2350), winter 2022 (n = 1786), fall 2022 (n = 1848), winter 2023 (n = 1665), and fall 2023 (n = 2230) with fall terms spanning from September to December and winter terms from January to April of each year.

Table 2

Characteristics of Undergraduate Samples

Demographic Information	Sample						
	Fall 2018	Winter 2019	Fall 2019	Winter 2022	Fall 2022	Winter 2023	Fall 2023
N	2184	2046	2350	1786	1848	1665	2230
Gender							
Woman (cis or trans)	1605	1508	1754	1333	1368	1270	1643
Man (cis or trans)	565	516	539	393	390	339	494
Gender non-conforming	9	13	18	38	49	36	60
Other specified	5	5	9	13	16	5	10
Ethnicity							
Caucasian	903	815	988	669	723	633	855
East Asian	502	438	463	370	349	344	425
South Asian	380	385	434	397	386	344	493
Southeast Asian	108	88	113	73	79	77	97
Middle Eastern	74	81	84	68	81	69	86
Black	62	70	61	67	53	54	78
West Indian	44	39	36	30	29	21	32
Hispanic	42	32	41	23	33	27	34
Indigenous	4	3	6	7	5	9	12
Mixed	NA	57	77	51	70	58	80
Other specified	27	13	13	8	10	10	11
M_{age} (*SD*)	20.11 (2.70)	20.90 (2.45)	20.21 (2.97)	22.07 (3.32)	21.84 (3.14)	21.15 (3.01)	21.00 (3.33)

Note. Fall terms = September to December; Winter terms = January to April.

Materials

Self-Report Questionnaires

As outlined above, the SPIN (Connor et al., 2000) is a 17-item measure of social anxiety with responses ranging from 0 (*not at all*) to 4 (*extremely*) on items such as, “I avoid going to

parties" and "Being embarrassed or looking stupid are among my worst fears." The SDS (Sheehan, 1983) is a three-item measure of impairment due to clinical symptoms, which assesses impairment in three main life domains (i.e., work/school, social life, family life/home responsibilities). SDS responses range from 0 (*not at all*) to 10 (*extremely*) on three items: "Within the past week, my concerns about social evaluation tended to disrupt my work/schoolwork," "Within the past week, my concerns about social evaluation tended to disrupt my social life/leisure activities," and "Within the past week, my concerns about social evaluation tended to disrupt my family life/home responsibilities." The items on the SDS were adjusted to ask about impairment specifically due to social evaluation concerns related to symptoms of social anxiety, rather than general life impairment due to factors that may be unrelated to social anxiety symptoms. All community and undergraduate participants completed the SPIN followed immediately by the SDS. Reliability coefficients for scores from each measure are reported in Table 3 (community sample) and Table 4 (undergraduate samples). Copies of both the SPIN and SDS can be found in Appendix B.

Table 3

Descriptive Statistics for Community Sample

Sample	*N*	SPIN		SDS	
		M (*SEM*)	Cronbach's alpha	*M* (*SEM*)	Cronbach's alpha
Total	941	29.46 (.573)	.951–.953	9.79 (.367)	.807–.858
Non-Clinical Control Group	313	14.25 (.667)	.927–.933	4.04 (.580)	.698–.832
Clinical Control Group	199	26.02 (.968)	.905–.917	8.60 (.634)	.739–.815
SAD Group	429	42.15 (.600)	.874–.886	14.53 (.546)	.705–.783

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. The minimum and maximum Cronbach alpha values are reported from the 20 multiply imputed datasets.

Table 4

Descriptive Statistics for Undergraduate Samples

Sample	*N*	SPIN		SDS	
		M (*SEM*)	Cronbach's alpha	*M* (*SEM*)	Cronbach's alpha
Fall 2018	2167	26.36 (.316)	.934	9.36 (.147)	.823–825
Winter 2019	2040	25.61 (.329)	.937	7.09 (.130)	.806–.815
Fall 2019	2305	26.73 (.313)	.936	8.12 (.141)	.859–.863
Winter 2022	1758	31.18 (.362)	.938	10.77 (.173)	.839–.844
Fall 2022	1807	33.45 (.347)	.933	11.86 (.166)	.820–.826
Winter 2023	1622	32.69 (.369)	.936–.937	11.31 (.178)	.835–.840
Fall 2023	2201	31.64 (.317)	.933	11.48 (.155)	.844–.847

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. The minimum and maximum Cronbach alpha values are reported from the 20 multiply imputed datasets.

Data Analysis Plan

All statistical analyses were performed using IBM SPSS Statistics (Version 29), except multiple imputation of the community sample dataset and ROC analyses, which were performed using R (Version 4.3.2; R Core Team, 2023). The *mice* (van Buuren & Groothuis-Oudshoorn, 2011) and *miceafter* (Heymans, 2022) packages were used to perform multiple imputation and pool the results. The *pROC* (Robin et al., 2011) and the *ROCR* (Sing et al., 2005) packages were used to perform the ROC analyses.

Missing Data

Specific details on the level of missingness for each dataset before imputation can be found in Table A1. Twenty datasets were multiply imputed for all SPIN and SDS data for all participants who had at least one datapoint, including those with a diagnosis but no questionnaire data in the community sample. All analyses for which a single value is reported were pooled from the 20 imputed datasets using Rubin's Rules (Rubin, 1987), including the ROC analyses

consisting of the Area Under the Curve (AUC), sensitivity, and specificity computations. For analyses that did not require single pooled values, the minimum and maximum values of the 20 imputed datasets are reported for descriptive purposes.

For the SDS scale, one item asks about impairment due to school/work and contains a "Not Applicable" option. This response option was recoded as a 'missing value' for both the community sample and all undergraduate samples.

Receiver Operating Characteristic Analyses

To assess our first hypothesis that the optimal cutoff score would be higher on both the SPIN and SDS when distinguishing between the clinical control group and the SAD group compared to the non-clinical control group and the SAD group, we completed several ROC analyses. ROC analyses provide the sensitivity (i.e., the true positive rate) and 1-specificity (i.e., the false positive rate) for all possible cutoff scores on a measure (Fluss et al., 2005). Sensitivity and specificity can then be balanced, based on the needs of a study, to determine the optimal cutoff score for the measure. For example, a certain diagnostic test may require a low false positive rate due to more risky treatments, compared to another diagnostic test that may require a low false negative rate due to the high risks of missing a diagnosis. The overall predictive accuracy, or diagnostic performance, of a measure is provided by the Area Under the ROC Curve (AUC; Mossman & Somoza, 1991), which ranges from 0.5 (chance performance) to 1.0 (perfect performance). Optimal cutoff scores were determined using the Index of Union (IU) method (Unal, 2017), which results in a cutoff score for which sensitivity and specificity are simultaneously at their highest and closest to the AUC value. With the IU method, the optimal cutoff score, (c), satisfies this equation: IU (c) = (|Sensitivity (c) − AUC| + |Specificity (c) – AUC|). Another condition satisfied by the IU method is that, at the optimal cutoff score, the

absolute difference between sensitivity and specificity is at its minimum. This criterion, however, is necessary to satisfy only when the equation yields more than one optimal cutoff score (Unal, 2017).

Hierarchical Logistic Regression

First, we ran three models that examined the variance explained in SAD diagnosis by using both measures combined over and above using either measure individually. Specifically, these models included two dummy-coded binary predictors (i.e., scoring 34 or above on the SPIN and scoring 11 or above on the SDS) that were entered as main effects on step one, as well as their interaction that was entered on step two. This model was run separately while differentiating between SAD group versus non-clinical control group, SAD group versus nonclinical control group, and SAD group versus all control participants combined.

The interaction term in the above models represents a direct comparison of scoring at or above both the SPIN and the SDS cutoffs (i.e., SPIN $\geq$ 34 & SDS $\geq$ 11), to scoring below both the SPIN and SDS cutoffs (i.e., SPIN < 34 & SDS < 11), while taking into account the variance accounted for by each of the main effect binary predictor variables (i.e., controlling for the variance explained by scoring at or above the cutoff scores on either of the two scales alone). Thus, while this analysis represented a helpful starting point, it did not adequately test our second hypothesis.

Subsequently, we ran three logistic regression models that allowed us to more closely examine and compare mutually exclusive categories of the cutoff score combinations. These represented our primary analyses as they enabled us to test our second hypothesis most directly; namely, that scoring at or above the predetermined cutoff scores on both the SPIN and the SDS would provide the highest odds of an accurate SAD diagnosis and result in the identification of a

sample with the highest proportion of participants who likely have SAD compared to the other cutoff score combinations, thus providing the highest likelihood of differentiating between individuals in the SAD group and individuals in the non-clinical and clinical control groups, as well as between individuals in the SAD group and individuals in all control groups combined. For the dependent variable, the first model classified the non-clinical control group versus the SAD group, the second model classified the clinical control group versus the SAD group, and, for the final model, the non-clinical and clinical controls were combined and the model classified this combined control group versus the SAD group. The independent variable (i.e., SPIN/SDS status) was a four-level categorical predictor, which was dummy coded using our newly determined high cutoffs based on the ROC analyses. The reference level for the model consisted of participants who scored below 34 on the SPIN and below 11 on the SDS, the next level consisted of participants who scored 11 or above on the SDS but below 34 on the SPIN, the following level consisted of participants who scored 34 or above on the SPIN but below 11 on the SDS, and the final level consisted of participants who scored 34 or above on the SPIN and 11 or above on the SDS.

Finally, we conducted three follow-up logistic regression analyses to assess whether scoring at or above both cutoffs was significantly better at predicting SAD diagnosis than only scoring at or above the cutoff on one measure but not the other. To do this, we altered the reference level to consist of participants who scored 34 or above on the SPIN and 11 or above on the SDS. Finally, we also compared whether scoring at or above both cutoffs could significantly differentiate individuals with a diagnosis of SAD from individuals without a diagnosis of SAD when compared to any other combination of scores. This model included one binary predictor comparing those who scored 34 or above on the SPIN and 11 or above on the SDS (SPIN $\geq$ 34 &

SDS ≥ 11) to individuals with any other combination of scores on the two measures (SPIN ≥ 34 & SDS < 11, SDS ≥ 11 & SPIN < 34, SPIN < 34 & SDS < 11). Thus, we first examined the odds of accurately predicting SAD diagnosis using both high cutoff scores compared to each of the other combinations of scores on the two measures, and then we examined the odds of predicting SAD diagnosis accurately using both high cutoff scores compared to all the other binary groups combined.

Frequency Observations in Undergraduate Samples

As noted in the introduction, for our third hypothesis, we predicted that, descriptively, using the newly determined cutoff scores—especially when used in combination—would reduce the overall proportion of students with scores exceeding the threshold for inclusion in the SAD analogue groups to more closely represent the true prevalence rate of SAD in the population. In our fourth hypothesis, we further predicted that post-pandemic samples would have a higher proportion of undergraduate participants who met the threshold for high social anxiety than the pre-pandemic samples. To test both of these hypotheses, we calculated these proportions and compared them descriptively across semesters.

Transparency and Openness

Study design and analyses were not preregistered. Final data files and analytic code for this study are publicly available on the OSF website at https://osf.io/ag5vs/ (Kudryk et al., 2024).

Results

For full descriptive statistics of the SPIN and SDS in both the community and undergraduate samples, see Table 3 and Table 4, respectively. We conducted independent sample *t*-tests to assess potential gender differences in the SPIN and SDS for all our samples. In the community sample, no gender differences were found between men (cis or trans) and women (cis or trans) on either the SPIN or SDS. In the undergraduate samples, there were gender differences found for all but one undergraduate sample (i.e., the SDS in winter 2019) such that women (cis or trans), compared to men (cis or trans), reported higher levels of social anxiety symptoms and impairment (see Table A2 [SPIN] and Table A3 [SDS] for *t*-test results).

Receiver Operating Characteristic Analyses

To test Hypothesis 1, we determined the predictive accuracy, sensitivity, specificity, and the optimal cutoff value of both the SPIN and SDS in the community sample by performing four ROC analyses with two different control groups. First, we compared the predictive accuracy of the SPIN to discriminate between the non-clinical control group (n = 313) and SAD group (n = 429). For this analysis, the AUC was .939 (95% confidence interval [CI] = .928-.949). Given that a value of .5 included in the 95% CI would indicate chance performance in discrimination between the two groups (Sosic et al., 2008), results show that the predictive accuracy of the SPIN in differentiating between participants with SAD and non-clinical controls was significantly better than chance. The optimal cutoff score according to the IU method was 28, which resulted in both a sensitivity and specificity of .86. Accordingly, 86% of participants with SAD were correctly classified as having SAD, whereas 14% of non-clinical control participants were misclassified as having SAD.

A second ROC analysis was completed that compared the predictive accuracy of the SPIN to discriminate between the clinical control group (n = 199) and the SAD group (n = 429). The AUC for this analysis was .813 (95% CI = .792-.832). This CI excludes the chance value of .5, indicating that the predictive accuracy of the SPIN was significantly better than chance when differentiating individuals in the SAD group from those in the clinical control group. The optimal cutoff score according to the IU method was 34, resulting in a sensitivity of .74 and specificity of .73. Accordingly, 74% of participants with SAD were correctly classified as having SAD, whereas 27% of clinical control participants were misclassified as having SAD.

The third ROC analysis compared the predictive accuracy of the SDS to discriminate between the non-clinical control group (n = 313) and the SAD group (n = 429). The AUC was .870 (95% CI = .826-.905), which excludes .5 and indicates that the SDS can discriminate between those with SAD and those with no clinical diagnoses at a level significantly better than chance. The optimal cutoff score using the IU method was 7, which provided a sensitivity of .80 and specificity of .83. Consequently, 80% of participants with SAD were correctly classified as having SAD, whereas 17% of participants with no clinical diagnoses were misclassified as having SAD.

The final ROC analysis compared the predictive accuracy of the SDS on discriminating between the clinical control group (n = 199) and the SAD group (n = 429). The AUC for this analysis was .718 (95% CI = .672-.761). This CI does not include .5, which indicates that the SDS performed better than chance when distinguishing participants with SAD from those with clinical diagnoses other than SAD. The optimal cutoff score according to the IU method was 11, corresponding to a sensitivity of .64 and specificity of .68. Accordingly, 64% of participants with

SAD were correctly classified as having SAD, whereas 32% of participants with diagnoses other than SAD were misclassified as having SAD.

An ancillary ROC analysis was performed to assess the sensitivity and specificity of the SPIN in discriminating between both control groups combined (n = 512) versus the SAD group (n = 429) in order to determine if a similar trade-off in sensitivity and specificity could be achieved compared to the combined cutoffs of 34 or above on the SPIN and 11 or above on the SDS by raising the cutoff score on the SPIN alone. Results revealed that a cutoff score of 39 or above on the SPIN was associated with a sensitivity of 62.9% and a specificity of 92.4%, values which were substantively similar to the sensitivity (57.03%) and specificity (91.25%) values associated with the combined cutoffs of 34 or above on the SPIN and 11 or above on the SDS (see Table 5). The positive predictive value associated with a cutoff score of 39 or above on the SPIN was 85.2% and the false discovery rate was 14.8%. The area under the curve for this analysis was .890 (95% CI = .878–.902). This CI excludes the chance value of .5, indicating that the predictive accuracy of the SPIN was significantly better than chance when differentiating individuals in the SAD group from those in either control group combined.

Table 5

Proportion of Community Sample Scoring Above and Below High Cutoff Scores

SPIN/SDS Status				Subgroup			
	Sensitivity (%)	Specificity (%)	Total Sample (%)	Non-Clinical Control (%)	Clinical Control (%)	All No-SAD (%)	SAD (%)
SPIN ≥ 34	76.04	83.73	43.52	5.84	14.51	20.34	79.68
SDS ≥ 11	68.21	77.62	43.27	10.04	18.10	28.14	71.86
SPIN ≥ 34 & SDS ≥ 11	57.03	91.25	30.77	3.66	11.81	15.47	84.53
SPIN ≥ 34 & SDS < 11	19.02	92.48	12.76	11.07	20.98	32.06	67.94
SDS ≥ 11 & SPIN < 34	11.19	86.37	12.51	25.74	33.56	59.25	40.78
SPIN < 34 & SDS < 11	12.77	29.88	43.97	62.57	24.21	86.76	13.24

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale; SAD = Social Anxiety Disorder; No-SAD = both control groups combined. Sensitivity = True Positives / (True Positives + False Negatives). Specificity = True Negatives / (True Negatives + False Positives). The percentages within each subgroup column represent the proportion of that subgroup that contribute to the overall percentage for each SPIN/SDS status in the Total Sample column. Positive Predictive Value (PPV) = True Positives / (True Positives + False Positives); PPV is the probability that someone scoring at or above the cutoff actually has SAD, which is represented by the values in the SAD column for each cutoff score combination. The False Discovery Rate (FDR) = False Positives / (False Positives + True Positives); FDR for each cutoff score combination is represented by the values in the All No-SAD column.

Hierarchical Logistic Regression Analyses

The first three logistic regression models assessed the variance explained in SAD diagnosis by using both measures combined over and above using either measure individually. For all three models (i.e., SAD group versus non-clinical control group, SAD group versus

nonclinical control group, and SAD group versus all control participants combined), results revealed significant main effects for each measure. However, there were no significant two-way interactions, suggesting that scoring above both cutoff scores combined does not significantly increase the odds of SAD diagnosis compared to scoring below both cutoff scores after accounting for variance from either measure alone (see Tables A4–A6 for full regression results).

Our primary logistic regression analyses testing Hypothesis 2 consisted of three models. The first model assessed the effects of SPIN/SDS status on the likelihood that participants belonged to the non-clinical group versus the SAD group. In this model (as for all three primary regression models), scoring 11 or above on the SDS but below 34 on the SPIN was entered on step one, scoring 34 or above on the SPIN but below 11 on the SDS on step two, and scoring 34 or above on the SPIN and 11 or above on the SDS on step three, whereas scoring below 34 on the SPIN and below 11 on the SDS was the reference level. Results indicated that, on step three of the regression model, all levels of SPIN/SDS status had significantly better odds of differentiating between individuals with SAD and those in the non-clinical control group, compared to when SPIN/SDS status was below both 34 on the SPIN and 11 on the SDS, $X^2 = (3, N = 742) = 431.69–481.70$, $p < .001$, Nagelkerke $R^2 = .593–.642$ (see Table A7 for the full regression output). The model correctly classified 83.7–86.8% of cases. Specifically, when SDS was 11 or above but SPIN was below 34, there was an 88.4% probability (ExpB = 7.62; 95% CI [3.534, 16.433]) that the participant has SAD compared to when SDS was below 11 and SPIN was below 34. The probability of a SAD diagnosis increased to 96.6% (ExpB = 29.39; 95% CI [13.749, 62.839]) when SPIN was 34 or above but SDS was below 11, compared to when SDS was below 11 and SPIN was below 34. Finally, the probability of predicting that a participant has SAD was highest at 99.1% (ExpB = 111.79; 95% CI [49.063, 254.726]) when SPIN was 34 or

above and SDS was 11 or above, compared to when SDS was below 11 and SPIN was below 34. Follow up analyses demonstrated that the odds of being in the SAD group versus being in the non-clinical control group were significantly higher when scoring 34 or above on the SPIN and 11 or above on the SDS compared to any of the other individual SPIN/SDS combinations (see Table A8 for the full regression output). The final analysis showed that scoring 34 or above on SPIN and 11 or above on the SDS predicted significantly greater odds of having a SAD diagnosis than all other SPIN/SDS combinations together (see Table A9 for full regression results).

The second model assessed the effects of SPIN/SDS status on the likelihood that participants belonged to the clinical control group versus the SAD group. Analyses revealed that, on step three of the regression model, all levels of SPIN/SDS status had significantly better odds of differentiating between individuals with SAD and those in the clinical control group, compared to when SPIN/SDS status was below both 34 on the SPIN and 11 on the SDS, X^2 = (3, N = 628) = 122.52–150.81, $p < .001$, Nagelkerke R^2 = .249–.299 (see Table A10 for full regression output). The model correctly classified 73.9–76.9% of cases. Specifically, when SDS was 11 or above but SPIN was below 34, there was a 69.1% probability (ExpB = 2.23; 95% CI [1.089, 4.552]) that the participant had SAD, compared to when SDS was below 11 and SPIN was below 34. The probability increased to 85.6% (ExpB = 5.94; 95% CI [3.099, 11.382]) when SPIN was 34 or above but SDS was below 11, compared to when SDS was below 11 and SPIN was below 34. Finally, the probability of accurately predicting that a participant has SAD was highest at 92.7% (ExpB = 13.15; 95% CI [7.495, 23.065]) when SPIN was 34 or above and SDS was 11 or above, compared to when SDS was below 11 and SPIN was below 34. In follow up analyses with SPIN at or above 34 and SDS at or above 11 as the reference level, it was

demonstrated that the odds of being in the SAD group versus the clinical control group were significantly higher for the reference level compared to any of the other SPIN/SDS combinations individually (see Table A11 for full regression output). The final analysis, which compared scoring 34 or above on SPIN and 11 or above on SDS to all other SPIN/SDS combinations together revealed that scoring above both cutoff scores produced significantly greater odds of being in the SAD group versus the clinical control group (see Table A12 for full regression results).

The third and final model assessed the effects of SPIN and SDS cutoff combinations on the likelihood that participants belonged to the SAD group versus both of the no-SAD control groups combined. Results indicated that, on step three of the regression model, all SPIN/SDS cutoff score combinations in which participants scored at or above the cutoff on either or both the SPIN or the SDS predicted significantly better odds of differentiating between individuals with SAD and those in either control group compared to scoring below both 34 on the SPIN and 11 on the SDS, $X^2 = (3, N = 941) = 393.86–441.60$, $p < .001$, Nagelkerke $R^2 = .455–.501$ (see Table A13 for full regression output). The model correctly classified 79.7–81.1% of cases. Specifically, when SDS was 11 or above but SPIN was below 34, there was an 81.9% probability (ExpB = 4.52; 95% CI [2.428, 8.417]) that the participant had SAD versus no-SAD, compared to when SDS was below 11 and SPIN was below 34. This probability increased to 93.3% (ExpB = 13.92; 95% CI [8.011, 24.202]) when SPIN was 34 or above but SDS was below 11, compared to when SDS was below 11 and SPIN was below 34. Finally, the probability of predicting that a participant had SAD versus no-SAD rose to 97.5% (ExpB = 35.98; 95% CI [21.938, 58.922]) when SPIN was 34 or above and SDS was 11 or above compared to when SDS was below 11 and SPIN was below 34. Follow up analyses demonstrated that the likelihood of being in the

SAD group versus either control group was significantly higher when SPIN/SDS were at or above the cutoff scores than any of the other combinations individually (see Table A14 for full regression output). The final analysis showed that scoring 34 or above on the SPIN and 11 or above 11 on the SDS versus all other combinations of scores combined, produced significantly greater odds of having a SAD diagnosis than no SAD diagnosis (i.e., greater odds of being in the SAD group than either of the two control groups; see Table A15 for full regression output).

Table 5 outlines the proportions of the total sample whose scores fall within these cutoff groups, along with the proportion of participants in each group who comprise the total proportions; in other words, Table 5 indicates the positive predictive value and false discovery rate, along with the sensitivity and specificity of each cutoff score combination.

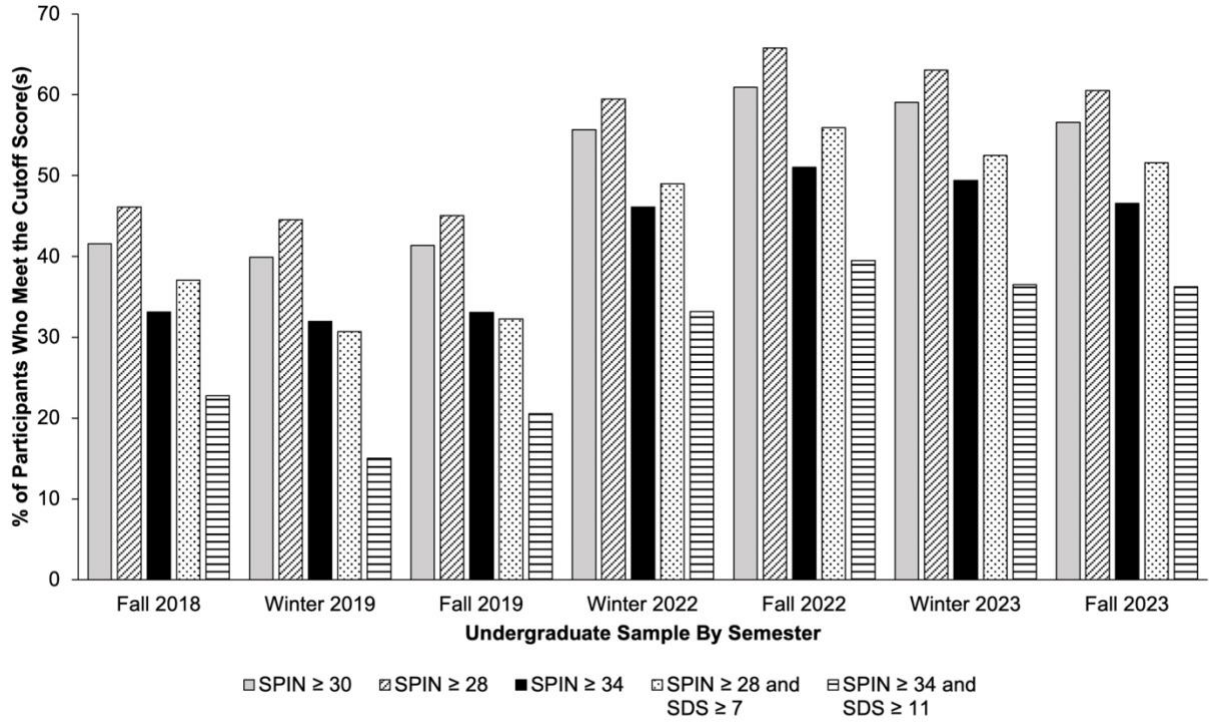
Frequency Observations in Undergraduate Samples Across Time

To assess our third and fourth hypotheses, we present descriptive data illustrating the application of the newly determined cutoff scores versus the previously recommended cutoff score of 30 or above on the SPIN, both alone (i.e., only SPIN) and in combination (i.e., SPIN and SDS) across seven undergraduate samples across time. As seen in Figure 1 (see Table A16 for exact frequency values), using the most stringent cutoff scores from the SPIN and SDS in combination (i.e., 34 and 11) leads to the lowest proportion of students across all samples being categorized as having high social anxiety (e.g., 36% in Fall 2023). In contrast, using the most lenient cutoff score from the SPIN alone (i.e., 28) leads to the highest proportion of students across all samples being categorized as having high social anxiety (e.g., 61% in Fall 2023). Additionally, it is evident that from pre to post COVID-19 pandemic periods (i.e., between fall 2019 to winter 2022), there was a marked increase in the proportion of students who met the

threshold for being categorized as having high social anxiety (e.g., those who scored above 34 on the SPIN and above 11 on the SDS increased from 21% to 33%).

Figure 1

Frequencies of Undergraduates Who Meet Old and New Cutoff Scores Across Time



Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale.

Discussion

Given the widespread use of analogue samples in clinical research, it is critical for researchers to trust that the methods they use to select such samples will yield valid and reliable outcomes. In the present study, we relied on data from large clinical and non-clinical samples to calculate updated cutoff scores for selecting analogue samples of individuals with high social anxiety from the community based on validated self-report measures of social anxiety symptoms (i.e., SPIN) and impairment (i.e., SDS), both alone and in combination. Our analyses showed that the updated cutoff scores of 34 or above on the SPIN and 11 or above on the SDS can reliably distinguish people with SAD from those without SAD and demonstrated the utility of these cutoff scores for optimally selecting analogue groups of undergraduates with high social anxiety. Critically, in data from seven distinct undergraduate samples collected from 2018 to 2023, we observed that the updated cutoff scores considerably reduced the proportion of participants whose social anxiety symptoms exceeded the thresholds for inclusion in analogue groups relative to the traditional cutoff scores. Although the proportion of undergraduates included in the analogue groups based on the new cutoff scores was lower than that included based on the traditional cutoff scores, the data also clearly illustrated a current rising trend in overall levels of self-reported social anxiety symptoms within the undergraduate population during the post-COVID era in comparison to pre-pandemic norms.

With respect to selecting analogue samples of individuals with high social anxiety, our results suggested that the optimal cutoff scores researchers should employ will differ depending on whether they wish to differentiate high social anxiety individuals from clinical or non-clinical controls. For the SPIN, we found that the optimal cutoff score was 28 when differentiating individuals with SAD from non-clinical controls (i.e., healthy individuals without any mental

disorders), which was 6 points lower than the optimal cutoff score of 34 for differentiating individuals with SAD from clinical controls (i.e., individuals with clinical diagnoses other than SAD). Similarly, for the SDS, the optimal cutoff score was 7 when differentiating people with SAD from non-clinical controls, which was 4 points lower than the optimal cutoff score of 11 for differentiating people with SAD from clinical controls. These results support our first hypothesis and suggest that individuals with clinical diagnoses other than SAD may resemble those with SAD in their self-reported social anxiety symptoms and impairment, thus requiring higher cutoff values on both symptom measures to distinguish between the groups.

Both the SPIN and SDS performed relatively weakly when differentiating reliably between individuals with SAD and those with clinical diagnoses other than SAD, but such results are not unexpected, considering the diagnostic composition of the clinical control group in the present study consisted of depressive disorders, anxiety disorders, obsessive compulsive disorder, and post-traumatic stress disorder (see Table 1)—each of which tends to be highly comorbid and overlapping with SAD in terms of specific symptom profiles and underlying cognitive processes (e.g., Erwin et al., 2002; Kraft et al., 2021). For example, someone with major depressive disorder and someone else with SAD might both endorse “I avoid activities in which I am the centre of attention” on the SPIN, and this symptom might affect both of their functioning to a similar degree—either in the same or different life domains. Even if the underlying thoughts driving the endorsement might be different, this distinction is difficult to make based on common self-report symptom scales. To this end, someone with major depressive disorder might avoid activities where they would be the centre of attention because they lack motivation to attend or believe they would not derive enjoyment from the activity, whereas someone with SAD might avoid these activities because they do not want others to judge them

for something they might say. Due to the similarities in experiences that people with these disorders share, the accuracy of the self-report scale decreases when differentiating between them, in contrast to differentiating between those with SAD and those with no clinical diagnoses.

During diagnostic interviewing, clinicians are often required to make differential diagnoses between several disorders based on descriptions of symptoms and impairment, while keeping in mind the similarities between disorders. If the client's or participant's presenting concerns are reminiscent of more than one disorder, the diagnostic process can be challenging compared to if the concerns are more obviously tied to only one disorder. Thus, relying on self-report measures to accomplish this differentiation process is not ideal, but is necessary when clinical interviewing is not possible. Given that most populations from which researchers wish to select valid analogue samples of individuals with high social anxiety are likely to include both healthy individuals and those with impairing symptoms of clinical disorders other than SAD, we recommend using the higher cutoff score combination of 34 on the SPIN and 11 on the SDS to optimize such selections. As noted above, using both measures also more closely aligns with how clinicians arrive at diagnostic decisions that account for impairment along with symptoms.

Findings from the initial logistic regression analyses suggest that a large amount of the variance in SAD diagnosis classification is accounted for by each of the SPIN and SDS measures alone, a finding which is consistent with past research where SPIN and SDS have either been used individually or interpreted separately, rather than in combination (e.g., Aderka et al., 2012; Shaughnessy et al., 2017). This does not mean that using both measures in combination is ineffective in identifying valid analogue samples of participants with high social anxiety from the population.

In contrast, the primary logistic regression results supported our second hypothesis by demonstrating that scoring at or above the high cutoffs on both the SPIN (i.e., 34) and the SDS (i.e., 11) provided the highest likelihood of differentiating individuals who have SAD from people without SAD, compared to scoring above the cutoff on only one measure or on neither measure, or compared to the combined likelihood of scoring above the cutoff on either or neither of the two measures. Indeed, the combined cutoff of scoring both at or above 34 on the SPIN and at or above 11 on the SDS produces the highest positive predictive value of these combinations (see Table 5), which demonstrates that a valid and accurate analogue sample of high social anxiety can be achieved by using the combined cutoffs; that is, this cutoff score combination captured a high proportion of participants with SAD (i.e., a high ratio of SAD to no-SAD). Furthermore, scoring above both cutoffs was a significantly better predictor across all three group comparisons (i.e., non-clinical control vs. SAD, clinical control vs. SAD, all controls vs. SAD). The comparison with the lowest predictive power was between individuals with SAD and those with disorders other than SAD, as both are associated with high levels of distress and impairment, which is consistent with the notion that similar levels of clinical dysfunction and impairment may be experienced due to differing symptoms (APA, 2013; Wakefield, 1992).

Examining the data overall suggests that when relying on self-report measures to select analogue groups of participants with high social anxiety whose symptoms ought to resemble those of clinical samples with SAD, high scores on the SPIN may be particularly important for distinguishing people with impairing SAD symptoms from those with impairing symptoms of clinical disorders other than SAD. High scores on the SDS, however, may be particularly helpful for differentiating people with symptoms of SAD from healthy individuals who might endorse elevated social anxiety without significant accompanying distress and impairment. Using the two

measures in combination, with the new suggested cutoff scores, is therefore likely to ensure a significant level of social anxiety symptoms as well as anxiety-related impairment while providing a high degree of predictive accuracy. Future studies are needed to examine how these recommended cutoff scores perform across diverse samples.

Desired trade-offs between sensitivity and specificity can also be considered when selecting cutoff scores to form analogue social anxiety groups in research. The sensitivity data (see Table 5) indicate that either the SPIN alone with a cutoff score of 34 or the SDS alone with a cutoff score of 11 can be used effectively by researchers to identify participants who are likely to have a diagnosis of SAD. The trade-off, however, is that using these single-measure cutoff scores to create analogue groups will compromise specificity, such that researchers will also be more likely to include a higher number of participants who do not actually have SAD (i.e., false positives). In contrast, using the combined cutoff scores of SPIN $\geq$ 34 and SDS $\geq$ 11 will compromise sensitivity somewhat while maximizing specificity, such that more participants who do not actually have SAD will be excluded from the analogue group, thereby producing a more valid analogue sample with a high positive predictive value and low false discovery rate, as shown in Table 5.

Ancillary ROC analyses revealed that a single-measure cutoff score of 39 or above on the SPIN can also achieve a similar trade-off between sensitivity and specificity, along with a high positive predictive value and low false discovery rate. This suggests that for researchers who only have access to SPIN scores, using this higher cutoff would achieve a similarly accurate analogue sample as using the recommended cutoffs from the combined measures. Notably, some participants who score 39 or above on the SPIN may also score below 11 on the SDS, as we found when we applied this cutoff score to our samples, which would indicate a lower level of

symptom-related impairment that does not meet the newly determined threshold. The relative validity and associated implications of selecting analogue samples of high social anxiety participants using one method (SPIN alone) versus the other (SPIN + SDS) are currently unclear but could be fruitfully explored in future studies.

When applying various cutoff scores to samples of undergraduate students, descriptive statistics reflected a striking increase in the proportion of undergraduates who met inclusion criteria for the high social anxiety analogue group over time, and a parallel increase in the mean scores of the SPIN and SDS over time, supporting Hypothesis 4. This increase was especially pronounced in changes observed from the pre- to post-COVID era, with the proportion of participants categorized as "high social anxiety" rising sharply but the slope of the rise differing depending on which cutoff scores are used (as predicted in Hypothesis 3). For example, using the most traditional cutoff score of 30 and above on the SPIN, 61% of students in the sample qualified as "high social anxiety" during the 2022 fall term compared to 41% in fall 2019. These proportions were reduced considerably when the combined SPIN and SDS cutoff scores of 34 and 11 were applied, with 40% of students meeting the cutoff criteria in fall 2022 compared to just 21% in fall 2019. It is important to highlight that even though applying the higher, most stringent cutoffs sharply reduced the overall prevalence of "high social anxiety" in the undergraduate population in both the pre- and post-COVID eras, the total proportion of students whose social anxiety symptom scores fell above the cutoff threshold was still considerably higher than the annual prevalence rate of SAD, which has been estimated to be approximately 2.4–7.1% (Kessler et al., 2005; Ruscio et al., 2008; Stein & Kean, 2000; Stein et al., 2017). Thus, no matter which cutoff scores are used, analogue sampling is not equivalent to clinical diagnosing and is unlikely to yield identical results—an expected outcome.

Even within clinical samples of those with SAD, there is a range of symptom severity and impairment (Aderka et al., 2012; Connor et al., 2000; Sheehan & Sheehan, 2008). As noted in the introduction, social anxiety and associated underlying cognitive processes are best conceptualized as dimensional constructs (Ruscio, 2010; Weeks et al., 2009), such that analogue samples may include those in the upper range of severity (i.e., those who would likely be diagnosed with SAD), as well as those in the mid-range of severity (i.e., those who may also be diagnosed with SAD but who experience less severe symptoms). There are also individuals who score within these mid to high ranges but whose symptoms would not warrant a SAD diagnosis, as seen in the sensitivity and specificity data in Table 5. Thus, compared to the more rigorous process of diagnostic interviewing, which also includes clinical judgement, self-report scales will be more likely to capture a higher number of participants.

The recent surge in social anxiety symptoms among undergraduates may reflect the negative mental health effects of social isolation during the COVID-19 pandemic (Santomauro et al., 2021; World Health Organization, 2022). In a recent systematic review, Kindred and Bates (2023) concluded that there was sufficient evidence to suggest that the pandemic was associated with rises in social anxiety symptoms, particularly for women and low-income individuals. Schmidt et al. (2023) also documented an increase in self-reported levels of shyness among Gen-Z undergraduate students studying at a Canadian university during the pandemic. Meanwhile, Arad and colleagues (2021) found there was a decrease in social anxiety symptoms among Israeli undergraduates from 2016–2019, when there was no social isolation, followed by a levelling off of such symptoms from 2019–2020, when there was forced social isolation due to COVID-19. In line with cognitive-behavioural models of social anxiety, they hypothesized that reduced exposure to social situations throughout the pandemic may have played a role in the maintenance

of social fears by facilitating avoidance and reinforcing anxiety that would have otherwise been lowered through natural exposure to various day-to-day social interactions. It is important to continue to track these data over time to observe whether levels of self-reported social anxiety symptoms among undergraduate students, which spiked during the pandemic, will begin to revert to pre-pandemic norms with increased exposure to social situations and norms that were previously restricted due to COVID-19. There are early signs that this may indeed be the case, with modest overall decreases in self-reported social anxiety observed in our undergraduate samples from fall 2022 to fall 2023.

Constraints on Generality

A major constraint on the generality of study findings pertains to the demographic composition of the present samples. Our samples included participants from backgrounds that were primarily Western, Educated, Industrialized, Rich, and Democratic (WEIRD; Henrich et al., 2010). The mean age of participants in both the community and undergraduate samples was below 30, and most participants identified as women and as either Asian or Caucasian, limiting the generalizability of our results to the broader population. Additionally, we found binary gender differences between men (cis or trans) and women (cis or trans) in the undergraduate samples, which were only presented descriptively but not incorporated into calculations of the new cutoff values. If undergraduate women, compared to men, tend to experience higher levels of social anxiety symptoms and impairment, further research is needed to determine whether separate cutoff scores should be used to stratify the identification of analogue samples based on participants' gender identification.

Additionally, the community sample, which was used to determine the recommended cutoff scores, consisted of participants who self-selected to be part of the participant pool by

responding to advertisements but not individuals who were treatment-seeking clients per se. Thus, the severity of social anxiety symptoms amongst participants in the SAD group in the current study may differ from a sample of individuals with SAD who are treatment-seeking clients or those referred by a clinician. However, our own past research suggests strong similarities between the clinical characteristics of treatment-seeking individuals with SAD in prior studies and those with SAD recruited from the community to join our research pool (see Moscovitch et al., 2015).

Availability of diagnostic information was also a limitation of the study. Specifically, diagnostic status of the undergraduate samples was unknown. It would have been most ideal to have completed the ROC and logistic regression analyses on undergraduate students with available SAD diagnostic statuses, or to have evaluated the accuracy of the new cutoff scores by determining the number of correctly classified undergraduate participants based on diagnosis. Additionally, both questionnaire data (i.e., SPIN and SDS scores) and diagnoses were unavailable for community participants who were excluded at the level of the screener survey or phone call as they were not invited to participate in the study beyond that point.

Another limitation is that data collection on undergraduate students occurred before, during, and after the COVID-19 pandemic, but did not include any data between 2020–2021 as data collection was suspended during this time. Understanding patterns in social anxiety and impairment scores during this period could have provided even greater insight into how social isolation affected undergraduate students. Continuing to track data regularly from future post-COVID samples will reveal the "new normal" more clearly when it comes to the prevalence of social anxiety and will enable researchers to draw more definitive conclusions about analogue sample norms. Since the cutoff score conclusions using the community sample were partially

based on symptoms reported during the COVID-19 era, future research should examine the extent to which our suggested cutoffs may be inflated due to the inclusion of COVID data.

Finally, we chose to focus on the SPIN and SDS as measures of social anxiety symptoms and impairment, but it may be fruitful for future research to explore concurrent validity with other measures. Specifically, we encourage future researchers to investigate whether our findings can be replicated with and extended to other commonly used measures of social anxiety symptoms and impairment such as the SIAS (Mattick & Clarke, 1998) and the Liebowitz Social Anxiety Scale (Liebowitz, 1987). Additionally, combining any two measures of social anxiety symptoms may increase the reliability of grouping participants (Cronbach, 1951) such that using more than one measure for selection would naturally restrict the number of participants that would be included in the resulting analogue sample. Future research could apply and extend our methods to re-assessing established cutoff scores on other established measures of social anxiety symptoms and anxiety-related distress and impairment other than the SPIN and SDS.

Conclusions

Despite its limitations, the present study offers novel recommendations for improving the methods used to recruit analogue samples of high socially anxious participants from community and undergraduate populations for research purposes. Specifically, our data-driven approach highlights the desirability of combining self-report measures of both social anxiety symptoms and functional impairment to optimize the accuracy of analogue sample recruitment. Indeed, results support the recommendation for researchers to use updated cutoff scores of 34 and above on the SPIN in combination with scores of 11 and above on the SDS, or to use a SPIN cutoff score of 39 and above, to identify a valid and reliable analogue sample of participants with high

social anxiety, thereby producing a research sample that most closely resembles a clinical sample.

Letter of Copyright Permission

AMERICAN PSYCHOLOGICAL ASSOCIATION LICENSE
TERMS AND CONDITIONS

Jul 19, 2024

This Agreement between Sophie Kudryk ("You") and American Psychological Association ("American Psychological Association") consists of your license details and the terms and conditions provided by American Psychological Association and Copyright Clearance Center.

License Number	5817700599123
License date	Jun 28, 2024
Licensed Content Publisher	American Psychological Association
Licensed Content Publication	Psychological Assessment
Licensed Content Title	Identifying analogue samples of individuals with clinically significant social anxiety: Updating and combining cutoff scores on the Social Phobia Inventory and Sheehan Disability Scale.
Licensed copyright line	Copyright © 2024, American Psychological Association
Licensed Content Author	Kudryk, Sophie M.; Ho, Jolie T. K.; Budge, Joshua R. C.; Moscovitch, David A.
Licensed Content Date	Jun 1, 2024
Licensed Content Volume	undefined
Licensed Content Issue	undefined
Type of Use	Thesis/Dissertation
Requestor type	Academic institution
Format	Electronic
Portion	page
Number of pages requested	13
Page range of portion	1-13
Rights for	Main product and any product related to main product
Duration of use	life of current edition
Creation of copies for the disabled	no
With minor editing privileges	no
In the following language(s)	Original language of publication

With incidental promotional use	no
The lifetime unit quantity of new product	0 to 499
Title of new work	Identifying Analogue Samples of Individuals with Clinically Significant Social Anxiety: Updating and Combining Cutoff Scores on the SPIN and SDS
Institution name	University of Waterloo
Expected presentation date	Aug 2024
Portions	Pages 1-13
The Requesting Person / Organization to Appear on the License	Sophie Kudryk

Terms and Conditions

RightsLink Plus Terms and Conditions
American Psychological Association

The publisher for this copyrighted material is the American Psychological Association ("APA"). By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by the Copyright Clearance Center, Inc. ("CCC") at the time that you opened your CCC account.

APA hereby grants you a non-exclusive license to use this material, subject to the conditions below.

1. Limited License.
   Licenses are for one-time use only with a maximum distribution equal to the number that you identified in the licensing process; any form of republication must be completed with 12 months from the date hereof (although copies prepared before then may be distributed thereafter); and any electronic posting is limited to a period of 12 months.

2. Credit Lines and Translation Disclaimer.
   The reproduced material must include one of the following credit lines:

   For English language content: Copyright © [year] by [Copyright Owner]. Reproduced [or Adapted] with permission. [Full bibliographic citation.]

   For translated language content: This material originally appeared in English as

[full bibliographic citation]. Copyright © [year] by [Copyright Owner]. Translated and reproduced [or adapted] with permission. [Copyright Owner] is not responsible for the quality or accuracy of this translation. This translation cannot be reproduced or distributed further without prior written permission.

3. Author Permission.
   You must obtain the author's (or, in case of multiple authorship, one author's) permission. A good faith effort must be made to locate the author and obtain the author's permission. Author permission is not required for the reuse of small excepts or 1 to 3 figures or 1 to 3 tables; or for course pack or electronic reserve use.

4. Geographic Rights.
   Licenses may be exercised anywhere in the world.

5. Book Edition Limit.
   If the APA content will be reproduced in a book, then permission is limited to the life of the current edition.

6. Online Use Limitations.
   APA full-text articles or book chapters may only be posted on a secure and restricted web site. The credit line specified in Section 2 shall appear on the first screen on which the APA content appears and shall be amended to include the following additional wording: No further reproduction or distribution is permitted without written permission from the American Psychological Association.

7. Reservation of Rights.
   APA reserves all rights not specifically granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.

8. License Contingent on Payment.
   While you may exercise the rights licensed immediately upon issuance of the license at the end of the licensing process for the transaction, provided that you have disclosed complete and accurate details of your proposed use, no license is finally effective unless and until full payment is received from you (either by APA or by CCC) as provided in CCC's Billing and Payment terms and conditions. If full payment is not received on a timely basis, then any license preliminarily granted shall be deemed automatically revoked and shall be void as if never granted. Further, in the event that you breach any of these terms and conditions or any of CCC's Billing and Payment terms and conditions, the license is automatically revoked and shall be void as if never granted. Use of materials as described in a revoked license, as well as any use of the materials beyond the scope of an unrevoked license, may constitute copyright infringement and APA reserves the

right to take any and all action to protect its copyright in the materials. "$0.00" fee means that APA waived the fee.

9. License Revocation.
   APA or CCC may, within 60 days from the date of license, deny the permissions described in this License at their sole discretion, for any reason or no reason, with a full refund payable to you. Notice of such denial will be made using the contact information provided by you. Failure to receive such notice will not alter or invalidate the denial. In no event will APA or CCC be responsible or liable for any costs, expenses or damage incurred by you as a result of a denial of your permission request, other than a refund of the amount(s) paid by you to CCC for denied permissions.

10. Warranties.
    APA warrants that it has, to the best of its knowledge, the rights to license reuse of this content. However, you must ensure that the material you are requesting is original to APA and does not carry the copyright of another entity (as credited in the published version). If any part of the material you have requested indicates that it was reprinted or adapted with permission from another source, then you should also seek permission from that original source to reuse the material.

11. Indemnity.
    You hereby indemnify and agree to hold harmless APA and CCC, and their respective officers, directors, employees and agents, from and against any and all claims arising out of your use of the licensed material other than as specifically authorized pursuant to this license.

12. No Transfer of License.
    This license is personal to you, but may be assigned or transferred by you to your employer or a business associate if you give prompt written notice of the assignment or transfer to the APA. No such assignment or transfer shall relieve you of the obligation to pay the designated license fee on a timely basis (although payment by the identified assignee can fulfill your obligation).

13. No Amendment except in Writing.
    This license may not be amended except in a writing signed by both parties (or, in the case of APA, by CCC on APA's behalf).

14. Objection to Contrary Terms.
    APA hereby objects to any terms contained in any purchase order, acknowledgment, check endorsement or other writing prepared by you, which terms are inconsistent with these terms and conditions or CCC's Billing and Payment terms and conditions. These terms and conditions, together with CCC's Billing and Payment terms and conditions (which are incorporated herein), comprise the entire agreement between you and APA (and CCC) concerning this licensing transaction. In the event of any conflict between your obligations

established by these terms and conditions and those established by CCC's Billing and Payment terms and conditions, these terms and conditions shall control.

15. Jurisdiction.
    This license transaction shall be governed by and construed in accordance with the laws of the District of Columbia. You hereby agree to submit to the jurisdiction of the federal courts located in the District of Columbia for purposes of resolving any disputes that may arise in connection with this licensing transaction.

Other Conditions:
v1.2

https://s100.copyright.com/CustomerAdmin/PLF.jsp?ref=3d9cdfee-4f69-41d0-9eb7-3019b984a664

References

Abramowitz, J. S., Fabricant, L. E., Taylor, S., Deacon, B. J., McKay, D., & Storch, E. A. (2014). The relevance of analogue studies for understanding obsessions and compulsions. *Clinical Psychology Review*, *34*(3), 206–217. https://doi.org/10.1016/j.cpr.2014.01.004

Aderka, I. M., Hofmann, S. G., Nickerson, A., Hermesh, H., Gilboa-Schechtman, E., & Marom, S. (2012). Functional impairment in social anxiety disorder. *Journal of Anxiety Disorders*, *26*(3), 393–400. https://doi.org/10.1016/j.janxdis.2012.01.003

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Antony, M. M., Roth, D., Swinson, R. P., Huta, V., & Devins, G. M. (1998). Illness intrusiveness in individuals with panic disorder, obsessive-compulsive disorder, or social phobia. *The Journal of Nervous and Mental Disease*, *186*(5), 311. DOI: 10.1097/00005053-199805000-00008

Arad, G., Shamai-Leshem, D., & Bar-Haim, Y. (2021). Social distancing during a COVID-19 lockdown contributes to the maintenance of social anxiety: A natural experiment. *Cognitive Therapy and Research*, *45*(4), 708–714. DOI: 10.1007/s10608-021-10231-7

Brown, T. A., & Barlow, D. H. (2014). *Anxiety and Related Disorders Interview Schedule for DSM-5 (ADIS-5)® - Adult Version: Client Interview Schedule 5-Copy Set*. Oxford University Press.

Brozovich, F., & Heimberg, R. G. (2011). The relationship of post-event processing to self-evaluation of performance in social anxiety. *Behavior Therapy*, *42*(2), 224–235. https://doi.org/10.1016/j.beth.2010.08.005

Bui, V., & Moscovitch, D. A. (2024). Predictors of excessive reassurance seeking in social anxiety. *Cognitive Therapy and Research*, *48*, 292–302. https://doi.org/10.1007/s10608-024-10473-1

Carleton, R. N., Collimore, K. C., Asmundson, G. J. G., McCabe, R. E., Rowa, K., & Antony, M. M. (2010). SPINning factors: Factor analytic evaluation of the Social Phobia Inventory in clinical and nonclinical undergraduate samples. *Journal of Anxiety Disorders*, *24*(1), 94–101. https://doi.org/10.1016/j.janxdis.2009.09.003

Chang, L., & Krosnick, J. A. (2009). National surveys via RDD telephone interviewing versus the internet: Comparing sample representativeness and response quality. *Public Opinion Quarterly*, *73*(4), 641–678. https://doi.org/10.1093/poq/nfp075

Clark, D. M. & Wells, A. (1995). A cognitive model of social phobia. In R.G. Heimberg, M.R. Liebowitz, D.A. Hope, F.R. Schneier (Eds.), *Social phobia: Diagnosis, assessment and treatment* (pp. 69–93). Guilford Press.

Cody, M. W., & Teachman, B. A. (2010). Post-event processing and memory bias for performance feedback in social anxiety. *Journal of Anxiety Disorders*, *24*(5), 468–479. https://doi.org/10.1016/j.janxdis.2010.03.003

Connor, K. M., Davidson, J. R. T., Churchill, L. E., Sherwood, A., Weisler, R. H., & Foa, E. (2000). Psychometric properties of the Social Phobia Inventory (SPIN): New self-rating scale. *The British Journal of Psychiatry*, *176*(4), 379–386. DOI: 10.1192/bjp.176.4.379

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334. https://doi.org/10.1007/BF02310555

Cuming, S., Rapee, R. M., Kemp, N., Abbott, M. J., Peters, L., & Gaston, J. E. (2009). A self-report measure of subtle avoidance and safety behaviors relevant to social anxiety:

Development and psychometric properties. *Journal of Anxiety Disorders*, *23*(7), 879–883. https://doi.org/10.1016/j.janxdis.2009.05.002

Enns, M. W., Cox, B. J., & Borger, S. C. (2001). Correlates of analogue and clinical depression: A further test of the phenomenological continuity hypothesis. *Journal of Affective Disorders*, *66*(2–3), 175–183. https://doi.org/10.1016/S0165-0327(00)00305-0

Erwin, B. A., Heimberg, R. G., Juster, H., & Mindlin, M. (2002). Comorbid anxiety and mood disorders among persons with social anxiety disorder. *Behaviour Research and Therapy*, *40*(1), 19–35. https://doi.org/10.1016/S0005-7967(00)00114-5

Fluss, R., Faraggi, D., & Reiser, B. (2005). Estimation of the Youden Index and its associated cutoff point. *Biometrical Journal*, *47*(4), 458–472. DOI: 10.1002/bimj.200410135

Fowler, D., Freeman, D., Smith, B., Kuipers, E., Bebbington, P., Bashforth, H., Coker, S., Hodgekins, J., Gracie, A., Dunn, G., & Garety, P. (2006). The Brief Core Schema Scales (BCSS): Psychometric properties and associations with paranoia and grandiosity in non-clinical and psychosis samples. *Psychological Medicine*, *36*(6), 749–759. https://doi.org/10.1017/S0033291706007355

Furmark, T. (2002). Social phobia: Overview of community surveys. *Acta Psychiatrica Scandinavica*, *105*(2), 84–93. https://doi.org/10.1034/j.1600-0447.2002.1r103.x

Hackmann, A., Clark, D. M., & McManus, F. (2000). Recurrent images and early memories in social phobia. *Behaviour Research and Therapy*, *38*(6), 601–610. https://doi.org/10.1016/S0005-7967(99)00161-8

Hackmann, A., Surawy, C., & Clark, D. M. (1998). Seeing yourself through others' eyes: A study of spontaneously occurring images in social phobia. *Behavioural and Cognitive Psychotherapy*, *26*(1), 3–12. https://doi.org/10.1017/S1352465898000022

Hambrick, J. P., Turk, C. L., Heimberg, R. G., Schneier, F. R., & Liebowitz, M. R. (2004). Psychometric properties of disability measures among patients with social anxiety disorder. *Journal of Anxiety Disorders*, *18*(6), 825–839. https://doi.org/10.1016/j.janxdis.2003.10.004

Hand, D. J. (2012). Assessing the performance of classification methods. *International Statistical Review / Revue Internationale de Statistique*, *80*(3), 400–414. https://www.jstor.org/stable/41819855

Heymans, M. (2022). miceafter: Data and statistical analyses after multiple imputation. R package version 0.5.0, https://CRAN.R-project.org/package=miceafter

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, *466*(7302), Article 7302. https://doi.org/10.1038/466029a

Herbert, J. D., Brandsma, L. L., & Fischer, L. (2014). Assessment of social anxiety and its clinical expressions. In S. G. Hofmann & P. M. DiBartolo (Eds.), *Social anxiety: Clinical, developmental, and social perspectives* (pp. 45–94). Elsevier Academic Press.

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy*, *36*(4), 193–209. https://doi.org/10.1080/16506070701421313

Hyett, M. P., & McEvoy, P. M. (2018). Social anxiety disorder: Looking back and moving forward. *Psychological Medicine*, *48*(12), 1937–1944. https://doi.org/10.1017/S0033291717003816

Jefferies, P., & Ungar, M. (2020). Social anxiety in young people: A prevalence study in seven countries. *PLoS ONE*, *15*(9), e0239133. https://doi.org/10.1371/journal.pone.0239133

Joyce-Beaulieu, D., & Sulkowski, M. L. (2016). The diagnostic and statistical manual of mental disorders: Fifth edition (DSM-5) model of impairment. In S. Goldstein & J. A. Naglieri (Eds.), *Assessing impairment: From theory to practice* (pp. 167–189). Springer US. DOI: 10.1007/978-1-4899-7996-4_8

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of twelve-month DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R). *Archives of General Psychiatry*, *62*(6), 617–627. https://doi.org/10.1001/archpsyc.62.6.617

Kindred, R., & Bates, G. W. (2023). The influence of the COVID-19 pandemic on social anxiety: A systematic review. *International Journal of Environmental Research and Public Health*, *20*(3), Article 3. https://doi.org/10.3390/ijerph20032362

Kraft, J. D., Grant, D. M., White, E. J., Taylor, D. L., & Frosio, K. E. (2021). Cognitive mechanisms influence the relationship between social anxiety and depression among college students. *Journal of American College Health*, *69*(3), 245–251. https://doi.org/10.1080/07448481.2019.1661844

Kudryk, S. M., Budge, J. R. C., Ho, J. T. K., & Moscovitch, D. A. (2024, April 13). Identifying analogue samples of individuals with clinically significant social anxiety: Updating and combining cutoff scores on the SPIN and SDS. https://doi.org/10.17605/OSF.IO/AG5VS

Leon, A. C., Olfson, M., Portera, L., Farber, L., & Sheehan, D. V. (1997). Assessing psychiatric impairment in primary care with the Sheehan Disability Scale. *The International Journal of Psychiatry in Medicine*, *27*(2), 93–105. DOI: 10.2190/T8EM-C8YH-373N-1UWD

Liebowitz, M. R. (1987). Social phobia. *Modern Problems of Pharmacopsychiatry*, *22*, 141–173. https://doi.org/10.1159/000414022

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198–1202. https://doi.org/10.1080/01621459.1988.10478722

Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction. *Behaviour Research and Therapy*, *36*(4), 455–470. https://doi.org/10.1016/S0005-7967(97)10031-6

McManus, F., Sacadura, C., & Clark, D. M. (2008). Why social anxiety persists: An experimental investigation of the role of safety behaviours as a maintaining factor. *Journal of Behavior Therapy and Experimental Psychiatry*, *39*(2), 147–161. https://doi.org/10.1016/j.jbtep.2006.12.002

Merikangas, K. R., Avenevoli, S., Acharyya, S., Zhang, H., & Angst, J. (2002). The spectrum of social phobia in the zurich cohort study of young adults. *Biological Psychiatry*, *51*(1), 81–91. https://doi.org/10.1016/S0006-3223(01)01309-9

Mörtberg, E., & Jansson Fröjmark, M. (2019). Psychometric evaluation of the Social Phobia Inventory and the Mini-Social Phobia Inventory in a Swedish university student sample. *Psychological Reports*, *122*(1), 323–339. https://doi.org/10.1177/0033294118755097

Moscovitch, D. A. (2009). What is the core fear in social phobia? A new model to facilitate individualized case conceptualization and treatment. *Cognitive and Behavioral Practice*, *16*(2), 123–134. https://doi.org/10.1016/j.cbpra.2008.04.002

Moscovitch, D. A., & Huyder, V. (2011). The Negative Self-Portrayal Scale: Development, validation, and application to social anxiety. *Behavior Therapy*, *42*(2), 183–196. https://doi.org/10.1016/j.beth.2010.04.007

Moscovitch, D. A., Gavric, D. L., Merrifield, C., Bielak, T., & Moscovitch, M. (2011). Retrieval properties of negative vs. positive mental images and autobiographical memories in social anxiety: Outcomes with a new measure. *Behaviour Research and Therapy*, *49*(8), 505–517. https://doi.org/10.1016/j.brat.2011.05.009

Moscovitch, D. A., Rowa, K., Paulitzki, J. R., Ierullo, M. D., Chiang, B., Antony, M. M., & McCabe, R. E. (2013). Self-portrayal concerns and their relation to safety behaviors and negative affect in social anxiety disorder. *Behaviour Research and Therapy*, *51*(8), 476–486. https://doi.org/10.1016/j.brat.2013.05.002

Moscovitch, D. A., Shaughnessy, K., Waechter, S., Xu, M., Collaton, J., Nelson, A. L., Barber, K. C., Taylor, J., Chiang, B., & Purdon, C. (2015). A model for recruiting clinical research participants with anxiety disorders in the absence of service provision: Visions, challenges, and norms within a Canadian context. *Journal of Nervous & Mental Disease*, *203*(12), 943–957. https://doi.org/10.1097/NMD.0000000000000400

Moser, J. S., Hajcak, G., Huppert, J. D., Foa, E. B., & Simons, R. F. (2008). Interpretation bias in social anxiety as detected by event-related brain potentials. *Emotion*, *8*(5), 693–700. https://doi.org/10.1037/a0013173

Mossman, D., & Somoza, E. (1991). ROC curves, test accuracy, and the description of diagnostic tests. *The Journal of Neuropsychiatry and Clinical Neurosciences*, *3*(3), 241–354. https://doi.org/10.1176/jnp.3.3.330

Nayak, M., & Narayan, N. (2019). Strengths and weakness of online surveys. *IOSR Journal of Humanities and Social Sciences*, *24*(5), 31–38. https://doi.org/10.9790/0837-2405053138

Plasencia, M. L., Alden, L. E., & Taylor, C. T. (2011). Differential effects of safety behaviour subtypes in social anxiety disorder. *Behaviour Research and Therapy*, *49*(10), 665–675. https://doi.org/10.1016/j.brat.2011.07.005

R Core Team (2023). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*(8), 741–756. https://doi.org/10.1016/S0005-7967(97)00022-3

Robin, X., Turck, N., Hainard, A., Tiberti, N., Lisacek, F., Sanchez, JC., & Müller, M. (2011). pROC: An open-source package for R and S+ to analyze and compare ROC curves. *BMC Bioinformatics*, *12*, p. 77. DOI: 10.1186/1471-2105-12-77

Rowa, K., Paulitzki, J. R., Ierullo, M. D., Chiang, B., Antony, M. M., McCabe, R. E., & Moscovitch, D. A. (2015). A false sense of security: Safety behaviors erode objective speech performance in individuals with social anxiety disorder. *Behavior Therapy*, 46(3), 304–314. https://doi.org/10.1016/j.beth.2014.11.004

Rubin, D.B. (1987) *Multiple imputation for nonresponse in surveys*. John Wiley & Sons Inc. DOI:10.1002/9780470316696

Ruscio, A. M. (2010). The latent structure of social anxiety disorder: Consequences of shifting to a dimensional diagnosis. *Journal of Abnormal Psychology*, *119*(4), 662–671. https://doi.org/10.1037/a0019341

Ruscio, A. M., Brown, T. A., Chiu, W. T., Sareen, J., Stein, M. B., & Kessler, R. C. (2008). Social fears and social phobia in the United States: Results from the National

Comorbidity Survey Replication. *Psychological Medicine*, 38(1), 15–28. https://doi.org/10.1017/S0033291707001699

Ruscio, A. M., & Ruscio, J. (2002). The latent structure of analogue depression: Should the Beck Depression Inventory be used to classify groups? *Psychological Assessment*, *14*(2), 135–145. https://doi.org/10.1037/1040-3590.14.2.135

Santomauro, D. F., Herrera, A. M. M., Shadid, J., Zheng, P., Ashbaugh, C., Pigott, D. M., Abbafati, C., Adolph, C., Amlag, J. O., Aravkin, A. Y., Bang-Jensen, B. L., Bertolacci, G. J., Bloom, S. S., Castellano, R., Castro, E., Chakrabarti, S., Chattopadhyay, J., Cogen, R. M., Collins, J. K., … Ferrari, A. J. (2021). Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *The Lancet, 398*(10312), 1700–1712. DOI: 10.1016/S0140-6736(21)02143-7

Schmidt, L. A., Brook, C. A., Hassan, R., MacGowan, T., Poole, K. L., & Jetha, M. K. (2023). iGen or shyGen? Generational differences in shyness. *Psychological Science*, *34*(6), 705–713. https://doi.org/10.1177/09567976231163877

Shaughnessy, K., Rocheleau, J. N., Kamalou, S., & Moscovitch, D. A. (2017). The effects of social anxiety and online privacy concern on individual differences in internet-based interaction anxiety and communication preferences. *Cyberpsychology, Behavior, and Social Networking*, *20*(4), 212–217. https://doi.org/10.1089/cyber.2016.0329

Sheehan, D.V. (1983). *The anxiety disease*. Scribner.

Sheehan. D. V. (2014). The Mini-International Neuropsychiatric Interview, Version 7.0 for DSM- 5 (M.I.N.I 7.0). Medical Outcomes Systems.

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview

(M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *The Journal of Clinical Psychiatry, 59*, 11980. https://www.psychiatrist.com/jcp/neurologic/neurology/mini-international-neuropsychiatric-interview-mini/

Sheehan, K. H., & Sheehan, D. V. (2008). Assessing treatment effects in clinical trials with the Discan metric of the Sheehan Disability Scale: *International Clinical Psychopharmacology*, *23*(2), 70–83. https://doi.org/10.1097/YIC.0b013e3282f2b4d6

Silva-Rocha, V. V., de Sousa, D. A., & Osório, F. L. (2019). Psychometric properties of the Brazilian version of the Sport Anxiety Scale-2. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00806

Sing, T., Sander, O., Beerenwinkel, N., & Lengauer, T. (2005). ROCR: Visualizing classifier performance in R. *Bioinformatics*, *21*(20), 7881. http://rocr.bioinf.mpi-sb.mpg.de

Sosic, Z., Gieler, U., & Stangier, U. (2008). Screening for social phobia in medical in- and outpatients with the German version of the Social Phobia Inventory (SPIN). *Journal of Anxiety Disorders*, *22*(5), 849–859. https://doi.org/10.1016/j.janxdis.2007.08.011

Spurr, J. M., & Stopa, L. (2002). Self-focused attention in social phobia and social anxiety. *Clinical Psychology Review*, *22*(7), 947–975. https://doi.org/10.1016/S0272-7358(02)00107-1

Stein, M. B., & Kean, Y. M. (2000). Disability and quality of life in social phobia: Epidemiologic findings. *American Journal of Psychiatry*, *157*(10), 1606–1613. https://doi.org/10.1176/appi.ajp.157.10.1606

Stein, D. J., Lim, C. C. W., Roest, A. M., de Jonge, P., Aguilar-Gaxiola, S., Al-Hamzawi, A., Alonso, J., Benjet, C., Bromet, E. J., Bruffaerts, R., de Girolamo, G., Florescu, S., Gureje,

O., Haro, J. M., Harris, M. G., He, Y., Hinkov, H., Horiguchi, I., Hu, C., … WHO World Mental Health Survey Collaborators. (2017). The cross-national epidemiology of social anxiety disorder: Data from the World Mental Health Survey Initiative. *BMC Medicine*, 15(1), 143. https://doi.org/10.1186/s12916-017-0889-2

Tonge, N. A., Lim, M. H., Piccirillo, M. L., Fernandez, K. C., Langer, J. K., & Rodebaugh, T. L. (2020). Interpersonal problems in social anxiety disorder across different relational contexts. *Journal of Anxiety Disorders*, *75*, 102275. https://doi.org/10.1016/j.janxdis.2020.102275

Turner, S. M., Beidel, D. C., Dancu, C. V., & Stanley, M. A. (1989). An empirically derived inventory to measure social fears and anxiety: The Social Phobia and Anxiety Inventory. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 1, 35–30. https://doi.org/10.1037/1040-3590.1.1.35

Unal, I. (2017). Defining an optimal cut-Point value in ROC analysis: An alternative approach. *Computational and Mathematical Methods in Medicine, 2017*, 3762651. https://doi.org/10.1155/2017/3762651

van Buuren, S. & Groothuis-Oudshoorn, K. (2011). mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45*(3), 1-67. DOI 10.18637/jss.v045.i03

Voncken, M. J., & Bögels, S. M. (2008). Social performance deficits in social anxiety disorder: Reality during conversation and biased perception during speech. *Journal of Anxiety Disorders*, *22*(8), 1384–1392. https://doi.org/10.1016/j.janxdis.2008.02.001

Wakefield, J. C. (1992). The concept of mental disorder: On the boundary between biological facts and social values. *American Psychologist, 47*(3), 373–388. https://doi.org/10.1037//0003-066x.47.3.373

Weeks, J. W., Norton, P. J., & Heimberg, R. G. (2009). Exploring the latent structure of two cognitive components of social anxiety: Taxometric analyses of fears of negative and positive evaluation. *Depression and Anxiety*, *26*(2), E40–E48. https://doi.org/10.1002/da.20414

Wong, Q. J. J. (2015). Psychometric evaluation of the English version of the Extended Post-event Processing Questionnaire. *Anxiety, Stress, & Coping*, *28*(2), 215–225. https://doi.org/10.1080/10615806.2014.925546

Wong, Q. J. J., Gregory, B., & McLellan, L. F. (2016). A review of scales to measure social anxiety disorder in clinical and epidemiological studies. *Current Psychiatry Reports*, *18*(4), 38. https://doi.org/10.1007/s11920-016-0677-2

World Health Organization. (2022). *Mental Health and COVID-19: Early evidence of the pandemic's impact: Scientific brief, 2 March 2022*. https://www.who.int/publications-detail-redirect/WHO-2019-nCoV-Sci_Brief-Mental_health-2022.1

Zou, J. B., & Abbott, M. J. (2012). Self-perception and rumination in social anxiety. *Behaviour Research and Therapy*, *50*(4), 250–257. https://doi.org/10.1016/j.brat.2012.01.007

Appendices

Appendix A: Supplemental Tables

Table A1

Percent of Missing Values for Questionnaire Data

Sample	Total Missing (%)	SPIN Missing (%)	SDS Missing (%)
Community	14.28	5.48	64.19
Undergraduate			
Fall 2018	1.68	1.18	4.53
Winter 2019	1.02	0.46	4.20
Fall 2019	2.61	2.10	5.66
Winter 2022	2.68	2.05	6.25
Fall 2022	2.92	2.56	4.96
Winter 2023	3.86	3.53	5.71
Fall 2023	2.14	1.78	4.19

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale.

Table A2

T-test Output for Binary Gender Differences on the SPIN

Sample	*t*	df	*p*	M_{Women}	SEM_{Women}	M_{Men}	SEM_{Men}
Community	-1.82	9509.56	.069	29.93	.691	27.64	1.055
Undergraduate							
Fall 2018	-6.15	2738929.19	<.001	27.43	.375	23.25	.567
Winter 2019	-6.56	176457731.2	<.001	26.74	.390	22.13	.585
Fall 2019	-7.59	143253490.17	<.001	27.96	.370	22.80	.570
Winter 2022	-10.42	41536947.51	<.001	32.88	.419	24.53	.683
Fall 2022	-6.96	34639088	<.001	34.55	.399	28.66	.736
Winter 2023	-6.52	867623	<.001	33.85	.418	27.94	.796
Fall 2023	-8.53	1326242	<.001	32.86	.364	26.45	.640

Note. SPIN = Social Phobia Inventory.

Table A3

T-test Output for Binary Gender Differences on the SDS

Sample	*t*	df	*p*	M_{Women}	SEM_{Women}	M_{Men}	SEM_{Men}
Community Undergraduate	-.26	55	.797	9.88	.381	9.65	.816
Fall 2018	-2.12	384181.91	.034	9.52	.173	8.83	.275
Winter 2019	-.514	67564	.607	7.09	.152	6.94	.255
Fall 2019	-2.04	424130.99	.041	8.27	.165	7.60	.283
Winter 2022	-5.75	109902	<.001	11.28	.201	8.89	.349
Fall 2022	-2.26	69017	.024	12.03	.191	11.10	.365
Winter 2023	-2.43	361892	.015	11.54	.202	10.47	.397
Fall 2023	-3.85	365813	<.001	11.70	.180	10.27	.319

Note. SDS = Sheehan Disability Scale.

Table A4

Hierarchical Logistic Regression Output Classifying Non-Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34	3.652	.248	1	<.001	38.522	[23.690, 62.677]
Constant	-1.035	.119	1	<.001	.355	[.281, .448]
SPIN34	3.106	.270	1	<.001	22.327	[13.137,37.943]
SDS11	1.834	.323	1	<.001	6.261	[3.294, 11.900]
Constant	-1.498	.155	1	<.001	.223	[.165, .303]
SPIN34	3.381	.386	1	<.001	29.393	[13.749, 62.839]
SDS11	2.031	.386	1	<.001	7.621	[3.534, 16.433]
SPIN34xSDS11	-.695	.677	1	.307	.499	[.131, 1.907]
Constant	-1.555	.168	1	<.001	.211	[.152, .294]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34 = participants who scored 34 or above on the SPIN; SDS11 = participants who scored 11 or above on the SDS.

Table A5

Hierarchical Logistic Regression Output Classifying Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34	2.010	.198	1	<.001	7.465	[5.061, 11.013]
Constant	-.307	.134	1	.022	.736	[.566, .957]
SPIN34	1.778	.214	1	<.001	5.920	[3.889, 9.009]
SDS11	.797	.261	1	.003	2.219	[1.322, 3.725]
Constant	-.604	.170	1	<.001	.546	[.392, .762]
SPIN34	1.782	.330	1	<.001	5.939	[3.099, 11.382]
SDS11	.801	.361	1	.029	2.227	[1.089, 4.552]
SPIN34xSDS11	-.006	.524	1	.991	.994	[.352, 2.806]
Constant	-.605	.189	1	.001	.546	[.376, .792]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34 = participants who scored 34 or above on the SPIN; SDS11 = participants who scored 11 or above on the SDS.

Table A6

Hierarchical Logistic Regression Output Classifying Combined Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34	2.795	.171	1	<.001	16.360	[11.691, 22.894]
Constant	-1.429	.114	1	<.001	.240	[.192, .300]
SPIN34	2.367	.190	1	<.001	10.667	[7.343, 15.495]
SDS11	1.248	.227	1	<.001	3.484	[2.220, 5.468]
Constant	-1.788	.142	1	<.001	.167	[.127, .221]
SPIN34	2.634	.281	1	<.001	13.924	[8.011, 24.202]
SDS11	1.509	.314	1	<.001	4.520	[2.428, 8.417]
SPIN34xSDS11	-.559	.442	1	.208	.572	[.239, 1.369]
Constant	-1.882	.165	1	<.001	.152	[.110, .211]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34 = participants who scored above 34 or above on the SPIN; SDS11 = participants who scored 11 or above on the SDS.

Table A7

Hierarchical Logistic Regression Output Classifying Non-Clinical Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SDS11ySPIN34n	.177	.350	1	.614	1.194	[.595, 2.394]
Constant	.299	.082	1	<.001	1.348	[1.148, 1.583]
SDS11ySPIN34n	.370	.351	1	.295	1.448	[.720, 2.915]
SPIN34ySDS11n	1.720	.358	1	<.001	5.585	[2.759, 11.305]
Constant	.105	.090	1	.244	1.111	[.930, 1.327]
SDS11ySPIN34n	2.031	.386	1	<.001	7.621	[3.534, 16.433]
SPIN34ySDS11n	3.381	.386	1	<.001	29.393	[13.749, 62.839]
SPIN34ySDS11y	4.717	.418	1	<.001	111.793	[49.063, 254.726]
Constant	-1.555	.168	1	<.001	.221	[.152, .294]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SDS11ySPIN34n = participants who scored 11 or above on the SDS but below 34 on the SPIN; SPIN34ySDS11n = participants who scored 34 or above on the SPIN but below 11 on the SDS; SPIN34ySDS11y = participants who scored 34 or above on the SPIN and 11 or above on the SDS. The SPIN34nSDS11n (i.e., participants who scored below 34 on the SPIN and below 11 on the SDS) was the reference level for the categorical independent variable in this analysis. For the dependent variable, the non-clinical control group was coded as 0 and the SAD group as 1.

Table A8

Logistic Regression Output Classifying Non-Clinical Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34ySDS11n	-1.336	.571	1	.021	.263	[.085, .815]
SDS11ySPIN34n	-2.686	.492	1	<.001	.068	[.026, .180]
SPIN34nSDS11n	-4.717	.418	1	<.001	.009	[.004, .020]
Constant	3.161	.390	1	<.001	23.605	[10.933, 50.959]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34ySDS11n = participants who scored 34 or above on the SPIN but below 11 on the SDS; SDS11ySPIN34n = participants who scored 11 or above on the SDS but below 34 on the SPIN; SPIN34nSDS11n = participants who scored below 34 on the SPIN and below 11 on the SDS. The SPIN34ySDS11y (i.e., participants who scored 34 or above on the SPIN and 11 or above on the SDS) was the reference level for the categorical independent variable in this analysis. For the dependent variable, the non-clinical control group was coded as 0 and the SAD group as 1.

Table A9

Logistic Regression Output Classifying Non-Clinical Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34ySDS11y	3.657	.404	1	<.001	38.752	[17.452, 86.047]
Constant	-.496	.103	1	<.001	.609	[.498, .745]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34ySDS11y = participants who scored 34 or above on the SPIN and 11 or above on the SDS.

Table A10

Hierarchical Logistic Regression Output Classifying Clinical Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SDS11ySPIN34n	-.676	.305	1	.029	.509	[.278, .930]
Constant	.871	.099	1	<.001	2.389	[1.965, 2.904]
SDS11ySPIN34n	-.607	.314	1	.056	.545	[.292, 1.017]
SPIN34ySDS11n	.374	.314	1	.235	1.454	[.782, 2.704]
Constant	.802	.116	1	<.001	2.230	[1.773, 2.803]
SDS11ySPIN34n	.801	.361	1	.029	2.227	[1.089, 4.552]
SPIN34ySDS11n	1.782	.330	1	<.001	5.939	[3.099, 11.382]
SPIN34ySDS11y	2.576	.286	1	<.001	13.148	[7.495, 23.065]
Constant	-.605	.189	1	.001	.546	[.376, .792]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SDS11ySPIN34n = participants who scored 11 or above on the SDS but below 34 on the SPIN; SPIN34ySDS11n = participants who scored 34 or above on the SPIN but below 11 on the SDS; SPIN34ySDS11y = participants who scored 34 or above on the SPIN and 11 or above on the SDS. The SPIN34nSDS11n (i.e., participants who scored below 34 on the SPIN and below 11 on the SDS) was the reference level for the categorical independent variable in this analysis. For the dependent variable, the non-clinical control group was coded as 0 and the SAD group as 1.

Table A11

Logistic Regression Output Classifying Clinical Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34ySDS11n	-.795	.380	1	.039	.452	[.213, .959]
SDS11ySPIN34n	-1.776	.347	1	<.001	.169	[.085, .336]
SPIN34nSDS11n	-2.576	.286	1	<.001	.076	[.043, .113]
Constant	1.971	.209	1	<.001	7.178	[4.759, 10.825]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34ySDS11n = participants who scored 34 or above on the SPIN but below 11 on the SDS; SDS11ySPIN34n = participants who scored 11 or above on the SDS but below 34 on the SPIN; SPIN34nSDS11n = participants who scored below 34 on the SPIN and below 11 on the SDS. The SPIN34ySDS11y (i.e., participants who scored 34 or above on the SPIN and 11 or above on the SDS) was the reference level for the categorical independent variable in this analysis. For the dependent variable, the non-clinical control group was coded as 0 and the SAD group as 1.

Table A12

Logistic Regression Output Classifying Clinical Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34ySDS11y	1.860	.254	1	<.001	6.421	[3.891, 10.597]
Constant	.111	.118	1	.346	1.118	[.886, 1.410]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34ySDS11y = participants who scored 34 or above on the SPIN and 11 or above on the SDS.

Table A13

Hierarchical Logistic Regression Output Classifying Combined Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SDS11ySPIN34n	-.225	.263	1	.349	.799	[.474, 1.344]
Constant	-.149	.073	1	.042	.862	[.747, .994]
SDS11ySPIN34n	-.075	.267	1	.781	.928	[.546, 1.577]
SPIN34ySDS11n	1.050	.252	1	<.001	2.859	[1.739, 4.701]
Constant	-.299	.084	1	<.001	.741	[.629, .874]
SDS11ySPIN34n	1.509	.314	1	<.001	4.520	[2.428, 8.417]
SPIN34ySDS11n	2.634	.281	1	<.001	13.924	[8.011, 24.202]
SPIN34ySDS11y	3.583	.251	1	<.001	35.975	[21.938, 58.922]
Constant	-1.882	.165	1	<.001	.152	[.110, .221]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SDS11ySPIN34n = participants who scored 11 or above on the SDS but below 34 on the SPIN; SPIN34ySDS11n = participants who scored 34 or above on the SPIN but below 11 on the SDS; SPIN34ySDS11y = participants who scored 34 or above on the SPIN and 11 or above on the SDS. The SPIN34nSDS11n (i.e., participants who scored below 34 on the SPIN and below 11 on the SDS) was the reference level for the categorical independent variable in this analysis. For the dependent variable, the non-clinical control group was coded as 0 and the SAD group as 1.

Table A14

Logistic Regression Output Classifying Combined Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34ySDS11n	-.949	.319	1	.003	.387	[.206, .727]
SDS11ySPIN34n	-2.074	.304	1	<.001	.126	[.069, .229]
SPIN34nSDS11n	-3.583	.251	1	<.001	.028	[.017, .049]
Constant	1.700	.185	1	<.001	5.476	[3.803, 7.886]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34ySDS11n = participants who scored 34 or above on the SPIN but below 11 on the SDS; SDS11ySPIN34n = participants who scored 11 or above on the SDS but below 34 on the SPIN; SPIN34nSDS11n = participants who scored below 34 on the SPIN and below 11 on the SDS. The SPIN34ySDS11y (i.e., participants who scored 34 or above on the SPIN and 11 or above on the SDS) was the reference level for the categorical independent variable in this analysis. For the dependent variable, the non-clinical control group was coded as 0 and the SAD group as 1.

Table A15

Logistic Regression Output Classifying Combined Control Group vs. SAD Group

Variable	B	*SE*	df	*p*	Exp(B)	95% CI for Exp(B)
SPIN34ySDS11y	2.631	.217	1	<.001	13.891	[9.058, 21.302]
Constant	-.931	.098	1	<.001	.394	[.325, .478]

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale. SPIN34ySDS11y = participants who scored 34 or above on the SPIN and 11 or above on the SDS.

Table A16

Frequencies of Undergraduates Who Meet Old and New Cutoff Scores Across Time

Cutoff Score Combination	Sample						
	Fall 2018 (%)	Winter 2019 (%)	Fall 2019 (%)	Winter 2022 (%)	Fall 2022 (%)	Winter 2023 (%)	Fall 2023 (%)
SPIN ≥ 30	41.56	39.89	41.38	55.68	60.94	59.05	56.59
SPIN ≥ 28	46.14	44.55	45.06	59.48	65.78	63.05	60.51
SPIN ≥ 34	33.14	31.96	33.06	46.14	51.04	49.41	46.58
SPIN ≥ 28 and SDS ≥7	37.09	30.69	32.29	49.01	55.92	52.50	51.58
SPIN ≥ 34 and SDS ≥ 11	22.76	15.02	20.57	33.16	39.51	36.52	36.27

Note. SPIN = Social Phobia Inventory; SDS = Sheehan Disability Scale.

Appendix B: Self-Report Measures

Social Phobia Inventory (SPIN)

Please check how much the following problems have bothered you during the past week. Mark only one box for each problem and be sure to answer all items.

If you have not encountered any in-person social situations over the past week due to restrictions associated with COVID-19, please respond to each question by imagining how you would feel for each item described below.

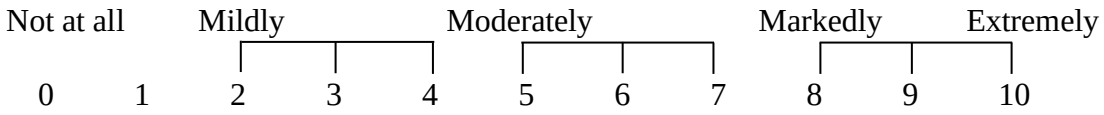
0 = Not at all
1 = A little bit
2 = Somewhat
3 = Very much
4 = Extremely

1. I am afraid of people in authority.
2. I am bothered by blushing in front of people.
3. Parties and social events scare me.
4. I avoid talking to people I don't know.
5. Being criticized scares me a lot.
6. Fear of embarrassment causes me to avoid doing things or speaking to people.
7. Sweating in front of people causes me distress.
8. I avoid going to parties.
9. I avoid activities in which I am the centre of attention.
10. Talking to strangers scares me.
11. I avoid having to give speeches.
12. I would do anything to avoid being criticized.
13. Heart palpitations bother me when I am around people.
14. I am afraid of doing things when people might be watching.
15. Being embarrassed or looking stupid are among my worst fears.
16. I avoid speaking to anyone in authority.
17. Trembling or shaking in front of others is distressing to me.

Sheehan Disability Scale (SDS)

Please indicate to what degree your concerns about social evaluation, rated above, tended to interfere with each of the life domains described below. Please base your ratings on the degree of interference you have experienced in each domain during the past week by selecting ONE number from 0-10 for each.

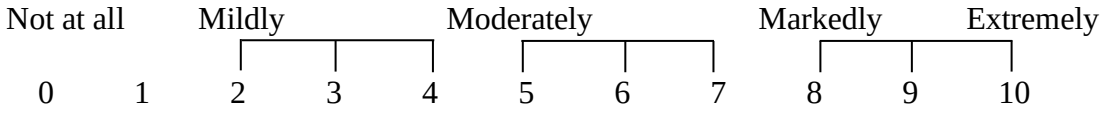
Work*/School
Your concerns about social evaluation tended to disrupt your work/school work:



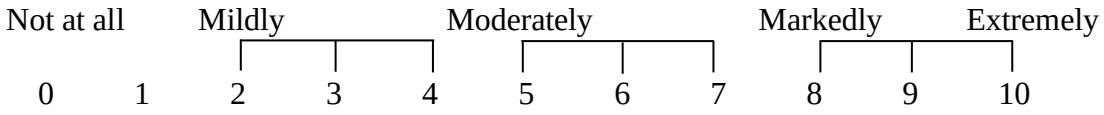
☐ I have not worked* or studied at all in the past week for reasons unrelated to social evaluation concerns

** Work includes paid, unpaid, volunteer work or training*

Social Life
Your concerns about social evaluation tended to disrupt your social life/leisure activities:



Family Life/Home Responsibilities
Your concerns about social evaluation tended to disrupt your family life/home responsibilities:



Days Lost
On how many days in the last week did your concerns about social evaluation cause you to miss school or work or leave you unable to carry out your normal daily responsibilities?

Days Unproductive
On how many days in the last week did you feel so impaired by your concerns about social evaluation, that even though you went to school or work, your productivity was reduced?

Representativeness

Are your ratings of social evaluation concerns and the degree of interference they have caused in the past week representative of what is typical for you in general? Please select one of the following:

My ratings above for social evaluation concerns and life interference experienced in the past week are:

- ☐ Not at all representative of what they are like generally [*after selection, open text box*: Comments: ___]
- ☐ Somewhat representative of what they are like generally [*after selection, open text box*: Comments: ___]
- ☐ Quite representative of what they are like generally [*after selection, open text box*: Comments: ___]
- ☐ Perfectly representative of what they are like generally [*after selection, open text box*: Comments: ___]