Social Anxiety Scale for Adolescents and School Anxiety Inventory: Psychometric

properties in French adolescents

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Abstract

School and social anxiety are common problems and have a significant impact on youths'

development. Nevertheless, the questionnaires to assess these anxious symptoms in French

adolescents have limitations. The aim of this study is to provide a French version of the

Social Anxiety Scale for Adolescents (SAS-A) and the School Anxiety Inventory (SAI),

analysing their psychometric properties by the factor structure, internal consistency, and

convergent validity. The SAS-A and the SAI were collectively administered in a sample of

1,011 French adolescents (48.5% boys) ranging in age from 11 to 18 years. Confirmatory

factor analyses replicated the previously identified correlated three-factor structure of the

SAS-A and the correlated four-factor structure of the SAI. Acceptable internal consistency

indexes were found for SAS-A and SAI scores. Correlations supported the convergent

validity of the questionnaires' subscales. Overall, results supported the internal consistency

and validity of the French versions of the SAS-A and SAI.

Keywords: social anxiety, school anxiety, self-report, France, adolescence

During childhood, and especially during adolescence, youth often have fears in specific situations [1]. In some cases, moderately intense fears can be adaptive by providing a stimulus to act in new or important situations, thereby increasing youths' likelihood of success. In fact, for most youth, common fears are transient and do not hinder their personal, social, and academic functioning; however, in some children and adolescents, fear is so intense and excessive that it can be impossible to function appropriately in the presence of the feared situations [1]. Some of the most commonly feared or anxiety-provoking situations among youth are those relating to social interactions (e.g., social anxiety) or school attendance (e.g., school anxiety) [2, 3, 4, 5].

Specifically, social anxiety is defined as an intense and persistent fear of one or more social situations in which the person is exposed to unfamiliar people or to possible scrutiny by others [6]. Conversely, school anxiety is defined as the response pattern, which includes unpleasant thoughts and apprehension, high level of arousal, and avoidance and/or escape behaviour, that is elicited by stressful school environment (e.g., speaking to the class, being bullied or rejected by peers, answering questions of the teacher) that the student perceives as threatening and/or dangerous [7]. These anxiety problems appear to be quite prevalent in child-adolescent population (12% social anxiety) [3] (5% school anxiety) [8], usually beginning in late childhood or early adolescence, with a chronic course when it is not treated that significantly interferes with youths' personal, social, and academic functioning [1, 9]. Most studies have found higher levels of social anxiety among women [10, 11]. With respect to age differences, the results are less conclusive. Thus, some studies have found that levels of social anxiety increase with age [12, 13], other studies have not found statistically significant differences with respect to the age of the students [14]. The

disparity of previous results related to differences in social anxiety among adolescents could be attributed both to the use of different samples (clinical vs. community), and to the use of global measures, without specifically addressing the factors or components of social anxiety. With respect to sex and age differences in school anxiety, multiple investigations have found that adolescent girls suffer greater school anxiety than boys [15, 16, 17, 18], arguing that the prevalence of school anxiety in women could be explained, among other factors, because they are more likely to show their emotions, due to the education received and the social stereotypes [19]. With respect to age, previous empirical evidence has also revealed that school anxiety levels substantially increase during the age of 11 or 12 years old, which can be explained by the higher educational demands of higher levels [17, 20].

Self-report measures are an important and common method for assessing social anxiety [21] and school anxiety [22] given the subjective and internalized nature of anxiety. In this regard, the Social Anxiety Scale for Adolescents (SAS-A) [22] and the School Anxiety Inventory (SAI) [23], are self-report measures that assess the frequency of adolescents' anxiety-related thoughts and behaviours in responses to social and school situations, respectively.

The SAS-A [22, 24] is a well-developed, widely used and empirically-supported measure of social anxiety in adolescence. In addition, the SAI [23] is a questionnaire recently designed to assess cognitive, physiological, and behavioural symptoms of anxiety in school situations.

School anxiety and social anxiety are constructs closely related [25, 26]. Students with school anxiety or social anxiety usually also show anxiety in social situations inside the classroom. Thus, SAI includes items about social feared situations in the school

environment (i.e. speaking to the class, reading aloud) and SAS-A includes items about social interactions with teacher and schoolmates (i.e. giving the opinion in a debate, beliefs about critiques of the classmates).

Social anxiety and school anxiety involve serious repercussions for the personal, social, emotional and academic adjustment of the student [1, 9]. Thus, early identification and intervention of the problematic are especially relevant to improve social and school functioning and preventing other possible psychological disorders [27]. Thus, it is necessary to prepare valid and reliable self-reports that allow detecting these students with the appropriate psychometric guarantees. An early identification will allow mitigating its consequences and establishing intervention programs adjusted to the needs of the students. The French validation of the SAS-A and the SAI will provide adequate instruments for professionals to detect social anxiety and school anxiety in French adolescents. Although there are other questionnaires for the evaluation of social anxiety in the French adolescent population, these do not generally reflect the wide range of social anxiety symptoms included in SAS-A. Also, there are currently no self-reports that assess school anxiety in French population, so the validation of the SAI would be the first validated measure in this population for the evaluation of this construct. With the added advantage that the SAI is one of the few self-reports that collects the most feared situations by students in the school setting and also provides information on the three school anxiety response systems (cognitive, psysiological and behavioral anxiety).

Thereby, the purpose of this study was to adapt theses questionnaires into French and then examine the internal consistency and validity of French adolescents' scores on the SAS-A and SAI.

Previous Psychometric Support for the SAS-A

The conceptual basis of the SAS-A [22, 24, 28] was originated from a model of social anxiety derived from studies of adults [29, 30] that identified two components of social anxiety: Social Evaluative Anxiety, and Social Avoidance and Distress. Initially, factor analytic studies of American adolescents [22] provided further differentiation of the conceptual model of social anxiety. Specifically, three factors were identified: Fear of Negative Evaluation (FNE), Social Avoidance and Distress in New Situations (SAD-N), and Social Avoidance and Distress-General (SAD-G). This three-factor model has been replicated by the authors [24] and other researchers in samples of American adolescents [24, 31, 32], Spanish adolescents [33, 34, 35], Turkish adolescents [36], Chinese adolescents [37] and Finnish adolescents [38] using confirmatory factor analysis.

Accumulated evidence has shown that the three subscales of the SAS-A have adequate internal consistency (Cronbach's alpha of .75 or higher) and test-retest reliability ($r > .55$) for a 2-month [11] and 12-month interval [32]. Similar reliability indexes were found for adolescents in different countries (e.g., Spain, China, Portugal, and Finland).

Additional support for the validity of the SAS-A scores comes from its associations with other variables such as social anxiety, interpersonal anxiety, and social functioning (i.e., convergent and discriminant validity, and test-criterion relationships) in different samples of adolescents [22, 25, 31, 33, 37, 38].

Previous Psychometric Support for the SAI

The conceptual basis of the SAI was originated from Lang's three-dimensional theory of anxiety [39, 40] which establishes that anxiety is manifested as a triple response system (cognitive, physiological, and behavioural), and the person-situation interaction

model of anxiety proposed by Endler [41], which considers that any anxiety reaction

depends on the interaction between the subject's anxiety trait and the characteristics of the

stressful situation.

Considering this theoretical basis, García-Fernández et al. [23] developed the SAI

with 23 school situations and 19 anxiety responses, which were combined to create 200

items or blank cells (see García-Fernández et al. [23], for details about development

process of the SAI), and administered the SAI to Spanish secondary education students (12

to 18 years). Four principal axis factoring (PAF) analyses were conducted, one

corresponding to school situations and one for each of the three components of the response

system of school anxiety. The PAFs of the "school situation" items identified four factors:

Anxiety about Academic Failure and Punishment, Anxiety about Aggression, Anxiety

about Social Evaluation, and Anxiety about Academic Evaluation. The PAFs applied for

each "response system" (i.e., cognitive, behavioural, and physiological) identified three

factors: Cognitive Anxiety, Physiological Anxiety, and Behavioural Anxiety. The four

factors of the "school situation" and the three factors of "response system" are on different

hierarchized level. Confirmatory factor analyses revealed good fit indexes for the correlated

four-factor model of school situations (situational dimensions) and for the three models of

each response system.

Since its initial development [23], the SAI has been adapted into several languages,

including Slovenian [42], Mandarin-Chinese, Portuguese, and Chilean-Spanish [43].

There is also support for the convergent validity of the SAI [23]. Findings revealed

positive and statistically significant correlations between the SAI and the State-Trait

Anxiety Inventory. Two recent studies found that SAI subscales correlated positive and

moderately with assertiveness, heterosexual relationships, and public speaking subscales

scores of the Questionnaire about Interpersonal Difficulties for Adolescents, whereas the

correlations of SAI subscales with close friends and family difficulties were small [25, 42].

In addition, the correlations between school factors of SAI were higher for emotional

symptoms of social anxiety such as apprehension and fear of negative evaluation than for

behavioural manifestations of anxiety such as tension and social inhibition [42].

Regarding the reliability of the SAI, Cronbach's alpha coefficients reported by

García-Fernández et al. [23] were reasonable, ranging from .82 (Behavioural Anxiety) to

.93 (Anxiety about Social Evaluation) for the four situation subscales and the three

response subscales. Furthermore, test-retest reliability over a 2-week period was also

adequate for all the SAI scores ($r's$ = .74-.84).

The Present Study

Although school and social anxiety are common in adolescent populations and have

a significant impact on youths' personal, social, and academic development, there are no

questionnaires to assess the symptoms of school anxiety in French adolescents, and existing

measures of social anxiety that are available in French [44, 45, 46, 47], these do not

generally reflect the wide range of social anxiety symptoms included in SAS-A (e.g. fear of

negative evaluation, distress, escape and avoidance behaviours)". Given the importance of

having psychometrically sound measures to assess social anxiety and school anxiety for

identifying adolescents with similar impairments in feared social or school situations, the

purpose of this study was to adapt theses questionnaires into French and then examine the

internal consistency, validity and gender and age differences of French adolescents' scores

on the SAS-A and SAI.

Based on previous findings [10, 14, 17, 23, 27, 42], the following main goals were tested:

1. First, the correlated three-factor structure and subscale internal consistency found by La Greca [27] will fit with the data of the French version of the SAS-A.

2. Second, the factor structure and internal consistency of the French version of the SAI will replicate the correlated four-factor structure of school situations and three independent factors of response system and internal consistency indexes found by García-Fernández et al. [23].

3. Third, scores on the three subscales of the SAS-A and the seven subscales of the SAI (four school situations and three response system) will significantly and positively correlate with each other. However, according to previous studies [42] it is expected that the links with SAI subscales will be higher for emotional symptoms of social anxiety (i.e. apprehension and fear of negative evaluation) than for manifestations of anxiety as tension and social inhibition.

4. Finally, it is expected that girls will show higher scores on social anxiety and school anxiety. In addition, it is expected that the youngest students will manifest higher scores on school anxiety. However, based on previous empirical evidence in the community population [14], it is expected that there will not be differences in social anxiety depending on the age groups.

Method

Participants

The initial sample consisted of 1.124 high school students from 11 to 18 years of age. Of this total, 74 (6.6%) students were excluded because their parents did not provide

informed written consent, 24 (2.1%) were excluded because they were foreign nationals with major gaps in their knowledge of the French language, and 15 (1.3%) were excluded because their answers were incomplete.

The final sample was comprised of 1.011 students (48.5% boys) with a mean age of 14.55 years (SD = 1.86; range =11-18 years). Of the participants, 32.2% were between 11 and 13 years of age (16.3% boys and 15.9% girls), 33.8% were between 14 and 15 years of age (16.7% boys and 17.1% girls), and 34% were between 16 and 18 years of age (16.5% boys and 17.4% girls). A chi-square test evaluated gender and age differences in the distribution of adolescents, finding no significant differences for the eight Age by Gender groups (X^2 = 9.141, df = 8, p = 0.331).

The study took place in southern France, in the Haute-Garonne Department (i.e., a regional division of France). The Haute-Garonne Department served 132.127 students of *collège* secondary education (Grades 6-9) in 115 middle schools, and 68.096 students of *lycée* secondary education (Grades 10-12) in 44 high schools [48]. Two-stage random sampling was conducted. In the first stage, four public secondary schools were randomly selected in Toulouse city and three neighbouring municipalities to represent the department. Once the schools were selected, in the second stage of sampling, nine classes were randomly selected from each school. Due to the random sampling method, the socioeconomic status and ethnic compositions of the overall sample are assumed to be representative of the community in terms of key variables (e.g. ethnicity, academic performance, etc.).

Measures

The French translations of the Social Anxiety Scale for Adolescents (SAS-A) and

the School Anxiety Inventory (SAI) were conducted using the back-translation method
[49]. First, the original Spanish version of SAI and the original English version of SAS-A
were translated into French by two French interpreters having a university degree in the
Spanish and English languages and knowledge of the Spanish and English cultures,
respectively. Once completed, the French translation was back translated into Spanish and
English by two native French translators with a degree in Spanish and English and
knowledge of both cultures. The original version of the questionnaires was then compared
with the back translation, and translators made corrections to the final French translation.
No items were eliminated or significantly changed during the translation process.

Social Anxiety Scale for Adolescents (SAS-A) [22, 27]. The SAS-A is a self-report
questionnaire that measures social avoidance, fears and worries in social situations among
adolescents. It contains 18 items that are self-statements and four filler items (e.g., "I like to
play sports") that are not accounted for the evaluation. Items are rated on a five-point scale
(1 = *not at all* to 5 = *all of the time*). The SAS-A includes three subscales: Fear of Negative
Evaluation (FNE) consists of eight items that assess fears, concerns, or worries regarding
peers' negative evaluations (e.g., I'm afraid that others will not like me"); Social Avoidance
and Distress in New Situations (SAD-N) consists of six items that assess social avoidance
and distress in new social situations or with unfamiliar peers (e.g., "I feel nervous when I'm
around certain people"); and Social Avoidance and Distress-General (SAD-G) consists of
four items that assess general social inhibition, distress, and discomfort (e.g., "It's hard for
me to ask others to do things with me"). Items from each subscale are summed such that
higher scores reflect great levels of social anxiety. The French translations are available
from the first author upon request.

School Anxiety Inventory (SAI) [23]. The SAI is designed to assess the situations

and responses of school anxiety for adolescents. The SAI includes 23 school situations and

19 anxiety responses (nine cognitive, five physiological, and five behavioural). The

inventory assesses the frequency in which students experience cognitive, physiological and

behavioral anxiety responses in certain school situations. The student must answer through

a two-way table format, where the horizontal axis includes school situations and the vertical

axis includes cognitive, behavioural and physiological responses. Therefore, the adolescent

must read a school situation on the horizontal axis (e.g. "If the teacher asks me a question")

and the answer corresponding to the cognitive (e.g. I'm frightened of making a mistake),

physiological (e.g. "My heart beats quickly"), or behavioural (e.g. "I cannot find words to

say what I want") response on the vertical axis. After that, they must write the frequency of

emission of the response to the situation in the box corresponding to the intersection of the

situation and the response. Only the blank cells in each table must be completed, as a result,

some boxes that should not be answered for that item are shaded in black. Items are

answered on a Likert scale (0 = *never* to 4 = *always*). The SAI includes four school

situational factors and three response system factors. The situational factors are: Anxiety

about Academic Failure and Punishment (AAFP; eight items), which describes situations of

school failure and punishment (e.g., "Being sent to the head teacher"); Anxiety about

Aggression (AA; six items), which describes situations of anxiety derived from suffering

physical or verbal aggression by peers (e.g., "Being insulted or threatened"); Anxiety about

Social Evaluation (ASE; five items), which describes social fears related to public speaking

(e.g., "Speaking to the class"); and Anxiety about Academic Evaluation (AAE; four items),

which describes situations where academic competence is assessed (e.g., "Taking a written

exam"). The response system factors are: Cognitive Anxiety (CA; nine items), which assesses thoughts, feelings, etc., about different school situations (e.g., "I am afraid of making mistakes"); Behavioural Anxiety (BA; five items), which assesses observable behaviours (e.g., "My voice trembles"); and Physiological Anxiety (PA; five items), which assesses physiological reactions in school situations (e.g., "I get nauseous"). The French translations are available from the first author upon request.

Procedure

Adolescents answered questionnaires collectively and anonymously in the classroom, after obtaining the Ethics Committee approval of the Education Authority of French Regional Government and the informed consent from parents. Research assistants informed the adolescents that their participation was strictly voluntary and anonymous. The questionnaires were distributed with instructions and answer sheets, which were subsequently scored by computer. The instructions were read aloud and the importance of answering each question was emphasised. Research assistants supervised each administration, answered questions, and verified that respondents completed the questionnaires independently. The average administration times were 10 (SAS-A) and 20 minutes (SAI).

Data Analyses

The data analytic plan was as follows. First, according to experts on factor analysis [50], the total sample ($N = 1.011$) was randomly divided in two subsamples: subsample 1: ($n1 = 524$; 254 boys and 270 girls) and subsample 2 ($n2 = 487$; 250 boys and 237 girls) to carry out exploratory factor analysis (EFA) before confirmatory factor analysis (CFA).

Second, in order to determine the number of factors, research showed that the Kaiser criterion for eigenvalues greater than 1 can either underestimate or overestimate the appropriate number of factors [51]. The scree test has been strongly promoted alternative rule of thumb [52]. However, the reliability of scree plot interpretation is low, even among experts [53]. Vellicer, Eaton & Fava [54] after revising 6 component analysis (Known a priori, Bartlett's test, Scree test, Percent Variance, Kaiser Rule, Parallel analysis and MAP), recommend only the use of the two last (Parallel analysis and MAP test). For calculating these tests was used the syntaxes for SPSS written by O'Connor [55]. A principal axis factoring (PAF) with promax rotation (Kaiser criterion) was conducted on the first subsample because of the assumption of correlated factors [50]. Only items with a loading of .30 or higher were deemed important and used when interpreting the extracted factors [51].

Third, CFA (robust maximum likelihood) was conducted to test the factor structure of the SAS-A and SAI. It was used Satorra–Bentler chi-square (SBX^2), which is a scaling method recommended for non-normal multivariate data. Ideally, a non-significant SBX^2 statistic represents a good fit. However, because the chi-square statistic is sensitive to sample size, additional fit indexes were examined: Standardised Root Mean Square Residual (SRMR), robust Comparative Fit Index (CFI), robuts Root Mean Square Error of Approximation (RMSEA), Tucker–Lewis Index (TLI). A good fit is indicated by CFI and TLI values greater than .90 or close to .95, and SRMR values less than .08. Also, a RMSEA value less than .06 indicates a good fit [52]. In addition, Akaike's information criterion (AIC) was analyzed for model selection, being usually selected the model with the lowest index.

Fourth, internal consistencies for the SAS-A and SAI subscale scores were computed using Cronbach's alpha. Hunsley & Marsh [53] established the following cut-offs for the alpha values: Adequate =.70 to .79; Good =.80 to .89; and Excellent = greater than .90.

Fifth, bearing in mind the presence of severe non-normality in the distribution of scores on the SAS-A ans SAI, the convergent validity of subscale scores on the questionnaires was examined by Spearman Rho correlation coefficients. A correlation coefficient between .10 and .29 represents a relationship of small magnitude, and correlation coefficients between .30 and .49, and >.50 are considered relationships of moderate and high magnitude, respectively [54].

Finally, to evaluate gender and age difference in SAS-A and SAI and its domains, Gender by Age groups (2x3) ANOVAs were performed across the scale scores. The Scheffe method was chosen because this test does not require the sample sizes to be the same. Similarly, the effect size d [54] was used to calculate the magnitude of the observed differences. Its interpretation is simple: small effect size ($0.20 \leq d \leq 0.49$), moderate ($0.50 \leq d \leq 0.79$), and large ($d \geq 0.80$).

Results

Validity and Internal Consistency of the SAS-A

Principal Axis Factoring: Subsample 1

MAP test indicated that 3 factors should be retained. Parallel analysis showed that only the first three eigenvalues form the actual data are larger than the corresponding first three 95th percentile (and mean) random data eigenvalue. This indicates that three factor

should be retained. The factor solution was composed of 18 items grouped into three

factors which were also obtained by La Greca [27] that accounted for 52.78 % of the

variance. Factor 1, FNE (eigenvalue = 6.62), accounted for 36.78% of the variance and

included 8 items about fears, concerns, or worries regarding peers' negative evaluations.

Factor loading ranged from .53 to .78 (M = .69). Factor 2, SAD-N (eigenvalue = 1.729),

accounted for 9.62 % of the variance and was composed of 6 items that assess social

avoidance and distress in new social situations or with unfamiliar peers. Factor loadings

ranged from .53 to .79 (M = .67). Factor 3, SAD-G (eigenvalue = 1.15), accounted for 6.39

% of the variance and comprised 4 items referring to general social inhibition, distress, and

discomfort. Factor loading ranged from .45 to .60 (M = .53). The correlations between

factors of the SAS-A were statistically significant ($p < .001$) and moderate for SAS-N-

SAS-G (.39), for FNE-SAD-N (.45), and FNE-SAD-G (.46) [54].

Confirmatory factor analyses: Subsample 2

Five models were tested to examine the internal structure of the SAS-A: the null

model (Model 0), which assumes the maximum independence among items (i.e., the model

without a factor structure); the one-factor model (Model 1), which assumes that all items

will load on one factor (i.e., social anxiety); the two-factor model (Model 2), which

assumes that items will load on two factors (i.e., social avoidance and distress, and fear of

negative evaluation); the non-correlated three-factor model (Model 3); and the correlated

three-factor model (Model 4), which is based on the results of La Greca and Lopez [22] and

La Greca [27].

The Model 4 presented reasonable values in all indexes (see Table 1). The SBχ^2 modified revealed that Model 3 represented a statistically significant improvement over the Model 2 (SBX^2 (1) = 334.48; $p < .001$), and that Model 4 represented a statistically significant improvement over the Model 3 (SBX^2 (19) = 272.41; $p < .001$).

Table 1 about here

Figure 1 presents the alpha coefficients, the correlation between factors, and factor loadings for the latent variables of the correlated three-factor structure of the SAS-A. The total SAS-A scale had a good alpha coefficient (.82) All the factor loadings for latent variables assessed by confirmatory factor analysis were acceptable (>.34). In addition, all correlations between factors of the SAS-A were statistically significant ($p < .01$). The general intercorrelation mean between factors was .70.

Figure 1 about here

Mean scores and standard deviations were as follows: SAS-A total (range: 18-95; M = 43.20; SD = 12.01), FNE (range: 8-63; M = 20.27; SD = 7.03), SAD-G (range: 4-18; M = 7.31; SD = 2.72) and SAD-N (range: 6-30; M = 15.63; SD = 4.62).

Validity and Internal Consistency of the SAI

Principal Axis Factoring: Subsample 1

MAP test and Parallel Analysis recommended retaining 4 components. The factor solution for school situations was composed of 23 items grouped into four factors which were also obtained by García-Fernández et al. [23] that accounted for 73% of the variance. Factor 1, AAFP (eigenvalue = 12.62, accounted for 54.32% of the variance and included 8 items about situations of school failure and punishment. Factor loading ranged from .75 to

.84 (M = .78). Factor 2, AA (eigenvalue = 2.00), accounted for 8.64% of the variance and was composed of 6 items about situations of anxiety derived from suffering physical or verbal aggression by peers. Factor loadings ranged from .74 to .92 (M = .85). Factor 3, ASE (eigenvalue = 1.38), accounted for 5.86% of the variance and comprised 5 items referring to social fears related to public speaking. Factor loading ranged from .80 to .91 (M = .86). Factor 4, AAE which describes (eigenvalue = 1.02), accounted for 3.98% of the variance and was composed of 4 items about situations where academic competence is assessed. Factor loading ranged from .67 to .89 (M = .81). The correlations between factors of the SAI were statistically significant (p < .001) for AAPF-AA (.62), AAPF-ASE (.64), AAPF-AAE (.58), AA-ASE (.50), AA-AAE (.68), ASE-AAE (.56).

The factor solution for three response system was as follows. Regarding cognitive response, factor analysis identified a factor, Cognitive Anxiety (eigenvalue = 4.85), 65.84% explained of the total variance. This factor consists of 9 items that indicate thoughts and feelings about the different school situations. The factor loadings ranged between .65 and .89 (M = .75). Regarding the psychophysiological response, factorial solution also was constituted by a factor, Physiological Anxiety (eigenvalue = 3.58), which accounted for 66.76% of the total variance. This factor consists of 5 items that assess the activation of the nervous system to the school situations. The factor loadings ranged between .68 and .89 (M = .79). Finally, as for the behavioural response, the factor solution was constituted by a factor called Behavioural Anxiety (eigenvalue = 3.62), which accounted for 57.83% of the variance and consists of 5 items that assess observable behavioural aspects to school environments. The factor loadings ranged between .31 and .86 (M = .71).

Confirmatory factor analyses: Subsample 2

Four models examined the internal structure of the SAI: the null model (Model 0), which assumes the maximum independence among items (i.e., the model without a factor structure); the one-factor model (Model 1), which assumes that all items will load in one factor (i.e., school anxiety); the non-correlated four-factor model (Model 2); and the correlated four-factor model (Model 3), which is based on the results of García-Fernández et al. [23] (see Table 2).

<div align="center">Table 2 about here</div>

CFA supported the correlated four-factor model. Thus, the overall fit was reasonable, and the values for the fit indexes were adequate (see Table 2). Furthermore, Model 2 represented a statistically significant improvement over Model 1 (SBX^2 (4) = 78.39; $p < .001$), and Model 3 represented a statistically significant improvement over Model 2 (SBX^2 (10) = 16805; $p < .001$).

Figure 2 presents the alpha coefficients, the correlation between factors, and factor loadings for the latent variables of the correlated four-factor structure of the SAI. All the factor loadings for latent variables assessed by confirmatory factor analysis were acceptable (> .55). All the correlations between the situational dimensions of the SAI (four school situational factors) were high (> .50) [54]. The average intercorrelation between the situational factors of the SAI was .65.

<div align="center">Figure 2 about here</div>

The overall fit of the response systems of anxiety models measured on the SAI were adequate, with appropriate values for all indexes (see Table 3). The 5 items of the Physiological Anxiety factor had loadings from .44 to .85 ($M = .70$), the 9 items of the Cognitive Anxiety factor had loadings from .50 to .88 ($M = .67$), and the 5 items of the

Behavioural Anxiety factor had loadings from .41 to .76 ($M = .61$). The Cronbach's alpha

coefficients were as follows: .74 (Physiological Anxiety), .87 (Cognitive Anxiety), .83

(Behavioural Anxiety), and .95 (SAI-total).

Table 3 about here

Convergent Validity of the SAS-A and SAI

First, all SAS-A scores and SAI scores positively and significantly correlated ($p <$

.001) (see Table 4). The associations between the SAS-A scores and the SAI scores were of

different ranges. Strong relations were obtained for the total SAS-A with total SAI, Anxiety

about Social Evaluation (ASE), Anxiety about Aggression (AA), Cognitive Anxiety (CA)

and Physiological Anxiety (PA) subscales. Moderate correlations were found between

SAD-N and FNE subscales of the SAS-A and all subscales on the SAI, whereas the

associations were low between SAD-G subscale and anxiety about academic failure and

punishment (AAFP) and anxiety about academic evaluation (AEE) on the SAI. Together,

these data provide evidence for the convergent validity of the SAS-A and SAI scores.

Table 4 about here

Sex and age differences in SAS-A and SAI

To evaluate gender and age difference in SAS-A and SAI and its domains, Gender by Age

groups (2x3) ANOVAs were performed across the scale scores. The magnitude of the

differences was analyzed and different effect sizes (Scheffe) for these differences were

obtained. Girls achieved higher mean in all the subscales and in the total score of the SAS-

A in comparison with boys, being these differences statistically significant in the factor

FNE, SAD-N and in the total score of SAS-A. The effect sizes of these differences were

moderate ($d = .44$, $d = .33$ and $d = .41$, respectively). No statistically significant differences were found in the SAD-G factor with respect to sex. In the same line, regarding school anxiety, girls obtained significantly higher means than boys in all the factors of the SAI. The effect sizes of these differences were small for the AAFP factor ($d = .36$) and for the BA factor ($d = .49$) and moderate for the AA factor ($d = .57$), ASE ($d = .52$) , AAE ($d = .57$), CA ($d = .51$) and PA ($d = .51$) (see Table 5).

Table 5 about here

With regard to SAS-A scores, no statistically significant differences were found according to age. In the SAI scale, statistically significant differences were found in the AAFP dimension between the group of 11-13 years and two more groups: the group of 14-15 years ($d = .19$) and the group of 16-18 years ($d = .21$). The sizes of these differences were small. Likewise, statistically significant differences were also found in the AAE scale between the group of 11-13 years and the group of 16-18 years ($d = .26$), although the effect size was also small (see Table 6).

Table 6 about here

Discussion

The purpose of this study was to examine the internal consistency and validity evidence for the French language versions of the SAS-A and SAI in a sample of French adolescents. The main results provide support for the psychometric properties and the internal consistency and validity of these two questionnaires in French adolescents.

Psychometric Properties of the French Version of SAS-A

In support of our first goal, and consistent with the results obtained by La Greca and colleagues [24] with samples of American adolescents as well by other investigators using samples of Spanish [33, 34, 35], Chinese [37], and Finnish [38] adolescents, our findings support a correlated three-factor structure for the SAS-A. Thus, applying a PAF with promax rotation, this study replicated the factor solution found by La Greca [27]. This solution comprised three factors that accounted for 52.78% of the variance. Furthermore, confirmatory factor analysis replicated the same correlated three-factor structure, with adequate fit indexes and lowest AIC value. We note that the high correlations among the SAS-A subscale scores ($M = .70$) suggest that although scales represent distinct aspects of social anxiety (evaluative fears, social distress and avoidance), they are strongly related, especially the SAD-G and SAD-N subscales.

Adequate internal consistency indexes were obtained for the French version of the SAS-A. According to the rating criteria proposed by Hunsley and Marsh [53], the internal consistency coefficients were acceptable for SAD-G and SAD-N subscales, and good for FNE subscale and total SAS-A score. These results were slightly lower than those obtained for the original SAS-A [22, 24, 27], the Spanish version [33], and Finnish version [38], but were higher than the internal consistency values found in the Chinese version [37]. In any case, as indicated for some researchers [55], it is important to remember that the alpha coefficient of a test depends as much on the homogeneity sample being tested as on the test. Considering that internal consistency estimates can significantly vary among different administrations of the same instrument, it cannot be trusted that published estimates of Cronbach's alpha apply in all situations. Thus, scores on the SAS-A seem to be sufficiently reliable to permit appropriate interpretations in French adolescents.

Psychometric Properties of the French Version of SAI

Consistent with our second goal, exploratory factor analyses replicated the factor solution found by original authors [23] and Slovenian researchers [42] for school situations and response systems of the SAI. The factorial solution for school situations comprised four factors that accounted for 73% of the variance. Furthermore, confirmatory factor analysis replicated the same correlated four-factor structure, with adequate fit indices and lowest AIC value. All correlations between the situational dimensions of the SAI were large (mean .65) [54], and similar to those obtained by García-Fernández et al. [23], providing additional evidence that the subscales represent interrelated but distinct aspect of school anxiety. We also found that the factors related to the three response systems of school anxiety (Cognitive Anxiety, Physiological Anxiety, and Behavioural Anxiety) had adequate values for all fit indexes. The inclusion of the three-response systems of anxiety proposed by Lang [39] in the SAI is relevant for the evaluation of school anxiety because it enables professionals to detect adolescents' school anxiety not only through feared situations, but also through other anxiety symptoms (cognitive, physiological, behavioural) that adolescents show. This feature will improve the design of interventions more suited to the needs of young people with school anxiety.

The internal consistencies were adequate for the SAI-total and all SAI subscales. Specifically, based on the cut-offs of Hunsley and Marsh [53], the internal consistencies were excellent for the Total SAI and the SAI subscales for Anxiety about Academic Failure and Punishment, Anxiety about Aggression, and Anxiety about Social Evaluation; good for SAI scores of Anxiety about Academic Evaluation, Cognitive Anxiety, and Behavioural Anxiety; and adequate for Physiological Anxiety. The obtained internal consistency

indexes were similar to the Spanish [23] and Slovene version of SAI [42], thus the second

goal of this study is supported.

Convergent Validity of French Version of SAS-A and SAI

Results of this study also supported our third goal regarding the convergent validity

of the SAS-A and the SAI. The SAS-A total and subscales were highly to moderately

correlated with anxiety in school situations (Anxiety about Social Evaluation, and Anxiety

about Aggression subscales) and anxiety responses (Behavioural Anxiety, Cognitive

Anxiety and Physiological Anxiety subscales), consistent with the notion that both the

SAS-A and the SAI measure perceived adolescent's anxiety in social and school situations,

respectively. Only two low correlations were found between SAD-G subscale (Anxiety and

Distress in General Social Situations) and Anxiety about Academic Failure and Punishment

and Anxiety about Academic Evaluation on the SAI. These results are consistent with

Puklek et al. [42], who found that the association between the school anxiety factors and

tension and social inhibition in social situations were lower than with the fear of negative

evaluation. These results suggest that adolescents with social anxiety often manifest

avoidance behaviours regarding school work, such as avoiding oral presentations, asking

the teacher questions, reading aloud, etc., therefore hampering their academic learning.

Such avoidance behaviours may lead to school maladjustment, such as truancy and school

avoidance (typical of school anxiety), which in turn can decrease the probability of

finishing compulsory education. However, despite the associations between the SAS-A and

SAI scores, results suggest that both measures have different nosological entities that

distinguish them in the feared situations and contexts, being anxiety about academic failure

and punishment and anxiety about academic evaluation more characteristic of school

anxiety than social anxiety.

Sex and age differences in SAS-A and SAI

With respect to sex and age differences, statistically significant differences were found in

the factors and total score of the SAS-A and in the factors of the SAI. Girls obtained

significantly higher mean scores than boys in both social anxiety and school anxiety. These

results are consistent with the majority of research in this regard [10, 11, 15, 16, 17, 18].

However, in general, no statistically significant differences were found between the age

groups. Only differences were found in the AAFP factor between the 11-13 year-old group

and two other groups, which are the 14-15 year-old group and the 16-18 year-old group.

Besides, in the AAE factor differences were found between the 11-13 year-old group and

the 16-18 year-old group. However, all these differences were of small magnitude. These

results are in line with those investigations that have not found differences in social anxiety

with respect to the age of the students [14], and also with those researches that have found a

higher degree of school anxiety at the age of 11-13 years [20, 17].

Despite these study's soundness, there are some limitations that should be addressed

in future research. Although the results support the internal consistency and convergent

validity of the SAS-A and SAI, it would be important to extend the reliability and validity

evidence of the instruments by, for example, evaluating the test-retest reliability, predictive

validity, and discriminant validity of the measures, and conduct multi-trait multi-level

analyses. Additionally, to accumulate further evidence on validity, it would be useful to

analyse the convergent validity (i.e. by means of the *Social Interaction Phobia Scale*, or the

Liebowitz Social Anxiety Scale), the influence of shared actor/modality variance, and the

measurement invariance and latent mean differences across age and gender groups in French adolescents. In addition, it would be recommendable to include teacher and parent's ratings to validate self-reports. Furthermore, the SAS-A and SAI scores should be analysed with respect to their ability to detect improvements in social functioning resulting from treatment programs. Despite these limitations, the results of the present study suggest that SAS-A and SAI are psychometrically sound measures for assessing social anxiety and school anxiety, respectively, in French adolescents and support the use of these instruments in the French-speaking adolescent population.

Summary

This study evaluated psychometric properties of the scores on the French version of the Social Anxiety Scale for Adolescents (SAS-A) and School Anxiety Inventory (SAI) in a large population sample of French adolescents, ranging in age from 11 to 18 years of age. The SAS-A is a well-developed, widely used and empirically-supported measure of social anxiety in adolescence, whereas the SAI is a questionnaire recently designed to assess cognitive, physiological, and behavioral symptoms of anxiety in school situations. Exploratory and confirmatory factor analyses conducted in the present study replicated the previously identified correlated three-factor structure of the SAS-A (Fear of Negative Evaluation, Social Avoidance and Distress-General, Social Avoidance and Distress in New Situations) and the correlated four-factor structure of the SAI (Anxiety about Academic Failure and Punishment, Anxiety about Aggression, Anxiety about Social Evaluation, and Anxiety about Academic Evaluation). The SAS-A and SAI yielded acceptable reliability scores for French adolescents. Correlations supported the convergent validity of the questionnaires' subscales. Overall, the results of the present study suggest

that SAS-A and SAI are psychometrically sound measures for assessing social anxiety and school anxiety, respectively, in French adolescents and support the use of these instruments in the French-speaking adolescent population.

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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Table 1. *Fit statistics for confirmatory factor models of SAS-A*

Model	X^2	*df*	*p*	AIC	SRMR	CFI	TLI	RMSEA
M0	2229.58	153	.000	2525.4	.405	.000	.000	.167(.161-.173)
M1	527.39	135	.000	460.15	.073	.811	.748	.077(.070-.077)
M2	336.04	134	.000	192.27	.060	.903	.861	.056(.048-.063)
M3	577.48	135	.000	307.49	.199	.787	.727	.087(.082-.091)
M4	265.02	131	.000	102.40	.054	.935	.898	.046(.038-.054)

Note. M0: Null Model; M1: One-factor Model; M2: Two-Factor model with correlated factors; M3: Three-Factor model with uncorrelated factors; M4: Three-Factor model with correlated factors.

Table 2. *Fit statistics for confirmatory factor models of SAI*

Model	X^2	df	p	AIC	SRMR	CFI	TLI	RMSEA
M0	7515.22	253	.000	8946.58	.477	.000	.000	.247(.242-.251)
M1	2380.08	230	.000	3462.96	.103	.704	.613	.141 (.135–.146)
M2	1808.91	226	.000	1689.87	.375	.78	.770	.121 (.115–.126)
M3	1736.88	220	.000	492.70	.065	.927	.911	.071 (.066–.077)

Note. M0: Null Model; M1: One-factor Model; M2: Four-Factor model with uncorrelated

factors; M3: Four-Factor model with correlated factors.

Table 3. *Fit statistics for confirmatory factor models for Cognitive Anxiety, Physiological Anxiety and Behavioural Anxiety of SAI*

Model	X^2	*df*	*p*	AIC	SRMR	CFI	TLI	RMSEA
Cognitive anxiety								
M0	2061.55	36	.000	2353.08	.450	.000	.000	.345 (.332-358)
M1	105.88	22	.000	81.41	.048	.960	.929	.090 (.073-.107)
Physiological anxiety								
M0	777.80	10	.000	1011.12	.430	.000	.000	.043 (.379-.427)
M1	9.79	4	.000	2.70	.016	.99	.984	.055 (.008-.100)
Behavioural anxiety								
M0	470.62	10	.000	450.61	.347	.000	.000	.312 (.288-.336)
M1	21.20	5	.000	11.19	.026	.980	.931	.080 (.036-.129)

Note. M0: Null Model; M1: One-factor Model.

Table 4. *Spearman Rho Correlations among SAS-A scales and SAI scales*

		SAS-A			
		FNE	SAD-N	SAD-G	Total SAS-A
SAI	AAFP	.36**	.37**	.27**	.42**
	AA	.46**	.43**	.32**	.51**
	ASE	.46**	.49**	.40**	.55**
	AAE	.40**	.39**	.27**	.44**
	CA	.46**	.44**	.34**	.52**
	PA	.46**	.46**	.34**	.53**
	BA	.41**	.40**	.33**	.47**
	Total SAI	.46**	.46**	.33*	.52**

Note. **correlations are significant at level .001; * correlations are significant at level .05;

FNE = Fear of Negative Evaluation, SAD-N = Social Avoidance and Distress in New

Situations, SAD-G = Social Avoidance and Distress in General, Total SAS-A = Social

Anxiety Scale for Adolescents, AAFP = Anxiety about Academic Failure and Punishment,

AA = Anxiety about Aggression, ASE = Anxiety about Social Evaluation, AAE = Anxiety

about Academic Evaluation, CA= Cognitive Anxiety, PA= Physiological Anxiety, BA=

Behavioural Anxiety, Total SAI = School Anxiety Inventory.

Table 5. *Sex differences in SAS-A and SAI*

SAS-A dimensions	Sex				Statistical significance	
	Boys		Girls			
	M	*SD*	*M*	*SD*	*F*	*p*
FNE	18.73	6.95	21.73	6.59	49.889	<.001
SAD-N	14.61	4.74	16.19	4.52	29.268	<.001
SAD-G	7.08	2.61	7.37	2.76	2.882	.090
Total SAS-A	40.42	11.95	45.28	11.74	42.716	<.001
SAI dimensions						
AAFP	13.15	7.24	15.76	7.12	33.356	<.001
AA	5.79	4.98	8.93	5.97	82.543	<.001
ASE	6.53	5.83	9.80	6.68	69.183	<.001
AAE	11.31	6.71	15.96	6.85	83.252	<.001
CA	66.80	40.66	88.43	43.81	66.441	<.001
BA	22.04	19.49	31.97	19.89	62.313	<.001
PA	36.02	28.29	51.11	30.62	66.491	<.001

Note. FNE = Fear of Negative Evaluation, SAD-N = Social Avoidance and Distress in New

Situations, SAD-G = Social Avoidance and Distress in General, Total SAS-A = Social

Anxiety Scale for Adolescents, AAFP = Anxiety about Academic Failure and Punishment,

AA = Anxiety about Aggression, ASE = Anxiety about Social Evaluation, AAE = Anxiety

about Academic Evaluation, CA= Cognitive Anxiety, PA= Physiological Anxiety, BA=

Behavioural Anxiety.

Table 6. *Age differences in SAS-A and SAI*

	Age						Statistical significance	
	11-13		14-15		16-18		*F*	*p*
SAS-A dimensions	*M*	*SD*	*M*	*SD*	*M*	*SD*		
FNE	20.52	7.64	20.26	7.01	19.95	6.14	0.562	.570
SAD-N	15.57	4.98	15.11	4.61	15.55	4.52	1.029	.358
SAD-G	7.40	2.64	7.18	2.74	7.06	2.65	1.450	.235
Total SAS-A	43.49	12.62	42.56	12.27	42.55	11.45	0.662	.516
SAI dimensions								
AAFP	15.51	8.10	13.99	7.14	13.99	6.52	4.794	.008
AA	7.47	6.46	7.08	5.42	7.57	5.27	0.690	.502
ASE	7.84	6.64	7.96	6.13	8.74	6.67	1.950	.143
AAE	12.37	7.59	13.26	6.88	14.18	6.58	5.601	.004
CA	76.77	47.13	74.67	43.33	81.83	40.15	2.437	.088
BA	28.38	22.71	25.46	19.19	27.15	18.82	1.754	.174
PA	45.65	33.51	41.13	29.83	44.18	27.70	1.934	.145

Note. FNE = Fear of Negative Evaluation, SAD-N = Social Avoidance and Distress in New

Situations, SAD-G = Social Avoidance and Distress in General, Total SAS-A = Social

Anxiety Scale for Adolescents, AAFP = Anxiety about Academic Failure and Punishment,

AA = Anxiety about Aggression, ASE = Anxiety about Social Evaluation, AAE = Anxiety

about Academic Evaluation, CA= Cognitive Anxiety, PA= Physiological Anxiety, BA=
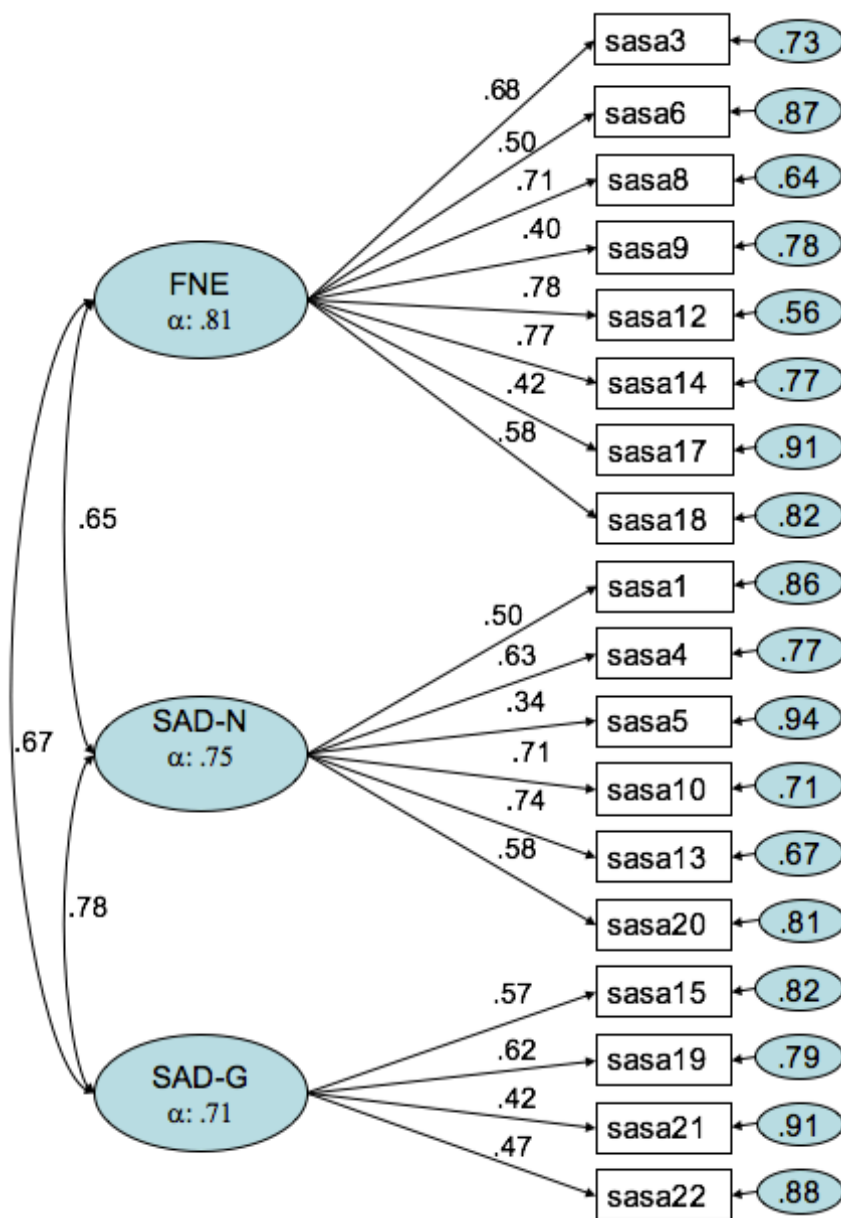
Behavioural Anxiety.

Figure 1. Coefficient alpha consistency, correlation between factors, and factor loadings of

the SAS-A. FNE = Fear of Negative Evaluation, SAD-N = Social Avoidance and Distress

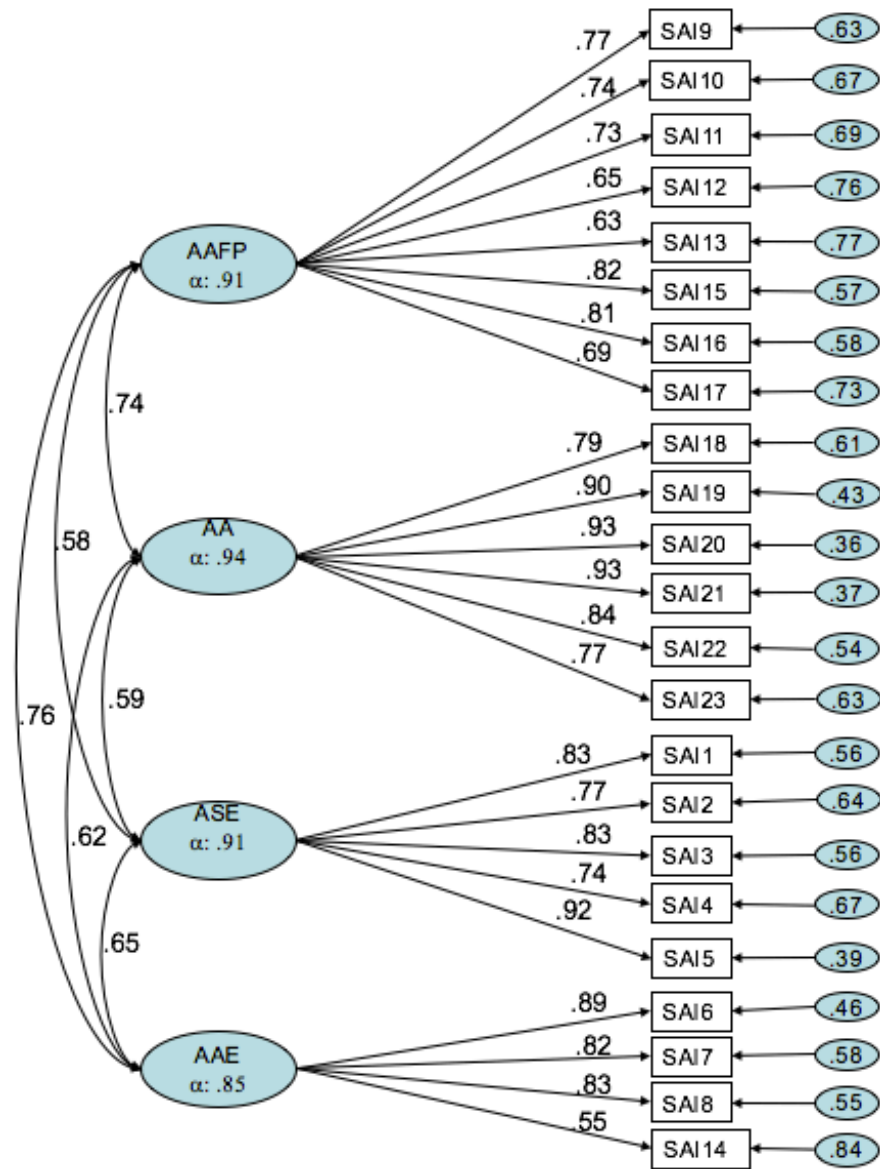in New Situations, SAD-G = Social Avoidance and Distress in General.

Figure 2. Coefficient alpha consistency, correlation between factors, and factor loadings of

the SAI. AAFP = Anxiety about Academic Failure and Punishment; AA = Anxiety about

Aggression); ASE = Anxiety about Social Evaluation; AAE = Anxiety about Academic

Evaluation.