Academic Procrastination in Relation to Achievement Values, Self-esteem, Intelligence and Course Stream

A Multivariate Study

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Abstract

A sample of 451 students, belonging to Arts and Science faculties, from the junior colleges of Maharashtra, were administered to check Academic Procrastination Scale (with four dimensions or 'subscales'), Achievement Values and Anxiety Inventory, Rosenberg's Self-esteem Scale, and Cattell's Culture Fair Intelligence Test. The data were analysed by hierarchical MANOVA, multiple regressions and correlations, multivariate multiple regression and canonical correlation analysis. Academic procrastination was negatively related with achievement values, self-esteem and intelligence. Science students procrastinated less than the arts

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students and this faculty-wise difference was partially accounted by achievement values, self-esteem, and intelligence. Neither gender differences were obtained in academic procrastination nor gender moderated the effect of faculty. The study provided empirical distinction between procrastination in curricular and co-curricular activities. The relationship between academic procrastination and achievement values, self-esteem and intelligence was attributed to procrastination in curricular activities and not procrastination in co-curricular activities. The implications of these findings are briefly indicated in the paper.

Keywords: *Academic Procrastination, Achievement Values, Self-esteem, Intelligence, Course Stream, Junior Colleges.*

सार

महाराष्ट्र के कनिष्ठ महाविद्यालयों से कला और विज्ञान संकायों से संबंधित 451 छात्रों के एक नमूने का अध्ययन अकादमिक शिथिलता पैमाना; चार आयामों या 'उप-स्तर' के साथद्ध, उपलब्धि मूल्य और चिंता सूची, रोसेनबर्ग का आत्म-सम्मान पैमाना, और कैटेल का कल्चर पफेयर इंटेलिजेंस टेस्ट पर किया गया था। आंकड़ों का विश्लेषण पदानुक्रमित MANOVA एकाधिक प्रतिगमन और सहसंबंध, बहुभिन्नरूपी एकाधिक प्रतिगमन, और विहित सहसंबंध विश्लेषण द्वारा किया गया था। विश्लेषण के अनुसार अकादमिक शिथिलता, उपलब्धि मूल्यों, आत्म-सम्मान और बुद्धि से नकारात्मक रूप से संबंधित थी। विज्ञान के छात्रों मंे कला के छात्रों की तुलना में कम शिथिलता पाई गई, और यह संकाय-वार अंतर आंशिक रूप से उपलब्धि मूल्यों, आत्म-सम्मान और बुद्धि के कारण प्रतीत होता है। अकादमिक शिथिलता में लिंग भेद नहीं दिखाई पड़ा। इस अध्ययन में पाठ्यचर्या और सह-पाठ्यक्रम गतिविधियों मंे शिथिलता का प्रभाव दिखाई पड़ता है। अकादमिक शिथिलता और उपलब्ध मूल्यों, आत्म-सम्मान और बुद्धिमत्ता के मध्य संबंध का कारण पाठ्यचर्या संबंधी गतिविधियों में शिथिलता को पाया गया। इन विशेषताओं तथा पाठ्य सहगामी गतिविधियों में शिथिलता के बीच सहसंबध नहीं परिलक्षित होता है। इन परिणामों के निहितार्थ इस शोधपत्र में इंगित किए गए हैं।

Introduction

Philosophers, political thinkers, military personnel, poets, saints and writers on religion and spirituality, both from eastern and western traditions, have expressed their concern for procrastination. According to Steel (2007), the earliest records, related to procrastination, stretch back to at least 3000 years. However, procrastination as a variable in empirical research, has quite a short history. The procrastination research started

gathering momentum in the fourth quarter of the twentieth century. Procrastination pervades practically all domains of life. According to Steel and Klingsieck (2016), researchers studied procrastination in various life domains such as, education (academic procrastination), work and financial, health and subjective well-being. Among these, academic procrastination is comparatively a more widely studied domain. The various meta-analytic and review papers (Kim and Seo, 2015; Rozental et al., 2018; Steel, 2007; Van Eerde, 2003; Van Eerde and Klingsieck, 2018; Zacks and Hen, 2018) present excellent state of the art panorama about the nature, causes, correlates and consequences of academic procrastination and the academic and psychological interventions.

Research has linked procrastination with several cognitive, motivational, personality and demographic variables including self-regulation, self-efficacy, effort regulation, fear of failure, anxiety, depression, self-esteem, perfectionism, pessimism, academic and achievement motivation, time perspective, intellectual ability, scholastic aptitude, gender, etc. Due to space limitation, only the selective review, relevant to the present research, is offered here.

Several studies have explored the role of motivation in academic procrastination using the self-determination theory and the distinction between intrinsic and extrinsic motivation (Deci and Ryan, 1985; Ryan and Deci, 2008). Senecal et al. (1995) examined the relationship between academic procrastination and academic motivation, the latter having several subscales. The intrinsic motivation subscale correlated negatively, whereas the external regulation and a motivation subscales correlated positively with the academic procrastination. Senecal, et al. (1995) concluded that 'procrastination is a motivational problem that involves more than poor time management skills or trait laziness' (p. 607). In a similar study, Cavusoglu and Karatas (2015) replicated the negative relationship between intrinsic motivation and academic procrastination. A motivation was positively correlated, whereas extrinsic motivation was uncorrelated with academic procrastination. Rakes and Dunn (2010) reported that academic procrastination was negatively correlated with intrinsic motivation and effort regulation. Brownlow and Reasinger (2000) found that low academic procrastinators had more intrinsic as well as extrinsic motivation than the high procrastinators. Brownlow and Reasinger's finding can very well be explained in terms of the classic 'need-press' conceptualisation (Murray, 1938) and

Atkinson's (1964) theory of achievement motivation, according to which performance is a function of achievement-related motivation plus extrinsic motivation.

The very idea that persons with high need for achievement have a strong urge for excellence and they persistently put in vigorous efforts to achieve their goals suggests that high achievement motivation would be negatively associated with academic procrastination. In the recent past, Van Eerde (2003) and Steel (2007) have tried to describe procrastination in the personality space defined by the Big Five Model (Goldberg, 1990) and Five-Factor Model (Costa and McCrae, 1992; McCrae and Allik, 2002) of personality. Incidentally, the Five-Factor Model is well-validated in India by Lodhi and coworkers (Lodhi et al., 2002, 2004). According to Van Eerde (2003) and Steel (2007), procrastination is linked with Conscientiousness and Neuroticism factors. The two facets of Conscientiousness— 'Achievement striving' and 'Self-discipline' are quite important in this regard. Based on his meta-analysis, Steel (2007) concluded that the two constructs—Need for achievement and intrinsic motivation correlated negatively, –0.44 and –0.26 respectively, with procrastination.

As Steel (2007) pointed out, poor self-esteem is related with neuroticism and hence it is expected to be related with academic procrastination. Solomon and Rothblum (1984) reported negative correlation between academic procrastination and self-esteem. They factor analysed several reasons for procrastination and reported two important factors—Fear of failure and Task aversiveness—self-esteem, loading negatively on fear of failure. Since then, several studies (e.g., Browne, 2016; Chen et al., 2016; Kandemir et al., 2014; Klassen et al., 2008; Karatas, 2015; Senecal et al., 1995; Hajloo, 2014; Vijay and Kadhiravan, 2016) reported negative correlation between self-esteem and academic procrastination. Steel (2007), based on his meta-analysis, estimated a negative correlation –0.27, between self-esteem and procrastination.

Although the role of several cognitive variables in academic procrastination has been well researched, the utility of intelligence as a general construct is questionable in predicting procrastination. For example, Ferrari (1991) found that procrastinators and non-procrastinators did not differ significantly on verbal and abstract intelligence. Ferrari et al., (1995) presented a brief review of the relationship between procrastination, and intelligence and ability. In this review, they cited a study by McCown and Ferrari

in 1995, which indicated that in a specific curriculum, high verbal ability was associated with procrastination of verbal curriculum, while low math ability was associated with procrastination of mathematics-based work. If mathematics-based wok, as compared to verbal curriculum, is assumed to be more complex and difficult, it can be inferred that at least for complex and difficult academic tasks, procrastination is negatively related with the relevant ability.

A few studies have focused on the relationship between course stream or faculty and academic procrastination. Vijay and Kadhiravan (2016) found that Arts faculty university students procrastinated more than the Science faculty students. However, such difference between arts and science background was not found for high school students (Das, 2016). Bashir (2019) reported that among university students, science students procrastinated less than commerce students; the difference between science and arts students was statistically insignificant. Somehow, we could not locate an Indian study exploring faculty-wise differences in academic procrastination in junior college students. Science courses are considered more demanding in terms of intellectual capacity, motivation and efforts. Especially for admission to professional degree courses in engineering, technology, architecture, medicine, etc., the marks obtained in junior college examination or the entrance test, primarily based on junior college syllabi, are crucial. Junior college science students, as compared to arts students, are therefore more performance conscious. As such, we expect that junior college science students would be procrastinating less as compared to arts students. We also expect that science students, as compared to arts students, would have higher intelligence, more achievement values and probably better self-esteem.

There are many studies exploring gender differences in procrastination. Van Eerde (2003), in his meta-analysis, observed that over half of the number of studies reported non-significant gender differences, though some non-significance might be due to inadequate power in studies employing small samples. Steel (2007) commented that men may score higher, lower or the same as women depending upon the procrastination measure. Nevertheless, both the meta-analyses concluded that males are only slightly procrastinating than females. Under such circumstances, we expect that in the present study, gender difference in academic

procrastination, if any, would be small. We also intend to explore whether gender moderates the effect of faculty (course stream) on academic procrastination.

Research Objectives

The present research is guided by three objectives, the first two related to academic procrastination and its correlates, and the third related to quantitative methodology.

- To study the relationship between academic procrastination and achievement values, self-esteem and intelligence among junior college students.
- To study the faculty-wise and gender-wise differences in academic procrastination and explore whether gender moderates the effect of faculty.
- To offer an illustration of the application of multivariate analysis to educational and psychological data.

Broad Hypotheses

Based on the above review, we proposed the following broad hypotheses.

- Science students would procrastinate less than arts students.
- Gender differences in academic procrastination, if any, would be small.
- Academic procrastination would be negatively related with achievement values, self-esteem and intelligence.

Method

Participants

Four hundred and fifty-one junior college students, 239 belonging to Arts faculty (114 males and 125 females) and 212 belonging to Science faculty (100 males and 112 females), participated in this study. The sample was drawn from eight junior colleges of Sangli and Kolhapur districts of Maharashtra. All the students were studying in Class XI. All participants, except six, reported their age as 17 years; the six participants reported their age as 16 years. Majority of the participants had semi-urban or rural background.

Tools

Academic Procrastination Scale (APS) (Kalia and Yadav, 2014)

This Hindi scale consists of 25 items covering four academic areas or dimensions of procrastination: Procrastination in homework (HOPR)—10 items, Procrastination in preparation for examination, EXPR, (6 items), Procrastination in project work (PPR), 5 items, and Procrastination in co-curricular activities, (COP—R)—4 items (area/subscale abbreviations ours). Each item is followed by a five-point rating scale ranging from strongly agree (5) to strongly disagree (1). Nine items are reverse scored. Thus, the scale can provide scores on four subscales and a score on total academic procrastination. Higher score denotes more procrastination. The test manual reports Guttman split-half reliability coefficient of 0.71 and the test-retest reliability coefficient of 0.84. The manual claims satisfactory face and content validity. The scale has been used in quite a few studies (e.g., Kalia and Yadav, 2014; Ahmed and Shumaim, 2017; Mangat, 2019).

Achievement Values and Anxiety Inventory (AVAI) (Mehta, 1976)

This semi-projective tool has 22 items. Each item briefly describes some situation in which one or more persons are doing something. Each situation is followed by six alternatives (sentences) describing some of the ways in which the situation can be interpreted. The respondent is required to mark one alternative which he or she thinks as the best way to describe that situation for him or her. Out of six alternatives for each item, two are achievement related (AR), two are task related (TR) and two are unrelated to achievement (UR). Thus, for every marked item, the respondent gets a score of 1 under one of the three categories. As such, for every respondent, four scores can be obtained: AR score, TR score, UR score, and a total score (i.e., AR – UR). The UR scores tend to show avoidance motive or achievement anxiety. The reliability and validity data, in brief, are available in the manual. The Marathi translation of the AVAI, developed earlier (Jadhav, 1997), has been used in the present research. Only AR scores are employed in this investigation.

Rosenberg's Self-esteem Scale (RSES) (Rosenberg, 1965, 1979)

Developed long back, RSES still continues to be probably the most popular measure of the global self-esteem. It is a 10 item self-report scale, each item followed by a four-point rating scale ranging from

'strongly agree' (3) to 'strongly disagree' (0). [The items can also be scored as '*strongly agree* (4)' to '*strongly disagree* (1)'. This point should be remembered while interpreting mean values.] Five items are reverse scored. Higher score indicates higher self-esteem. Being a very widely used scale, extensive psychometric data are available (Schmitt and Allik, 2005). The scale was translated in Marathi for the purpose of this research.

Cattell's Culture Fair Intelligence Test (CFIT) (Scale 3, Form A, 1963) (Cattell, 1973)

A very well-known non-verbal test of fluid intelligence or Spearman's 'g', this test has four individually timed subtests— (i) series (13 items, 3 minutes), (ii) classifications (14 items, 4 minutes), (iii) matrices (13 items, 3 minutes), and (iv) conditions (topology) (10 items, 2 and 1/2 minutes). The test score is the number of correct answers on all the four subtests together. Being a very widely used test, there is a vast theoretical, empirical and psychometric data for the test.

Procedure

The tests were administered to the students under standard testing conditions at the respective colleges with the prior permission of the principals, in a group of 10 to 30 students at a time. The students were told that the participation was voluntary, and they were assured of complete confidentiality of the responses and results. The tests were administered in the following order: CFFT, APS, AVAI and RSES.

Results

Data Scrutiny and Detection of Univariate and Multivariate Outliers

The data for each variable were scrutinised for the entire sample as well as separately for each of the four groups — arts males, arts females, science males and science females. For this purpose and for detecting univariate outliers, descriptive statistics including skewness and kurtosis, frequency distributions, graphical displays including normal curve-imposed histograms and Q-Q normal plots, and extreme *z* scores were employed (Tabachnick and Fidell, 2019; Meyers et al., 2006; Hair et al., 2003). The search revealed two univariate outliers (subject no. 159, Procrastination for

homework, raw score = 47, z = 4.19 for the entire sample; subject no. 188, Achievement values, raw score = 21, z = 3.51 for the entire sample). These two cases were not deleted; however, to reduce their influence, following Tabachnick and Fidell (2019), each of the two outlying scores was replaced by the raw score which was larger by 1 than the next extreme score.

The multivariate outliers were searched using seven variables—four APS subscales, Achievement values, Self-esteem and Intelligence. (The total Procrastination score was not included, since its inclusion along with its four subscales, would lead to the problem of 'singularity'). The search was carried out for the entire sample as well as for each of the four groups separately. Mahalanobis distance (D^2) was calculated between each case and the centroid of the remaining cases. The cut-off criterion of 24.32 [i.e., value of $x^2(7)$ with p = 0.001] was used. In the group-wise search, only in the group of Arts-Females, one case slightly exceeded the cut-off value (subject no. 303, D^2 = 24.90). For the entire sample, two cases slightly exceeded the cut-off value (subject no. 111, D^2 = 25.99; subject no. 451, D^2 = 24.45). These so few borderline outliers were not excluded from further analysis, a decision in line with Cohen and coworkers (cited in Meyers et al., 2006). Thus, the entire sample of 451 cases was retained for further analysis.

Descriptive Statistics

The descriptive statistics for Academic procrastination and its subscales, Achievement values, Self-esteem and Intelligence, faculty-wise and for the entire sample, are presented in Table 1.

Table 1

Descriptive Statistics for Academic Procrastination and Predictors

Procrastination	**Arts Faculty**		**Science Faculty**		**Entire Sample**	
Scale/Subscale	Mean	SD	Mean	SD	Mean	SD
Academic Procrastination total (APS)	59.09	11.32	53.77	11.13	56.59	11.53
Procrastination in homework (HOPR)	23.93	5.35	21.81	5.85	22.94	5.69
Procrastination in exam preparation (EXPR)	12.17	3.98	11.71	3.96	11.95	3.98

Procrastination in project work (PPR)	11.24	3.89	8.92	3.47	10.15	3.87
Procrastination in co-curricular activities (COPR)	11.77	2.43	11.32	2.06	11.56	2.27
Achievement values (AVAL)	9.10	2.93	9.96	3.55	9.51	3.26
Self-esteem (SEL)	19.09	3.81	20.17	3.96	19.60	3.92
Intelligence (INT)	13.03	4.45	17.75	4.85	15.25	5.20

Academic Procrastination in relation to Course Stream (Faculty) and Gender

The 2 × 2 Hierarchical MANOVA: Justification and Evaluation of the Assumptions

To study the faculty-wise and gender wise differences in procrastination and the moderating effect of gender, if any, a 2 × 2 hierarchical multivariate analysis of variance (MANOVA) was carried out employing Faculty (FAC) and Gender (GEN) as the independent variables and the four Procrastination subscales (HOPR, EXPR, PPR and COPR), as the dependent variables. (Procrastination total scores were not included in this analysis to avoid the problems of singularity.) The order of effects, in priority, was Faculty, Gender and FAC × GEN interaction. With unequal number of cases per cell in factorial designs, hierarchical ANOVA/ MANOVA is especially suitable, provided the priority order of the effects can be specified. [In the present analysis, despite of the different cell sizes, the gender wise distribution of cases in the two faculties is practically proportional (for disproportionality, $x^2(1)= 0.013$, $\phi = 0.005$, $p = 0.91$), thus indicating that the usual regression approach (Type III sum of squares) to ANOVA/MANOVA and hierarchical approach would yield practically the same results.].

The pooled-within-cells correlations among the four subscales range from 0.14 to 0.48, with half of them being 0.40 or above. Bartlett's test of sphericity, applied to pooled-within-cells correlation matrix, yielded a test statistic 258.02 ($df = 6$, $p< 0.001$), and indicated that the pooled-within-cells correlation matrix significantly departed from the identity matrix, justifying the application of MANOVA. No issues, related to multicollinearity, were detected.

The assumption of multivariate normal distribution for residuals was evaluated by Q-Q chi-square plot, with sample quantiles of Mahalanobis distance (D^2) for the set of four residuals on X axis and the corresponding theoretical chi-square quantiles on Y axis (Johnson and Wichern, 2007). The correlation between two quantiles turned out to be 0.992 (95 per cent confidence interval through bootstrapping, using 10,000 bootstrap samples, being 0.990 to 0.993) suggesting reasonably satisfactory multivariate normality. The assumption of homogeneity of covariance matrices was also satisfied (Box's $M = 38.23$, $x^2(30) = 37.61$, $p = 0.16$).

The ratio of subjects to number of dependent variables is 25 even in the smallest cell, thus indicating the adequacy of sample size (guidelines by Kres, 1983, cited in Huberty and Petoskey, 2000). Thus, the assumptions underlying MANOVA are met quite satisfactorily in the present analysis.

Table 2

Summary of 2 × 2 Hierarchical MANOVA using Wilks' Λ as a Test Statistic

Effect	Wilks' Λ	F	Hypothesis *df*	Error *df*	p	Partial η^2 mult
Faculty (FAC)	0.897	12.70	4	444	<0.001	0.103@
Gender (GEN)	0.982	1.99	4	444	—	—
FAC × GEN	0.980	2.28	4	444	—	—

— Denotes insignificant; Effect size (Partial η^2 mult) not reported.
@Cohen's f^2= .11 (Near-medium effect size).

The Results of the MANOVA. The results of the 2 × 2 hierarchical MANOVA are presented in Table 2.

The results in Table 2 indicate that the main effect of Faculty is significant at 0.001 level [Wilks' Λ = 0.897, F (4,444) = 12.70, p< 0.001, partial $\eta^2_{mult} = 0.103$]. The partial η^2_{mult} of 0.103 suggests that the Faculty explains 10.3 percent of variance in the corresponding canonical variate. A reference to Table 1 indicates that on academic procrastination total and all four subscales, science students scored less than the arts students. Thus, the results supported hypothesis 1 stating 'science students would procrastinate less than arts students'. We label the effect size as 'small to medium'

(Cohen's f^2= 0.11, Cohen, 1988, p. 481). The structure coefficients, i.e., the correlations between the dependent variables and the associated canonical variate, are: PPR (–0.93), HOPR (–0.56), COPR (–0.30), and EXPR (–0.17). Thus, the faculty-wise difference in academic procrastination appears to be contributed by three areas, procrastination in project work, homework and co-curricular activities. This is confirmed by the results of univariate analyses accompanying the MANOVA output. Thus, the main effect of faculty is significant for PPR [F (1, 447) = 43.92, p< 0.001, partial η^2 = 0.089, medium effect size], HOPR [F (1, 447) = 16.32, p< 0.001, partial η^2 = 0.035, small effect size], and COPR [F (1, 447) = 4.56, p< 0.05, partial η^2 = 0.010, small effect size]. Needless to say, the main effect of Faculty is insignificant for EXPR [F (1, 447) = 1.53, p> 0.05]. Incidentally, the univariate F ratio for the main effect of Faculty on Academic procrastination total score is also highly significant— [F (1, 447) = 25.19, p< 0.001, partial η^2 = 0.053, small effect size], thus supporting hypothesis 1.

The main effect of Gender and FAC × GEN interaction are statistically insignificant. As such, to save space, gender-wise and faculty by gender wise descriptive statistics for the APS and its subscales are not presented in Table 1. The results support hypothesis 2 stating 'Gender differences in academic procrastination, if any, would be small'. The insignificant FAC × GEN interaction implies that the effect of Faculty is not moderated by Gender.

Academic Procrastination in relation to Achievement Values, Self-esteem, Intelligence and Course-stream

We have four subgroups in the sample— art males, art females, science males and science females. For computing bivariate correlations among the seven variables (four subscales of the APS, Achievement values, Self-esteem and Intelligence) we had three options— first, computing and interpreting correlations separately for each subgroup; second, computing pooled within-cells correlations (after adjusting for the effects of Faculty, Gender and the Interaction); and third, pooling the four subgroups and computing correlations for the entire sample. The preliminary analyses showed that the natural logarithms of the determinants of the covariance matrices for the four subgroups are 17.64, 16.98, 17.22 and 17.86, respectively. These four values are 'in the same

ball park' (Huberty and Petoskey, 2000, p. 195) suggesting that the four subgroups appear to have the similar pattern of relations among the seven variables. The data were further examined for subgroup-wise differences, subgroup sample sizes and the magnitudes of the correlations (Sockloff, 1975). This scrutiny indicated that the four subgroups could be combined for further correlational analyses. This option would be in line with the recommendations of Charter and Alexander (1993). Actual analyses revealed that the correlations based on the entire sample and the corresponding pooled within-cells correlations were very similar, the difference being only at the third or second decimal place. We preferred to report correlations based on the entire sample since they have advantages for the multivariate analysis employing dummy variables. The 9 × 9 correlation matrix, based on seven variables listed in the beginning of this section, the APS total scores and Faculty, is presented in Table 3. Faculty was treated as a dummy variable (Arts faculty coded 0, and Science faculty coded 1); the correlations of Faculty with other continuous variables are point biserial correlations).

Table 3

Correlation Matrix among Nine Variables

Var. #	APS	HOPR	EXPR	PPR	COPR	AVAL	SEL	INT	FAC
APS	1.00								
HOPR	–	1.00							
EXPR	–	0.47***	1.00						
PPR	–	0.49***	0.39***	1.00					
COPR	–	0.14**	0.16***	0.16***	1.00				
AVAL	–0.25***	–0.25***	–0.20***	–0.19***	0.05	1.00			
SEL	–0.28***	–0.23***	–0.24***	–0.24***	0.01	0.18***	1.00		
INT	–0.23***	–0.12**	–0.14**	–0.31***	–0.10*	0.15**	0.14**	1.00	
FAC@	–0.23***	–0.19***	–0.06	–0.30***	–0.10*	0.13**	0.14**	0.45***	1.00

*** p <0.001; ** p <0.01; * p <0.5. # Abbreviations: See Table 1, Column 1.

@ Correlations of Faculty with other variables are point biserial correlations, Arts faculty coded 0, and Science faculty coded 1. — 'Spurious' correlations due to 'part-whole' relationship (Guilford and Fruchter, 1985, pp. 331–332); hence not reported.

Bivariate Correlations

From Table 3, we note four points:

1. The correlations of Academic procrastination (total) with Achievement values (r= –0.25, p< 0.001), Self-esteem (r= –0.28, p< 0.001) and Intelligence (r= –0.23, p< 0.001) support hypothesis 3. As per Hopkins' (2002) effect size benchmarks, these correlations are small.
2. Faculty correlated negatively with total academic procrastination (r= –0.23, p < 0.001, small effect size). Since Science faculty is coded 1 and Arts faculty is coded 0, the negative correlation implies that the science students procrastinated less than the arts students, thus supporting hypothesis 1.
3. The correlations among the first three subscales of Academic Procrastination, HOPR, EXPR and PPR are quite satisfactory, especially in view of the small number of items in each subscale. However, the correlations of these three subscales with the fourth subscale (COPR) are small, though statistically significant by virtue of large sample size.
4. Achievement values, Self-esteem, Intelligence and Faculty appear to correlate more with the first three subscales of Academic Procrastination than with the fourth subscale (COPR).

Multiple Regressions/ Correlations

We carried out multiple regression with total Academic procrastination as the DV and Faculty (dummy variable), Achievement values, Self-esteem, and Intelligence as predictors. The advantages of using dummy variable as a predictor in multiple regression are discussed by Draper and Smith (2003). The results are presented in Table 4.

Table 4

Results of Multiple Regression with Academic Procrastination (Total Score) as a DV

Predictors	Unstandardized Coefficients		Standard Coefficients	t	P
	B	Standard error	Beta		
(Constant)	80.08	2.97		26.96	<0.001
Faculty	–2.85	1.13	–0.12	2.52	≈0.01
Achievement values	–0.62	0.16	–0.18	3.96	<0.001

Self-esteem	–0.62	0.13	–0.21	4.72	<0.001
Intelligence	–0.27	0.11	–0.12	2.47	≈0.01

The results in Table 4 indicate that the regression coefficients associated with all four predictors are statistically significant. The multiple correlation is 0.40 [F (4, 446) = 21.01, p< 0.001). The four predictors explain 15.9 per cent variance in Academic procrastination. The examination of the results support hypotheses 1 and 3. Following Cohen's (1988) benchmarks for multiple correlations, the present value can be labeled as 'medium'.

Using standard multiple regression, multiple correlations were obtained between each of the academic procrastination subscale and the set of four predictors—Faculty, Achievement values, Self-esteem and Intelligence. The standard multiple regression was preferred to stepwise regression, since the latter capitalises on chance more and the replicability across samples is less (Tabachnick and Fidell, 2019). The results are summarised in Table 5.

Table 5

Multiple Correlation of Academic Procrastination Subscales with Faculty, Achievement Values, Self-esteem and Intelligence as Predictors

Dependent variable	Multiple R	F (4, 446)	p	Effect size	PV*
Procrastination in homework	0.34	14.48	< 0.001	Small	11.5
Procrastination in exam preparation	0.30	11.39	< 0.001	Small	9.3
Procrastination in project work	0.42	23.56	< 0.001	Medium	17.4
Procrastination in co-curricular	0.13	2.00	> 0.05	—	1.8

* Per cent of variance explained in DV.

The results in Table 5 indicate that the set of predictors explain 11.5, 9.3 and 17.4 percent variance respectively in the first three subscales — Procrastination in homework (R = 0.34, p< 0.001, small effect size), Procrastination in preparation for examination (R = 0.30, p< 0.001, small effect size) and Procrastination in project work (R = 0.42, p< 0.001, medium effect size). The multiple

correlation of the fourth subscale, Procrastination in co-curricular activities, with the four predictors is statistically insignificant.

Multivariate Multiple Regression and Canonical Correlations Analysis

The multivariate multiple regression (MMR) (Rencher, 2002) and canonical correlations analysis (CCA) have lots of conceptual, mathematical and procedural commonalities. As such, we present their selected results jointly. The four subscales of Academic procrastination constituted set 1 or the set of DVs and Faculty, Achievement values, Self-esteem and Intelligence as set 2 or the set of predictors. The results of the MMR are presented in Table 6.

Table 6

Summary of the Results of Multivariate Multiple Regression

Effect	Wilks' Λ	F	df 1	df 2	P	Partial η^2	Effect Size
Entire model	0.741	8.74	16	1354	<0.001	0.259	
Faculty	0.952	5.60	4	443	<0.001	0.048	Small
Achievement values	0.943	6.64	4	443	<0.001	0.057	Small
Self-esteem	0.938	7.32	4	443	<0.001	0.062	Small
Intelligence	0.955	5.26	4	443	<0.001	0.045	Small

The results in Table 6 indicate that the multivariate tests, one for the entire model and the others for each of the four predictors, are significant. The multivariate test for the entire model in MMR is equivalent to the test of independence between the two sets of variables in CCA; the significant value for Wilks' Λ rejects the null hypothesis of independence. The term 1 - Λ (i.e., 0.259) indicates the multivariate association between the two sets and is labeled as 'Hotelling-Rozeboom measure' (Cramer and Nicewander, 1979) or 'set correlation', R^2 Y, X (Cohen, 1988). It suggests that 25.9 per cent of generalised variance of the set of procrastination subscales can be accounted by the set of four predictors.

To clarify the picture through CCA, four canonical correlations 0.44, 0.25, 0.15 and 0.01 were obtained. Although the first three canonical correlations could be retained based on dimension reduction analysis, the second and third canonical correlations

are reasonably small and their contribution toward redundancy is low. As such, only the first canonical correlation (CR1) has been interpreted. The results are summarised in Table 7.

Table 7

Summary of Results for the First Canonical Correlation

Variables	Standardised Canonical Coefficients	Structure Coefficients	Percent Variance Condensed	Redundancy Percent (DVs)
Set 1: Dependent Variables				
Procrastination in homework	−0.289	−0.726	52.7	10.2
Procrastination in exam preparation	−0.203	−0.612	37.4	7.2
Procrastination in project work	−0.724	−0.932	86.9	16.7
Procrastination in co-curricular activities	0.080	−0.109	1.2	0.2
Percent of variance condensed by first canonical variate of DVs			44.5	
Set 2: Predictors				
Faculty	0.340	0.624	40.0	
Achievement values	0.397	0.584	34.1	
Self-esteem	0.492	0.661	43.7	
Intelligence	0.360	0.640	41.0	
Percent of variance condensed by first canonical variate of predictors			39.4	
First canonical correlation: 0.44				

The standardised canonical coefficients can be used for computing canonical variate scores. The examination of structure coefficients and the per cent variance condensed column indicate that the first canonical variate of the DVs condensed substantial variance from the first three subscales but ignorable variance from the COPR. The first canonical variate of DVs condensed 44.5 per cent variance from its own set. The first canonical variate of predictors also condensed substantial variance from each of the four predictors, thus extracting 39.4 per cent variance from its set. The first pair of canonical variates correlated 0.44. In other words,

the first pair of canonical variates have 19.3 per cent common variance or that the first canonical variate of the predictors explained 19.3 per cent variance in the first canonical variate of the DVs. The examination of the structure coefficients of the two sets revealed that the students with higher achievement values, higher self-esteem and higher intelligence procrastinate less. Thus, the results are in line with Hypothesis 3. The tendency of science students to show comparatively less academic procrastination than the arts students is also indicated. The redundancy column indicates that the canonical variate of predictors explains enough variance in the first three subscales but practically zero variance in the COPR. The average redundancy for the first three subscales is 11.4 per cent. A comparison of the last columns of Table 7 and Table 5 indicates that the first canonical correlation alone has captured the major redundancy of the Procrastination subscales, thus justifying the interpretation of the first canonical correlation only. Thus, in the present analysis, the CCA results are well supplemented by the redundancy analysis, in spite of its several limitations and not being considered as 'multivariate in the strict sense' (Cramer and Nicewander,1979, p. 43). An interesting result, not presented in Table 7, is that the canonical variate of predictors can explain 15.8 per cent variance in the APS total scores, a value which is extremely close to the results reported in Table 4 using multiple regression.

The post analysis diagnosis revealed that the assumptions underlying MMR and CCA were well satisfied including the multivariate normal distribution of the residuals, and satisfactory (1:56) variables to subjects ratio.

Discussion

The present research has yielded some interesting results. All the three hypotheses are verified. Since the rationale-cum-explanation for these hypotheses is already provided in review, it is not repeated here. As predicted by Hypothesis 1, science students procrastinated less than the arts students. These results are in line with the findings of Vijay and Kadhiravan (2016) for university students. The findings (Results Section 3.2) further revealed that the faculty-wise difference in total academic procrastination is more due to procrastination in project work [F (1, 447) = 43.92, p< 0.001, partial η^2 = 0.089, medium effect size], followed by

procrastination in homework [F (1, 447) = 16.32, p< 0.001, partial η^2 = 0.035, small effect size], and procrastination in co-curricular activities [F (1, 447) = 4.56, p< 0.05, partial η^2 = 0.010, small effect size]. In science curriculum and teaching, as compared to arts curriculum, there is more emphasis on projects and practical work and procrastination in this regard may have adverse consequences. Also, the students having comparatively more leaning for projects and practical work would join the science stream. This explains the medium effect size for the PPR subscale.

In line with Hypothesis 2, the present research did not reveal gender differences in academic procrastination. Employing the same academic procrastination scale used in the present research, some studies (e.g., Kalia and Yadav, 2014; Prasad, 2017; Mangat, 2019) did not obtain gender difference, whereas another study (Ahmed and Shumaim, 2017) reported boys scoring higher on procrastination than girls. The present finding, however, cannot be regarded as tool specific. For example, Gartia et al., (2011), using Tuckman Procrastination Scale, reported absence of gender difference in a sample from Odisha. Such findings are in line with meta-analytic results of Van Eerde (2003) and Steel, (2007). The present research also revealed that gender did not moderate the faculty-wise difference in academic procrastination.

The bivariate correlations provided evidence in favour of Hypothesis 3. The results of multiple regression (Table 4), with total academic procrastination as the DV and Faculty, Achievement values, Self-esteem and Intelligence as predictors, yielded a multiple correlation of 0.40 [F (4, 446) = 21.01, p< 0.001, medium effect size) and provided further evidence for Hypothesis 3. The beta coefficients associated with each of the four predictors are significant and the four predictors explain 15.9 per cent variance in total academic procrastination. The multivariate multiple regression (MMR) (Results Section 4.3, Table 6) suggested that although the effects of each predictor are small, the set of four predictors account for 25.9 per cent generalised variance in the set of Academic procrastination subscales [Wilks' Λ = 0.741, F (16, 1354) = 8.74, p< 0.001]. The results of canonical correlations analysis (CCA) (Table 7), especially the first canonical correlation (CR1) of 0.44 and the associated canonical variates, are also in line with Hypothesis 3.

From Table 3, we note the point biserial correlations of Faculty with Intelligence (r = 0.45, p< 0.001, medium or near-large effect

size), Achievement values (r = 0.13, p< 0.001, small effect size) and Self-esteem (r = 0.14, p< 0.001, small effect size). Since Arts is coded 0 and Science is coded 1, the positive point biserial correlations indicate that science students, as compared to arts students, have higher intelligence, more achievement values and better self-esteem. It seems that students with higher intelligence, more achievement values and better self-esteem tend to opt for science faculty over the arts faculty; however, the effect sizes of achievement values and self-esteem are small. At this point, the effect sizes of Faculty for its effect on Academic procrastination need to be revisited. Table 2 reports the partial η^2_{mult} of 0.103, a nearly medium effect size for Faculty. Table 6, however, reports the partial η^2_{mult} of 0.048 (small effect size) for Faculty, which represents the effect size for Faculty, when the effects of achievement values, self-esteem and intelligence are partialed out. Thus, the relationship between faculty and academic procrastination is partially accounted by achievement values, self-esteem and intelligence.

Here we briefly recapitulate a few results. As per the results (Table 3), the first three subscales of the Academic Procrastination Scale—Procrastination in homework (HOPR), Procrastination in preparation for examination (EXPR), Procrastination in project work (PPR) intercorrelate quite satisfactorily. However, the correlations of these three subscales with the fourth subscale, Procrastination in co-curricular activities (COPR) are small, though statistically significant. Moreover, Achievement values, Self-esteem, Intelligence and Faculty appear to correlate more with the first three subscales of Academic Procrastination than with the fourth subscale. Results (Table 5) indicate that Achievement values, Self-esteem, Intelligence and Faculty explain 11.5, 9.3 and 17.4 per cent variance respectively in the first three subscales — HOPR (R = 0.34, p< 0.001, small effect size), EXPR (R = 0.30, p< 0.001, small effect size) and PPR (R = 0.42, p< 0.001, medium effect size); but the multiple correlation of the fourth subscale, COPR, with the four predictors is statistically insignificant. Results (Table 7) indicate the canonical variate of the DVs (Procrastination subscales) condense 52.7 per cent variance from the HOPR, 37.4 per cent variance from the EXPR, 86.9 per cent variance from the PPR, but only 1.2 per cent variance from the COPR. Similarly, the canonical variate of the predictors explains 10.2 per cent variance in the HOPR, 7.2 per cent variance in the EXPR, 16.7 per cent variance in the PPR, but only 0.2 percent variance in the COPR. The results,

recapitulated in this paragraph clearly reveal that the fourth subscale, Procrastination in co-curricular activities, is distinct from the first three subscales. Homework, examination preparation and project work, all three constitute curricular activities. Thus, the present work suggests a distinction between procrastination in curricular activities and co-curricular activities, both in terms of covariation among the subscales and the relationship with psychological variables like achievement values, self-esteem, and intelligence and demographic variable like faculty (course stream). This finding is not in line with that of Kalia and Yadav (2014), who reported four subscales (dimensions) sufficiently correlated. However, their sample was a mixed sample of secondary and senior secondary students, the latter corresponding to junior college or higher secondary stage in Maharashtra. We speculate that junior college students, as compared to school children, probably because of their better developed cognitive abilities and sense of freedom from teachers' pressure, discriminate curricular and co-curricular demands and respond to them independently. As compared to curricular activities, the students and perhaps the teachers and the concerned system, undervalue the co-curricular activities, although they play a crucial role in the holistic development of the students. Probably in response to such situation, the *National Education Policy* (2019 draft) has called for 'no hard separation of content in terms of curricular, extracurricular, or co-curricular' areas (p. 78, sec. P.4.4.2).

To sum up, the present research has replicated the findings of negative relationship between academic procrastination and achievement values, self-esteem and intelligence. The present research has also demonstrated that science students procrastinate less than the arts students and this faculty-wise difference is partially accounted by variables like achievement values, self-esteem and intelligence. Neither gender differences were obtained in academic procrastination nor gender moderated the effect of faculty. An interesting finding, however, is the empirical distinction between procrastination in curricular and co-curricular activities. The relationship between academic procrastination and achievement values, self-esteem and intelligence is attributed to procrastination in curricular activities and not procrastination in co-curricular activities.

The present study has several clinical, educational, psychometric and research implications, a few of which are hinted here. Zacks

and Hen (2018) reviewed and categorised the approaches to reduce academic procrastination in three categories: (i) therapeutic treatment, (ii) therapeutic prevention and (iii) instructor/teacher intervention. The present study suggests that in these intervention programmes, there should be inputs to improve self-esteem and cultivate achievement values. This suggestion is in line with Van Eerde and Klingsieck's (2018) call 'for future intervention studies based on self-determination theory' (p. 82) which emphasises intrinsic motivational processes. The present study also contributes some basic data necessary for counselling the junior college students and a slightly younger group from rural and semi-urban Maharashtra and similar locales. While developing the tools to assess academic procrastination, the distinction between procrastination for curricular and co-curricular activities should be remembered and item writing and psychometric methodology should be planned accordingly. Research is also needed to demonstrate these two factors through appropriate factor-analytic studies. The application of multivariate methodology, in the present study, has added new insights to our understanding of academic procrastination, and we urge Indian researchers in this arena to undertake further multivariate explorations.

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