Psychometric properties and measurement invariance of the Academic Procrastination Scale-Short Form (APS-S) in Spanish children and adolescents[1]

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Abstract

The objectives were to examine the factorial structure of the Academic Procrastination Scale-Short Form (APS-S; McCloskey, 2011; Yockey, 2016) and the measurement invariance across gender and educational levels, to determine possible differences in procrastination across gender, educational levels and grades. The sample was formed of 1486 Spanish primary and secondary school students between the ages of 7 and 19 years. A one-factor model provided an adequate fit. Scalar and partial scalar invariance were achieved through gender and educational levels, respectively. Internal consistency was good and slightly higher for secondary school students than primary school students. Moderate convergent validity was obtained. The APS-S scores showed a weak but significant correlation with math anxiety. Procrastination scores increased with grade, and males showed significantly higher procrastination scores than females. The Spanish APS-S demonstrated adequate reliability and validity scores, and could be a useful tool for examining academic procrastination in children and adolescents.

Keywords: Academic Procrastination Scale-Short Form, psychometrics properties, measurement invariance, children, adolescents.

Procrastination involves "voluntarily delay [of] an intended course of action despite expecting to be worse off for the delay" (Steel, 2007, p. 66). Although procrastination can occur in numerous areas, it has been studied mainly in the academic domain. In this domain, procrastination tends to refer to a student who has postponed, or fails to accomplish, academic tasks such as completing and submitting a paper, or studying for an exam. A high prevalence of procrastination has been reported among college students; this population typically shows prevalence rates higher than 50% (Steel, 2007). Past research suggested that procrastination may have negative consequences for people's mental and physical health, or their ability to achieve goals (Rozental & Carlbring, 2014).

In the academic domain, procrastination may also have a detrimental impact on academic performance, decreasing learning efficiency and thus leading to lower grades or engagement in cheating behaviors (Kim & Seo, 2015; Roig & DeTomasso, 1995; Ziegler & Opdenakker, 2018). Procrastination is also related to emotional and affective outcomes (e.g., Ferrari, 1991; Flett et al., 1995; Haycock et al., 1998; Solomon, & Rothblum, 1984). For instance, Fernie et al., (2016) found correlations between procrastination and depression, anxiety and stress ranging from .42 to .49. Some research has shown positive relationships of procrastination with statistical anxiety (e.g., Macher et al., 2012; Onwuegbuzie, 2004; Rodarte-Luna & Sherry, 2008) and math anxiety (e.g., Paechter et al., 2017) (r values ranging from .15 to .26). Milgram & Toubiana (1999) explained the relationship between anxiety and procrastination using the appraisal-anxiety-avoidance (AAA) model of procrastination. According to this view, perceived difficulty in accomplishing tasks or fear of failure generates anxiety that is alleviated by procrastination. This leads to a negative reinforcement cycle that perpetuates this avoidance behavior.

McCloskey (2011) developed the 25-item Academic Procrastination Scale (APS) to measure academic procrastination in general, as opposed to focusing on specific tasks. The psychometric properties of the APS were initially examined in a sample of 681 undergraduate college students from the United States; it showed high reliability (Cronbach $\alpha = .94$) and positive correlations (*r*s = .53 to .70) with other procrastination measures. Negative associations were found with the grade point average ($r = -.23$) and conscientiousness ($r = -.57$). A negative correlation with age was observed ($r = -.23$) and no gender differences were found. An exploratory factor analysis (EFA) favored a unidimensional structure for the APS. Given the relatively high number of items for a single factor, McCloskey proposed an abbreviated scale, the APS-S, from which redundant items were removed. This scale, which comprised five items, was subsequently investigated and validated by Yockey (2016) in a sample of 284 students from a university in the United States. The original one-factor solution was replicated with the short scale. Yockey reported an internal consistency, as measured by Cronbach's alpha, of .87. The APS-S showed moderate-high correlations with other procrastination scales, such as the Tuckman Scale (Tuckman, 1991) (r = .79) and PASS (Onwuegbuzie, 2004) (r = .54), comparable to those obtained with the original (full) scale. The higher correlation with the Tuckman Scale than the PASS may be due to the fact that the former measures procrastination in a general sense, while the PASS focuses on highly specific academic tasks (Yockey, 2016).

The fact that the APS-S measures procrastination in general, rather than focusing on specific tasks, makes it appropriate for assessing procrastination at different educational levels, where students may be required to perform a wide range of different tasks. Another important characteristic of the scale is its brevity; it consists of only five items. Short scales have several practical advantages (see Ziegler et al., 2014), and are recommended for longitudinal research, large-scale Internet studies and studies including a considerable number of measures (Sandy et al., 2017). In addition, as described above, the APS-S has demonstrated good psychometric properties, including both reliability and convergent validity, making it an ideal candidate for rapid screening of procrastination but the psychometric properties of the APS-S have not been studied in children and adolescents.

Regarding age differences in procrastination, the majority of the extant research on academic procrastination has involved college students, with only a few studies focusing on secondary school education and even fewer on primary education. Results for adults indicate that younger people tend to procrastinate more than older adults. In a meta-analysis based mainly on samples of college students, Van Eerde (2003) found a negative relationship between age and procrastination. A meta-analysis carried out by Steel (2007) showed a similar result. This negative relationship suggests that individuals learn to deal with procrastination as they age (O'Donoghue & Rabin, 1999; Steel, 2007). Katz et al. (2014) argued that it is reasonable to assume that procrastination evolves over the years in the educational context.

However, little is known about procrastination during the primary and secondary school years (Kim & Seo, 2015), or about the mechanisms that explain the phenomenon in younger age groups, where they may be different from those in adulthood. For example, younger children have a lower capacity for self-control, so that task completion (e.g., homework) is controlled to a greater extent by parents. Thus, findings in adults might not be applicable to primary and secondary school students. Therefore, it is important to study academic procrastination in children of different ages to examine the potential differences in this behavior across educational levels. Furthermore, it is important to consider the early stages of education, because some behaviors manifesting in adulthood can appear and become entrenched during this period.

Research on gender differences in procrastination has been inconclusive. Some studies with adults have reported that men are more prone to procrastination than women (Gröpel & Steel, 2008; Özer et al., 2009; Steel & Ferrari, 2013). However, other research found no gender differences in procrastination (Balkis et al., 2017; Effert & Ferrari, 1989; Ferrari, 1991; Hess et al., 2000; Klibert et al., 2011; Klibert et al., 2016; Onwuegbuzie, 2004; Şirin, 2011). A similar pattern has been observed in younger age groups. For example, Klassen & Kuzucu (2009) reported no gender differences in procrastination among high school students. Given these inconclusive results and the scarcity of data on children, additional research exploring possible gender differences in procrastination among educational levels is needed.

Before examining an instrument in terms of possible differences by educational level or gender, it must be demonstrated that the construct of interest can be compared in a meaningful way across groups. Establishing measurement invariance is important to confirm that participants in different groups interpret the questions and underlying factor/s in the same manner (Van de Schoot et al., 2012). A concept closely related to measurement invariance is differential item functioning (DIF). DIF is present when the relationship that an item has with the underlying construct (e.g., procrastination) is affected by group membership (e.g., gender). Thus, DIF can indicate that an item has a different psychological meaning across groups and hence may affect validity (Gómez-Benito et al., 2018). On the contrary, the absence of DIF implies that groups can be meaningfully compared. Thus, in order to compare procrastination scores between gender and educational levels, it is necessary to first confirm measurement invariance and investigate DIF. To our knowledge, no research has addressed the issue of measurement invariance for a procrastination measure across gender and educational levels. Therefore, this study aimed to examine this issue using a large sample of children and adolescents.

The objectives of the present study were twofold. First, we examined the factorial structure of the APS-S (McCloskey, 2011; Yockey, 2016), and the measurement invariance across gender and educational levels. And second, to determine possible differences in procrastination across gender, educational levels and grades.

We had no a priori hypothesis about the relationship between educational level and procrastination. On the one hand, given the negative relationship previously observed in adults between age and procrastination (Steel, 2007), it could be expected that, at younger ages (primary school), procrastination levels would be higher than in secondary education. On the other hand, given the greater involvement and control exercised by parents over primary school compared to secondary school students (Epstein, 1987), it could be hypothesized that procrastination would be greater in the latter group. Regarding gender, informed by previous research on school students (Klassen & Kuzucu, 2009), we would not expect gender differences in procrastination. However, in the event of such differences appearing (as in some studies with adults; see Steel & Ferrari, 2013), male students would be expected to procrastinate more than female students. Finally, based on previous literature (e.g., Paechter et al., 2017; Rodarte-Luna & Sherry 2008), we expected to find a positive relation between math anxiety and procrastination.

Method

Participants

The initial sample consisted of 1486 students (46.03% males) between the ages of 7 and 19 years (M = 13.07, SD = 2.73), i.e., in Grades 3 to 12, recruited from nine primary and high-schools in two medium-sized cities in [omitted for anonymized peer review] (in southern Spain). Although we did not collect sociodemographic information, the students attending these schools had a variety of socioeconomic backgrounds, so we consider that different levels of socioeconomic status are well represented in the sample. The majority of the participants were native Spanish speakers, since the percentage of immigrants in the region is less than 3%. Participants were separated into two groups based on their educational level: primary education (Grades 3 to 6) and secondary education (Grades 7 to 12). Table 1 presents the mean age by gender and grade group. The study was approved by the Ethics Committee of the University of [omitted for anonymized peer review]. Informed consent was obtained from the children's parents or legal guardians, and consent was also sought from all of the children.

Table 1 about here

Measures

Academic Procrastination Scale–Short Form (APS-S). The APS-S is a 5-item questionnaire assessing the tendency to postpone academic tasks (McCloskey, 2011; Yockey, 2016). The scale was independently translated by two native Spanish speakers who are fluent in English; a final version was then obtained by consensus. A researcher reviewed the translation to determine whether it retained the original meanings of the items. No substantial changes were needed, so this translation was used as the Spanish version of the APS-S. Table 2 shows the items in the original and Spanish versions of the APS-S. Items are rated on a 5-point Likert scale ranging from 1 (disagree) to 5 (agree). The sum of the scores was calculated and used for the analyses. Total possible scores range from 5 to 25, with higher scores indicating a greater tendency to engage in procrastination.

Table 2 about here

Single-item procrastination scale (SIP). The SIP is a single item-scale that measures the tendency of students to postpone math homework. Since this scale was developed for this study, no information is available on its psychometric properties. The item is rated on a Likert scale ranging from 1 (“not at all”) to 10 (“a lot”).

Math Anxiety Scale for Young Children (Harari et al., 2013). The MASYC is made up of 12 items describing situations in which students encounter mathematics. This scale was translated into Spanish following the procedure described for the APS-S. Items are rated on a 4-point Likert scale (1 = no; 2 = not really; 3 = kind of; 4 = yes). The total score is obtained by summing the responses to all the items. Possible scores on the MASYC range from 12 to 48, with higher scores indicating higher anxiety. The Cronbach’s alpha (α) in this study was .77 (primary school children, α = .73; secondary school children, α = .76).

Procedure

Children were tested during a classroom session, in which the procrastination and math anxiety scales were administered. The participants also completed a series of motivational and cognitive measures not reported in the present study. In the first part of the session, the scales used in this study were presented in the following fixed order: MASYC, APS-S, and SIP. The assessment session lasted about 60 and 90 minutes for the secondary and primary school children, respectively. The groups of primary school children had a brief rest period.

Data analysis

Firstly, using the psych package (Revelle, 2020) for R software (version 4.0.2; R Core Team, 2020), an EFA was conducted on the data of the entire cohort to examine the dimensionality of the APS-S. Several methods were used for determining the number of factors to extract, including eigenvalues > 1 (Kaiser, 1960), examination of the scree plot (Cattell, 1966), parallel analysis (Horn, 1965) and Velicer's minimum average partial (MAP) test (Velicer, 1976). The last two methods are well suited for the extraction of factors from polychoric correlations matrices comprised of ordinal data (Garrido et al., 2011, 2012).

The EFA was followed up with a confirmatory factor analysis (CFA) to confirm the unifactorial structure of the APS-S (using the lavaan R package; Rosseel, 2012). The mean-adjusted maximum likelihood (MLM) was used as the parameter estimator, and the following scaled indices were used to assess model fit: the Satorra-Bentler χ^2 test (χ^2_{S-B}), comparative fit index (CFI), Tucker-Lewis Index (TLI), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR). The cutoff values indicative of adequate model fit were as follows: CFI greater than or equal to 0.95; TLI greater than or equal to 0.95; RMSEA less than or equal to 0.06; and SRMR less than or equal to 0.08 (Hu & Bentler, 1999).

Secondly, measurement invariance across gender and educational level was tested by fitting a series of multigroup CFA models with increasing invariance constraints. Initially, a configural model was tested. When configural invariance was observed, metric invariance was examined by constraining factor loadings to be equal across groups. In the event of metric invariance, scalar invariance was determined by constraining the intercepts to be equal across the groups. This latter type of invariance would indicate an absence of systematic group differences (Putnich & Bornstein, 2016).

Because the likelihood ratio test (χ^2) is affected by sample size, differences in CFI and RMSEA values were used to test increasingly stringent invariance models. Values above .01 in ΔCFI and .015 in ΔRMSEA were considered indicative of noninvariance (Chen, 2007). When metric or scalar invariance were not supported, partial invariance models were tested after freeing certain parameters (Putnich & Bornstein, 2016). The parameters to be freed were identified by modification indices and Lagrange multiplier test provided by the lavTestScore function in semTools (Jorgensen et al., 2021). The modification indices suggest changes in the model that may enhance the fit (e.g., by adding parameters associated with new paths or freeing a constraint). The lavTestScore function provides χ^2 difference tests that indicate which equality constraints should be freed. Partial invariance was assumed if at least 80% of the parameters were invariant (Dimitrov, 2010).

Thirdly, a DIF analysis was conducted; we used the lordif R package (Choi et al., 2011) to evaluate the items of the APS-S by gender and educational level. Lordif compares three nested models to test each item for DIF. Model 1 predicts item scores from APS-S total scores; Model 2 predicts item scores from observed total scores and group membership (e.g., gender); and Model 3 predicts item scores from observed total scores, group membership, and their interaction. For a given item, DIF is present when there is a statistically significant difference between the amount of variance explained by two models. The χ^2 difference test has been used frequently to determine DIF, but given that this statistic depends on sample size, and considering the large sample of this study, we used a change in McFadden's pseudo-R^2 statistic < .02 as the criterion for assessing DIF (Choi et al., 2011).

Fourthly, the psychometric properties of the APS-S were investigated. Internal consistency was estimated through Cronbach’s alpha coefficient. Convergent and discriminant validity were evaluated by correlating the APS-S with the single-item procrastination scale and a measure of math anxiety, respectively.

Finally, we determined the possible effects of educational level, grade and gender on procrastination. Because a hierarchical data structure (i.e., children embedded within classrooms within schools in this study) can be a source of nonindependence, we evaluated the effects with multilevel mixed-effects linear regression models. The specification for the general model (without interactions) was:

$$Y_{ijk} = \beta_0 + \beta_1 \times \text{level}_{ijk} + \beta_2 \times \text{grade}_{ijk} + \beta_3 \times \text{gender}_{ijk} + u_k + u_{j|k} + \varepsilon_{ijk}$$

Where Y_{ijk} is the APS-S score for individual *i* in classroom *j* nested within school *k*; β_0 is the fixed intercept, and β_1 to β_3 are the fixed effects of the predictors (i.e., educational level, grade and gender); u_k and $u_{j|k}$ represent the random effects associated with the intercept for school *k*, and for classroom *j* within school *k*, respectively; and ε_{ijk} are the residuals.

In the first steps, we determined the random-effects structure by sequentially entering the school and classroom variables. Given that the model fit improved significantly at each step, both random effects were included in the model. Then, we tested the fixed effects of educational level and gender, as well as their interactions. Gender was coded as 0 for female and 1 for male, and educational level as 0 for primary and 1 for secondary education. All of the predictors were centered. This analysis was performed using the lme4 package (Bates et al., 2014) and the ANOVA table for the inferential statistics was obtained with the car R package (Fox, & Weisber, 2019). The R code used for the analyses can be found in the supplementary material.

Results

Exploratory and Confirmatory Factor Analyses

Only the eigenvalue for the first factor was > 1. Visual inspection of the scree plot also indicated that a single factor solution should be retained. Parallel analysis and Velicer's MAP test suggested a single factor solution. Table 3 presents descriptive statistics for the five APS-S items, as well as the matrix of the polychoric correlations, factor loadings and communality estimates for the one-factor solution.

Table 3 about here

A CFA for the total sample using the MLM estimator was then conducted. The MLM estimator was used because the assumption of multivariate normality was violated, as revealed by Mardia's multivariate normality test (kurtosis coefficient = 25.60, p < .001, obtained using the MVM R package; Korkmaz et al., 2014). The CFA results indicated a good fit of the one-factor model (χ^2_{S-B} = 16.84, *df* = 5, *p* = .005, CFI = 0.992, TLI = .983, SRMR = .019, RMSEA = .051 [90%CI: .026–.079]. The factor loadings for each item were as follows: .77 (Item 1), .68 (Item 2), .59 (Item 3), .78 (Item 4) and .62 (Item 5).

Measurement Invariance across Gender and Educational Level

Measurement invariance was examined across gender (female and male) and educational level (primary and secondary) groups using MLM. As shown in Table 4, measurement invariance across gender was supported. The configural model, in which factor loadings and intercepts varied freely, had a good fit, indicating the same structure across gender. Metric invariance, in which factor loadings were restricted across gender, was also tenable, because even though $\Delta\chi^2$ was significant for gender, $\Delta\chi^2_{S-B}$ = 14.14, *df* = 4, p = .007, the ΔCFI and ΔRMSEA values were below the cut-offs. Scalar invariance, with the factor loadings and intercepts constrained across gender, was also supported for gender ($\Delta\chi^2_{S-B}$= 6.52, *df* = 4, p = .163, while ΔCFI was lower than .01 and ΔRMSEA was lower than .015).

Table 4 about here

As for invariance across educational levels, the fit of the configural model was good, indicating the same structure for both educational levels. Metric invariance was also found ($\Delta\chi^2_{S-B}$ = 8.07, *df* = 4, p = .089, where the ΔCFI and ΔRMSEA values were both below the cut-offs). However, scalar invariance was not supported for educational level, $\Delta\chi^2_{S-B}$ = 51.63, *df* = 4, p < .001, indicating that the intercepts were not equivalent. Inspection of the test statistics indicated that the intercept of Item 5 (*I frequently find myself putting important deadlines off*) had to be freed. The intercept of Item 5 was slightly higher in the primary (2.14) than secondary school group (1.70). After freeing this equality constraint, partial scalar invariance was obtained ($\Delta\chi^2_{S-B}$ = 8.54, *df* = 3, p = .036, and the ΔCFI and ΔRMSEA values were below the cut-offs).

DIF across Gender and Educational Level

With regard to the DIF analysis, no APS-S items were flagged for DIF by gender (all McFadden's pseudo $R^2 \leq .002$) or educational level (all McFadden's pseudo $R^2 \leq .015$). The absence of DIF across gender and educational levels indicated that the groups could be meaningfully compared.

Reliability and Validity

Cronbach's alpha was .87 (95% CI: .85–.88), .80 (95% CI: .76–.82) and .88 (95% CI: .87–.89), for the total, primary school and secondary school samples, respectively. Internal consistency for the scale was higher for the secondary than primary school sample ($\chi^2(1) = 34.81$, $p < .001$) (the difference was tested using the Cocron package; Diedenhofen, & Musch, 2016). All five items contributed to internal consistency. Regarding convergent validity, the APS-S scores correlated with the convergent measure of the single-item procrastination scale ($r = .54$; $p < .001$). Finally, regarding divergent validity, as expected, the APS-S scores showed a weak but significant correlation with math anxiety ($r = .24$; $p < .001$).

Effects of Educational Level, Grade and Gender on Procrastination

A series of multilevel mixed-effects linear regression models were tested to determine the extent to which educational level, grade and gender accounted for differences in procrastination scores. The estimates of the fixed effects from the final model are presented in Table 5.

Table 5 about here

Table 6 displays the mean APS-S scores by group and gender. All of the effects were reliable in the final model. The effect of gender ($\beta = 2.08$, $p < .001$) was due to higher scores for male ($M = 11.98$, $SD = 5.42$) compared to female students ($M = 10.10$, $SD = 4.63$). The effect of educational level was also reliable ($\beta = 2.40$, $p < .001$), because the mean score was lower in primary ($M = 9.38$, $SD = 4.3$) than secondary school ($M = 11.6$, $SD = 5.26$) students. Finally, there was a significant effect of grade ($\beta = 0.47$, $p < .001$), where the procrastination score increased by half a point per year. None of the interactions were significant.

Table 6 about here

Discussion

The objective of the present study was to analyze the factor structure of a Spanish adaptation of the APS-S for children and adolescents, and to investigate whether this brief scale is measurement-invariant across gender and educational level. Additionally, we examined the relations among age, gender, math anxiety and procrastination.

The results of this study confirm the unidimensionality of the APS-S. Invariance testing provided support for scalar invariance across gender, and partial scalar invariance across educational levels. For one item (*I frequently find myself putting important deadlines off*), the intercept was larger in the primary than secondary school group. This may be indicative of group differences in response styles or the reference frameworks used for responding (Han et al., 2019). It is also possible that the greater control exercised over primary school children (Eccles & Harold, 1993; Thomas et al., 2019) makes them more conscientious with respect to postponing important tasks, leading to somewhat higher responses on this item. Overall, these results indicate that scores on the APS-S can be directly compared, irrespective of subject gender or educational level. The internal consistency of the scale was found to be good, and slightly higher for the secondary than primary school level.

Regarding convergent validity, a moderate positive correlation was found between the APS-S and single-item procrastination scale scores, indicating that the measures are similar, although they may also reflect different aspects of the procrastination construct. Regarding discriminant validity, as expected, a small positive correlation was observed between procrastination and math anxiety. This result is in line with past research on math and statistical anxiety (Macher et al., 2012; Onwuegbuzie, 2004; Paechter et al., 2017; Rodarte-Luna & Sherry, 2008), and with previous metaanalytical studies (Steel, 2007; Van Eerde, 2003). It has been argued that people tend to avoid aversive or stressful tasks, and individuals more prone to negative affect and anxiety can be expected to procrastinate more (see Steel, 2007). Overall, the results demonstrate adequate psychometric of for the APS-S when applied to Spanish children and adolescents.

It is surprising that procrastination during the primary school years has received so little research attention. In this study, procrastination scores increased as a function of grade, which is an important result because it indicates that procrastination is present early on, and evolves over the primary and secondary school years. Successful task completion by younger children depends more on adult guidance (Eccles & Harold, 1993; Thomas et al., 2019), but as they grow older and gain autonomy, children must learn to direct their own learning activities. Thus, the increase in procrastination seen in the elementary school years may reflect the fact that children are becoming increasingly responsible for learning tasks, sometimes in the context of little positive experience.

In this study, procrastination also increased with grade in secondary school students. The transition from primary to secondary education is often characterized by a decrease in academic performance, interest and enjoyment in academic subjects, and self-efficacy and attitudes towards academic subjects (Evans et al., 2018; Wigfield & Eccles, 1998). In this context, procrastination may become more prevalent. Rosário et al., (2009) also reported that students' level of procrastination increased from grade 7 to grade 9. Factors with opposing effects can influence procrastination at these ages. Although cognitive functions, such as self-regulation and goal setting, develop during adolescence (Rozental & Carlbring, 2014), procrastination also increases across this period. This indicates that there must be other non-cognitive factors that counteract the effect of age-related cognitive abilities and induce adolescents to procrastinate. Epstein

(1987) proposed that teachers demand progressively less parental involvement in school activities as children grow older, and parents feel less able to assist their children with schoolwork in secondary school (Thomas et al., 2019). As a result, some aspects of parental involvement decline during secondary (Hill & Tyson, 2009; Lucas & Lusthaus, 1978) and high school (Paulson & Sputa, 1996). Therefore, despite children's increasing self-regulation capacity, factors such as diminished parental involvement in school activities may contribute to an increased likelihood of children delaying completion of their academic tasks.

It should be noted that the observed tendency toward higher levels of procrastination with age may change later in adulthood. The meta-analysis of Steel (2007), which comprised mainly adult studies, showed a negative relationship between age and procrastination. It is interesting to note that this author reported a reduction in the magnitude of the relationship when considering studies of children aged below 12 years, which is compatible with a positive relationship between age and procrastination at younger ages. This pattern, however, suggests that additional factors may determine procrastination at older ages. Although procrastination has long been considered a stable trait (e.g., Van Eerde, 2000), the changes that it shows over time suggest that the tendency to postpone the completion of academic tasks may depend on task- and context-related factors (Ziegler & Opdenakker, 2018).

Regarding gender, procrastination levels were found to be higher in the boys in this study, consistent with evidence from adult studies (Özer et al., 2009; Steel, 2007; Steel & Ferrari, 2013; but see Klassen & Kuzucu, 2009, for an absence of differences in children). Such a result might be due to differences in values between genders (Van Eerde, 2003), and to differences in self-control and impulsivity, where boys tend to be more impulsive than girls (Ziegler & Opdenakker, 2018).

The current study has several strengths, such as the inclusion of a large sample covering a wide range of ages, and the use a short scale that offers a number of practical advantages. Alongside these strengths, this study also has some limitations. First, the design was cross-sectional; extending the research through longitudinal studies should be considered to avoid possible cohort effects. Second, as a counterpart to the advantage of the brevity of the scale, only one type of procrastination was considered. Another limitation is that test-retest reliability could not be assessed, as the scale was not administered repeatedly. Also, we used a single-item scale (SIP) developed specifically for the study. Whereas some authors have reported that such abbreviated scales have acceptable psychometric properties (e.g., Núñez-Peña et al., 2014; Yarkoni, 2010), others noted that they produced less valid results (e.g., Credé et al., 2012). Therefore, further comparison of APS-S with external criteria is warranted. Finally, the sample in this study consisted only of Spanish-speaking children and adolescents residing in Spain. Thus, this version may require further validation before being used in individuals from countries where other variants of Spanish are spoken.

In summary, the most important results of this study are that the maladaptive behavior of procrastination increases throughout high school, and that boys are more likely to engage in it than girls. The present findings also provide support for the use of the APS-S to measure procrastination in samples of children and adolescents. This measure of procrastination for both children and adolescents should be useful for future research aiming to fully elucidate this complex behavior. In addition, this scale could contribute to earlier detection of school-age children at risk for engaging in task-avoiding behavior, and could inform interventions aimed at providing students with the tools necessary to tackle procrastination and increase the likelihood of success in school.

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Table 1. Mean and standard deviation age by grade and gender

	Males			Females		
Grade	*n*	*M*	*SD*	*n*	*M*	*SD*
3	61	8.71	0.32	53	8.68	0.35
4	47	9.73	0.39	59	9.73	0.31
5	52	10.80	0.36	73	10.60	1.22
6	48	11.70	0.47	55	11.70	0.40
7	65	12.60	0.43	93	12.60	0.49
8	83	13.50	0.43	110	13.40	1.38
9	84	14.60	0.54	97	14.70	0.45
10	94	15.80	1.06	103	15.70	0.62
11	88	16.60	0.45	99	16.60	1.03
12	62	17.40	0.42	60	17.50	0.27

Table 2. Items in the Spanish version of the APS-S

	Item
APS1	Dejo los deberes para el último minuto
APS2	Sé que debería hacer el trabajo de clase, pero no lo hago.
APS3	Me distraigo con otras cosas más divertidas cuando se supone que debería trabajar en las tareas de clase.
APS4	Cuando me dan una tarea, normalmente la dejo y me olvido de ella hasta que es casi el momento de entregarla.
APS5	Con frecuencia me encuentro aplazando tareas importantes

Table 3. Descriptive statistics of the APS_S ítems, polychoric correlations, factor loadings and communality estimates for the one-factor solution

Item	*n*	*M*	*SD*	Skewness	Kurtosis	Correlations				Loadings	Communality
						APS1	APS2	APS3	APS4		
APS1	1486	2.18	1.36	0.83	-0.60					.817	.667
APS2	1486	1.85	1.28	1.36	0.55	.634				.766	.586
APS3	1486	2.68	1.41	0.35	-1.18	.504	.539			.651	.424
APS4	1486	2.05	1.32	1.00	-0.28	.707	.628	.521		.840	.706
APS5	1486	2.20	1.33	0.85	-0.48	.554	.498	.469	.598	.689	.475

Table 4. Summary statistics for evaluating measurement invariance across gender and educational level

Models Invariance	CFI	TLI	RMSEA [90%CI]	SRMR	ΔCFI	ΔRMSEA
Gender						
Configural	.986	.971	.066 [.039, .094]	.024		
Metric	.981	.973	.064 [.043, .086]	.036	.005	.002
Scalar	.980	.978	.058 [.040, .077]	.038	.001	.006
Educational level						
Configural	.989	.978	.059 [.031, .087]	.020		
Metric	.987	.981	.055 [.032, .078]	.028	.002	.004
Scalar	.970	.966	.073 [.055, .091]	.040	.017	-.018
Scalar2	.985	.982	.054 [.034, .074]	.031	.002	.001

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; ΔCFI = change in CFI; ΔRMSEA = change in RMSEA. *** $p < .001$, ** $p < .01$, * $p < .05$

Table 5. Estimates of the fixed effects on procrastination scores from the final model

	Estimate (*SD*)	95% CI	*df*	*F*	*p*
(Intercept)	10.6 (0.51)	[9.62, 11.59]	16.20	422.24	<.001
Educational level	2.56 (1.11)	[0.12, 4.71]	103.46	5.05	.027
Grade	0.47 (0.13)	[0.22, 0.72]	87.92	13.37	<.001
Gender	2.08 (0.53)	[1.04, 3.12]	1473.52	15.35	<.001
Educational level x Grade	0.59 (0.3)	[-0.03, 1.17]	104.72	3.82	.053
Educational level x Gender	-0.2 (1.54)	[-3.2, 2.84]	1471.89	0.02	.897
Grade x Gender	0.17 (0.18)	[-0.18, 0.52]	1473.69	0.90	.343
Educational level x Grade x Gender	-0.26 (0.45)	[-1.13, 0.62]	1473.63	0.33	.564

Table 6. Mean APS-S scores and standard deviation by grade and gender

	Males			Females		
Grade	*n*	*M*	*SD*	*n*	*M*	*SD*
3	61	9.13	4.58	53	9.00	4.84
4	47	10.60	4.21	59	9.31	4.48
5	52	10.67	4.67	73	8.78	3.69
6	48	9.38	4.45	55	8.64	3.23
7	65	11.42	5.73	93	9.33	4.36
8	83	11.57	5.37	110	9.80	4.48
9	84	13.15	5.74	97	10.25	4.44
10	94	12.14	5.23	103	11.16	5.18
11	88	14.57	4.90	99	12.33	4.90
12	62	14.61	5.63	60	10.58	4.70