

Review

The Influence of Active and Passive Procrastination on Academic Performance: A Meta-Analysis

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Abstract: The relationship between academic performance and procrastination has been well documented over the last twenty years. The current research aggregates existing research on this topic. Most of the studies either find no result or a small negative result. However, recent studies suggest that procrastination can have a positive influence on academic performance if the procrastination is active instead of passive. To analyse the effect of active procrastination on academic performance, a meta-analysis was conducted. The analysis includes 96 articles with 176 coefficients including a combined average of 55,477 participants related to the correlation between academic performance and procrastination. The analysis uncovered a modest negative correlation between academic performance and procrastination overall. Importantly, the type of procrastination exerted a substantial impact on the strength of this correlation: active procrastination demonstrated a small positive effect size, whereas passive procrastination registered a small negative effect size. Additionally, participant-specific characteristics and indicators further modulated the magnitude of the correlation. The implications of this research extend to underscoring a potential beneficial aspect of procrastination, specifically elucidating how certain types of procrastination can positively influence academic performance.

Keywords: procrastination; academic performance; meta-analysis; active procrastination; passive procrastination



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1. Introduction

While academic performance is relatively straightforward to define as the extent to which someone has achieved their academic goals, such as sufficient grades and diplomas [1], the definition of procrastination proves more complex due to its multifaceted nature and various types. A common method employed to classify these types of procrastination is to distinguish between trait (or general) procrastination and state (or situational) procrastination. Trait procrastination refers to a general tendency to procrastinate, while situational procrastination is triggered by a specific context [2]. One of the most pressing forms of situational procrastination occurs in academic contexts. Academic procrastination is defined as the delay of completion or initiation of academic tasks to the point where the delay can be described as irrational [3]. A study conducted by Sirin [4] revealed a moderate correlation between situational and academic procrastination. Within academic procrastination, one can distinguish between behavioural or avoidant procrastination, defined as the postponement of action, and decisional procrastination, defined as the postponement of decisions [5].

Over the past four decades, research has consistently indicated a high prevalence of procrastination. An early study reported that 46% of students exhibited signs of academic procrastination [6]. Another study by Harriot and Ferrari [7] reported that chronic procrastination affects 20% of adults. A recent study by Popova and Pronenko [8], based on

self-reported data, indicated that up to 60% of college students exhibit significant levels of academic procrastination. So, the prevalence rates of procrastination vary considerably across studies and specific types of procrastination.

Unfortunately, academic procrastination can come at a serious cost to well-being, self-efficacy, and academic performance, while increasing test anxiety and academic stress [9]. Other research has linked procrastination to anxiety, lack of self-esteem, and depression [10]. Multiple meta-analyses have consistently found a negative correlation between procrastination and academic performance, with effects ranging from minor to moderate in severity [11–16].

The decline in academic performance associated with procrastination can be attributed to both direct causes and a multitude of indirect effects. A direct influence of procrastination is the delay of academic tasks, reducing the time available for studying or project work, which in turn diminishes performance due to time constraints. This behaviour may hinder the utilisation of distributed practice, a technique known to enhance memory retention when applied effectively [17]. This typically leads to cramming, often compromising sleep quality [18]. Indirectly, procrastination may influence academic performance through various factors including lack of motivation, suboptimal learning approaches [19], increased anxiety, aversiveness, loss of productivity, sense of social disapproval, stress [20], and poor self-regulation [21]. The many indirect effects complicate the assessment of procrastination's direct impact on academic performance. Moreover, most studies report correlational data, which do not clarify the causal relationships between these variables. It is possible that there is no direct causal link, and that the observed low academic performance and procrastination are both outcomes of other underlying factors. This complexity contributes to ongoing debates regarding the relationship between procrastination and academic performance [22].

While the existing literature has predominantly concentrated on the negative aspects of procrastination, some types may lead to benefits. Chu and Choi [23] argue for a differentiation between passive and active procrastination. Passive procrastination is characterised by indecision to act, whereas active procrastination is marked by a preference and deliberate decision to work under pressure. Alternative terminologies for these procrastination types have been proposed, such as structured and unstructured procrastination [24], or strategic delay and procrastination [25], serving similar conceptual roles as active and passive procrastination, respectively. According to Kim et al. [26], active and passive procrastination differ in their correlation with personality and academic performance. They report that passive procrastination is negatively related to the ability to meet deadlines, extraversion, agreeableness, conscientiousness, and Grade Point Average (GPA), but positively related to neuroticism, which is the inclination to experience adverse emotions. Conversely, active procrastination has positive low to high correlations with a preference for pressure, ability to meet deadlines, outcome satisfaction, extraversion, and a negative correlation with neuroticism. Although active procrastination has no significant correlation with GPA, it is preferable relative to passive procrastination, which has a medium negative correlation with GPA.

Knowing this distinction between active and passive procrastination, one can divide the different procrastination measurement tools into those that measure active and passive procrastination (see Appendix A for a comprehensive summary of different procrastination indicators). The summary was compiled by applying the snowball technique to existing literature [27]. This means that an initial pool of articles was searched using the keyword "procrastination assessment", from which each reference list was examined to find further references, and this repeated until no new procrastination indicators were found. The summary in Appendix A lists the most common procrastination indicator tools, including how they assess both procrastination itself and procrastination type. The list does not include workplace-related procrastination, but mostly general, behavioural, avoidant, decisional, and academic procrastination.

Of all the different measurement tools, the Procrastination Assessment Scale for Students (PASS) [6] is the most known and established assessment tool. The PASS assesses procrastination using 12 self-reported items using two subscales related to the frequency and problem of procrastination. Similarly, most other procrastination indicators use self-assessment questionnaires, with the only exception being the Procrastination Checklist Study tasks (PCS) [28], which offer a measurement based on study-related behaviours including time of initiation intention and time of completion. To our knowledge, the only procrastination indicators that look at both passive and active procrastination are the Academic Procrastination Scale (APSM) [24] and the Metacognitive Beliefs about Procrastination scale (MaP) [29]. The APSM assesses both active and passive procrastination by assessing the common characteristics of both types of procrastination in a self-assessment questionnaire. The MaP assesses metacognitive beliefs about procrastination using 16 self-assessment items that result in an indication of passive, active, or non-procrastinator. There is one indicator that looks at active procrastination only, named the Active Procrastination Scale (APSCM) [30]. The APSCM is a 16-item self-assessment questionnaire that assesses four characteristics of procrastination: satisfaction with an outcome, ability to meet deadlines, intention to procrastinate, and preference for time pressure. The rest of the procrastination indicators focus on the negative aspects of procrastination, and will therefore be classified as measurements for passive procrastination.

When reviewing works on procrastination in relationship with academic performance, the following performance indicators are prevalent: Grade Point Average (GPA), midterm and final examination score, assignment grade, quiz, course grade, homework, and American College Test (ACT) [12].

This study will focus on the relationship between procrastination and academic performance. The relationship will be assessed using the research questions: (a) What is the relationship between academic performance and procrastination? (b) Does the type of procrastination, active or passive, influence the relationship with academic performance? (c) Is the relation between academic performance and procrastination influenced by the variables age, type of measurement, academic performance indicators, and procrastination indicators?

In this study, we hypothesise a negative correlation between procrastination and academic performance, consistent with the extant literature [9,11–16,31]. Building on Chu and Choi's [23] framework, we anticipate distinct relationships between types of procrastination and academic performance: a negative correlation for passive procrastination and a positive correlation for active procrastination. We expect that younger students will exhibit stronger correlations between academic performance and procrastination than older students, aligning with the findings of Kim and Seo [12]. With respect to measurement, we expect self-reported data to yield smaller correlations due to inherent variability and reliability issues. For academic performance indicators, we anticipate uniform correlations, contrasting the varied correlations expected from different forms and types of procrastination measures.

This study aims to bring clarity to the mixed findings concerning the relationship between procrastination and academic performance. Various studies have depicted this relationship in contrasting lights: as negative [9], neutral [32], and even positive [23]. With our results we intend to provide more definitive insights into this complex association. A meta-analysis by Kim and Seo [12] found a negative correlation between academic performance and procrastination. However, they found a high variation in the correlation sizes and between different subgroups, such as geographical region, self-reported data, performance indicators, procrastination indicators, and age. Using the newly published data, this study contributes to the scientific knowledge base by extending this research with more published data. This study's findings will equip educators with the critical understanding of when procrastination might negatively or positively influence academic performance.

The research questions will be addressed by synthesising results from previous studies on the topic of procrastination and academic performance. The method used in this study is a meta-analysis, which is used to provide an overview of already published articles in a structured fashion [33] (pp. 3–13).

2. Method

Data were sourced from the Web of Science database and accessed through various platforms: Erasmus University Rotterdam Library (EUR Library), free databases via Google Scholar, and Unpaywall [34]. The sample was compiled using a targeted search query incorporating the keywords “procrastination” and “academic performance”. The keyword search query included synonyms and terms identified in prior meta-analyses [11–16]. The exact keyword search query stated the following: “procrastination” (Topic) AND “academic performance” OR “performance” OR “accomplishment” OR “academic achievement” OR “GPA” OR “grade” OR “school performance” OR “examination score” OR “ACT” OR “academic success” OR “missing deadline” OR “task completion time” OR “task delay” OR “task preparation time” OR “grade point average” (Topic) and Proceeding Paper or Article (Document Types).

Data research was limited to the year 1975, the earliest year of publication Web of Science can access, until the 13th of May 2023, the date of data extraction. Studies included in the analysis had to meet the criteria listed in Table 1.

Table 1. Inclusion and exclusion criteria.

Number	Inclusion Criteria	Exclusion Criteria
1	The study is empirical in nature.	The study is a review.
2	The article is on the topic of procrastination and academic procrastination.	The article is not on the topic of procrastination and academic procrastination.
3	The article is accessible through open databases or via EUR Library.	The article is not accessible through open databases or via EUR Library.
4	Reported Pearson correlation coefficients between academic performance and procrastination, along with sample sizes.	The article did not report the correct correlation coefficient as per inclusion
5	Articles are available in English.	Articles are not available in English.
6	The sample size of the article was less than 10,000	The sample size of the article was over 10,000.
7	The sample represents a population with normal learning capabilities.	The study has a sample size consisting of only academically challenged participants.
8	The study was not retracted.	The study was retracted.
9	The studies are unique in individual participants, procrastination measures, or academic performance measures.	The studies are not unique in individual participants, procrastination measures, or academic performance measures (copy of article excluded).
10	The study does not attempt to influence the procrastination of the participants.	The study is on procrastination interventions.

The studies found through the keyword search were first scanned using the title and abstract to assess their relevance to the topic of procrastination and academic performance. Studies that did not mention the topic of procrastination and academic performance in the title or abstract were excluded from further analysis. Then the studies were scanned with a focus on the inclusion and exclusion criteria, particularly in the Sections 2 and 3. If a study met all criteria, the entire article was assessed, and data were extracted. The following data were extracted: the author(s) name(s), publication year, sample size (N), sample age range (pre-primary, primary school, secondary education, college, adults), geographic location, procrastination indicator (see Appendix A), academic achievement indicator, correlation coefficient(s), type of procrastination (active or passive procrastination), and

type of measurement (self-assessment or external assessment). If a study had altered an existing measure of procrastination and academic performance to an extent where the measure became unique or the study had a unique measurement tool, then the indicator was noted as research specific.

The retrieved studies and excluded studies were visualised using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow [35] and can be found in Figure 1. The PRISMA flow diagram was used to note the records that were identified, removed, screened, excluded, retrieved, not retrieved, assessed, excluded after assessment, and included.

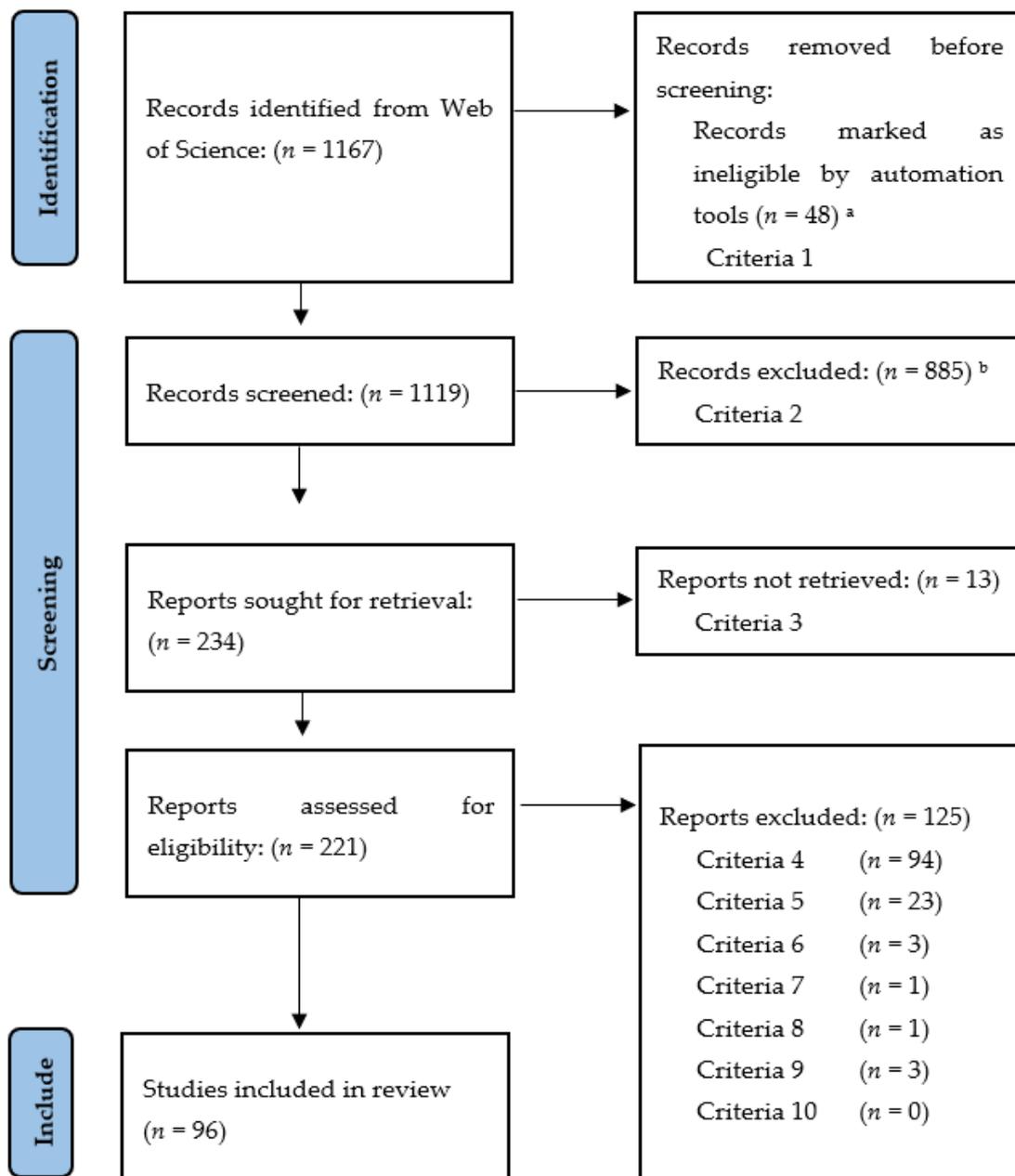


Figure 1. PRISMA flow diagram including the number of articles per meta-analytic phase identification, screening, and included. Note. This flow diagram denotes the specific number of articles in every step of the meta-analysis process and how the number of articles was reduced to just those included into the meta-analytic review. ^a Recognized by Web of Science as review articles and excluded by exclusion criteria two. ^b Records are excluded from eligibility assessment as the research topic is irrelevant to the topic of the current research.

When an article reported multiple coefficients, all relevant coefficients were extracted. If an article reported multiple similarly tested procrastination scores over a period of time, then only the score closest to the time that the academic performance score was obtained was noted. If an article used multiple procrastination indicators and academic performance indicators, all variations were extracted. However, for analysis, these results were averaged and weighted to ensure that each study contributed proportionally to its sample size. Coefficients derived from the same participant pool were weighted based on sample size and the total number of relevant coefficients using the formula: ((sample size/number of relevant coefficients)/total number of participants in the meta-analysis) x Pearson correlation coefficients. In cases where studies reported correlation coefficients for differing sample sizes drawn from the same participant pool, an average sample size for each study was calculated to determine the total number of participants.

The extracted data were organised using Excel version 2304 and analysed using IBM SPSS Statistics 29. The data were weighted according to the sample size of the individual study. The correlation coefficients r were transformed into a z statistic using Fisher's z transformation, before an average was calculated to make the average r less biased [36] when transformed back from an average z to an average r [37]. Fisher's z was also used to calculate significant differences between effect sizes. Effect sizes were characterised as small ($r < 0.2$), small to medium ($r = 0.2-0.5$), medium to large ($r = 0.5-0.8$), and large ($r > 0.8$) [38]. p values would indicate decisive evidence ($p < 0.001$), substantive evidence ($p = 0.001-0.01$), positive evidence ($p = 0.01-0.05$), or no evidence ($p > 0.05$) [38].

A meta-analysis was planned using either a random-effects model or fixed-effects model, pending the results of the heterogeneity tests. Given that the included studies employed diverse indicators to measure various facets of procrastination, it was anticipated that a random-effects model would be more appropriate. The studies also varied in terms of geographic location, year of publication, time between measurements, sample age, type of procrastination, and performance indicators. These variations likely violate the assumption of identical empirical settings needed to perform a fixed-effects model [39]. A random-effects model approach is in line with most meta-analytic approaches [40]. The estimator used for the meta-analysis was the Restricted Maximum Likelihood (REML) [41].

Apart from the weighted r , all test statistics were gathered using the meta-analysis function included in the IBM SPSS 29th edition. The meta-analysis on continuous effect size reported an effect size estimate, homogeneity test statistics, heterogeneity test statistics, Egger's regression-based test, Trim-and-Fill analysis [42], and a Forrest plot. Using the average z , a 95 per cent confidence interval [43] was computed separately for the extraction variables where applicable. The average z was also used to compute a p -value to examine the statistical significance of the correlation coefficients. To perform the weighted r analysis, a standard error was calculated using the formula $(1 - r^2)/\sqrt{N - 3}$ to minimise potential bias. This formula was, compared to other formulas, one of the most unbiased methods available to calculate the standard error, only becoming slightly negatively biased for correlations larger than $r = 0.60$ [44].

The data were analysed on homogeneity using the homogeneity statistic Q and the heterogeneity statistic I^2 . The Q statistic was used to assess the presence of heterogeneity [45]. This meant that a significant Q statistic would result in the use of a random-effects model, as the data were not homogenous, and a non-significant Q statistic would result in a fixed-effects model, as the data were homogenous [46]. The I^2 was interpreted to quantify the extent of heterogeneity, where $I^2 \approx 25\%$ was defined as low heterogeneity, $I^2 \approx 50\%$ was defined as medium heterogeneity, and $I^2 \approx 75\%$ was defined as high heterogeneity [47].

The potential for publication bias was analysed using the Trim-and-Fill method [48]. A small study bias was assessed using Egger's regression test [49]. These tests are most accurate in detecting publication bias and small study bias when compared to the Tang's regression test and Begg's regression test [50].

The data were analysed for outliers using the interquartile range technique. This technique entails that an outlier must be at least 1.5 times the length of the interquartile

range away from the mean to be identified as a mild outlier. If the outlier is three lengths of the interquartile range away from the mean it was classified as an extreme outlier [51]. However, based on the research by Hansen et al. [39], outliers were not removed due to the variation in procrastination indicators, performance indicators, procrastination facets, and performance facets, which likely resulted in very different effect sizes. This variation in effect sizes was desired for this study as we were interested in overall effect size.

3. Results

The search query on procrastination and academic performance resulted in 1167 articles. From those articles, 48 articles were removed as they were identified as reviews by Web of Science. This resulted in 1119 records that were screened based on the title, keywords, and abstract. This screening process deemed 885 articles irrelevant to the current research and excluded them from the full article assessment. This led to the identification of 234 articles, which were subsequently accessed using open databases and resources available through EUR Library. All but 13 articles were successfully retrieved for full assessment. The full assessment identified 96 articles that fit the inclusion and exclusion criteria and basic guidelines. This meant that 125 articles did not meet these requirements. A full rundown of the article selection process is available in Figure 1 and the list of included studies (n) is available in Appendix B Table A2.

Articles included in the analysis ($n = 96$) reported a combined number of coefficients ($k = 176$). The articles had a combined average number of participants ($N = 55,477$) and a unique pool of participants ($N_{um} = 55,555$) based on the unique number of participants per study, excluding the study by Seo [52], as this study used the same participant data as in a study by Seo [18]. The articles show a positive trend towards the year of publication, with more recent years having more published articles.

Before examining the correlation sizes, the heterogeneity was assessed using the Q statistic ($Q = 5354.761, p < 0.001$) and resulted in a significant statistic, meaning a random-effects model is most appropriate for our data analysis. The high I^2 statistic ($I^2 = 95.7\%$) suggests the data are highly heterogeneous, confirming this choice.

The Trim-and-Fill analysis for publication bias resulted in zero imputed and this suggests that the data do not suffer from publication bias. The Egger's regression test resulted in a significantly low negative intercept ($a = -0.225, t = -6.049, p < 0.001$), which indicates that studies with smaller sample sizes show larger effects in our data. A visual inspection confirms this test result with hardly noticeable asymmetry in the data, as shown in the funnel plot in Appendix C Figure A1.

However, what is noticeable is the asymmetry in the standard error, with most studies having a standard error smaller than 0.10 and only one study having a standard error larger than 0.20.

The interquartile range technique identified four mild outliers, two positives ($r = 0.42, r = 0.34$) and two negatives ($r = -0.87, r = -0.71$). These outliers were confirmed by visually inspecting the Forest plot. Together, these outliers are responsible for the sum of 1247 participants, which is about 2.2% of the overall sample size. The outliers have a slightly negative influence on the overall correlation coefficients, with an averaged correlation slightly lower than the overall correlation ($r = -0.21$). These outliers are identified for discussion purposes but not removed due to the allowed variance in methods.

The weighted mean for the correlation between procrastination and academic performance was significant ($r = -0.18$). The weighted means of the correlations for the type of procrastination were all significant, including active ($r = 0.15$), passive ($r = -0.17$), and not provided ($r = -0.43$). All mentioned indicators for academic performance were significant for weighted r : average grade ($r = -0.28$), course grade ($r = -0.17$), exam ($r = -0.22$), and GPA ($r = -0.20$). The listed indicator API ($r = -0.03$) had a non-significant weighted r , while the rest were significant: APSCM ($r = 0.16$), dilatory behaviour ($r = -0.24$), GPS ($r = -0.22$), PASS ($r = -0.17$), and TPS ($r = -0.22$). The sample age ranges resulted in correlations that were marginally significant and varied across groups, including adults

($r = -0.39$), college ($r = -0.22$), and secondary education ($r = -0.11$). The type of reported academic performance resulted in two significant weighted correlations for externally gathered ($r = -0.18$) and self-reported ($r = -0.22$) performance, but an insignificant result when performance was not provided ($r = 0.00$). The type of reported procrastination resulted in two significant weighted correlations for externally gathered ($r = -0.49$) and self-reported ($r = -0.16$) procrastination data.

The unweighted correlations (estimated r) and relevant statistics for all collected variables can be viewed in Table 2 and Appendix D Tables A3 and A4.

Table 2. The correlations between academic performance and procrastination and other variables.

Total	<i>k</i>	Sample Average <i>N</i>	Weighted <i>r</i>	Estimated <i>r</i>	Confidence Interval (95%)	Q-Value	<i>I</i> ² (%)
Procrastination-performance	176	55,477	-0.18	-0.19	[-0.223, -0.163]	5354.761	95.7
Type of Procrastination and Performance							
Active	14	2377	0.15	0.13 *	[0.035, 0.266]	125.450	89.3
Passive	137	53,398	-0.17	-0.20	[-0.230, -0.174]	3160.315	94.0
Not provided	25	2868	-0.43	-0.33	[0.411, -0.245]	537.908	94.5
Indicator of Performance							
Average grade	23	7252	-0.28	-0.27	[-0.332, -0.217]	134.398	86.5
Course grade	25	14,915.5	-0.17	-0.28	[-0.396, -0.168]	2927.722	98.9
Exam	39	7176	-0.22	-0.16	[-0.220, -0.106]	554.141	91.7
GPA	60	16,743.5	-0.20	-0.18	[-0.224, -0.138]	589.932	91.0
Indicator of Procrastination							
API	13	2999	-0.34	-0.27	[-0.343, -0.189]	87.730	87.0
APSCM	22	2377	0.16	0.07 **	[0.003, 0.143]	169.589	87.5
Dilatory behaviour	10	772	-0.23	-0.24	[-0.297, -0.181]	19.377 **	49.9
GPS	11	2993	-0.22	-0.31	[-0.431, -0.190]	81.074	90.4
PASS	21	5424	-0.17	-0.14	[-0.217, -0.068]	335.113	94.5
TPS	20	8479	-0.22	-0.24	[-0.286, -0.190]	109.431	82.5
Sample Age Range							
Adults	1	83	-0.39	-0.39	[-0.576, -0.204]	SR	SR
College	158	33,048.5	-0.22	-0.19	[-0.221, -0.155]	4380.464	94.7
Secondary education	17	22,345.5	-0.11	-0.23	[-0.297, -0.153]	624.412	97.4
Reported Performance							
Externally gathered	98	24,864	-0.18	-0.21	[-0.259, -0.169]	3813.492	96.2
Self-reported	76	25,190	-0.22	-0.17	[-0.206, -0.163]	1124.649	93.6
Not provided	2	6540	0.00 ***	-0.14 ***	[-0.439, 0.162]	27.871	96.4
Reported Procrastination							
Externally gathered	24	2256	-0.49	-0.38	[-0.467, -0.289]	720.136	96.0
Self-reported	152	53,676	-0.16	-0.16	[-0.194, -0.135]	2329.641	94.7

Note. Variables weighted r , estimated r , and Q-value are significant at $p < 0.001$ unless marked with an asterisk. SR = statistics cannot be computed because this subgroup contains a single record. The abbreviations found in the ‘Indicator of Procrastination’ section are explained in Appendix A. * $p < 0.01$, ** $p < 0.05$, *** $p > 0.05$.

4. Discussion

The present study was undertaken to aggregate existing research on the relationship between procrastination and academic performance. Our findings suggest a small negative correlation between the two variables. This could imply that those who procrastinate may either have lower academic aptitude, underperform due to procrastination, or develop procrastination tendencies due to poor academic performance. Notably, the data exhibited significant heterogeneity, indicating that the included studies may have focused on disparate aspects or types of procrastination. This was partially confirmed by analysing the most popular procrastination measures (see Appendix A, which mentions a variety of measurement techniques, aspects of procrastination, and types of procrastination that likely contribute to the observed heterogeneity). However, additional factors such as participant

characteristics, geographical location, performance metrics, data collection methods, and temporal aspects of the study further contributed to the observed heterogeneity.

This result is very similar to an earlier meta-analysis by Kim and Seo [12], but their study reported a slightly lower effect size. The result is also comparable to those of van Eerde [16] and Steel [15], with some comparable effect sizes, some slightly larger and some slightly smaller. However, the result did differ significantly from the average effect size reported by Setayeshi Azhari [14], which reported a small to medium overall effect size compared to the small effect size found in this study. Overall, our results mostly align with those of previous studies.

Of interest were the results related to the type of procrastination. Active procrastination showed a small positive relationship with academic performance, while passive procrastination had a small negative relationship with academic performance. Noticeable is that the studies wherein the type of procrastination was not specified showed a small to medium negative correlation with academic performance. The results of the type of procrastination closely matched the accompanying procrastination indicators, as most passive indicators reported similar correlations to the correlation between passive procrastination and academic performance. Active procrastination and academic performance showed similar effect sizes compared to APSCM and academic performance. The externally gathered procrastination data aligned closely with the non-specified type of procrastination. The effect sizes of the externally gathered procrastination data were significantly higher compared to previous meta-analyses on this type of data [12,53].

Another interesting variable is the sample age range, as adults appear to have the highest effect size for the relationship between procrastination and academic performance, followed by college students with about half the effect size, and then followed by students in secondary education with half the effect size of the college students. This being said, only one study in this dataset used adults as their participant population, so this phenomenon is not strongly supported. It is, however, interesting to consider, as this finding directly opposes the results found by Kim and Seo [12].

Due to the correlational nature of the extracted coefficients, a causal relationship cannot be confirmed. It could be the case that procrastination causes poor academic performance, or that people with low academic performance tend to procrastinate more compared to those with high academic performance. These relationships may also exist simultaneously.

These results can be used to answer the research questions. The first research question on the relationship between academic performance and procrastination can be answered by the overall correlation statistic, stating that there is a bivariate small negative correlation between academic performance and procrastination. This is in line with the hypothesis and previous research. The second research question was on the influence of the type of procrastination on the correlation with academic performance. Passive procrastination was found to have a small negative correlation with academic performance, and active procrastination had a small positive correlation with academic performance. These results confirm the hypothesis that active procrastination is positively correlated with academic performance and passive procrastination is negatively correlated with academic performance. Contrary to our hypothesis, the impact of age on effect sizes was inversely related, leading us to reject this aspect of our hypothesis. As for the influence of measurement type, our findings partially corroborate and contradict our initial expectations. Specifically, self-reported data for academic performance yielded larger effect sizes compared to externally collected data. Conversely, for procrastination, self-reported data produced smaller effect sizes relative to externally sourced data. The results of the performance indicators were in line with the hypothesis, with all indicators having the same directionality in correlation, all hovering around a small to medium correlation. The hypothesis related to the procrastination indicators was also confirmed, as procrastination indicators appear to correlate with the type of procrastination that they are intended to measure.

This study has several limitations. One such factor is the possibility of publication bias. Even though the Trim-and-Fill analysis concluded there was no publication bias, the

test is known to perform poorly in the presence of high heterogeneity [48,54], which is the case for this dataset. The second bias test, Egger's regression test, resulted in a negative small study bias, meaning that small studies show more extreme effect sizes compared to larger studies. This could be negligible for a number of reasons: most studies in the dataset have a relatively high sample size, the weighted r makes these studies less impactful, and the reported bias was relatively small. Knowing this does not rule out the possibility of publication bias.

The weighted r also has limitations. Using a weighted correlational approach means that large studies have more of an impact on the overall correlation statistic. However, one could argue that it is not fair to assign more weight to large studies, as they might have less controlled methods compared to smaller studies, where the study process can be more easily controlled. This method makes the overall correlation coefficient more biased towards the facets of procrastination and academic performance that are measured by larger studies. To combat this limitation, both the weighted r and the unweighted estimated r have been reported for comparison. The difference between the weighted r and the unweighted r was very small for most variables.

Self-reported data can influence the objectivity of the correlation. Self-reported data on academic performance such as GPA generally correlate well with objective GPA, but the correlation can vary depending on many of the participants' characteristics [55]. The objective measures of procrastination might also be questionable as they generally tend to focus on measures such as delay, absence, and time, which do not cover the full extent of procrastination and cannot distinguish between active and passive delay related to the types of procrastination [56].

Articles used in this study span a wide timeframe in which the academic setting has changed. Particularly during the years 2020 to 2022, online education became more prevalent due to the pandemic [57]. This could have influenced the relationship between procrastination and academic performance. It could be that the correlation between the variables has decreased as the gap in academic performance has declined due to COVID-19. It could also have increased the correlation, as COVID-19 could have impacted procrastinators more than others in terms of academic performance.

Results on active procrastination and the comparison with passive procrastination should be interpreted more critically compared to the rest of the results. The definitions of procrastination and active procrastination differ substantially, as one is considered irrational and the other deliberate and intentional. A review study by Klingsieck [25] compared popular definitions of procrastination and strategic delay, which is similar to active procrastination, and found that strategic delay differs in facets such as irrationality, awareness, and discomfort. It might not be fair to compare active and passive procrastination as they analyse different facets. This difference is visible in the effects sizes, as they differ significantly. This difference in definition might limit the comparison strength between the two procrastination types.

The review process of this study also has some limitations. Due to the method of screening, if the appropriate variables were not mentioned in the title, abstract, or keywords, the study was not included in the full article review. This method allowed us to find many articles, but may have caused some relevant publications to go unnoticed.

The selection and screening of articles were done by the first author using one database, and are therefore prone to more mistakes in data assessment and extraction compared to the use of multiple assessors. Potentially overlooked articles could have provided different or more definitive results. The results of this study could be biased towards the journals that are supported by Web of Science.

The procrastination indicators and academic performance indicators were selected due to their broad nature, to allow for summative results after analysis. However, most articles used these indicators in line with their own needs, and adapted them accordingly. The meta-analysis prioritizes quantitative data at the expense of qualitative precision. Put differently, the result is statistically extremely robust, but compromises the conditions under

which the results are attained. A more stringent data collection process would introduce a greater variety of indicators, thereby reducing the certainty of the conclusions due to a smaller number of studies for each specific indicator.

To address these limitations, future research should implement the following strategies: employ multiple assessors for data selection and extraction to reach consensus and establish inter-rater reliability; incorporate additional tests for publication bias; expand database searches and integrate data from existing meta-analyses on the subject; establish more precise criteria for indicators to preserve their interpretive value; and include grey literature in the search parameters to ensure a comprehensive review.

The implications of this research are mainly related to academic settings, as the correlation is primarily focused on academic performance. The direct implications of this research are the following: procrastination among students should be monitored to identify students that could suffer in terms of academic performance; not all procrastination should be viewed as negative as active procrastination is positively related to academic performance; procrastination should be given more attention the older people get, as there seems to be a positive correlation between age and effect size.

The implications of this research enrich the existing body of knowledge regarding the interrelationship between procrastination and academic performance. It also provides an overview of the different procrastination indicators and their relationship with academic performance. The results of the subgroup analysis on the type of procrastination are also of interest for researchers in this field; researchers should account for different types of procrastination when using or developing an indicator for procrastination. The type of procrastination can greatly influence the correlation with academic performance.

Procrastination as a concept should be well defined, as the results of this research show that procrastination can refer to a variety of behaviours. These behaviours generally follow the line of delay of tasks, but with different intentions and surrounding behaviours that lead to different performance results. The example provided in this study relates to academic performance correlating differently with active and passive procrastination; however, future research may distinguish many more differences between types of procrastination.

The results of this study can also be used to theorise about the direct and indirect influences of procrastination on academic performance. The distinction between passive and active procrastination can serve as a comparison between procrastination associated with negative performance and procrastination associated with positive performance. Both forms of procrastination contain dilatory behaviour within their definition; however, active is regarded as more positive compared to passive. One can theorise that if both forms of procrastination delay tasks to the same extent, then the only difference between the two is the traits associated with them. If this statement is true, then one can assume that the indirect effects of procrastination determine the direction and strength of the relationship. However, further research needs to be conducted to verify that both forms of procrastination cause task delay to the same extent, and determine whether the definitions are related enough to compare.

5. Conclusions

The overall relationship between procrastination and academic performance is negative and small. The type of procrastination does matter when compared with academic performance, as active procrastination is positively related to academic performance, while passive procrastination is negatively related to academic performance. When measuring procrastination, one should consider that external measurements of procrastination correlate more with academic performance compared to participant-reported data, keeping in mind that these forms of data collection differ in procrastination facets. It can be inferred that the correlation between academic performance and procrastination is more pronounced among college students compared to those in secondary education.

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Appendix A. A Summary of Measurement Tools Used to Assess Procrastination

Table A1. A comprehensive summary of procrastination indicators.

Measurement	Abbreviation	Active or Passive Procrastination	How Procrastination Is Assessed	Test–Retest Reliability
Academic Delay Scale [58]	EDA	Passive, it reports the tendency to delay tasks considering the negative consequences.	Assesses delay tendency in academic tasks.	-
Academic Procrastination Scale [24]	APSM	Both, it has dimensions related to both types of procrastination.	Assess the type of procrastination using cognitive efficiency, peak experience, deliberate procrastination, preference for pressure, ability to meet deadlines, and outcome satisfaction to measure active procrastination and passive procrastination using fear of failure, taskaversiveness, and laziness.	-
Academic Procrastination [59]	APF	Passive, it reports on task avoidance, which is related to passive procrastination.	Assesses the avoidance of academic tasks using five self-reported items.	-
Academic Procrastination Questionnaire [60]	APQ	Passive, it relates to the delay of academic work without mentioning benefits.	Assesses procrastination of academic work and tasks using a questionnaire format.	-
Academic Procrastination Scale [61]	EPA	Passive, it relates to self-regulation failure and can therefore not be active.	Assesses academic procrastination through two dimensions named academic self-regulation and postponement of activities through a 12-item questionnaire.	-
Academic Procrastination Scale [62]	APSC	Passive, it aims to define procrastination in one dimension with a negative connotation.	Assesses academic procrastination behaviours using 19 self-assessment items to indicate greater or more procrastination behaviours.	$r = 0.89$
Academic Procrastination Scale [9]	APSG	Passive, it assesses the negative aspects of academic procrastination.	Assesses student academic procrastination based on five self-assessment items.	-
Academic Procrastination Scale [63]	APSMT	Passive, it focuses on the difficulty to start an academic task.	Assesses academic procrastination with a focus on homework, examinations, and papers using seven items.	-
Academic Procrastination Scale [64]	APSO	Passive, it relates to the negative aspects of procrastination behaviour.	Assesses the probability of procrastination behaviour using 11 self-assessment items.	-

Table A1. Cont.

Measurement	Abbreviation	Active or Passive Procrastination	How Procrastination Is Assessed	Test–Retest Reliability
Academic Procrastination Scale-Short Form [65]	APSS	Passive, it notes the negative outcome of procrastination on academic tasks.	Assesses academic procrastination using five items on tendency to procrastinate on academic tasks.	-
Academic Procrastination State Inventory [66]	APSI	Passive, it has a focus on state procrastination with a negative connotation.	Assesses state procrastination using 13 items with facets such as delay, lack of energy, and concentration.	$r = 0.69$ [67]
Academic Time Management and Procrastination Measure [68]	ATMPM	Passive, it gives a rating to procrastination's relationship to poor time management.	Assesses behaviours related to time management (planning and monitoring) and procrastination using 14 self-report items.	
Active Procrastination Scale [30]	APSCM	Active, highlights the positive aspects of procrastination. The scale can be reverse keyed for passive procrastination.	Assesses four characteristics of procrastination items: satisfaction with an outcome, ability to meet deadlines, intention to procrastinate, and preference for time pressure using 16 self-assessment items.	$r = 0.80$
Adult Inventory of Procrastination [69]	AIP	Passive, it highlights the negative relationship with time.	Assesses adult procrastination on the subscales: time loss, time management, and time commitment.	$r = 0.71$ [70]
Aitken Procrastination Inventory [71]	API	Passive, it is used to differentiate students from chronic academic procrastinators.	Assesses students and analyses their level of chronic academic procrastination using 21 items.	$r = 0.87$ [72]
Avoidance Reactions to a Deadline Scale [73]	ARDS	Passive, it focusses on avoidance instead of the positive aspect of delay.	Assesses avoidance reactions indicative of procrastination using 8 self-reported items.	-
Behavioural and Emotional Academic Procrastination Scale [74]	BEPS	Passive, it provides a rating based on negative aspects of delay and comfort.	Assesses the self-reported behavioural aspect of procrastination using three items on academic task delay and the emotional aspect of procrastination using three items on subjective discomfort.	$r = 0.62$ (delay) and $r = 0.52$ (subjective discomfort)
Conscientiousness Measurement [75]	CCM	Passive, it measures the opposite of procrastination behaviour.	Assesses self-reported conscientiousness using the facets industriousness, perfectionism, tidiness, procrastination refrainment, control, caution, task planning, and perseverance using 68 items.	-
Decisional Procrastination Scale [5]	DPS	Passive, negative aspects of decisional procrastination.	Assesses five items that relate to delay in coming to decisions and delay in implementing decisions.	$r = 0.69$ [76]
General Procrastination Scale [32]	GPS	Passive, keyed towards procrastination in everyday situations and tasks.	Assesses general procrastination using 20 items on everyday situations and tasks.	$r = 0.80$ [77]
Irrational Procrastination Scale [78]	IPS	Passive, as scores are lower when procrastination is not viewed negatively.	Assesses the self-reported feeling of experiencing an irrational delay.	$r = 0.84$ [79]

Table A1. Cont.

Measurement	Abbreviation	Active or Passive Procrastination	How Procrastination Is Assessed	Test–Retest Reliability
Melbourne Decision Making Questionnaire [80]	MDMQ	Passive, it is related to the negative results of procrastination.	Assesses decision-coping patterns using the factors procrastination, hyper-vigilance, buck-passing, and vigilance using 22 self-report items.	-
Metacognitive beliefs about Procrastination scale [26]	MaP	Both, relates to the positive and negative metacognitive beliefs about procrastination.	It assesses metacognitive beliefs about procrastination using 16 self-assessment items.	-
Multidimensional Academic Procrastination Scale [81]	MAPS-15	Passive, it is related to the negative consequence of procrastination.	Assesses academic procrastination using the factors core procrastination, poor time management, and work disconnection.	$r = 0.85$
Passive Procrastination Scale [23]	PPSC	Passive, it is meant to contrast with active procrastination.	Assesses academic procrastination using six self-reported items adapted from the DPS and APSI.	-
Procrastination Checklist Study tasks [28]	PCS	Passive, it is related to study behaviours and time in a negative fashion.	It is an external procrastination measurement using 12 study behaviours scored for both the intended and complete time.	-
Procrastination Assessment Scale for Students [6]	PASS	Passive, as student scores are lower when they do not think procrastination is a problem.	Assesses procrastination and to what extent it causes problems using 12 items and two subscales related to frequency and problem.	$r = 0.57$
Procrastination Inventory [82]	PI	Passive, it denotes the negative connotation of procrastination.	Assesses procrastination using the four subscales controllability, expectation to change, motivation to change, and justification using 36 items.	-
Procrastination Log-Behaviour [83]	PLB	Passive, it has a focus on procrastination behaviour and satisfaction.	Assesses self-reported procrastination behaviour weekly with a satisfaction rating using 11 items.	-
Procrastination State in Academic Tasks [84]	PATS	Passive, it relates to negative aspects of procrastination behaviour and state of mind.	Assesses self-reported procrastination over the course of a week using the factors procrastination behaviour, fear of failure, and lack of academic motivation.	-
Procrastination Styles Questionnaire [85]	PSQ	Passive, it accounts for delay of academic tasks but not the benefit of delay.	Assesses behavioural procrastination using ten academic scenarios that are rated using the four responses: classic procrastination, non-academic productive procrastination, academic productive procrastination, and non-procrastination.	-

Table A1. Cont.

Measurement	Abbreviation	Active or Passive Procrastination	How Procrastination Is Assessed	Test–Retest Reliability
Pure Procrastination Scale [78]	PPS	Passive, it highlights the dysfunction of procrastination.	Assesses dysfunctional procrastination using 12 self-report items from different procrastination identifiers.	$r = 0.89$ [86]
Revised NEO Personality Inventory [87]	NEO-PI-R	Passive, it relates to the refrainment of negatively associated procrastination.	Assesses procrastination refrainment through items of the facet of self-discipline.	-
Student Learning Inventory [88]	SSLI	Passive, it highlights the negative aspect of procrastinative metacognition.	Assesses five self-assessment factors on metacognition named postdictive, predictive help, predictive no help, procrastinative, and piecemeal.	-
Test Procrastination Questionnaire [89]	TPQ	Passive, it focuses on the likelihood of procrastination over a test.	Assesses the likelihood of procrastination over a test using ten self-assessment items.	-
The Studying Procrastination Scale [90]	SPS	Passive, it views active procrastination as wrong by the definition of procrastination.	Assesses study procrastination of students and the self-assessed implications towards performance alongside affect and self-forgiveness.	-
The Unintentional Procrastination Scale [91]	UPS	Passive, it is related to unintentional procrastination and highlights the negative aspects of procrastination.	It assessed unintentional procrastination using 6 items.	-
Tuckman Procrastination Scale with 35 items [92]	TPS	Passive, no items related to positive aspects of procrastination.	Assesses 35 statements about the participant's relationship with procrastination including self-efficacy and self-regulated performance items.	$r = 0.90$

Note. This table gives a summary of most indicators of procrastination and how they assess procrastination, including the type of procrastination and the test–retest reliability. If the test–retest reliability was not found, then a hyphen is used instead. When a source is cited next to the test–retest coefficient, then the coefficient is extracted from a different source than the original article in the measurement section. The abbreviations have been gathered from the article in which the measurement tool was found, or the abbreviations have been composed from the first letters of each the measurement and when necessary the first letters of the author's name.

Appendix B. An Overview of Included Studies

Table A2. Studies included in the meta-analysis.

Number	Author	Year	Sample Size	Sample Age	Location
1	Alp and Sungur [93]	2017	117	College	Turkey
2	Artino et al. [94]	2012	170	College	United States
3	Atalayin et al. [95]	2017	452	College	Turkey
4	Balkis [96]	2011	364	College	Turkey
5	Balkis and Duru [97]	2017	441	College	Turkey
6	Balkis (a) [31]	2013	290	College	Turkey
7	Balkis (b) [98]	2013	323	College	Turkey
8	Balkis et al. [99]	2012	281	College	Turkey
9	Batool [100]	2019	502	College	Pakistan
10	Bolden and Fillauer [101]	2020	114	College	United States
11	Bong et al. [102]	2014	304	Secondary education	South Korea
12	Caratiquit and Caratiquit [103]	2023	223	Secondary education	Philippines

Table A2. Cont.

Number	Author	Year	Sample Size	Sample Age	Location
13	Cerezo et al. [104]	2016	140	College	Spain
14	Chen and Zeng [105]	2022	566	College	China
15	Chissmom et al. [106]	1989	118	College	United States
16	Chu and Choi [23]	2005	230	College	Canada
17	Clariana et al. [107]	2012	171	College	Spain
18	Clarke and MacCann [108]	2016	457	College	Australia
19	Corkin et al. [56]	2011	206	College	United States
20	Corkin et al. [109]	2021	223	College	United States
21	Cosnefroy et al. [110]	2018	303	College	France
22	Custer [111]	2018	195	College	United States
23	de la Fuente et al. [112]	2021	430	Secondary education	Colombia
24	Duru and Balkis [113]	2017	348	College	Turkey
25	Duru and Balkis [114]	2014	261	College	Turkey
26	Elias et al. [115]	2005	145	College	Malaysia
27	Estrada Araoz et al. [116]	2020	47	College	United States
28	Fernández Da Lama and Brenlla [117]	2022	257	College	Argentina
29	Franzen et al. [118]	2021	6609	Secondary education	Luxembourg
30	Gadosey et al. [119]	2022	1556	College	Germany
31	García-Ros et al. [9]	2022	728	Secondary education	Spain
32	Gareau et al. [120]	2018	258	College	Canada
33	Garzón-Umerenkova et al. [121]	2018	363	College	Spain
34	Ghayas et al. [122]	2022	200	College	Pakistan
35	Goroshit [123]	2018	142	College	Israel
36	Grunschel et al. [124]	2016	635	College	Germany
37	Han et al. [125]	2023	1216	College	United States
38	Hensley [126]	2014	320	College	United States
39	Hofer et al. [127]	2012	697	Secondary education	Germany
40	Job et al. [128]	2015	145	College	United States
41	Kandemir [129]	2014	619	College	Turkey
42	Karatas [130]	2015	475	College	Turkey
43	Kármen et al. [131]	2015	162	College	Romania
44	Kertechian [132]	2018	404	College	France
45	Kim and Nembhard [133]	2019	59	College	United States
46	Kim and Seo [134]	2013	278	College	South Korea
47	Kim et al. [26]	2017	178	College	Switzerland
48	Kindt et al. [135]	2019	418	Secondary education	Germany
49	Klassen et al. [136]	2008	456	College	Canada
50	Klingsieck et al. [137]	2012	1396	College	Germany
51	Kljajic and Gaudreau [138]	2022	269	College	Canada
52	Kljajic and Gaudreau [139]	2018	208	College	Canada
53	Kljajic et al. [140]	2022	359	College	Canada
54	Kljajic et al. [141]	2017	510	College	Canada
55	Kurtovic et al. [142]	2019	227	College	Croatia
56	Lim [143]	2016	214	College	United States
57	Lubbers et al. [144]	2010	9811	Secondary education	Netherlands
58	MacCann et al. [75]	2009	275	College	United States
59	Macher et al. [145]	2011	147	College	Austria
60	Martín-Antón et al. [146]	2022	794	College	Spain
61	Martinie et al. [147]	2022	236	College	France
62	Michinov et al. [148]	2011	83	Adults	France
63	Moon and Illingworth [149]	2005	303	College	United States
64	Moon et al. [150]	2020	96	College	United States
65	Morris and Fritz [151]	2015	67	College	United Kingdom
66	Paechter et al. [152]	2017	225	College	Austria
67	Pekpazar et al. [153]	2021	378	College	Turkey
68	Pilotti et al. [154]	2022	609	College	Saudi Arabia
69	Purwanto and Natalya [155]	2019	239	College	Indonesia
70	Ragusa et al. [156]	2023	991	Secondary education	Spain

Table A2. Cont.

Number	Author	Year	Sample Size	Sample Age	Location
71	Rikoon et al. [87]	2016	426	College	United States
72	Roig and DeTommaso [157]	1995	58	College	United States
73	Sæle et al. [158]	2016	379	College	Norway
74	Sage et al. [159]	2021	96	College	United States
75	Saman and Wirawan [160]	2021	1670	College	Indonesia
76	Seo ^a [18]	2011	172 ^a	College	South Korea
77	Seo ^a [52]	2012	172 ^a	College	South Korea
78	Shaked and Altarac [161]	2022	145	College	Israel
79	Steel et al. [162]	2001	152	College	United States
80	Suárez-Perdomo et al. [163]	2022	1784	College	Spain
81	Sun and Kim [164]	2022	157	College	United States
82	Tian et al. [165]	2020	108	Secondary education	China
83	Tian et al. [166]	2021	3511	College	China
84	Tice and Baumeister [167]	1997	104	College	United States
85	Tisocco and Liporace [168]	2022	928	College	Argentina
86	Wesley [169]	1994	244	College	United States
87	Westgate et al. [85]	2016	1104	College	United States
88	Wolters [170]	2004	525	Secondary education	United States
89	Wolters and Hussain [171]	2014	213	College	United States
90	Wu [172]	2020	78	College	Taiwan
91	Xu [173]	2023	1072	Secondary education	China
92	Yang et al. [174]	2020	242	College	Estonia
93	You [175]	2015	569	College	South Korea
94	Yu et al. [176]	2021	465	Secondary education	China
95	Zhang and Zhang [177]	2022	55	College	China
96	Zhang et al. [178]	2022	265	College	United States

Note. The sample size of each article is reported as the highest number of participants reported per correlation coefficient in cases of pooled participants and the combined number of participants in cases of multiple separate studies to report the number of unique participants per article. ^a These studies share sample sizes but are analysed using different indicators.

Appendix C. Funnel Plot

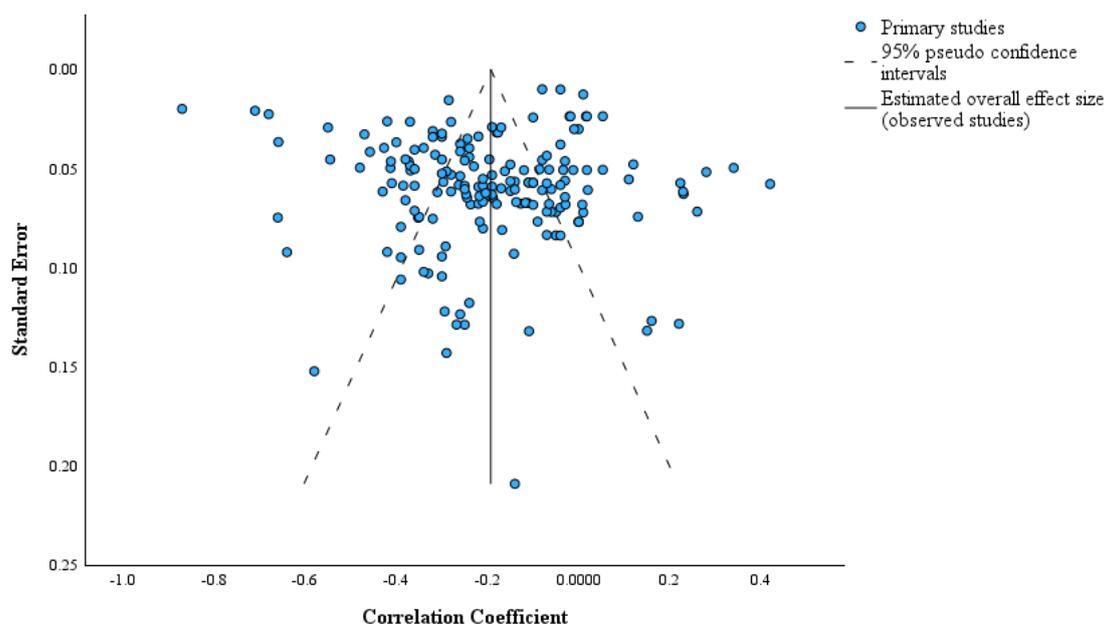


Figure A1. The funnel plot related to the Egger's regression test for correlation coefficient and standard error. Note. The blue dots in the funnel graph represent individual correlation coefficients.

Appendix D. The Results of Subgroup Statistical Tests

Table A3. Results of effect size (r) estimates for subgroup academic performance indicators.

Academic Performance Indicator	k	Effect Size (r)	Std. Error	Z-Value	Sig. (2-Tailed)	95% Confidence Interval	
						Lower	Upper
ACT	2	0.04	0.0700	0.575	0.565	-0.097	0.177
Average Grade	23	-0.27	0.0292	-9.388	<0.001	-0.332	-0.217
Course grade	25	-0.28	0.0583	-4.831	<0.001	-0.396	-0.168
Coursework	1	-0.39	0.1060	-3.680	<0.001	-0.598	-0.182
Exam	39	-0.16	0.0293	-5.566	<0.001	-0.220	-0.106
Flesch-Kincaid Grade Level	1	-0.27	0.1287	-2.082	0.037	-0.520	-0.016
General Average	1	-0.19	0.0650	-2.891	0.004	-0.315	-0.061
GPA	60	-0.18	0.0219	-8.284	<0.001	-0.224	-0.138
Homework assignment	7	-0.14	0.0919	-1.476	0.140	-0.316	0.044
Research specific	9	-0.12	0.0559	-2.084	0.037	-0.226	-0.007
SATs	5	0.01	0.0124	0.977	0.329	-0.012	0.037
Written report	3	-0.33	0.0666	-4.967	<0.001	-0.461	-0.200
Overall	176	-0.19	0.0153	-12.569	<0.001	-0.223	-0.163

SATs = Standard Assessment Tests.

Table A4. Results of effect size (r) estimates for subgroup procrastination indicators.

Procrastination Indicator	k	Effect Size (r)	Std. Error	Z-Value	Sig. (2-Tailed)	95% Confidence Interval	
						Lower	Upper
Absence	2	-0.63	0.0800	-7.893	<0.001	-0.788	-0.475
APF	2	-0.18	0.1400	-1.289	0.197	-0.455	0.094
API	13	-0.27	0.0393	-6.759	<0.001	-0.343	-0.189
APSCM	22	0.07	0.0356	2.050	0.040	0.003	0.143
APSG	1	-0.24	0.0349	-6.986	<0.001	-0.312	-0.176
APSMT	1	-0.21	0.0802	-2.618	0.009	-0.367	-0.053
APSO	2	-0.25	0.0543	-4.673	<0.001	-0.360	-0.147
APSS	7	-0.30	0.0275	-10.917	<0.001	-0.355	-0.247
CCM	2	-0.08	0.0998	-0.835	0.404	-0.279	0.112
Days between assignments	1	-0.25	0.0647	-3.786	<0.001	-0.372	-0.118
Days to complete	1	-0.39	0.0586	-6.566	<0.001	-0.500	-0.270
Days to start	1	-0.13	0.0677	-1.875	0.061	-0.260	0.006
Days-hand-in	1	-0.35	0.0748	-4.703	<0.001	-0.499	-0.205
Dilatory behaviour	10	-0.24	0.0296	-8.085	<0.001	-0.297	-0.181
DPS	1	-0.20	0.0637	-3.139	0.002	-0.325	-0.075
EDA	1	-0.38	0.0660	-5.757	<0.001	-0.509	-0.251
EPA	1	-0.30	0.0324	-9.272	<0.001	-0.363	-0.237
GPS	11	-0.31	0.0614	-5.059	<0.001	-0.431	-0.190
Inactive time	2	-0.61	0.0567	-10.679	<0.001	-0.716	-0.494
IPS	9	-0.21	0.0404	-5.172	<0.001	-0.288	-0.130
Late submission	2	-0.58	0.1050	-5.489	<0.001	-0.782	-0.371
NEO-PI-R	1	0.12	0.0479	2.504	0.012	0.026	0.214
PASS	21	-0.14	0.0381	-3.746	<0.001	-0.217	-0.068
PI	1	-0.04	0.0838	-0.477	0.633	-0.204	0.124
PPS	4	-0.27	0.0707	-3.845	<0.001	-0.410	-0.133
PPSC	2	-0.37	0.0691	-5.322	<0.001	-0.503	-0.232
PSQ	4	-0.09	0.0507	-1.828	0.067	-0.192	0.007
Research specific	25	-0.18	0.0417	-4.375	<0.001	-0.264	-0.101
SPS	1	-0.35	0.0744	-4.702	<0.001	-0.496	-0.204
SSLI	2	-0.04	0.2050	-0.217	0.829	-0.446	0.357
Time pressure reactivity	2	-0.21	0.0922	-2.259	0.024	-0.389	-0.028
TPS	20	-0.24	0.0247	-9.646	<0.001	-0.286	-0.190
Overall	176	-0.19	0.0153	-12.569	<0.001	-0.223	-0.163

Note. The abbreviations found in the 'Procrastination Indicator' row are explained in Appendix A.

References

1. Steinmayr, R.; Meißner, A.; Weidinger, A.F.; Wirthwein, L. Academic Achievement. In *Oxford Bibliographies Online Datasets*; Oxford University Press: Oxford, UK, 2014. [CrossRef]
2. Can, S.; Zeren, Ş.G. The role of internet addiction and basic psychological needs in explaining the academic procrastination behavior of adolescents. *Cukurova Univ. Fac. Educ. J.* **2019**, *48*, 1012–1040. [CrossRef]
3. Senécal, C.; Julien, E.; Guay, F. Role conflict and academic procrastination: A self-determination perspective. *Eur. J. Soc. Psychol.* **2002**, *33*, 135–145. [CrossRef]
4. Sirin, E.F. Academic procrastination among undergraduates attending school of physical education and sports: Role of general procrastination, academic motivation and academic self-efficacy. *Educ. Res. Rev.* **2011**, *6*, 447–455. Available online: <https://academicjournals.org/journal/ERR/article-full-text-pdf/AB66EE15294.pdf> (accessed on 13 May 2023).
5. Mann, L. Procrastination revisited: A commentary. *Aust. Psychol.* **2016**, *51*, 47–51. [CrossRef]
6. Solomon, L.J.; Rothblum, E.D. Academic procrastination: Frequency and cognitive-behavioral correlates. *J. Couns. Psychol.* **1984**, *31*, 503–509. [CrossRef]
7. Harriott, J.; Ferrari, J.R. Prevalence of procrastination among samples of adults. *Psychol. Rep.* **1996**, *78*, 611–616. [CrossRef]
8. Popova, D.; Pronenko, E. Academic procrastination in the context of meaning structures of personality: Why is it important for the formation of sustainable behavior. *E3S Web Conf.* **2023**, *376*, 05058. [CrossRef]
9. García-Ros, R.; Pérez-González, F.; Tomás, J.M.; Sancho, P. Effects of self-regulated learning and procrastination on academic stress, subjective well-being, and academic achievement in secondary education. *Curr. Psychol.* **2022**, *42*, 26602–26616. [CrossRef]
10. Senécal, C.; Koestner, R.; Vallerand, R.J. Self-regulation and academic procrastination. *J. Soc. Psychol.* **1995**, *135*, 607–619. [CrossRef]
11. Akpur, U. The effect of procrastination on academic achievement: A meta-analysis study. *Int. J. Educ. Methodol.* **2020**, *6*, 681–690. [CrossRef]
12. Kim, K.R.; Seo, E.H. The relationship between procrastination and academic performance: A meta-analysis. *Personal. Individ. Differ.* **2015**, *82*, 26–33. [CrossRef]
13. Richardson, M.; Abraham, C.; Bond, R. Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychol. Bull.* **2012**, *138*, 353–387. [CrossRef]
14. Setayeshi Azhari, M. Procrastination and academic performance: A meta-analysis study. *J. Appl. Psychol. Res.* **2019**, *10*, 115–133. [CrossRef]
15. Steel, P. The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychol. Bull.* **2007**, *133*, 65–94. [CrossRef]
16. van Eerde, W. A meta-analytically derived nomological network of procrastination. *Personal. Individ. Differ.* **2003**, *35*, 1401–1418. [CrossRef]
17. Benjamin, A.S.; Tullis, J. What makes distributed practice effective? *Cogn. Psychol.* **2010**, *61*, 228–247. [CrossRef]
18. Seo, E.H. The relationships among procrastination, flow, and academic achievement. *Soc. Behav. Personal. Int. J.* **2011**, *39*, 209–217. [CrossRef]
19. Everaert, P.; Opdecam, E.; Maussen, S. The relationship between motivation, learning approaches, academic performance and time spent. *Account. Educ.* **2017**, *26*, 78–107. [CrossRef]
20. Lakshminarayan, N.; Potdar, S.; Reddy, S.G. Relationship between procrastination and academic performance among a group of undergraduate dental students in India. *J. Dent. Educ.* **2012**, *77*, 524–528. [CrossRef]
21. Zimmerman, B.J.; Bandura, A.; Martinez-Pons, M. Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *Am. Educ. Res. J.* **1992**, *29*, 663–676. [CrossRef]
22. Janssen, J. Academic Procrastination: Prevalence among High School and Undergraduate Students and Relationship to Academic Achievement. Ph.D. Thesis, Georgia State University, Atlanta, GA, USA, 2015. Available online: https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1115&context=epse_diss (accessed on 13 May 2023).
23. Chu, A.H.C.; Choi, J.N. Rethinking procrastination: Positive effects of “active” procrastination behavior on attitudes and performance. *J. Soc. Psychol.* **2005**, *145*, 245–264. [CrossRef]
24. Morales, R. Development of an academic procrastination scale. *Asia-Pac. Educ. Res.* **2010**, *19*, 515–524. [CrossRef]
25. Klingsieck, K.B. Procrastination: When good things don't come to those who wait. *Eur. Psychol.* **2013**, *18*, 24–34. [CrossRef]
26. Kim, S.; Fernandez, S.; Terrier, L. Procrastination, personality traits, and academic performance: When active and passive procrastination tell a different story. *Personal. Individ. Differ.* **2017**, *108*, 154–157. [CrossRef]
27. Parker, C.; Scott, S.; Geddes, A. *Snowball Sampling*; SAGE Research Methods Foundations: London, UK, 2019; Available online: <https://eprints.glos.ac.uk/id/eprint/6781> (accessed on 13 May 2023).
28. Schouwenburg, H.C. The diagnosis of procrastination in students. *Ned. Tijdschr. Voor De Psychol. En Haar Grensgebieden* **1991**, *46*, 379–385. Available online: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc3&NEWS=N&AN=1992-86766-001> (accessed on 13 May 2023).
29. Fernie, B.A.; Spada, M.M.; Nikčević, A.V.; Georgiou, G.A.; Moneta, G.B. Metacognitive beliefs about procrastination: Development and concurrent validity of a self-report questionnaire. *J. Cogn. Psychother.* **2009**, *23*, 283–293. [CrossRef]
30. Choi, J.N.; Moran, S.V. Why not procrastinate? Development and validation of a new active procrastination scale. *J. Soc. Psychol.* **2009**, *149*, 195–212. [CrossRef] [PubMed]

31. Balkis, M. Academic procrastination, academic life satisfaction and academic achievement: The mediation role of rational beliefs about studying. *J. Cogn. Behav. Psychother.* **2013**, *13*, 57–74. Available online: https://www.researchgate.net/profile/Murat-Balkis-2/publication/236173872_Academic_procrastination_academic_life_satisfaction_and_academic_achievement_The_mediation_role_of_rational_beliefs_about_studying/links/0c960533a98186b6b9000000/Academic-procrastination-academic-life-satisfaction-and-academic-achievement-The-mediation-role-of-rational-beliefs-about-studying.pdf (accessed on 13 May 2023).
32. Lay, C.H. At last, my research article on procrastination. *J. Res. Personal.* **1986**, *20*, 474–495. [CrossRef]
33. Borenstein, M.; Hedges, L.V.; Higgins, J.P.T.; Rothstein, H.R. *Introduction to Meta-Analysis*, 2nd ed.; John Wiley & Sons: Hoboken, NJ, USA, 2021; pp. 3–13. Available online: https://books.google.nl/books?hl=en&lr=&id=pdQnEAAAQBAJ&oi=fnd&pg=PP1&ots=WE_pwYfGL_&sig=YAPaQagXTvpbEwodOj1d_EWsd&redir_esc=y#v=onepage&q&f=false (accessed on 13 May 2023).
34. Unpaywall. (n.d.). Unpaywall.org. Available online: <https://unpaywall.org/> (accessed on 18 May 2023).
35. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Br. Med. J.* **2021**, *372*, n71. [CrossRef]
36. Silver, N.C.; Dunlap, W.P. Averaging correlation coefficients: Should Fisher's z transformation be used? *J. Appl. Psychol.* **1987**, *72*, 146–148. [CrossRef]
37. Charter, R.A.; Larsen, B.S. Fisher's Z to r. *Educ. Psychol. Meas.* **1983**, *43*, 41–42. [CrossRef]
38. Wetzels, R.; Matzke, D.; Lee, M.D.; Rouder, J.N.; Iverson, G.J.; Wagenmakers, E.-J. Statistical evidence in experimental psychology. *Perspect. Psychol. Sci.* **2011**, *6*, 291–298. [CrossRef] [PubMed]
39. Hansen, C.; Steinmetz, H.; Block, J. How to conduct a meta-analysis in eight steps: A practical guide. *Manag. Rev. Q.* **2021**, *72*, 1–19. [CrossRef]
40. Aguinis, H.; Dalton, D.R.; Bosco, F.A.; Pierce, C.A.; Dalton, C.M. Meta-analytic choices and judgment calls: Implications for theory building and testing, obtained effect sizes, and scholarly impact. *J. Manag.* **2010**, *37*, 5–38. [CrossRef]
41. Smith, S.M.; Graser, H. Estimating variance components in a class of mixed models by restricted maximum likelihood. *J. Dairy Sci.* **1986**, *69*, 1156–1165. [CrossRef]
42. Duval, S.; Tweedie, R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* **2000**, *56*, 455–463. [CrossRef]
43. Hazra, A. Using the confidence interval confidently. *J. Thorac. Dis.* **2017**, *9*, 4124–4129. [CrossRef]
44. Gnamb, T. A brief note on the standard error of the Pearson correlation. *Collabra Psychol.* **2022**, *9*, 87615. [CrossRef]
45. Hardy, R.J.; Thompson, S.G. Detecting and describing heterogeneity in meta-analysis. *Stat. Med.* **1998**, *17*, 841–856. [CrossRef]
46. Borenstein, M.; Hedges, L.V.; Higgins, J.P.T.; Rothstein, H. *Introduction to Meta-Analysis*; John Wiley & Sons: Hoboken, NJ, USA, 2009. Available online: <https://introduction-to-meta-analysis.com/pages/order.php?cart=BVTH8881780> (accessed on 13 May 2023).
47. Huedo-Medina, T.B.; Sánchez-Meca, J.; Marín-Martínez, F.; Botella, J. Assessing heterogeneity in meta-analysis: Q statistic or I² index? *Psychol. Methods* **2006**, *11*, 193–206. [CrossRef]
48. Peters, J.L.; Sutton, A.J.; Jones, D.R.; Abrams, K.R.; Rushton, L. Performance of the trim and fill method in the presence of publication bias and between-study heterogeneity. *Stat. Med.* **2007**, *26*, 4544–4562. [CrossRef]
49. Egger, M.; Smith, G.D.; Schneider, M.; Minder, C. Bias in meta-analysis detected by a simple, graphical test. *BMJ* **1997**, *315*, 629–634. [CrossRef]
50. Lin, L.; Chu, H.; Murad, M.H.; Hong, C.; Qu, Z.; Cole, S.R.; Chen, Y. Empirical comparison of publication bias tests in meta-analysis. *J. Gen. Intern. Med.* **2018**, *33*, 1260–1267. [CrossRef]
51. Mowbray, F.I.; Fox-Wasylyshyn, S.M.; El-Masri, M.M. Univariate outliers: A conceptual overview for the nurse researcher. *Can. J. Nurs. Res.* **2018**, *51*, 31–37. [CrossRef]
52. Seo, E.H. Cramming, active procrastination, and academic achievement. *Soc. Behav. Personal. Int. J.* **2012**, *40*, 1333–1340. [CrossRef]
53. Wang, Q.; Mousavi, A. Which log variables significantly predict academic achievement? A systematic review and meta-analysis. *Br. J. Educ. Technol.* **2022**, *54*, 142–191. [CrossRef]
54. Terrin, N.; Schmid, C.H.; Lau, J.; Olkin, I. Adjusting for publication bias in the presence of heterogeneity. *Stat. Med.* **2003**, *22*, 2113–2126. [CrossRef] [PubMed]
55. Caskie, G.I.L.; Sutton, M.C.; Eckhardt, A.G. Accuracy of self-reported college GPA: Gender-moderated differences by achievement level and academic self-efficacy. *J. Coll. Stud. Dev.* **2014**, *55*, 385–390. [CrossRef]
56. Corkin, D.M.; Yu, S.L.; Lindt, S.F. Comparing active delay and procrastination from a self-regulated learning perspective. *Learn. Individ. Differ.* **2011**, *21*, 602–606. [CrossRef]
57. Mojdeh, S.; Elham, Y.; Majid, E.S. Challenges of online language teaching during the COVID-19 pandemic: A process tracing approach. *Teach. Engl. A Second Lang. (Former. J. Teach. Lang. Ski.)* **2021**, *40*, 159–195. Available online: <https://www.sid.ir/paper/969859/en> (accessed on 13 May 2023).
58. Clariana, M.; Martín, M. Escala de demora académica (EDA). *Rev. de Psicol. Gen. Y Apl.* **2008**, *61*, 37–51. Available online: <https://psycnet.apa.org/record/2008-15053-003> (accessed on 13 May 2023).
59. Dietz, F.; Hofer, M.; Fries, S. Individual values, learning routines and academic procrastination. *Br. J. Educ. Psychol.* **2007**, *77*, 893–906. [CrossRef] [PubMed]
60. Day, V.; Mensink, D.; O'Sullivan, M. Patterns of academic procrastination. *J. Coll. Read. Learn.* **2000**, *30*, 120–134. [CrossRef]

61. Busko, D.A. Causes and consequences of perfectionism and procrastination: A structural equation model [Thesis]. In *The Atrium*; University of Guelph: Guelph, ON, Canada, 1998. Available online: <https://atrium.lib.uoguelph.ca/xmlui/handle/10214/20169> (accessed on 13 May 2023).
62. Çakıcı, D.Ç. An Examination of the General Procrastination Behavior and Academic Procrastination Behavior in High-School and University Students. Master's Thesis, Ankara University, Ankara, Turkey, 2003. Available online: https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=ePX_SaJ0b35Gq45swKG3IDOMxhHaLQCHYiViUz5zKXyDaCMSR7IFicAyXeE2LkmN (accessed on 13 May 2023).
63. Milgram, N.; Toubiana, Y. Academic anxiety, academic procrastination, and parental involvement in students and their parents. *Br. J. Educ. Psychol.* **1999**, *69*, 345–361. [[CrossRef](#)] [[PubMed](#)]
64. Osiurak, F.; Faure, J.; Rabeyron, T.; Morange, D.; Dumet, N.; Tapiero, I.; Poussin, M.; Navarro, J.; Reynaud, E.; Finkel, A. Déterminants de la procrastination académique: Motivation autodéterminée, estime de soi et degré de maximation. *Prat. Psychol.* **2015**, *21*, 19–33. [[CrossRef](#)]
65. McCloskey, J. Finally, My Thesis on Academic Procrastination. *Open J. Soc. Sci.* **2011**, *5*, 10. Available online: https://rc.libra.ry.uta.edu/uta-ir/bitstream/handle/10106/9538/McCloskey_uta_2502M_11260.pdf?sequence=1&isAllowed=y (accessed on 13 May 2023).
66. Schouwenburg, H.C. Academic procrastination. In *Procrastination and Task Avoidance*; Plenum Press: New York, NY, USA, 1995; pp. 71–96. [[CrossRef](#)]
67. Krause, K.; Freund, A.M. Delay or procrastination—A comparison of self-report and behavioral measures of procrastination and their impact on affective well-being. *Personal. Individ. Differ.* **2014**, *63*, 75–80. [[CrossRef](#)]
68. Won, S.; Yu, S.L. Relations of perceived parental autonomy support and control with adolescents' academic time management and procrastination. *Learn. Individ. Differ.* **2018**, *61*, 205–215. [[CrossRef](#)]
69. McCown, W.; Johnson, J.; Petzel, T. Procrastination, a principal components analysis. *Personal. Individ. Differ.* **1989**, *10*, 197–202. [[CrossRef](#)]
70. Ferrari, J.R. Dysfunctional procrastination and its relationship with self-esteem, interpersonal dependency, and self-defeating behaviors. *Personal. Individ. Differ.* **1994**, *17*, 673–679. [[CrossRef](#)]
71. Aitken, M.E. A personality profile of the college student procrastinator. In *ProQuest Dissertations and Theses*; No. 8218139; ProQuest Dissertations & Theses Global; University of Pittsburgh: Pittsburgh, PA, USA, 1982. Available online: [CrossRef](https://media.proquest.com/media/hms/ORIG/2/ixkRI?_a=ChgyMDIzMDUwNjA5NTMyMzA5MDo1ODMzNDY5SBTk4MjY0GgpPTkVfU0VBUKNIIG42Mi4xNjMuMjIxLjIwMioFMTg3NTAyCTMwMzI0MjE1ODoNRG9jdW1lbnRjbWFnZUIBMFIGT25saW5lWgJGVGIDUEZUagByAHoAggEIUC0xMDEwMjY4LTEzNTk4LUNVU1RPTUVSLW51bGwtNzA5Mjk3NjJIBBk9ubGluZcoBgQFNb3ppbGxhLzUuMCAoV2luZG93cyBOVCAxMC4wOyBXaW42NDsgDY0KSBBcHBsZVdlYktpdC81MzcuMzYgKEtIVE1MLCBsaWtIEEdlY2tvKSBDbAkJvbnVvMTEyLjAuMCAwIFNhZmFyaS81MzcuMzYgRWRnLzExMi4wLjE3MjluNjJhSARZEaXNzZXJ0YXRpb25zICYgVGhlc2VzmgIHUHJIUGFpZKoCK09TOkVNUy1NZWRpYUxpbmtzU2VydmljZS1nZXRNZWRpYVYybzEzckl0ZW3KAhNEaXNzZXJ0YXRpb24vVGhlc2l2Z0gIBWfICAPoCAU6CAwNXZWKKAxDSUQ6MjAyMzA1MDYwOTUzMjMwOTA6NDY2NzU4&_s=g8Eq6j3qsHzjAdoLywZW0shH0mg= (accessed on 13 May 2023).72. Mehmet, K.; Tahsin, İ.; Ahmet, R.Z.; Mehmet, P. Analysis of academic self-efficacy, self-esteem and coping with stress skills predictive power on academic procrastination. <i>Educ. Res. Rev.</i> 2014, <i>9</i>, 146–152. [<a href=)]
73. Eerde, W.V. Procrastination at work and time management training. *J. Psychol.* **2003**, *137*, 421–434. [[CrossRef](#)] [[PubMed](#)]
74. Bobe, J.; Schnettler, T.; Scheunemann, A.; Fries, S.; Bäumle, L.; Thies, D.O.; Dresel, M.; Leutner, D.; Wirth, J.; Klingsieck, K.B.; et al. Delaying academic tasks and feeling bad about it. *Eur. J. Psychol. Assess.* **2022**, *40*, 59–72. [[CrossRef](#)]
75. MacCann, C.; Duckworth, A.L.; Roberts, R.D. Empirical identification of the major facets of conscientiousness. *Learn. Individ. Differ.* **2009**, *19*, 451–458. [[CrossRef](#)]
76. Ferrari, J.R.; Dovidio, J.F. Examining behavioral processes in indecision: Decisional procrastination and decision-making style. *J. Res. Personal.* **2000**, *34*, 127–137. [[CrossRef](#)]
77. Ferrari, J.R. Reliability of academic and dispositional measures of procrastination. *Psychol. Rep.* **1989**, *64* (Suppl. S3), 1057–1058. [[CrossRef](#)]
78. Steel, P. Arousal, avoidant and decisional procrastinators: Do they exist? *Personal. Individ. Differ.* **2010**, *48*, 926–934. [[CrossRef](#)]
79. Guilera, G.; Barrios, M.; Penelo, E.; Morin, C.; Steel, P.; Gómez-Benito, J. Validation of the Spanish version of the irrational procrastination scale (IPS). *PLoS ONE* **2018**, *13*, e0190806. [[CrossRef](#)]
80. Mann, L.; Burnett, P.; Radford, M.; Ford, S. The Melbourne decision making questionnaire: An instrument for measuring patterns for coping with decisional conflict. *J. Behav. Decis. Mak.* **1997**, *10*, 1–19. [[CrossRef](#)]
81. González-Brignardello, M.P.; Sánchez-Elvira Paniagua, Á. Dimensional structure of MAPS-15: Validation of the multidimensional academic procrastination scale. *Int. J. Environ. Res. Public Health* **2023**, *20*, 3201. [[CrossRef](#)] [[PubMed](#)]
82. Strong, S.R.; Wambach, C.A.; Lopez, F.G.; Cooper, R.K. Motivational and equipping functions of interpretation in counseling. *J. Couns. Psychol.* **1979**, *26*, 98–107. [[CrossRef](#)]
83. Lopez, F.G.; Wambach, C.A. Effects of paradoxical and self-control directives in counseling. *J. Couns. Psychol.* **1982**, *29*, 115–124. [[CrossRef](#)]
84. Schouwenburg, H.C. *Uitstelgedrag Bij Studenten*; Rijksuniversiteit Groningen: Groningen, The Netherlands, 1994.

85. Westgate, E.C.; Wormington, S.V.; Oleson, K.C.; Lindgren, K.P. Productive procrastination: Academic procrastination style predicts academic and alcohol outcomes. *J. Appl. Soc. Psychol.* **2016**, *47*, 124–135. [[CrossRef](#)] [[PubMed](#)]
86. Rebetz MM, L.; Rochat, L.; Gay, P.; Van der Linden, M. Validation of a french version of the pure procrastination scale (PPS). *Compr. Psychiatry* **2014**, *55*, 1442–1447. [[CrossRef](#)] [[PubMed](#)]
87. Rikoon, S.H.; Brenneman, M.; Kim, L.E.; Khorramdel, L.; MacCann, C.; Burrus, J.; Roberts, R.D. Facets of conscientiousness and their differential relationships with cognitive ability factors. *J. Res. Personal.* **2016**, *61*, 22–34. [[CrossRef](#)]
88. Chissom, B.; Iran-Nejad, A.; Burry, J. Development of an instrument to assess learning strategies. In the Annual Meeting of the American Psychological Association (97th, New Orleans, LA, August 11, 1989); Education Resources Information Center (ERIC). Available online: <https://eric.ed.gov/?id=ED311089> (accessed on 13 May 2023).
89. Cassady, J.C.; Johnson, R.E. Cognitive test anxiety and academic performance. *Contemp. Educ. Psychol.* **2002**, *27*, 270–295. [[CrossRef](#)]
90. Wohl, M.J.A.; Pychyl, T.A.; Bennett, S.H. I forgive myself, now I can study: How self-forgiveness for procrastinating can reduce future procrastination. *Personal. Individ. Differ.* **2010**, *48*, 803–808. [[CrossRef](#)]
91. Fernie, B.A.; Bharucha, Z.; Nikčević, A.V.; Spada, M.M. The unintentional procrastination scale. *J. Ration. Emotive Cogn. Behav. Ther.* **2016**, *35*, 136–149. [[CrossRef](#)]
92. Tuckman, B.W. The development and concurrent validity of the procrastination scale. *Educ. Psychol. Meas.* **1991**, *51*, 473–480. [[CrossRef](#)]
93. Alp, A.; Sungur, S. Investigating relationships between undergraduate students' flow experience, academic procrastination behavior, and calculus course achievement. *Eurasian J. Educ. Res.* **2017**, *17*, 1–22. [[CrossRef](#)]
94. Artino, A.R.; Dong, T.; DeZee, K.J.; Gilliland, W.R.; Waechter, D.M.; Cruess, D.; Durning, S.J. Achievement goal structures and self-regulated learning. *Acad. Med.* **2012**, *87*, 1375–1381. [[CrossRef](#)]
95. Atalayin, C.; Balkis, M.; Tezel, H.; Kayrak, G. Procrastination and predictor variables among a group of dental students in Turkey. *Psychol. Health Med.* **2017**, *23*, 726–732. [[CrossRef](#)]
96. Balkis, M. Academic efficacy as a mediator and moderator variable in the relationship between academic procrastination and academic efficacy. *Eurasian J. Educ. Res.* **2011**, *45*, 1–16. Available online: <https://ejer.com.tr/wp-content/uploads/2021/01/ejer.2011.45.1-1.pdf> (accessed on 13 May 2023).
97. Balkis, M.; Duru, E. Gender differences in the relationship between academic procrastination, satisfaction with academic life and academic performance. *Electron. J. Res. Educ. Psychol.* **2017**, *15*, 105–125. [[CrossRef](#)]
98. Balkis, M. The relationship between academic procrastination and student's burnout. *J. Educ.* **2013**, *28*, 68–78. Available online: <https://gcris.pau.edu.tr/bitstream/11499/21548/1/127-published.pdf> (accessed on 13 May 2023).
99. Balkis, M.; Duru, E.; Bulus, M. Analysis of the relation between academic procrastination, academic rational/irrational beliefs, time preferences to study for exams, and academic achievement: A structural model. *Eur. J. Psychol. Educ.* **2012**, *28*, 825–839. [[CrossRef](#)]
100. Batool, S.S. Academic achievement: Interplay of positive parenting, self-esteem, and academic procrastination. *Aust. J. Psychol.* **2019**, *72*, 174–187. [[CrossRef](#)]
101. Bolden, J.; Fillauer, J.P. "Tomorrow is the busiest day of the week": Executive functions mediate the relation between procrastination and attention problems. *J. Am. Coll. Health* **2020**, *68*, 854–863. [[CrossRef](#)] [[PubMed](#)]
102. Bong, M.; Hwang, A.; Noh, A.; Kim, S. Perfectionism and motivation of adolescents in academic contexts. *J. Educ. Psychol.* **2014**, *106*, 711–729. [[CrossRef](#)]
103. Caratiquit, K.D.; Caratiquit, L.J.C. Influence of social media addiction on academic achievement in distance learning: Intervening role of academic procrastination. *Turk. Online J. Distance Educ.* **2023**, *24*, 1–19. [[CrossRef](#)]
104. Cerezo, R.; Sánchez-Santillán, M.; Paule-Ruiz, M.P.; Núñez, J.C. Students' LMS interaction patterns and their relationship with achievement: A case study in higher education. *Comput. Educ.* **2016**, *96*, 42–54. [[CrossRef](#)]
105. Chen, H.; Zeng, Z. Associations of hedonic and eudaimonic orientations with subjective experience and objective functioning in academic settings: The mediating roles of academic behavioral engagement and procrastination. *Front. Psychol.* **2022**, *13*, 948768. [[CrossRef](#)] [[PubMed](#)]
106. Chissmom, B.; Iran-Nejad, A.; Burry, J. Development of an Instrument to Assess Learning-Strategies. 1989. Available online: <https://files.eric.ed.gov/fulltext/ED311089.pdf> (accessed on 13 May 2023).
107. Clariana, M.; Gotzens, C.; del Mar Badia, M.; Cladellas, R. Procrastination and cheating from secondary school to university. *Electron. J. Res. Educ. Psychol.* **2012**, *10*, 737–754. [[CrossRef](#)]
108. Clarke, I.E.; MacCann, C. Internal and external aspects of self-handicapping reflect the distinction between motivations and behaviours: Evidence from the self-handicapping scale. *Personal. Individ. Differ.* **2016**, *100*, 6–11. [[CrossRef](#)]
109. Corkin, D.M.S.; Lindt, S.F.; Williams, P.S. Effects of positive college classroom motivational environments on procrastination and achievement. *Learn. Environ. Res.* **2021**, *24*, 299–313. [[CrossRef](#)]
110. Cosnefroy, L.; Fenouillet, F.; Mazé, C.; Bonnefoy, B. On the relationship between the forethought phase of self-regulated learning and self-regulation failure. *Issues Educ. Res.* **2018**, *28*, 329–348. Available online: <https://hal.science/hal-02340652/document> (accessed on 13 May 2023).
111. Custer, N. Test anxiety and academic procrastination among prelicensure nursing students [Dissertation]. *Nurs. Educ. Perspect.* **2018**, *39*, 162–163. [[CrossRef](#)] [[PubMed](#)]

112. de la Fuente, J.; Malpica-Chavarria, E.A.; Garzón-Umerenkova, A.; Pachón-Basallo, M. Effect of personal and contextual factors of regulation on academic achievement during adolescence: The role of gender and age. *Int. J. Environ. Res. Public Health* **2021**, *18*, 8944. [CrossRef]
113. Duru, E.; Balkis, M. Procrastination, self-esteem, academic performance, and well-being: A moderated mediation model. *Int. J. Educ. Psychol.* **2017**, *6*, 97. [CrossRef]
114. Duru, E.; Balkis, M. The roles of academic procrastination tendency on the relationships among self doubt, self esteem and academic achievement. *Educ. Sci.* **2014**, *39*, 274–287. Available online: https://www.researchgate.net/profile/Murat-Balkis-2/publication/261688540_The_Roles_of_Academic_Procrastination_Tendency_on_the_Relationships_among_Self_Doubt_Self_Esteem_and_Academic_Achievement/links/5411acdd0cf2b4da1bec65ba/The-Roles-of-Academic-Procrastination-Tendency-on-the-Relationships-among-Self-Doubt-Self-Esteem-and-Academic-Achievement.pdf (accessed on 13 May 2023).
115. Elias, N.; Awang, A.; Mohamed, M.N. Examining religiosity and its relationship to self-control, procrastination and academic achievement. *Malays. J. Learn. Instr.* **2005**, *2*, 79–93. Available online: <https://e-journal.uum.edu.my/index.php/mjli/article/view/7579> (accessed on 13 May 2023).
116. Estrada Araoz, E.G.; Gallegos Ramos, N.A.; Huaypar Loayza, K.H. Procrastinación académica en estudiantes peruanos de educación superior pedagógica. *Rev. Cienc. Pedagógicas E Innovación* **2020**, *8*, 57–65. [CrossRef]
117. Fernández Da Lama, R.G.; Brenlla, M.E. Past-positive time perspective predicts academic achievement via motivation, and procrastination might not be as bad as it seems. *J. Appl. Res. High. Educ.* **2022**, *15*, 392–410. [CrossRef]
118. Franzen, P.; Arens, A.K.; Greiff, S.; van der Westhuizen, L.; Fischbach, A.; Wollschläger, R.; Niepel, C. Developing and validating a short-form questionnaire for the assessment of seven facets of conscientiousness in large-scale assessments. *J. Personal. Assess.* **2021**, *104*, 759–773. [CrossRef]
119. Gadosey, C.K.; Grunschel, C.; Kegel, L.S.; Schnettler, T.; Turhan, D.; Scheunemann, A.; Bäumle, L.; Thomas, L.; Buhlmann, U.; Dresel, M.; et al. Study satisfaction among university students during the COVID-19 pandemic: Longitudinal development and personal-contextual predictors. *Front. Psychol.* **2022**, *13*, 918367. [CrossRef]
120. Gareau, A.; Chamandy, M.; Kljajic, K.; Gaudreau, P. The detrimental effect of academic procrastination on subsequent grades: The mediating role of coping over and above past achievement and working memory capacity. *Anxiety Stress Coping* **2018**, *32*, 141–154. [CrossRef] [PubMed]
121. Garzón-Umerenkova, A.; de la Fuente, J.; Amate, J.; Paoloni, P.V.; Fadda, S.; Pérez, J.F. A linear empirical model of self-regulation on flourishing, health, procrastination, and achievement, among university students. *Front. Psychol.* **2018**, *9*, 536. [CrossRef]
122. Ghayas, S.; Hassan, Z.; Kayani, S.; Biasutti, M. Construction and validation of the research misconduct scale for social science university students. *Front. Psychol.* **2022**, *13*, 859466. [CrossRef] [PubMed]
123. Goroshit, M. Academic procrastination and academic performance: An initial basis for intervention. *J. Prev. Interv. Community* **2018**, *46*, 131–142. [CrossRef] [PubMed]
124. Grunschel, C.; Schwinger, M.; Steinmayr, R.; Fries, S. Effects of using motivational regulation strategies on students' academic procrastination, academic performance, and well-being. *Learn. Individ. Differ.* **2016**, *49*, 162–170. [CrossRef]
125. Han, J.; DiGiacomo, D.K.; Usher, E.L. College students' self-regulation in asynchronous online courses during COVID-19. *Stud. High. Educ.* **2023**, *48*, 1440–1454. [CrossRef]
126. Hensley, L.C. Reconsidering active procrastination: Relations to motivation and achievement in college anatomy. *Learn. Individ. Differ.* **2014**, *36*, 157–164. [CrossRef]
127. Hofer, M.; Kuhnle, C.; Kilian, B.; Fries, S. Cognitive ability and personality variables as predictors of school grades and test scores in adolescents. *Learn. Instr.* **2012**, *22*, 368–375. [CrossRef]
128. Job, V.; Walton, G.M.; Bernecker, K.; Dweck, C.S. Implicit theories about willpower predict self-regulation and grades in everyday life. *J. Personal. Soc. Psychol.* **2015**, *108*, 637–647. [CrossRef] [PubMed]
129. Kandemir, M. Reasons of academic procrastination: Self-regulation, academic self-efficacy, life satisfaction and demographics variables. *Procedia-Soc. Behav. Sci.* **2014**, *152*, 188–193. [CrossRef]
130. Karatas, H. Correlation among academic procrastination, personality traits, and academic achievement. *Anthropologist* **2015**, *20*, 243–255. Available online: [https://www.researchgate.net/profile/Hakan-Karatas/publication/286778727_Correlation_among_Academic_Procrastination_Personality_Traits_and_Academic_Achievement/links/57f4f05308ae886b897f5c23/Correlation-among-Academic-Procrastination-Personality-Traits-and-Academic-Achievement.pdf?_sg\[0\]=started_experiment_milestone&origin=journalDetail](https://www.researchgate.net/profile/Hakan-Karatas/publication/286778727_Correlation_among_Academic_Procrastination_Personality_Traits_and_Academic_Achievement/links/57f4f05308ae886b897f5c23/Correlation-among-Academic-Procrastination-Personality-Traits-and-Academic-Achievement.pdf?_sg[0]=started_experiment_milestone&origin=journalDetail) (accessed on 13 May 2023).
131. Kármen, D.; Kinga, S.; Edit, M.; Susana, F.; Kinga, K.J.; Réka, J. Associations between academic performance, academic attitudes, and procrastination in a sample of undergraduate students attending different educational forms. *Procedia-Soc. Behav. Sci.* **2015**, *187*, 45–49. [CrossRef]
132. Kertechian, S.K. Conscientiousness as a key to success for academic achievement among French university students enrolled in management studies. *Int. J. Manag. Educ.* **2018**, *16*, 154–165. [CrossRef]
133. Kim, J.-E.; Nembhard, D.A. The impact of procrastination on engineering students' academic performance. *Int. J. Eng. Educ.* **2019**, *35*, 1008–1017. Available online: https://www.ijee.ie/1atestissues/Vol35-4/04_ijee3774.pdf (accessed on 13 May 2023).
134. Kim, E.; Seo, E.H. The relationship of flow and self-regulated learning to active procrastination. *Soc. Behav. Personal. Int. J.* **2013**, *41*, 1099–1113. [CrossRef]

135. Kindt, S.; Szász-Janocha, C.; Rehbein, F.; Lindenberg, K. School-related risk factors of internet use disorders. *Int. J. Environ. Res. Public Health* **2019**, *16*, 4938. [[CrossRef](#)] [[PubMed](#)]
136. Klassen, R.M.; Krawchuk, L.L.; Rajani, S. Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemp. Educ. Psychol.* **2008**, *33*, 915–931. [[CrossRef](#)]
137. Klingsieck, K.B.; Fries, S.; Horz, C.; Hofer, M. Procrastination in a distance university setting. *Distance Educ.* **2012**, *33*, 295–310. [[CrossRef](#)]
138. Kljajic, K.; Gaudreau, P. Examining the association between procrastination and decreases in academic achievement during the transition from high school to university: A piecewise growth model. *Eur. J. Psychol. Educ.* **2022**, *38*, 1011–1030. [[CrossRef](#)]
139. Kljajic, K.; Gaudreau, P. Does it matter if students procrastinate more in some courses than in others? A multilevel perspective on procrastination and academic achievement. *Learn. Instr.* **2018**, *58*, 193–200. [[CrossRef](#)]
140. Kljajic, K.; Schellenberg, B.J.I.; Gaudreau, P. Why do students procrastinate more in some courses than in others and what happens next? Expanding the multilevel perspective on procrastination. *Front. Psychol.* **2022**, *12*, 786249. [[CrossRef](#)]
141. Kljajic, K.; Gaudreau, P.; Franche, V. An investigation of the 2×2 model of perfectionism with burnout, engagement, self-regulation, and academic achievement. *Learn. Individ. Differ.* **2017**, *57*, 103–113. [[CrossRef](#)]
142. Kurtovic, A.; Vrdoljak, G.; Idzanovic, A. Predicting procrastination: The role of academic achievement, self-efficacy and perfectionism. *Int. J. Educ. Psychol.* **2019**, *8*, 1–26. [[CrossRef](#)]
143. Lim, J.M. Predicting successful completion using student delay indicators in undergraduate self-paced online courses. *Distance Educ.* **2016**, *37*, 317–332. [[CrossRef](#)]
144. Lubbers, M.J.; Van Der Werf, M.P.C.; Kuyper, H.; Hendriks, A.A.J. Does homework behavior mediate the relation between personality and academic performance? *Learn. Individ. Differ.* **2010**, *20*, 203–208. [[CrossRef](#)]
145. Macher, D.; Paechter, M.; Papousek, I.; Ruggeri, K. Statistics anxiety, trait anxiety, learning behavior, and academic performance. *Eur. J. Psychol. Educ.* **2011**, *27*, 483–498. [[CrossRef](#)]
146. Martín-Antón, L.J.; Aramayo-Ruiz, K.P.; Rodríguez-Sáez, J.L.; Saiz-Manzanas, M.C. La procrastinación en la formación inicial del profesorado: El rol de las estrategias de aprendizaje y el rendimiento académico. *Educ. XX1* **2022**, *25*, 65–88. [[CrossRef](#)]
147. Martinie, M.-A.; Potocki, A.; Broc, L.; Larigauderie, P. Predictors of procrastination in first-year university students: Role of achievement goals and learning strategies. *Soc. Psychol. Educ.* **2022**, *26*, 309–331. [[CrossRef](#)]
148. Michinov, N.; Brunot, S.; Le Bohec, O.; Juhel, J.; Delaval, M. Procrastination, participation, and performance in online learning environments. *Comput. Educ.* **2011**, *56*, 243–252. [[CrossRef](#)]
149. Moon, S.M.; Illingworth, A.J. Exploring the dynamic nature of procrastination: A latent growth curve analysis of academic procrastination. *Personal. Individ. Differ.* **2005**, *38*, 297–309. [[CrossRef](#)]
150. Moon, N.A.; Converse, P.D.; Merlini, K.P.; Vaghef, K. The role of off-task thoughts and behaviors in linking self-control with achievement-related and well-being outcomes. *J. Res. Personal.* **2020**, *86*, 103935. [[CrossRef](#)]
151. Morris, P.E.; Fritz, C.O. Conscientiousness and procrastination predict academic coursework marks rather than examination performance. *Learn. Individ. Differ.* **2015**, *39*, 193–198. [[CrossRef](#)]
152. Paechter, M.; Macher, D.; Martskvishvili, K.; Wimmer, S.; Papousek, I. Mathematics anxiety and statistics anxiety. shared but also unshared components and antagonistic contributions to performance in statistics. *Front. Psychol.* **2017**, *8*, 1196. [[CrossRef](#)]
153. Pekpazar, A.; Aydın, G.K.; Aydın, U.; Beyhan, H.; Ari, E. Role of instagram addiction on academic performance among Turkish university students: Mediating effect of procrastination. *Comput. Educ. Open* **2021**, *2*, 100049. [[CrossRef](#)]
154. Pilotti, M.; Nazeeruddin, E.; Alkuhayli, H.; El-Moussa, O.J. Predicting performance of middle eastern female students: A challenge for sustainable education. *Psychol. Sch.* **2022**, *59*, 1790–1801. [[CrossRef](#)]
155. Purwanto, C.V.; Natalya, L. Tomorrow will always come, I am a last-minute person: Validation of the active procrastination scale-bahasa Indonesia. *Makara Hum. Behav. Stud. Asia* **2019**, *23*, 46. [[CrossRef](#)]
156. Ragusa, A.; González-Bernal, J.; Trigueros, R.; Caggiano, V.; Navarro, N.; Mínguez-Mínguez, L.A.; Obregón, A.I.; Fernández-Ortega, C. Effects of academic self-regulation on procrastination, academic stress and anxiety, resilience and academic performance in a sample of Spanish secondary school students. *Front. Psychol.* **2023**, *14*, 1073529. [[CrossRef](#)] [[PubMed](#)]
157. Roig, M.; DeTommaso, L. Are college cheating and plagiarism related to academic procrastination? *Psychol. Rep.* **1995**, *77*, 691–698. [[CrossRef](#)]
158. Sæle, R.G.; Dahl, T.I.; Sørli, T.; Friberg, O. Relationships between learning approach, procrastination and academic achievement amongst first-year university students. *High. Educ.* **2016**, *74*, 757–774. [[CrossRef](#)]
159. Sage, K.; Jackson, S.; Fox, E.; Mauer, L. The virtual COVID-19 classroom: Surveying outcomes, individual differences, and technology use in college students. *Smart Learn. Environ.* **2021**, *8*, 27. [[CrossRef](#)]
160. Saman, A.; Wirawan, H. Examining the impact of psychological capital on academic achievement and work performance: The roles of procrastination and conscientiousness. *Cogent Psychol.* **2021**, *8*, 1938853. [[CrossRef](#)]
161. Shaked, L.; Altarac, H. The possible contribution of procrastination and perception of self-efficacy to academic achievement. *J. Furth. High. Educ.* **2022**, *47*, 197–214. [[CrossRef](#)]
162. Steel, P.; Brothen, T.; Wambach, C. Procrastination and personality, performance, and mood. *Personal. Individ. Differ.* **2001**, *30*, 95–106. [[CrossRef](#)]
163. Suárez-Perdomo, A.; Ruiz-Alfonso, Z.; Garcés-Delgado, Y. Profiles of undergraduates' networks addiction: Difference in academic procrastination and performance. *Comput. Educ.* **2022**, *181*, 104459. [[CrossRef](#)]

164. Sun, T.; Kim, J.-E. The effects of online learning and task complexity on students' procrastination and academic performance. *Int. J. Hum.-Comput. Interact.* **2022**, *39*, 2656–2662. [CrossRef]
165. Tian, H.; Lai, S.; Wu, F. A prediction framework of learning outcomes based on meaningful learning features. In Proceedings of the 2020 Ninth International Conference of Educational Innovation through Technology (EITT), Porto, Portugal, 13–17 December 2020; pp. 205–210. [CrossRef]
166. Tian, J.; Zhao, J.; Xu, J.; Li, Q.; Sun, T.; Zhao, C.; Gao, R.; Zhu, L.; Guo, H.; Yang, L.; et al. Mobile phone addiction and academic procrastination negatively impact academic achievement among Chinese medical students. *Front. Psychol.* **2021**, *1*, 758303. [CrossRef]
167. Tice, D.M.; Baumeister, R.F. Longitudinal study of procrastination, performance, stress, and health: The costs and benefits of dawdling. *Psychol. Sci.* **1997**, *8*, 454–458. [CrossRef]
168. Tisocco, F.; Liporace, M.F. Structural relationships between procrastination, academic motivation, and academic achievement within university students: A self-determination theory approach. *Innov. High. Educ.* **2022**, *48*, 351–369. [CrossRef]
169. Wesley, J.C. Effects of ability, high school achievement, and procrastinatory behavior on college performance. *Educ. Psychol. Meas.* **1994**, *54*, 404–408. [CrossRef]
170. Wolters, C.A. Advancing achievement goal theory: Using goal structures and goal orientations to predict students' motivation, cognition, and achievement. *J. Educ. Psychol.* **2004**, *96*, 236–250. [CrossRef]
171. Wolters, C.A.; Hussain, M. Investigating grit and its relations with college students' self-regulated learning and academic achievement. *Metacognition Learn.* **2014**, *10*, 293–311. [CrossRef]
172. Wu, J.-Y. Learning analytics on structured and unstructured heterogeneous data sources: Perspectives from procrastination, help-seeking, and machine-learning defined cognitive engagement. *Comput. Educ.* **2020**, *163*, 104066. [CrossRef]
173. Xu, J. Homework expectancy value cost scale for middle school students: A validation study. *J. Psychoeduc. Assess.* **2023**, *41*, 328–342. [CrossRef]
174. Yang, Y.; Hooshyar, D.; Pedaste, M.; Wang, M.; Huang, Y.-M.; Lim, H. Predicting course achievement of university students based on their procrastination behaviour on Moodle. *Soft Comput.* **2020**, *24*, 18777–18793. [CrossRef]
175. You, J.W. Examining the effect of academic procrastination on achievement using LMS data in e-learning. *J. Educ. Technol. Soc.* **2015**, *18*, 64–74. Available online: <http://www.jstor.org/stable/jeductechsoci.18.3.64> (accessed on 13 May 2023).
176. Yu, Y.; Hua, L.; Feng, X.; Wang, Y.; Yu, Z.; Zi, T.; Zhao, Y.; Li, J. True grit in learning math: The math anxiety-achievement link is mediated by math-specific grit. *Front. Psychol.* **2021**, *12*, 645793. [CrossRef] [PubMed]
177. Zhang, C.; Zhang, W. The impact of academic procrastination on second language writing: The mediating role of L2 writing anxiety. *Front. Psychol.* **2022**, *13*, 851120. [CrossRef] [PubMed]
178. Zhang, J.; Cunningham, T.; Iyer, R.; Baker, R.; Fouh, E. Exploring the Impact of Voluntary Practice and Procrastination in an Introductory Programming Course. In Proceedings of the 53rd ACM Technical Symposium on Computer Science Education, Providence, RI, USA, 2–5 March 2022; p. 1. [CrossRef]

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