ABSTRACT

Title of Thesis:	CONSTRUCTING A BIFACTOR MODEL OF SAFETY SEEKING BEHAVIORS IN ADOLESCENT SOCIAL ANXIETY
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Safety behaviors are subtle avoidance strategies used to manage distress in social situations. Inconsistent findings create uncertainty about whether safety behavior use leads to poorer outcomes. To reconcile these inconsistencies, we leveraged a theoretical model of safety behaviors that classifies safety behaviors according to function using two categories: active behaviors that aim to enhance social performance, and restrictive behaviors that aim to reduce involvement within social situations. This informed development of a measurement model tested with a confirmatory bifactor approach in a mixed-clinical/community sample of 127 adolescent reports of safety behavior engagement. We identified two distinct factors of safety behaviors (i.e., active and restrictive). These factors predicted differential outcomes: increased restrictive safety behaviors predicted increased internalizing concerns and poorer social skills, and increased active safety behaviors predicted higher substance use. These findings have important implications for understanding conceptual and measurement models of safety behaviors in research and clinical contexts.

CONSTRUCTING A BIFACTOR MODEL OF SAFETY SEEKING BEHAVIORS IN ADOLESCENT SOCIAL ANXIETY

by

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Chapter 1: Introduction

Social anxiety disorder (SAD) is marked by the intense fear of negative judgment or evaluation from others (American Psychiatric Association [APA], 2013). While individuals with SAD can vary immensely in terms of symptoms, context of impairment, and patterns of comorbidity and clinical outcomes (Wong & Rapee, 2016; Aderka et al., 2012), conceptual and measurement models of SAD have evolved to account for this heterogeneity (Rapee & Heimberg, 1997; Clark & McManus, 2002). For example, these models can be used to partially explain the longstanding associations between SAD and outcomes including social functioning and comorbidity with substance use disorders (Morrison & Heimberg, 2013; Marmorstein, 2012). Consistent within these models is the reliance on safety seeking behaviors, or covert avoidance strategies (Clark & Wells, 1995). Safety seeking behaviors include averted gaze, intense rehearsal of conversation, or limited self-disclosure (Wells et al., 2016). While some studies find that targeting safety seeking behaviors during clinical interventions has the effect of boosting clinical outcomes (Kim, 2005; Morgan & Raffle, 1999), other studies fail to observe this effect (Hood, Antony, Koerner, & Monson, 2010; Parrish, Radomsky, & Dugas, 2008). One reason for these inconsistencies may be the seeming disconnect between underlying conceptual models of safety behaviors and the measurement models developed to quantify these behaviors. Thus, this study seeks to reconcile these differences, with a focus on safety behaviors in adolescence, a key developmental period linked with a

spike of incidence in SAD (i.e., relative to earlier and later developmental periods), and a period for which the emergence of SAD poses risk for poor outcomes in adulthood (Kessler et al., 2005).

Individuals with SAD tend to engage in safety seeking behaviors to reduce the experience of social distress (APA, 2013), particularly in social situations where immediate avoidance proves impossible (Thwaites & Freeston, 2005). Reliance on safety behaviors can result in a range of negative effects. First, while safety behaviors may reduce anxiety in the short term, continued use can maintain social anxiety in the long term by limiting key learning opportunities and encouraging inaccurate predictions of negative social outcomes (Hofmann, 2007; Piccirillo, Dryman, & Heimberg, 2016). Second, reliance on safety behaviors may lead to interpersonal deficits, such that individuals appear to social interaction partners or independent observers as more anxious, less likeable, and less socially skilled when they display safety behaviors in social situations (Alden & Bieling, 1998; McManus, Sacadura, & Clark, 2008; Stangier, Heidenreich, & Schermelleh-Engel, 2006). Third, safety behaviors impede experiencing positive outcomes of exposure-based interventions, and targeting safety behaviors during treatment is associated with increased reductions in anxiety symptoms (Morgan & Raffle, 1999; Kim, 2005; Rodebaugh, Holaway, & Heimberg, 2004).

Individuals may vary as to the situations or contexts in which they manifest social anxiety symptoms and impairments (Bögels et al., 2010). Similarly, safety behaviors display vastly heterogeneous functions, and given the idiosyncratic nature of safety behaviors, a key challenge involves defining and measuring safety

behaviors. Unlike models for SAD, models of safety behaviors lack a depth and breadth to account for such variance. The absence of an effective model for safety behaviors results in definitional and measurement issues, which may account for a number of inconsistent findings in the literature, particularly with regard to the consequences of using safety behaviors. For example, increased safety behavior use predicts both reductions and increases in short term, state anxiety (cf. Alden & Bieling, 1998; Hirsch, Meynen, & Clark, 1998). Helbig-Lang and Petermann (2010) conclude that while safety behaviors may generally serve to maintain anxiety, engaging in certain strategies may actually prove beneficial to treatment outcomes, depending on diagnosis (e.g., specific phobias), and the type of safety behavior (e.g., distraction). Similarly, others claim that some safety behaviors, but not all, may limit treatment gains (Piccirillo, Taylor, & Heimberg, 2016; Blakey & Abramowitz, 2016). Consequently, we await firm conclusions as to when use of safety behaviors positively versus negatively impacts experiences with social anxiety and the outcomes of clinical interventions designed to reduce social anxiety concerns.

The discrepant operational definitions of safety behaviors may also account for the seeming disconnect between conceptualizations of safety behaviors and the measurement models used to quantify them. Across the literature, researchers assess safety behaviors in multiple ways, including behavioral observations, verbal responses made by participants, or self-report scales, (Alden & Bieling, 1998; Hedtke, Kendall, & Tiwari, 2009; Kim, 2005; Sloan & Telch, 2002; Stangier, Heidenreich, & Schermelleh-Engel, 2006). Conceptually, distinguishing safety behaviors from adaptive coping behaviors further complicates matters (Hedtke et al.,

2009; Thwaites & Freeston, 2005). Investigators also vary widely as to whether they conceptualize safety behaviors as instantiations of a broadband construct (Furukawa, Chen, & Watanabe, 2009; Taylor & Alden, 2010; Mitchell & Schmidt, 2014), or alternatively constituent behaviors that systematically map onto distinct displays of the construct and/or display unique forms or functions (Moscovitch et al., 2013; Rowa et al., 2014).

To reconcile these findings, classifying safety behaviors according to their function may yield a promising model (Helbig-Lang & Petermann, 2010). Ultimately, safety behaviors serve to avoid the experience of a feared outcome, but the means by which they facilitate avoidance can be structured into two forms of behavior (Clark & Wells, 1995). *Active* behaviors consist of positive actions taken to avoid feared outcomes by enhancing social performance (Cuming et al., 2009). These behaviors can manifest as internal manipulations of emotional or physiological sensations, or external manipulations of the environment, such as mental rehearsal of conversation prior to engaging socially with others. *Restrictive* behaviors consist of actions to reduce involvement within a social situation. These are more inhibitory in nature and may include limiting self-disclosure or eye contact. In this respect, the active-restrictive distinction regarding safety behaviors shares a conceptual overlap with the behavioral inhibition system and behavioral activation system- distinctions made of psychopathology domains (Carver & White, 1994)

To date, only one study has empirically tested this conceptual model of safety behaviors using a factor analytic approach (Plasencia, Alden, & Taylor, 2011). Restrictive behaviors were associated with poor social performance, whereas active

behaviors did not seem to yield similarly negative consequences. Beyond social functioning, it remains an empirical question as to whether these two safety behavior factors explain individual differences in presentations of safety behaviors. Thus, a key aim of this study is to test the presence of individual differences using a form of modeling that addresses these concerns, namely a confirmatory bifactor model.

Similar to a second order model, a bifactor model identifies a general factor to account for common variance amongst all items assessing safety behaviors (Chen, Hayes, Carver, Laurenceau, & Zhang, 2012). Bifactor models also specify multiple domain-specific factors (e.g., active and restrictive) that account for unique variance, over and above the general factor (Chen et al., 2012). These components allow us to test how well individual factors uniquely relate to external criteria, over and above the general factor. Furthermore, preliminary evidence for this two-factor structure of safety behaviors, composed of active and restrictive factors, has been identified in an emerging adult sample (Racz et al., 2017). Specifically, active behaviors were observed to predict problematic drinking behaviors. Continuing to build upon this foundation may clarify mechanisms explaining comorbid SAD and substance use. In sum, leveraging a bifactor approach that models both active and restrictive safety behaviors may result in improved precision in predicting outcomes relevant to social anxiety, and enhanced connections between theoretical and measurement models of safety behaviors.

We also know relatively little about the consequences of safety behavior usage among adolescents (Blakey & Abramowitz, 2016). This dearth of knowledge is problematic, given that socially anxious youth engage in safety behaviors during

stressful social situations (Hedtke et al., 2009; Kley, Tuschen-Caffier, & Heinrichs, 2012). Given the relatively increased rates of SAD observed during adolescence, safety behaviors may play a pivotal role in the success of early treatment of SAD. Furthermore, examining safety behaviors in socially anxious youth may reveal insight into mechanisms that increase comorbid risk for substance use disorders (Thomas et al., 2015). That is, safety behaviors in adolescence may serve as a developmental precursor for later maladaptive coping behaviors evidenced by the increased risk for alcohol and drug use disorders concurrent with SAD (Back & Brady, 2008; Fehm, Beesdo, Jacobi, & Fiedler, 2008; Grant et al., 2005). In light of these concerns, identifying a model of safety behaviors that can facilitate predictions of key functional domains relevant to understanding adolescent social anxiety is necessary.

Thus, we sought to extend the literature on models of safety behavior classification by evaluating a model of safety behaviors in a mixed-clinical and community sample of adolescents whose parents who sought an evaluation for their adolescent's social anxiety and parents who participated with their adolescent in a non-clinic study about family relationships. Specifically, this research has the following aims.

Aim I: To investigate a bifactor model of safety behaviors, using active and restrictive factors.

Hypothesis I: We predicted a bifactor structure of adolescent safety behaviors as measured by the Subtle Avoidance Frequency Examination (SAFE; Cuming et al., 2009) will support a general factor of safety behaviors and two domain specific factors: active behaviors and restrictive behaviors. The SAFE is a 32-item measure

that has evidenced construct validity, and sensitivity to treatment changes in adult samples (Cuming et al., 2009). More recently, adolescent reports of the SAFE demonstrate strong psychometric properties and incremental validity in the prediction of adolescent social anxiety (Qasmieh et al., 2018; Thomas, Daruwala, Goepel, & De Los Reyes, 2012).

Aim II: To examine whether these factors can predict external criterion variables relating to behavioral measures of social skills, and self report measures of internalizing and externalizing domains of psychopathology. Specifically, the following hypotheses are proposed:

Hypothesis II: Prediction of external criterion variables

The active behaviors factor of safety behaviors will uniquely relate to measures of externalizing symptoms, over and above the restrictive behaviors factor.

The restrictive behaviors factor will uniquely relate to internalizing symptoms, over and above the active behaviors factor.

Aim III: In addition to these two primary research aims, we conducted exploratory tests to examine whether either domain of safety behaviors uniquely related to behavioral measures of social skills, a domain commonly impaired in individuals with SAD who engage in safety behaviors. However, given the lack of literature germane to incremental validity of these subdomains of safety behaviors, we considered these tests exploratory.

Chapter 2: Method

Participants

Participants were recruited from the Maryland, Washington DC, and Northern Virginia areas using advertisements both posted in local establishments (e.g., coffee shops, libraries) and online (e.g., Craigslist). Advertisements described one of two studies for parent-adolescent dyads: a clinical social anxiety evaluation for shy adolescents, or a nonclinical study about family interactions. Eligible dyads must (a) speak English, (b) understand the consenting and assenting process. Eligible adolescents also must be 14 to 15 years old, read at or above grade level, not have any pervasive developmental or learning disabilities, and have not received any cognitive behavioral therapy in the last 3 months.

Families responding to the clinical social anxiety evaluation advertisement (i.e., clinic-referred) were provided referrals for further mental health services for their adolescent as well as feedback on their adolescent's social anxiety and low mood concerns. Families responding to the nonclinical study (i.e., community control) did not receive this feedback about their adolescent's mental health status. All families participated in the same assessments described below, independent of referral status. Prior work suggests that this approach results in groups of clinic-referred and community control adolescents who can be distinguished on measures of social anxiety and physiology (Deros et al., 2018; Glenn et al., 2019; De Los Reyes et al., 2012).

The total sample consisted of 127 parent-adolescent dyads. 43 were clinic-referred adolescents and 84 were community control adolescents. Adolescents were 14 to 15 years old (M= 14.46, SD = 0.5) and most were female (N = 85; 66.9%). The adolescent sample was predominantly African American/Black (53.5%), followed by Caucasian/European American/White (27.6%), Other (e.g., Caribbean, biracial; 7.6%), Hispanic/Spanish/Latino/a (8.6%), Asian American/ Asian (4.8%), or American Indian (1.0%). These values exceed 100% because adolescents could identify as a member of more than one racial/ethnic category.

Caregivers included the adolescent's biological parent (95.3%) or another caregiver (e.g., adoptive mother/father, stepmother/father; 4.7%). A majority of caregivers reported being currently married (48.0%). 26% of parents reported earning a weekly household income of $500 or less. 22% of parents earned a weekly income between $501 and $900, and 52.% of parents earned $901 or more per week.

In the following study analyses, we pooled the clinic-referred and the community control samples. We intentionally recruited a larger community control sample of adolescents than clinic-referred adolescents because this approach mimics the dimensional variation in presentations of social anxiety in the general population and is consistent with dimensionally models of psychopathology (Casey, Oliveri, & Insel, 2014). Prior work using this approach also suggests that dimensional approaches to assessing psychopathology exhibit greater reliability and validity relative to categorical approaches (Markon, Chmielewski, & Miller, 2011).

To justify use of this pooled approach, we conducted Chi-square tests of demographic differences to determine whether the community control group significantly differed

from the clinic-referred group in terms of these demographic characteristics. A Bonferroni correction (i.e., 11 tests and a corrected p value of .0045) was applied and no significant differences between clinic-referred and community control groups were observed.

To further justify the pooled approach, we examined the distribution of psychopathology symptoms across multiple domains to determine the extent to which the clinical group varies from the community control group. In Table 1, we report descriptive statistics to confirm that variability in psychopathology is not solely demonstrated by the clinical group. While additional studies using this sample (e.g., Qasmieh et al., 2018, Keeley et al., 2018) identify these two groups to differ significantly on measures of psychopathology, we can conclude a range of psychopathology is present in both group

Survey Measures

Internalizing domains

Safety behaviors. To measure adolescent safety behaviors, adolescents completed the SAFE (Cuming et al., 2009). The measure consists of 32 items that each describe a safety seeking behavior (e.g., speaking softly, hiding face). Respondents report how frequently they engage in each behavior upon entering a social situation. Response options range from 1 (Never) to 5 (Always). Recent work has evidenced the SAFE to demonstrate high construct validity and reliability when administered to adolescents (Qasmieh et al., 2018; Thomas et al., 2012). Coefficient alpha for adolescent reports of the SAFE in this present study was .93.

Social anxiety. Adolescent social anxiety was measured using the Social Phobia and Anxiety Inventory for Children (SPAI-C; Beidel, Turner, & Morris, 1995), a 26-item measure describing various social interactions, to which the adolescent endorses how often they feel nervous or scared when encountering such a scenario. Items include feeling "too scared to ask questions in class" and feeling "scared when meeting new students." Response options range from 0 (Never) to 2 (Always). The SPAI-C has displayed strong construct validity and reliability on multiple occasions (Beidel, Turner, Hamlin, & Morris, 2000; Beidel et al., 1995; Storch, Masia-Warner, Dent, Roberti, & Fisher, 2004). Coefficient alpha for adolescent reports of the SPAI-C in this present study was .95.

Depressive symptoms. Adolescents reported their depressive symptoms using the Beck Depression Inventory-II (BDI-II; Beck, Steer, Ball, & Ranieri, 1996). This 21-item measure measures the severity of different aspects of depression (e.g. changes in sleep, feelings of worthlessness). Total scores range from 0 to 63, with higher scores reflecting greater levels of depressive symptoms. Items 9 and 21 were omitted from the measure, as they related to suicide and interest in sex, and parents in our studies tend to decline having their adolescents respond to such items. To maintain our ability to interpret scores of the BDI, we imputed responses on these two items using the average item score for each adolescent's report. The BDI has demonstrated high internal consistency and adequate convergent, incremental, and criterion-related validity when administered to adolescents within the age range of our sample (Osman, Barrios, Gutierrez, Williams, & Jennifer, 2007; Steer, Kumar,

Ranieri, & Beck, 1998). The coefficient alpha for adolescent reports of the BDI in this present study was .93

Externalizing domains

Attention Deficit Hyperactivity Disorder (ADHD). Adolescent ADHD symptoms were measured using the ADHD Short Report Scale (ASRS; Kessler et al., 2007). Adolescents rated the frequency they experience symptoms of inattentiveness and hyperactivity in the past month, using five response options ranging from 0 (Never) to 4 (Very often). We administered the first six items of the 18 item measure. Prior work indicates that these six items are most predictive of clinically relevant ADHD concerns and demonstrate strong reliability and validity in adolescent populations (Keeley et al., 2018; Kessler et al., 2007). The coefficient alpha for adolescent reports of the ASRS- 6 in this present study was .67.

Drug use and delinquent behaviors. Additional externalizing concerns including drug use and delinquent behaviors were measured using adolescent self report on the two subscales of the Problem Behavior and Frequency Scale (PBFS; Farrell, Danish, & Howard, 1992). We used 14 items to assess the frequency of behaviors including skipping school, smoking cigarettes, or drinking liquor. Participants could report their frequency of engagement from 0 (0-Never) to 5 (20 or more times). Due to the positive skew reflecting modal endorsement of no engagement in any delinquent behaviors, PBFS scores will be transformed into dichotomous groupings of those who self-reported no engagement in delinquent behaviors (0) or engagement in any behavior (1) (Augenstein et al., 2016). Prior work

has demonstrated the PBFS possesses good estimates of validity and reliability in community as well as delinquent samples of adolescents (Farrell, Kung, White, & Valois, 2000; Farrell, Sullivan, Goncy, & Le, 2016).

Behavioral Measures

Social interaction tasks

Adolescents participated in three counterbalanced social interaction tasks, approximately lasting 20 minutes. These three tasks included a Simulated Social Interaction Test (SSIT; adapted from Curran, 1982; Beidel et al. 2010), Unstructured Conversation Task (UCT; adapted from Beidel et al. 2010), and Impromptu Speech Task (IST; adapted from Beidel et al. 2010). Across all tasks, adolescents interact in a series of situations with undergraduate research assistants who were trained to pose as 14- to 15-year-olds. These unfamiliar peer confederates were masked to adolescents' referral status and all other clinical information, and they had no contact with participants prior to the tasks. Adolescents' reactions to interacting with these peer confederates predict their reactions to independent tasks where they are instructed to interact with same-age peers (see Karp et al. 2018), and relate to survey measures of adolescent psychopathology (e.g., social anxiety and mood concerns; Deros et al., 2018; Rausch et al., 2017).

The SSIT consists of a series of five role-playing scenes between an adolescent and a gender-matched peer confederate. These scenes portrayed a range of themes common to social interactions with a peer (e.g., offering/accepting assistance,

giving/receiving a compliment, and responding to inappropriate behavior). The UCT is a three-minute roleplay with consisting of the adolescent and the peer confederate, prompted only with the instruction "Pretend you are at a new school and you don't know anyone." Peer confederates were trained to provide neutral responses to the adolescent and allowed for the adolescent to lead the conversation. During the IST, the adolescent delivers a ten minute speech to an audience of three unfamiliar peers about topics not often discussed by adolescents (i.e., politics and public health). The audience consisted of the task administrator and two trained confederates with whom the adolescent had no prior contact. Adolescents were given a three-minute preparation period prior to delivering their speech. Adolescents were permitted to terminate their speech after a minimum of three minutes.

Independent Observers' Ratings of Adolescent Anxiety and Social Skills

Two independent observers were trained to use behavioral ratings of adolescent social skills and social anxiety. At this time, both independent observers rated 105 adolescents in the sample. The behavioral coding scheme originated from Beidel and colleagues (e.g., Beidel et al., 2010). For each adolescent, these independent observers made ratings on a 5-point scale of social skills, for each of the seven individual tasks. Social skills ratings ranged from 1 (Not effective at all) to 5 (Very effective), with greater scores indicating greater social skills. Similarly, these independent observers made ratings on a 5-point scale of social anxiety for each of the seven individual tasks. Social anxiety ratings ranged from 1(Animated) to 5(Severe Anxiety), with greater scores indicating greater anxiety.

The inter-rater reliability for the two observers' social skills ratings across the

seven tasks displayed an average ICC of .78 and the inter-rater reliability for the two observers' social anxiety ratings across the seven tasks displayed an average ICC of .75. These average ICC's are considered within the "excellent" range, according to recommendations by Cicchetti (1994). Ratings from each of the seven tasks were averaged to create one final composite social skill rating and one composite social anxiety rating.

We conducted chi-square analyses to determine whether participants with and without behavioral rating data differed on key demographic characteristics (i.e., adolescent age/gender, family income, parent's relationship to adolescent, parent's marital status). We did not conduct chi-square analyses for race/ethnicity for these two groups given that doing so would require comparisons of groups with cell sizes including fewer than 5 participants. Given the exploratory nature of these tests, we applied a Bonferroni correction (i.e., 5 tests and thus a corrected p-value of .01). We observed non-significant differences between participants with and without behavior rating data available.

Procedure

All study procedures received approval from the Institutional Review Board at the large, Mid-Atlantic university at which we conducted the study. Adolescents and parents completed a counterbalanced administration of survey measures using Qualtrics online software. After adolescents' completed the survey battery, they participated in a counterbalanced series of mock social interaction tasks with trained peer confederates. Consistent with recent work on adolescent social anxiety (e.g., Anderson & Hope, 2009; Deros et al., 2018; Rausch et al., 2017), undergraduate/post-

baccalaureate research assistants were trained to interact as unfamiliar peer confederates with adolescent participants across a series of social scenarios. These social scenarios included a simulated social interaction task consisting of five different role-playing scenarios, an unstructured conversation task, and an impromptu speech task. Following the completion of all social interactions, unfamiliar peer confederates completed measures of social anxiety about the adolescent. Upon the completion of the study, families received $100 monetary compensation (i.e., $50 to the parent, $50 to the adolescent).

Chapter 3: Data Analytic Plan

To address the first aim, a confirmatory factor analysis approach was used evaluate a bifactor model of safety seeking behaviors, with an underlying general factor of safety behaviors and two specific factors of active behaviors and restrictive behaviors. The model tested was consistent with prior exploratory findings with an emerging adult sample (Racz et al., 2017). Complete sets of SAFE data were used to estimate the model. Because indicators were considered continuous and evidenced some variation in skewness and kurtosis, a robust maximum likelihood estimator (MLR), an estimator robust to violations of normality, was used to fit the model.

A combination of absolute and relative fit indices were used to evaluate the fit of the model: the comparative fit index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Steiger, 1990), and Standardized Root Mean Square Residual (SRMR; .) The CFI was selected due to being least sensitive to sample size (Fan, Thompson, & Wang, 1999). Acceptable measures of the CFI range from .95 and higher (Hu & Bentler, 1999). The RMSEA allows for the calculation of confidence intervals and acceptable measures of the RMSEA are less than .07 (Steiger, 2007). Acceptable measures of SRMR are below .08 (Hu &Bentler, 1999).

Prior to addressing the second and third aims, we examined the relationships between any identified subscales with external criterion variables at the bivariate

level to justify further investigation. Bivariate correlations were calculated among all continuous variables. Significant correlations indicated continued analyses for aims two and three. An independent samples t-test was conducted to compare mean differences in SAFE subscale scores, among groups determined by categorical variables (i.e., transformed PBFS subscale scores of delinquency and drug use). Significant group differences among both subscale scores and groups indicated continued analyses for aims two and three.

To directly address the second and third aims, several hierarchical linear regression equations were used to determine the incremental validity of each subscale in predicting internalizing concerns, externalizing concerns, and social skills. Incremental validity of the restrictive subscale was assessed by predicting domains of internalizing concerns and social skills, entering active subscale scores in the first step then adding restrictive subscale scores in the second step. Incremental validity of the active subscale was assessed by predicting domains of externalizing concerns, entering restrictive subscale scores in the first step then adding active subscale scores in the second step.

Exploratory aims were evaluated in a similar procedure with two sets of hierarchical regressions. To test the restrictive subscale as the predictor of social skills, the active subscale was entered in the first step, followed by the addition of the restrictive subscale in the second step. The active subscale was also tested as the predictor of social skills, by entering the restrictive subscale in the first step, followed by the addition of the active subscale in the second step.

All analyses were completed using the R Statistical Package (R Development Core Team, 2010), and the libraries ‘lavaan’ (Rosseel, 2012) and 'psych' (Revelle, 2018)

Chapter 4: Results

Confirmatory Factor Analysis

We fit the bifactor model to all 32 items of the SAFE. All factors (i.e., the general factor and the specific factors of active and restrictive) were kept orthogonal to each other. Additionally, all error terms associated with the items were uncorrelated. Latent factors were constrained to have a mean of 0 and a variance of 1.

The initial model failed to produce a stable model, as item 16 became a Heywood case (i.e., variance larger than one; Kolenikov & Bollen, 2012). Because of this, an incomplete model was re-estimated by removing item 16 from the model. The incomplete model fit the data adequately with robust RMSEA = 0.069 [90%CI: 0.058-0.079], SRMR = 0.069. However, robust CFI = 0.842 was under recommended thresholds.

To address shortcomings with the model fit, correlations of error terms in the model can be specified by examining modification indices. However, modifications (e.g., specifying correlated error between items 1 and 11) did not yield any appreciable increases or decreases in model fit. Because of this, we retained the factor loadings for our incomplete model, as presented in Table 2. Data for all alternative solutions are available upon request

The presence of negative factor loadings within the restrictive factor suggested further examination into the identified subscales. Measures of internal consistency (e.g., alpha, inter-item correlations, item-total correlations) were

calculated to identify the degree to which items performed on their identified subscale. Specifically, scale alphas were examined after removing the items with negative loadings. Removing these items did not yield an appreciable impact on any measure of internal consistency. Thus, while these loadings may signal poor model fit, we observed no compelling evidence to suggest that specific items (e.g., items with negative loadings) reduced internal consistency estimates for the summary scores containing these items. Thus, we retained all 12 Active scale items and 19 Restrictive scale items for all findings reported below. Alphas for the two factors are reported in Table 2.

Preliminary Analyses of Subscales and Criterion Variables

In Table 3, we report descriptive statistics for the total, active, and restrictive SAFE scales. To justify use of criterion variables as potential covariates in tests of incremental validity, the relationships between the SAFE subscales and the criterion variables were also examined at the bivariate level. Correlations between continuous measures and the SAFE subscales are reported in Table 3.

To justify further examination of categorical criterion variables (i.e., drug use and delinquency), an independent samples t-test comparing mean differences in active and restrictive subscale scores among the two groups was conducted. Tables 4 and 5 report the results of these t-tests. No significant differences in either active or restrictive subscales were identified between adolescents who reported any delinquent behaviors and those who denied any delinquent behaviors. Whereas restrictive subscale scores did not differ between adolescents who reported any drug use

behaviors and those who denied drug use behaviors, active subscale scores were significantly higher in those who reported any drug use behavior.

Incremental Validity of Subscales

Internalizing symptoms

In Table 6, we report analyses examining the incremental validity of the restrictive SAFE subscore in predicting internalizing symptoms, across behavioral and self-report modalities, using the analytic plan described previously. In the first step of each linear regression, active SAFE subscores predicted behavioral ratings of anxiety as well as scores on the BDI-II and SPAI-C, (βs = 0.29 - 0.68). In the second step of each linear regression, the addition of the restrictive SAFE subscore accounted for variance in BDI-II and SPAI-C reports, (βs = 0.36 - 0.69). Consistent with our hypotheses, restrictive SAFE subscores predicted measures internalizing symptoms, over-and-above the variance accounted for by active SAFE subscores.

Externalizing symptoms

In Table 7, we report analyses examining the criterion related validity of the active SAFE subscore in predicting reports of adolescent ADHD symptoms, using the analytic plan described previously. In the first step of each linear regression, restrictive SAFE subscores predicted ASRS (βs =0.50). However, contrary to our hypotheses, the addition of active SAFE subscores to the second step of each linear regression did not significantly account for variance in ASRS reports, over-and-above variance explained by restrictive SAFE subscores.

Social skills

In Table 8, we report exploratory findings regarding the criterion related validity of the restrictive SAFE subscale with respect to behavioral measures of social skills. In the first step of the linear regression, active SAFE subscores predicted social skills in the negative direction. That is, increases in active SAFE subscores related to decreases in observed social skills (β = .30). In the second step of the linear regression, increases in restrictive SAFE subscores negatively related to social skills, over and above active SAFE subscores, at moderate levels (βs = .55). The active subscale did not explain variance over and above the restrictive subscale, when used as a predictor of social skills, β =.13, p = 0.36.

Chapter 5: Discussion

The purpose of this study was to extend the literature on the models of safety behavior classification. We evaluated a model of safety behaviors using a psychometrically robust measure of safety behaviors, in a mixed-clinical and community sample of adolescents. We observed four main findings, with implications for improving connections between theoretical and measurement models of safety behaviors.

First, a bifactor model adequately fit the data collected from adolescent self-report responses when using 31 of the 32 items on the SAFE. These 31 items loaded on a general, safety seeking behaviors factor, as well as two factors representing restrictive safety seeking behaviors, and active safety seeking behaviors. The restrictive factor contained items reflecting cognitive and behavioral strategies for reducing distress that involve reducing involvement in social situations. Conversely, the active factor contained items reflecting strategies to reduce distress that involve manipulating social situations or internal sensations stemming from these situations. Interestingly, several items in the restrictive subscale demonstrated negative factor loadings, which could indicate a negative relationship between these items and the factor. Although these loadings could signal poor model fit, we found no strong evidence to indicate that removing these items improved the internal consistency of the subscales. In fact, both the active and restrictive subscales demonstrated strong reliability, despite the negative loadings.

Second, the SAFE restrictive subscale predicted criterion variables in the internalizing domain of psychopathology (e.g., SAD, depressive symptoms), over-

and-above the SAFE active subscale. Third, our exploratory analysis suggested the SAFE restrictive subscale also predicted behavioral ratings of social skill, over-and-above the SAFE active subscale. This finding conforms to prior work indicating that social partners perceive safety behaviors to be signals of disinterest or discomfort (Plasencia, Alden & Taylor, 2011). Building on this work, our findings point to the possibility that restrictive safety behaviors largely drive this relation between safety behaviors and observers' impressions of adolescents' social skills.

Fourth, the SAFE active subscale demonstrated incremental validity for some, but not all measures of externalizing domains. Specifically, SAFE active subscale scores were significantly higher for adolescents who reported drug use behavior relative to adolescents reporting no such behavior. Contrary to our hypothesis, restrictive, and not active subscale scores, uniquely related to adolescent ADHD symptoms. This may be related to recent findings suggesting that while ADHD is broadly considered an externalizing disorder, emotion regulation difficulties common to ADHD may result in comorbid internalizing symptoms (e.g., anxiety; Bubier & Drabick, 2009; Steinberg & Drabick, 2015). These findings may suggest that when safety behaviors relate to ADHD concerns, restrictive (and not active) safety behaviors largely drive this relation.

Similarly, adolescents reporting delinquent behaviors did not differ in their reports of active safety behaviors, relative to adolescents reporting no such behavior. Approximately half of our sample was classified as endorsing delinquent behavior, it is possible that our approach to measuring delinquent behavior may have been too broad. Indeed, we took this approach, given the relatively low base rate of delinquent

behavior in our sample, and in doing so we compared adolescents endorsing no delinquent behavior to adolescents endorsing *at least one* such behavior. Although this is an approach similar to what has been used in prior work (e.g., Augenstein et al., 2016), future work should continue to examine safety behaviors in samples displaying greater rates of delinquent behaviors.

Research and Clinical Implications

This study has important implications for future research. First, these findings advance links between conceptual and measurement models of safety behaviors. Specifically, the model tested in this study conforms to the idea that safety behaviors vary in form and function and display a discernable structure (e.g., Hirsch, Meynen, & Clark, 2004; Cuming et al., 2009; Kocovski et al., 2018). That is, safety behaviors manifest as either strategies designed to reduce involvement in social situations (i.e., restrictive) or manipulate the environment (i.e., active) in an effort to reduce anxiety-related distress. Furthermore, these two domains of safety behaviors differentially relate to measures of internalizing concerns, externalizing concerns, and social functioning. Given the cross-sectional nature of our study, it remains to be seen whether these two domains of safety behaviors impact outcomes over time. In particular, adolescent social anxiety uniquely predicts the development of substance use in adulthood (Buckner et al., 2008; Wolitzky-Taylor, Bobova, Zinbarg, Mineka, & Craske, 2012). Although the mechanisms underlying this relationship remain

understood, an interesting direction for future research might involve examining whether active safety behaviors play a role in this link between adolescent social anxiety and adulthood substance use. These issues merit further study.

Second, our findings point to reasons for inconsistent findings between safety behaviors and poor outcomes, namely variations among studies in measurement of safety behavior domains. In particular, it appears that specific domains (i.e., active vs. restrictive) differentially relate to outcomes (e.g., internalizing vs. externalizing concerns). If so, future work should carefully consider the match between the domain of safety behaviors examined and outcomes they are designed to predict. We encourage future work to more closely examine the consequences of matching domains of safety behaviors to criterion domains of interest.

The model of safety behaviors tested in this study may also have important clinical implications. As mentioned previously, prior work suggests that use of safety behaviors during treatment may reduce treatment responsiveness (Kim, 2005; Morgan & Raffle, 1999). Our findings point to an interesting idea: Might the risk safety behaviors pose to reducing treatment responsiveness depend on (a) which safety behaviors a client displays and (b) the domain targeted for treatment? An interesting direction for future research might involve distinguishing clients' safety behaviors by their function (i.e., active vs. restrictive), and examining whether targeting reductions in specific safety behavior domains (e.g., restrictive safety behaviors) impacts outcomes in specific domains (e.g., reductions in social anxiety, depressive symptoms, or social skills). Alternatively, might clients displaying both social anxiety

and substance use (or other externalizing concerns) benefit from targeted reductions of active safety behaviors during treatment? These questions merit further study

Limitations

Several limitations should be considered when interpreting these findings. First, we observed adequate support for the bi-factor model in a sample of adolescents who were administered the SAFE in a sample of 127. Many best practice approaches to factor analytic models recommend examining samples of at least 200 to ensure a stable model fit (Hu & Bentler, 1999). While the model in our sample converged on a solution, aims to replicate this model in other samples may demand a larger sample size for stable model fit indices.

Second, we observed support for both the model and the incremental validity of the subscales, derived from a sample of 14 to 15-year-olds. However, we do not know if this model extends to other phases of development, including relatively older or younger adolescents. Future research should examine whether this model can be stably identified when assessing children and adolescents not covered by the age range of our sample.

Third, in this study, we only examined one measure of substance use with respect to safety behaviors. This measure required transformation from a continuous variable to a dichotomous one, given the variability in the mixed clinical-community sample. Future research should examine the relationship of additional measures of substance use with safety behavior use. Additionally, outcomes regarding social skills were based from brief, social interactions with unfamiliar peers. Future work may choose to examine how adolescents use and display safety behaviors in different

social settings and situations.

Fourth, measurement of safety behaviors was limited to a single self report of safety behaviors. While we had access to a series of measures assessing commonly associated features of safety behaviors (e.g., SAD, depressive symptoms), we did not have an alternative form of measuring safety behaviors beyond the SAFE (e.g., survey instrument, direct behavioral coding). The SAFE is a self-report measure that is widely used in the adult literature and while observed patterns were consistent with prior work, we encourage future research to incorporate alternative methods for assessing safety behaviors.

Concluding Comments

Safety behaviors comprise a key component of conceptual models of SAD. Yet, little attention has been dedicated to resolving gaps between conceptual models and measurement models of safety behaviors. These gaps create ambiguities in interpreting outcomes and associated impairments in adolescents with SAD. We sought to bridge this gap by testing a bifactor model of safety behaviors, and in doing so we learned that safety behaviors manifest as two related yet distinguishable domains (i.e., active vs. restrictive). These components evidence incremental validity in predicting unique outcomes, such that increased restrictive safety behaviors predict increased internalizing concerns, whereas increased active behaviors relate to higher substance use. We encourage future research in examining longitudinal links between safety behaviors and poor outcomes, as well as the utility of our measurement

approach to informing clinical decision-making in the treatment of SAD and associated concerns.

Tables

Table 1
Descriptive Statistics for Continuous Measures of Psychopathology

	Community Control Group (n = 84)				Clinical Group (n=43)			
Variable	***M***	***SD***	**Minimum**	**Maximum**	***M***	***SD***	**Minimum**	**Maximum**
SAFE	61.68	15.37	35.00	101.00	75.88	25.50	35.00	137.00
SPAI-C	14.47	8.19	1.33	35.47	22.83	12.52	1.83	45.33
BDI (Raw)	11.21	8.17	.00	39.79	17.27	14.01	.00	59.68
BDI (Square Root Transformation)	3.10	1.28	.00	6.31	3.81	1.68	.00	7.73
ASRS	10.64	3.61	2	20	12.51	4.32	3.00	22.00
Observers' Composite Rating of Social Anxiety[b]	2.81	.79	1.03	4.43	3.41	.77	1.30	4.67
Observers' Composite Rating of Social Skills[b]	3.63	.85	1.40	5.00	3.06	.86	1.17	4.90

Note: **SAFE** = Subtle Avoidance Frequency Examination; **BDI-II** = Beck Depression Inventory – II; **SPAI-C** = Social Phobia and Anxiety Inventory for Children; **ASRS** = ADHD Self Report Scale

Table 2

Factor Loadings of the Bifactor Model for 31 SAFE Items (n=127)

SAFE item	General Factor	Active	Restrictive
1. Before you arrive, excessively rehearse what you might say or how you might behave	.72***		-.52
2. Remain silent	.71***		.22
3. Try to keep tight control of your behaviour	.67***		-.02
4. Speak softly	.80***		.35
5. Say 'I'm not usually like this'	.34***	.27*	
6. Blank out or switch off mentally	.57***		.09
7. Hold your arms still	.36***		.06
8. Spend time thinking of good excuses for escaping	.70***		.08
9. Wear cool clothes to prevent sweating	.29**	.15	
10. Avoid eye contact	.78**		.37
11. Wear clothes or makeup to hide blushing	.24*	.25	
12. Say 'it's hot' to explain sweating or blushing	.37**	.32	
13. Account for poor performance by saying that you didn't have time to prepare	.51***	.31*	
14. Rehearse sentences in your mind	.89***		-.67*
15. Spend hours on grooming prior to the situation	.48***	.32	
17. Say that you are sick/unwell	.56***	.34	
18. Look closely at other people and try to gauge their reactions to you	.68***		-.06
19. Avoid asking questions	.90***		.11
20. Speak in short sentences	.87***		.37
21. Keep still to avoid drawing attention to yourself	.81***		.14
22. Hide your face	.70***		.17
23. Make excuses about your appearance	.37**	.51***	
24. Check the redness of your face in a mirror	.34**	.68***	
25. Try to think about other things	.77***		.07
26. Try to think of reasons why the other person is inferior to you	.47***	.21	

27. Avoid pauses in speech	.61***		-.21
28. Position yourself so as not to be noticed	.78***		.23
29. Hold your cup or glass tightly	.76***		.23
30. Ask others about your performance	.53***	.20	
31. Imagine you are somewhere else	.58***	.12	
32. Be reserved about what you say	.70***		-.1

Note. **SAFE =** Subtle Avoidance Frequency Examination; *$p < .05$; ** $p < .01$; ***$p < .001$.

Table 3

Means, SDs, and Bivariate Correlations of SAFE Subscales and Continuous Criterion Variables (n=127)

Variable	*α/ICC*	*M*	*SD*	1	2	3	4	5	6	7
1. SAFE: ACTIVE	.81	36.21	10.86	-	0.78***	0.68***	0.50***	0.43***	0.29***	-0.30***
2. SAFE: RESTRICTIVE	.92	28.53	10.32		-	0.80***	0.53***	0.50***	0.47***	-0.45***
3. SPAI-C	.95	17.30	10.59			-	0.53***	0.50***	0.44***	-0.41***
4. BDI (Square Root Transformation)	.93[a]	3.34	1.46				-	0.44***	0.25**	-0.25**
5. ASRS	.67	2.71	1.60					-	0.17	-0.18
6. Observers' Composite Rating of Social Anxiety[b]	.75	3.02	0.83						-	-0.86***
7. Observers' Composite Rating of Social Skills[b]	.78	3.43	0.89							-

Note: **SAFE** = Subtle Avoidance Frequency Examination; **BDI-II** = Beck Depression Inventory – II; **SPAI-C** = Social Phobia and Anxiety Inventory for Children; **ASRS** = ADHD Self Report Scale; [a]Reliability calculated for raw scale; [b]At the time of writing, only 105 behavioral ratings were available for analysis; **p* < .05; ** *p*< .01; ****p* < .001.

Table 4

Means (standard deviations) for adolescents reporting Presence or Absence of Problematic Drug Use Behaviors on the PBFS

Variable	No Drug Use Behaviors (n = 106)	Any Drug Use Behaviors (n = 21)	t value (df)	95% Confidence interval of difference between Means	Cohen's d
SAFE: Active	35.12(10.29)	41.71(12.24)	-2.31 (25.89)*	[-12.46, -0.73]	-.63
SAFE: Restrictive	28.22(10.3)	30.10(10.54)	-0.75(28.09)	[-7.02,3.26]	-.18

Note: **SAFE** = Subtle Avoidance Frequency Examination; **PBFS =** Problem Behavior Frequency Scale; *p < .05; ** p< .01; ***p < .001.

Table 5

Means (standard deviations) for adolescents reporting Presence or Absence of Problematic Delinquent Behaviors on the PBFS

Variable	No Delinquent Behaviors (n = 63)	Any Delinquent Behaviors (n = 64)	t value (df)	95% Confidence interval of difference between Means	Cohen's d
SAFE: Active	34.87 (11.59)	37.53(10.01)	-1.38(121.82)	[-6.47,1.15]	-.25
SAFE: Restrictive	28.52(11.56)	28.53(9.03)	-0.004(117.2)	[-3.66,3.64]	-.0007

Note: **SAFE** = Subtle Avoidance Frequency Examination; **PBFS =** Problem Behavior Frequency Scale; *p < .05; ** p< .01; ***p < .001.

Table 6

Hierarchical Regressions Examining the Incremental Validity of Restrictive SAFE Subscores in Predicting Adolescent Internalizing Symptoms (n = 127)

DV: Observers' Composite Rating of Social Anxiety[a]

Variable	**ΔR^2**	***B(SeB)***	***β***
Step 1	0.08**		
SAFE: **Active** Subscore		0.02(0.007)	.29**
Step 2	0.15***		
SAFE: **Active** Subscore		-0.02 (0.01)	-.22
SAFE: **Restrictive** Subscore		-0.05 (0.01)	.64***
DV: BDI-II, Self-Report			
Variable	**ΔR^2**	***B(SeB)***	***β***
Step 1	0.25***		
SAFE: **Active** Subscore		0.07(0.01)	0.50***
Step 2	0.05***		
SAFE: **Active** Subscore		0.03(0.02)	0.22
SAFE: **Restrictive** Subscore		0.05(0.02)	0.36*
DV: SPAI-C, Self-Report			
Variable	**ΔR^2**	***B(SeB)***	***β***
Step 1	0.46***		
SAFE: **Active** Subscore		0.66(0.06)	0.68***
Step 2	0.65***		
SAFE: **Active** Subscore		0.14(0.08)	0.14

SAFE: **Restrictive** Subscore	0.70(0.09)	0.69***

Note: **SAFE** = Subtle Avoidance Frequency Examination; **BDI-II** = Beck Depression Inventory – II**; SPAI-C** = Social Phobia and Anxiety
Inventory for Children; [a]At the time of writing, only 105 behavioral ratings were available for analysis; *$p < .05$; ** $p < .01$; ***$p < .001$

Table 7

Hierarchical Regression Examining the Incremental Validity of Active SAFE Subscores in Predicting Adolescent ADHD Symptoms (n = 127)

DV: ASRS, Self-Report			
Variable	ΔR^2	***B(SeB)***	***β***
Step 1	0.25***		
SAFE: **Restrictive** Subscore		0.18(0.03)	0.50***
Step 2	0.004***		
SAFE: **Restrictive** Subscore		0.16(0.05)	0.42***
SAFE: **Active** Subscore		0.04(0.04)	0.10

Note: **SAFE** = Subtle Avoidance Frequency Examination; **ASRS** = ADHD Self Report Scale; *$p < .05$; ** $p < .01$; ***$p < .001$.

Table 8

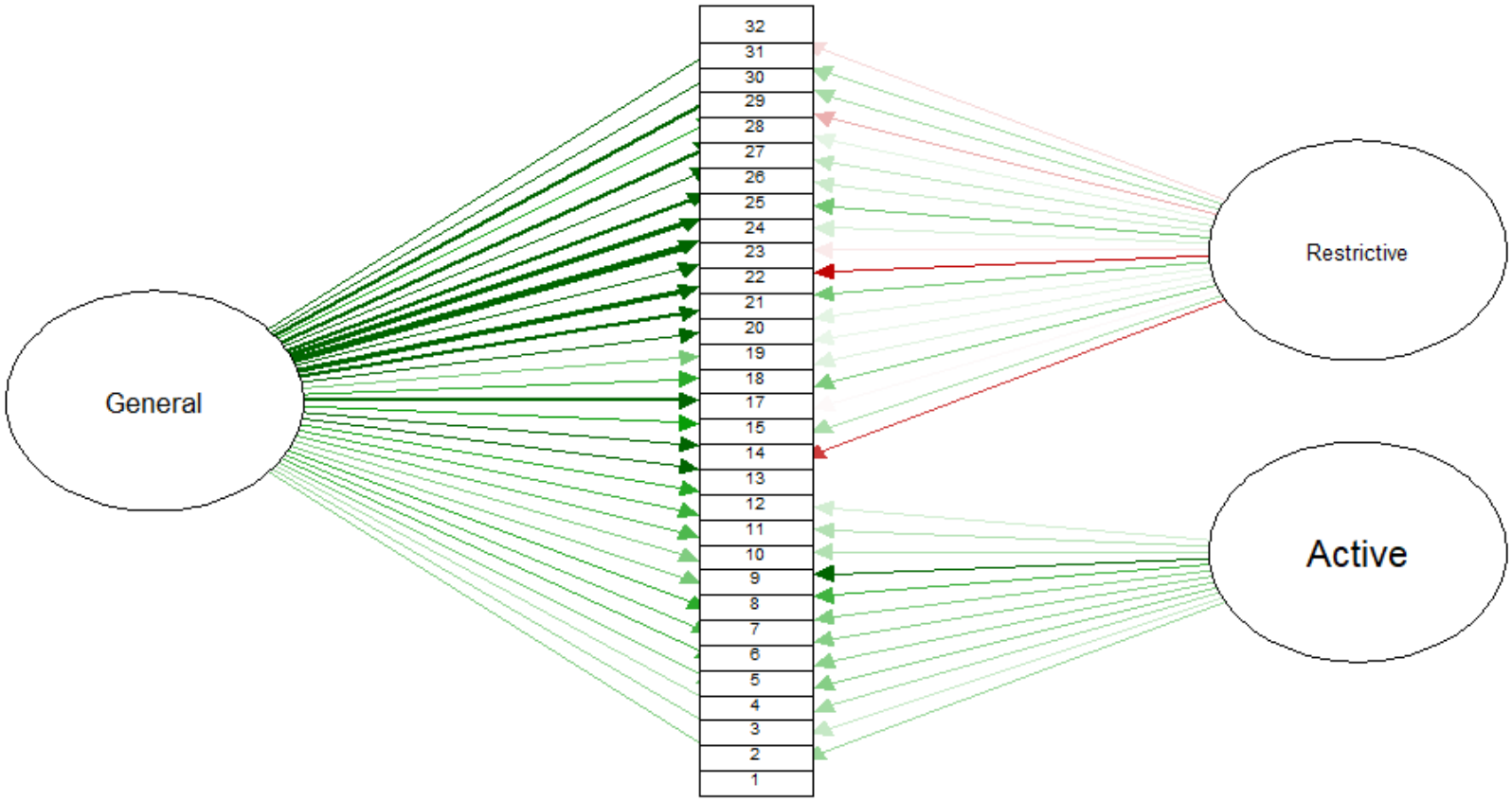
Hierarchical Regression Examining the Incremental Validity of Restrictive SAFE Subscores in Predicting Adolescent Social Skills (n = 105)

Variable	ΔR^2	***B(SeB)***	***β***
Step 1	0.09**		
SAFE: **Active** Subscore		-0.02(0.007)	-.30**
Step 2	0.11***		
SAFE: **Active** Subscore		0.01 (0.01)	0.13
SAFE: **Restrictive** Subscore		-0.05 (0.01)	-0.55***

Note. **SAFE =** Subtle Avoidance Frequency Examination; *$p < .05$; ** $p < .01$; ***$p < .001$.

Figure

Figure 1: Path diagram depicting the relationships between the proposed latent factors and the manifest variables of the SAFE items.



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