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Understanding Academic Procrastination in Academic Settings: Prevalence, Gender Variation, Motivational Factors And Innovative Assistive Device Solution

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Abstract
Academic procrastination is the term used to describe how students tend to put off or postpone finishing task. This research investigates the prevalence of academic procrastination among students based on their genders and education levels, and the reasons for their procrastination, focusing on their perception of assistive technologies. The Procrastination Assessment Scale Students (PASS) and Procrastination Scale (Lay,1986) was used. The sample comprises of more than 100 participants gathered from students of different academies and universities of Lahore, Pakistan with the are age ranging 15 years and above. The statistical analysis (Independent Sample t-test and One-Way ANOVA) reveals that there's no significant difference among genders or different educational levels. It also investigates the students' perception regarding the reasons, existing intervention and insight on the student's perception on assistive device-based solution and its features. By utilizing all these insights and the literature Mind Planner i.e. the assistive device along with its companion app was designed to aid the students in terminating this habit. Mind Planner offers a comprehensive approach to time management and self-improvement and accessible via a companion mobile app. This study recommends some amendments to be made in future for more improvements of this project.

Keywords: Assistive device, Habit formation, Health and Wellness, Passive procrastinators, Portable Device, Procrastination prevention.

Introduction

Solomon and Rothblum (1984a) define procrastination as the inclination to postpone significant tasks until reaching a point of discomfort (Solomon and Rothblum, 1984a). Procrastination may be a persistent trait, representing a predisposition to defer essential tasks crucial for achieving a particular goal (Lay, 1986). This tendency is frequently observed among college and university students, leading to adverse effects on their academic performance (Oweini & Harraty, 2005; Steel, 2007).
In a meta-analytical study by Steel (2007), it was revealed that 70-95% of students engage in problematic procrastination behavior (Steel *et al.*, 2007). This phenomenon is particularly prevalent in academic settings and is commonly referred to as academic procrastination or Academic Procrastination Behavior (APB) (Rozgonjuk, Kattago & Täht, 2018). Procrastination is positively related to academic burnout (Abdi Zarrin, Akbarzadeh et al., 2019; Hall et al., 2019) and is continuously seen as harmful to students' general well-being and academic progress
(Hailikari, 2021).

Many students face difficulties, when it comes to effectively managing their time, staying focused, and maintaining motivation for their studies. Academic procrastination is a common issue, with students frequently putting off essential tasks until the last minute, resulting in increased stress and lower quality work (Glick & Orsillo, 2015). The ever-present digital distractions, courtesy of smartphones and the internet, make it easy for students to deviate from the track, indulging in social media, games, and other online temptations during study sessions ((Flanigan et al., 2023). Sustaining concentration over extended periods proves to be a difficult task, particularly when dealing with intricate or uninteresting subjects.

Furthermore, many students grapple with time management, struggling to allocate their study hours efficiently among various subjects and assignments (Michael Vallejo, 2023). The looming pressure of exams, deadlines, and academic performance worsens the stress and anxiety, further hindering a student's ability to maintain focus (Michael Vallejo, 2023). Inefficient study habits and a lack of well-defined study routines leave some students disorganized and inattentive. Importantly, the growing reliance on screens contributes to screen fatigue (Neophytou et al., 2019), which can lead to reduced attention spans (Neophytou et al., 2019). These multifaceted challenges collectively undermine students' academic performance and call for effective solutions to support their success. For this it's crucial to understand procrastination, its root cause and possible ways of intervention to reduce this behaviour.

Literature

Throughout history, procrastination has been a recurring theme in literature and culture. In the late 20th century, with the rise of behavioral science, formal research on procrastination gained momentum. Psychologists Albert Ellis and Bill Knaus (1977) authored one of the first comprehensive books on the subject, focusing on college student procrastination. Later, Laura Solomon and Esther Rothblum (1984) explored the frequency and reasons behind college student procrastination and developed The Procrastination Assessment Scale--Students (PASS; Solomon & Rothblum, 1984) to assess the prevalence of and reasons for student procrastination. Also, with the passage of time more explorations were done and found that Procrastination's consequences extend beyond delayed tasks, leading to increased stress, compromised health, and diminished performance (Lay, C. H. 1986, Tice, D. M., & Baumeister, R. F. 1997, Van Eerde, W. 2003, Steel, P. 2007,). In the modern era, technological distractions exacerbate procrastination, with the shift to remote work adding new challenges. Despite its pervasive nature, overcoming procrastination remains a complex challenge deeply rooted in human behavior (Steel, P. 2007).

Several studies have associated procrastination with various psychological factors (Solomon & Rothblum, 1984a,Ferrari, 1992; Aziz & Tariq, 2013a,Steel and Klingsieck 2016). Three fears: fear of rejection, fear of success, and fear of failure are significant contributors (Ferrari, 1992). Procrastination is also linked to perfectionism and social anxiety (Solomon & Rothblum, 1984a), as well as depression and stress, which exacerbate procrastination tendencies (Ferrari, 1992; Aziz & Tariq, 2013a). Research has identified various demographic factors influencing procrastination. Age is a significant factor, with older students (21 years and over) exhibiting lower levels of procrastination than their younger counterparts (Rabin, Fogel, & Nutter-Upham, 2011; Klassen et al., 2007). Procrastination is also associated with low self-esteem and a poor self-concept (Effert & Ferrari, 1989). Procrastination is closely linked to deficits in self-regulation and executive functions. Rabin et al. (2011) discovered that academic procrastination is predicted by executive skills such as planning, monitoring, self-regulation, and organizational abilities. Passive procrastinators struggle with indecision, often failing to complete tasks on time, leading to self-doubt, anxiety, and missed deadlines (Chu & Choi, 2005). Passive procrastination is self-destructive, marked by distress, while active procrastination serves as a self-regulating strategy for successful deadline management (Zohar et al., 2019). Active procrastinators make intentional decisions to delay tasks, thriving under pressure (Chu & Choi, 2005). Active procrastinators, in contrast, demonstrate superior time management, self-efficacy, coping mechanisms, and positive results, such as improved academic performance. (Zohar et al., 2019). The difference between these types can also be understood through Emotion- Regulation Theory (ERT)

Procrastination, as explained ERT, happens when people prioritize short-term mood improvement over long-term goals. This involves delaying unpleasant tasks to avoid negative emotions or opting for more enjoyable activities. The theory views procrastination as a counterproductive coping strategy, hindering progress and potentially impacting overall emotional well-being (Tice & Bratslavsky, 2000). Aligned with self-regulation models, it underscores the clash between immediate gratification and long-term objectives. The theory highlights temporal disjunction, where individuals prioritize present desires over future consequences due to feeling disconnected from their future selves. In essence, it offers insights into the psychological factors behind procrastination, portraying it as a mis-regulation rooted in the misconception that delaying tasks will enhance emotional well-being (Tice & Bratslavsky, 2000). ERT focuses primarily on the emotional aspects providing a framework for understanding the psychological mechanisms behind procrastination,that covers a narrower scope. However the Temporal Motivation Theory (TMT)(Steel & König, 2006) offers a different perspective, explaining procrastination in terms of motivation.

TMT explains that people procrastinate when they have low motivation for a task (Steel & König, 2006). In simple terms, motivation is determined by how much someone values a task, expects to achieve it, and is sensitive to the delay in achieving it (Steel & König, 2006). The theory suggests that motivation increases when individuals value an outcome and expect to achieve it but decreases as the delay in achieving the outcome and sensitivity to delay increase (Steel & König, 2006). People generally prefer immediate and certain rewards over delayed and uncertain ones (Zhang et al., 2019). Motivation channels a learner's internal energies toward specific goals, explaining why individuals may be highly motivated in one task but not in another. Motivated individuals work diligently to achieve their aspirations, highlighting motivation's crucial role in determining the effort and perseverance exhibited in various activities. Emotion Regulation Theory (ERT) helps explain procrastination as an emotional coping mechanism but lacks the comprehensive approach provided by Temporal Motivation Theory (TMT). TMT's inclusion of value, expectancy, and sensitivity to delay offers a broader understanding, making it a better framework for investigating academic procrastination.

Mainly, there are two types of motivation as researches have shown: intrinsic motivation and extrinsic motivation. Intrinsic motivation originates within the individual and is driven by internal stimuli such as biological, emotional, spiritual, or social factors. Activities are undertaken for self-pleasure and personal satisfaction without external rewards (Ryan & Deci, 2000). Characterized by curiosity and a desire to meet challenges, intrinsic motivation arises from an inner drive to engage in tasks because they are enjoyable or inherently satisfying. For example, students aiming to understand and master content are intrinsically motivated (Cavallo et al. 2003). This type of motivation is more influential because it comes from within the learner, unaffected by external factors. Extrinsic motivation is driven by external stimuli, such as rewards, social approval, or appreciation (Ryan & Deci, 2000). It involves performing tasks to achieve outcomes beyond the activity itself. According to Ryan and Deci (1985), extrinsically motivated learners engage in activities anticipating outcomes other than learning. Chow and Yong (2013) note that extrinsic motivation drives students to engage in academic tasks for external reasons. Benabou and Tirole (2003) argue that extrinsic motivation enhances effort and performance, with rewards acting as positive reinforcers. Research shows People who are intrinsically motivated or autonomously motivated exhibit greater interest, enthusiasm, and confidence, which improves performance, creativity, perseverance, and general well-being (Ryan and Deci 2017).

Despite the widespread prevalence of academic procrastination, interventions to address it have yielded mixed results. A meta-analysis by van Eerde and Klingsieck (2018) reviewed 44 studies and found a moderate and significant overall effect size for intervention effectiveness (Eerde and Klingsieck, 2018). Notably, interventions rooted in Cognitive Behavioral Therapy (CBT) found to be most effective in reducing procrastination (Eerde and Klingsieck, 2018). However, these results must be interpreted cautiously due to the small sample sizes in many studies. Moreover, therapy-based interventions have practical drawbacks, such as the need for individual or small-group settings and the guidance of qualified therapists, making them less feasible for widespread implementation by classroom instructors. In contrast to therapy-based approaches, instructor-based interventions offer a promising yet under explored avenue. The latter strategy refers to teachers changing their methods of instruction to incorporate non-therapeutic techniques to stop academic procrastination. (Eerde and Klingsieck, 2018). Examples include strategic timing of access to study materials and timely reminders about impending deadlines. This method aligns with prevention science best practices and offers a more accessible and scalable intervention strategy for classroom instructors (Zacks & Hen, 2018). By embedding these practices into the classroom routine, instructors can effectively reduce procrastination without the need for specialized training or resources. Some instructors were reported to employ contemporary or technological strategies (i.e., gamification, big data analytics, collaborative learning etc.) to diminish academic procrastination.

Gamification, a term coined by programmer Nick Pelling in 2002, involves applying gaming elements and technology to non-gaming contexts (Deterding, Dixon, Khaled, & Nacke, 2011, p. 10). Gamification is used to enhance learning motivation in education, gamification utilizes the enjoyment and motivation derived from gaming experiences (Smiderle et al., 2020). Werbach and Hunter's (2012) framework outlines gamification through three facets: game elements, game-design techniques, and non-game context, employing a pyramid structure with dynamic, mechanic, and base layers (Werbach & Hunter, 2012). Human-computer interaction (HCI) research and practice have seen a rise in gamification, which is similar to serious games but uses game components for non-entertainment objectives (Deterding et al., 2011). Not bound to a specific application domain, gamification can motivate various behaviors, be it economic, individual, or societal, contributing to sustainable practices (Deterding et al., 2011). Gamification utilizes psychological principles like immediate feedback, clear goals, rewards, progress tracking, and social accountability to reduce procrastination. By manipulating how users perceive the rewards associated with tasks—both immediate and delayed—gamification increases their attractiveness and perceived value. This makes tasks more motivating, and rewarding.

Using gamification as an element integrated into the form of a mobile application, presently, there are multiple Productivity app-based intervention available for students to help them organizing their life, and enhance productivity.

Table 1: Productivity apps comparison table (source: adopted from Tide.fm. n.d., Todoist. n.d., Forest. n.d.)

Features	Tide App	Todoist App	Forest App
Primary Purpose	Focus, relaxation, sleep aid	Task management and productivity	Focus and productivity through gamification
Focus Techniques	Pomodoro timer, white noise, nature sounds	Task lists, project organization, reminders	Planting virtual trees to encourage focus
Task Management	No	Yes	No
Habit Tracking	Yes	Yes	No
Gamification	No	No	Yes
Collaboration Features	No	Yes (Team collaboration)	No
Unique Features	Relaxation and sleep sounds, focus music	Advanced task management tools, productivity reports	Virtual tree planting to maintain focus, distraction blocking

In addition to apps, various assistive device-based solutions are widely used, such as timers and time trackers . Additionally, several concept designs have been developed . One such concept is an electric pin-up board ('It's Time to Read Me) that lights up to remind you to check its messages and take action. Organizing memos using this attachment is really helpful, especially if your wall is cluttered with them. The main objective is to make sure you pay attention to the important notes since each pin pulls electricity from the board when it is pressed in (The Future, 2013). Another concept design is a desktop gadget (Summy) aimed at helping students study independently while fostering social connections. This touchscreen device is designed to aid students in connecting with their peers without losing their study focus. It functions as a voice messenger, timer, daily planner, and social network (Torres & Torres, 2023).

No doubt, using apps to address procrastination is a great concept; however, they often become sources of social media distractions. The available solutions in this aspect are mostly focused on basic time-related tools such as timers and time trackers. This gap highlights the need for a comprehensive solution that not only frees you from digital distractions but also encourages you to work, relax and assistance in managing daily tasks. However, to create such a solution, there is a need to know how prevalent procrastination is among people from different backgrounds and different levels of education, and to explore how students perceive these reasons and the intervention techniques they use. By addressing these aspects,we can create a more effective approach to tackling procrastination that aligns with students' needs and preferences.

Therefore, the key research questions are:

1.How prevalent is procrastination (i) between genders and (ii) across various education levels? What are the underlying causes of procrastination?

2.What are students' perceptions of these reasons, and what intervention techniques do they use to deal with it? What are students' views on device-based interventions, how likely are they to use them and what features they want to get incorporated?

Research methodology

Mixed-methods research method was adopted as it allows for both quantitative measurement and qualitative insights. The surveys were conducted to gain data related to prevalence and reasoning of procrastination. Qualitative information gathered via open-ended inquiries of the surveys will be used to understand the students' attitude towards device-based interventions and other interventions, targeting students of different education levels (i.e., Matric, Intermediate, Graduation and Post Graduation). These surveys were conducted online through google forms as well as by visiting educational institute.

Procedure

After obtaining participants' informed consent and providing them the basic information regarding the research purpose, data was collected during the administration procedure by having the questionnaires completed. Following data collection, scoring and analyzing were completed. Provide bullet points on how data was collected using online questionnaire:

- A link was provide to participants that leads them to the online questionnaire
- An informed consent was provided to participants
- Upon acceptance of consent form, participants were asked to provide response for demographic questions
- Questions related to the topic i.e., procrastination were presented
- Participants were asked to fill some open questions related to the topic followed by submission of the response.

Data collection

Data were collected using surveys. The first survey consisted of Procrastination Scale (Lay, 1986) to examine procrastination behavior and its prevalence within different demographic aspects. This scale consist of 20-item measure of general procrastination 10 items are reverse scored. Reversed-keyed items: 3,4,6,8,11,13,14,15,18,20. Also Procrastination Assessment Scale Student (PASS) (Solomon & Rothblum, 1984) was used to determine the reasons of procrastination by providing a procrastination scenario. It consists of 26 pieces, two for each of the 13 reasons why academic procrastination occurs.

The second survey was done through a questionnaire that includes closed and open ended question to get students opinion on reasons and combating strategies for procrastination and perception on Assistive Device based intervention to reduce procrastination.

Data Analysis

Quantitative data were analyzed using SPSS 27.00 to perform reliability analysis ensure that the data collected can be relied on from making decisions or drawing conclusions. The Independent Sample T-test is used to identify statistically significant differences between the means of two groups that are not related. When comparing the means of three or more independent groups, one way independent ANOVA can be used to identify statistically significant differences. Descriptive Statistics- to describe the main features of a data set also Histograms and charts- to present he relation between variables, were generated.

Results

Survey 1

Descriptive of Demographics

Descriptive Statistics of Demographic Variables (N=111)

Table 2

Variables	F	%
Gender		
Girls	76	68.5
Boys	35	31.5
Age (in ranges)		
15-18 years	36	32.4
19- 24 years	68	61.3
24+ years	7	6.3
Education		
Matric	14	12.6
Intermediate	25	22.5
Graduation	57	51.4
Post Graduate	15	13.5

Note: f = frequency; M = mean; SD = standard deviation; % = percentage

The table of demographics illustrates that girls are more in the sample as compared to boys, but SPSS smartly manages this sample size difference and the results remain unaffected. Most of the data has been obtained from the people having ages in between 19-24 years. Lastly, most of the students in the data are in their graduation degrees

Reliability Analysis

Table 3 displays the reliability coefficients for the scales utilized in this investigation.

Additionally, the table below reports the number of elements (k), mean, standard deviation, and actual and possible ranges of the scales.

Descriptive Statistics and Reliability Coefficients for Study Variables (N=111)

Table 3

Scales	α	k	M	SD	Range	
					Potential	Actual
Procrastination Scale	0.71	20	58.96	9.84	20-100	33-91
PASS	0.84	26	81.66	15.35	26-130	32-124

Note: a= Cronbach's alpha reliability; k= number of items in scale and subscale; M= Mean; SD= Standard Deviation; PASS; Procrastination Assessment Scale-Student

To determine the Cronbach's α reliability of the scales used in the study, reliability analysis was performed. Table 3 presents the reliability of Cronbach's alpha for two scales, along with the number of items in each scale, their means, and standard deviations. The alpha of Cronbach's reliability of Procrastination Assessment Scale-Student is well above 0.8 which is a good reliability. Whereas Procrastination Scale (Lay, 1986) reliability is near 0.7 which is acceptable.

Independent Sample t-test Analysis

It was proposed that there are notable variations in gender in procrastination among students. Thus, in order to check this hypothesis, an independent sample t-test analysis was run, which is shown below in the table 4

Table 4

Variables	boys (n=35)		girls (n=76)		t (109)	p	95% CI		
	M	SD	M	SD			LL	UL	Cohen's d
Procrastination	60.83	7.84	58.11	10.57	-1.4	0.20	-6.70	1.25	0.29

An Independent Sample t-test Analysis Showing the Gender Differences in Procrastination (N=111).

Note: M = mean; CI= confidence interval; LL= lower limit; UL= upper limit; SD = standard deviation

An Independent sample t-test analysis was run to find the significant gender differences in procrastination. The assumption of homogeneity of variances was fulfilled for all the variables. The results came out to be non-significant, which means that there were no significant gender differences in procrastination. Procrastination was found equal in both genders, but it was slightly higher in boys, as shown by their means.

One way Analysis of Variance

It was hypothesized that there are significant differences in procrastination across different education level. Thus, in order to check this hypothesis, one way Analysis of Variance was run, which is shown below in the table 5

One way ANOVA for Procrastination among 4 Education levels (N=111)

Table 5

Variable	Matric (n=14)		Inter (n=25)		Graduation (n=57)		Post. Gr (n=15)		F	p	Partial η2
	M	SD	M	SD	M	SD	M	SD			
Procrastination	61.36	5.12	59.32	10.10	58.42	9.50	58.20	13.87	0.37	0.77	.01

Note: M= Mean; SD= Standard Deviation; F=ANOVA; p= Level of significance; Partial η2=Effect size.

One way analysis of variance (ANOVA) was run to find the significant differences in procrastination across different levels of education. The assumption of homogeneity of variances is fulfilled. Results of ANOVA are non-significant $F(3,107) = 0.37$, $p > .05$, $\eta 2 = .01$. It means that no matter what the education level is, there is no significant difference in procrastination of students.

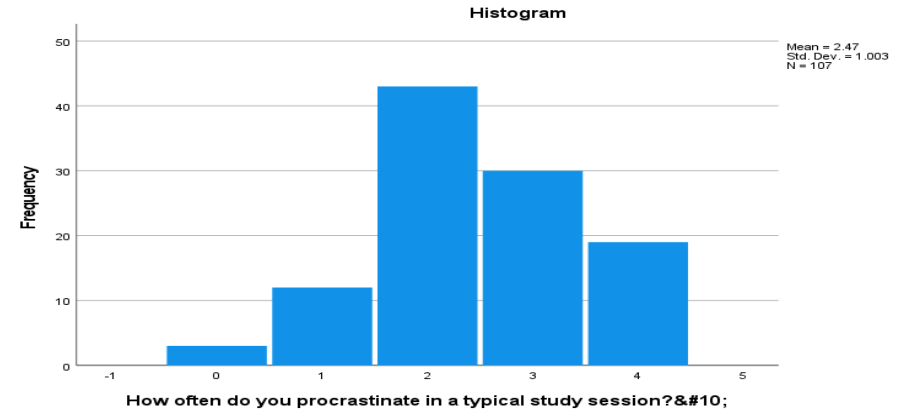
Descriptive Statistic for finding of Reasons of Procrastination

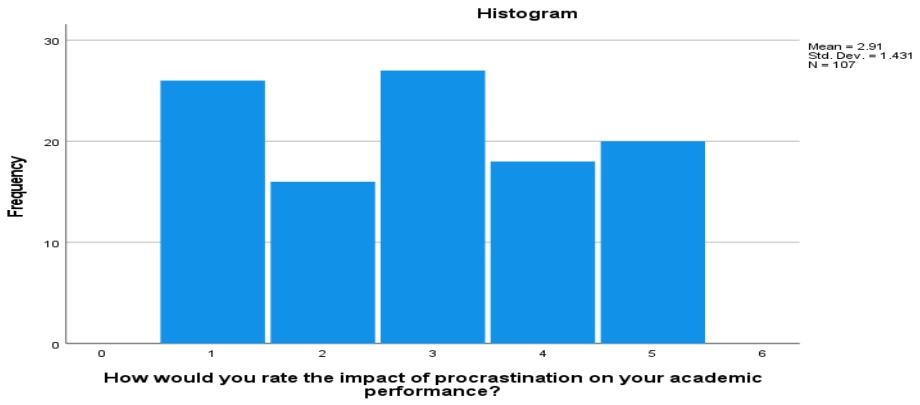
Thirteen divisions of Procrastination Assessment Student Scale were made, in order to find the mean and standard deviation of scores obtain on each item and the percentage of high and low procrastinators on each item. For these purposes Descriptive Statistics were run. The results are shown in the table below.

Sr. no.	Reasons for procrastination	Items	Mean	S.D	Range	Low procrastinator	High procrastinator
1.	Evaluation Anxiety	Concerned that professor wouldn't like your work	1.73	0.45	3-5(High) 2-1(Low)	27%	73%
		Worried about getting bad grade	1.74	0.44	3-5(High) 2-1(Low)	26.1%	73.9%
2.	Dependency	Waited until a classmate did his/her, so that he/ she could give me some advice	1.60	0.50	3-5(High) 2-1(Low)	39.6%	60.4%
		Waited to see if the professor would give some more information about the paper	1.56	0.50	4-5(High) 3-1(Low)	44.1%	55.9%
3.	Difficulty making decisions	Hard time knowing what to include or what not to include in paper	1.75	0.44	3-5(High) 2-1(Low)	25.2%	74.8%
		couldn't choose among all the topics	1.58	0.50	3-5(High) 2-1(Low)	42.3%	57.7%
4.	Time management	Had too many other things to do	1.78	0.41	3-5(High) 2-1(Low)	21.6%	78.4%
		Felt overwhelmed by the task	1.66	0.48	3-5(High) 2-1(Low)	34.2%	65.8%
5.	Lack of assertion	There's some information needed to ask professor, but felt uncomfortable approaching him/her	1.71	0.46	3-5(High) 2-1(Low)	28.8%	71.2%
		Had difficulty requesting information from other people	1.73	0.45	3-5(High) 2-1(Low)	27%	73%
6.	Rebellion against control	Resented having to do thing assigned by others	1.58	0.50	3-5(High) 2-1(Low)	42.3%	57.7%
		Resented people setting deadlines	1.60	0.50	3-5(High) 2-1(Low)	39.6%	60.4%
7.	Low self esteem	Didn't think know enough to write the paper	1.69	0.47	3-5(High) 2-1(Low)	31.5%	68.5%
		Didn't trust oneself can do a good job	1.38	0.49	3-5(High) 2-1(Low)	62.2%	37.8%
8.	Aversiveness of task	Really dislike writing term paper	1.87	0.34	3-5(High) 2-1(Low)	13.5%	86.5%
		Felt it just takes too long to write a term paper	1.95	0.23	3-5(High) 2-1(Low)	5.4%	94.6%
9.	Risk taking	Looked forward to excitement of doing this task at last minute	1.52	0.50	4-5(High) 3-1(Low)	47.7%	52.3%
		Liked the challenge of waiting until the deadline	1.68	0.47	3-5(High) 2-1(Low)	32.4%	67.6%
10.	Fear of success	Concerned that if did well classmates would resent	1.60	0.49	3-5(High) 2-1(Low)	39.6%	60.4%
		Were concerned that if got a good grade people would have higher expectation in the future	1.81	0.40	3-5(High) 2-1(Low)	18.9%	81.1%
11.	Laziness	Didn't have enough energy to begin the task	1.51	0.50	3-5(High) 2-1(Low)	48.6%	51.4%
		Just felt too lazy to write the term paper	1.83	0.38	3-5(High) 2-1(Low)	17.1%	82.9%
12.	Peer pressure	Knew that classmates hadn't started the paper either	1.72	0.45	3-5(High) 2-1(Low)	27.9%	72.1%
		Friend were pressing to do other things.	1.59	0.50	3-5(High) 2-1(Low)	41.4%	58.6%
13.	Perfectionism	Were concerned wouldn't meet other expectations	1.78	0.41	3-5(High) 2-1(Low)	21.6%	78.4%
		set very high standards and worried that wouldn't be able to meet those standards	1.66	0.48	3-5(High) 2-1(Low)	34.2%	65.8%

Survey 2

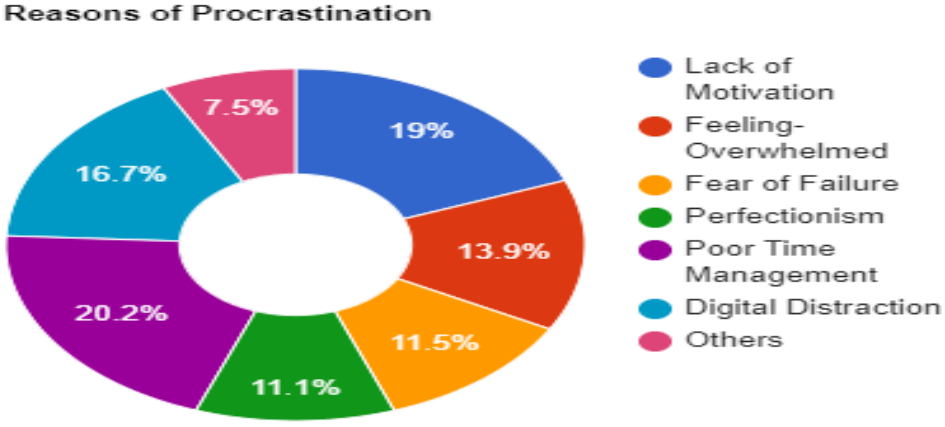
Section 1:

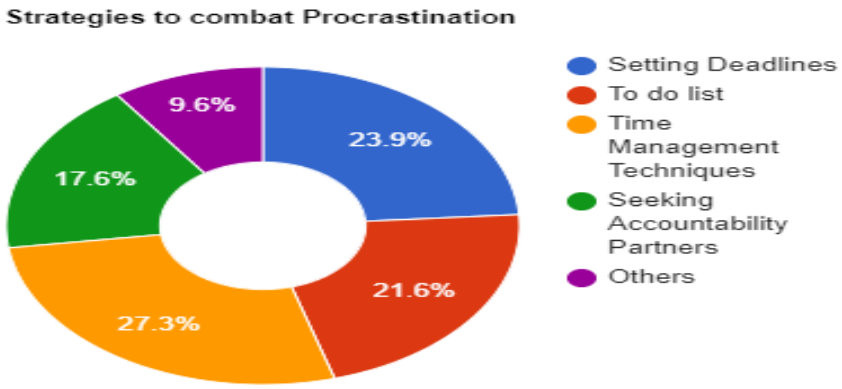




Through results we can conclude that majority of the participants procrastinate in a typical study session as the bars are more heighten toward high frequency. While 25.2% of the total participants consider a moderate impact of procrastination on their academic performance.

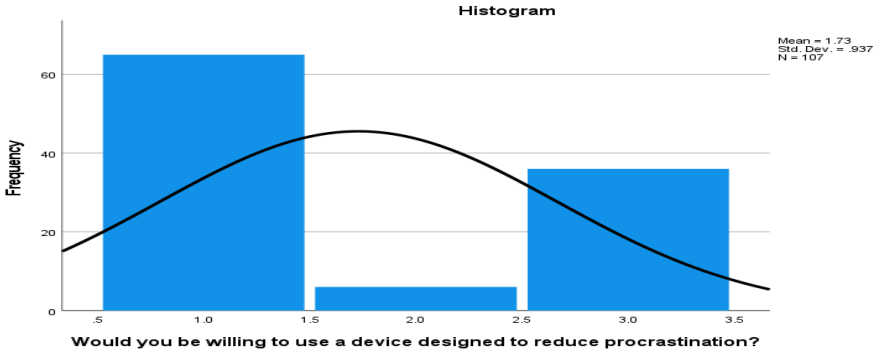
Section 2

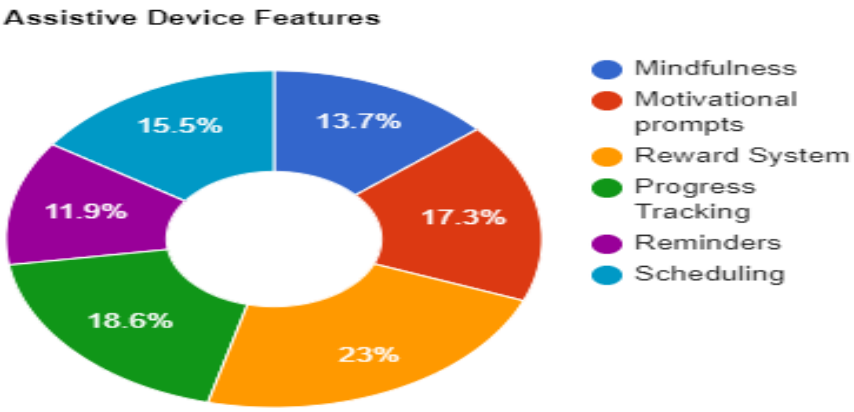




The Participants consider these as main reasons behind procrastination: Poor time management >Lack of Motivation >Digital distraction > Feeling overwhelmed > Fear of Failure > Perfectionism and other reasons like feeling stressed or depression. The strategies which participants already using to combat procrastination are: Using time management techniques >Setting Deadlines >creating Todo List >Seeking Accountability Partners and other which includes setting alarms and reminders on mobile phones or using productivity apps.

Section 3:





Significant number of participants, 60.3% were willing to use device based solution to reduce their procrastination while 33.6% were uncertain. The features they wanted to get incorporated were: Virtual Reward System >Progress Tracking >Motivational Prompts >Scheduling >Mindfulness and meditation >Reminders while other includes Group studies.

Design Development

Following an extensive brainstorming session and thorough research, we proposed a comprehensive design that integrates valuable insights. We finalized the features and workflow while adhering to key UX design principles, ensuring an intuitive user experience.

The UI design was crafted for both the device and the accompanying app, focusing on aesthetics and functionality. This collaborative process culminated in the creation of our final product: Mind Planner.

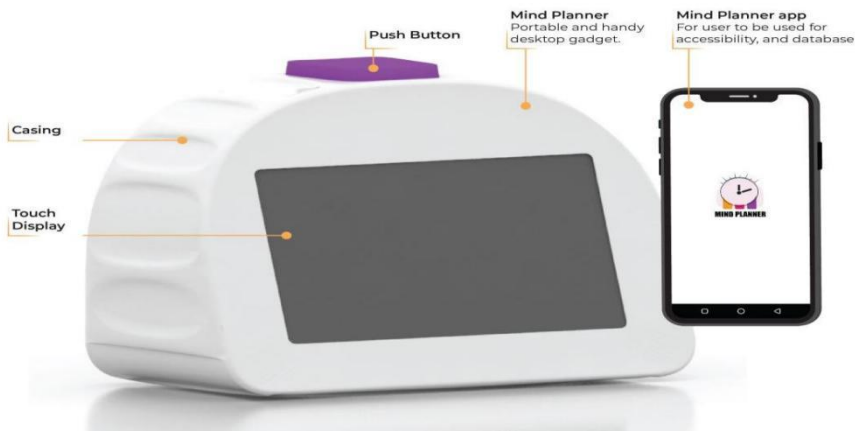


Figure 1: Proposed design of Mind planner and companion app

The features of Mind Planner are following:

- **Scheduling and Reminders:** Setting specific and achievable goals helps reduce procrastination by providing clear direction and purpose. Reminders reinforce these goals, aiding in time management and task prioritization.
- **Daily Progress tracking:** Tracking daily progress can significantly enhance self-regulation and accountability. Monitoring progress leads to increased motivation and productivity. Keeping track of daily goals helps students stay focused and on task, reducing the likelihood of procrastination.
- **Peer Progress:** Social accountability is a powerful motivator. Peer support can boost self-efficacy and encourage consistent effort towards goals. Connecting with friends and maintaining productivity streaks leverages social influence to sustain motivation and reduce procrastination.
- **Mindfulness Exercises:** Mindfulness exercises have been shown to improve attention, emotional regulation, and cognitive function. By incorporating mindfulness, Mind Planner helps users enhance their mental clarity and emotional well-being, which are crucial for maintaining focus and reducing stress-related procrastination.
- **Audio Journaling:** Journaling, particularly audio journaling, can aid in self-reflection and emotional processing. Audio journaling provides a convenient way to capture thoughts and feelings, enhancing self-awareness and memory recall.
- **Pomodoro timer:** The Pomodoro Technique, which involves working in focused intervals followed by short breaks, has been shown to improve concentration and productivity. Using a Pomodoro timer helps users maintain high levels of productivity over longer periods by preventing burnout and promoting sustained focus.
- **Mind Planner companion app:** The companion app ensures that users can access their planner anytime, anywhere, supporting continuous engagement with their goals.

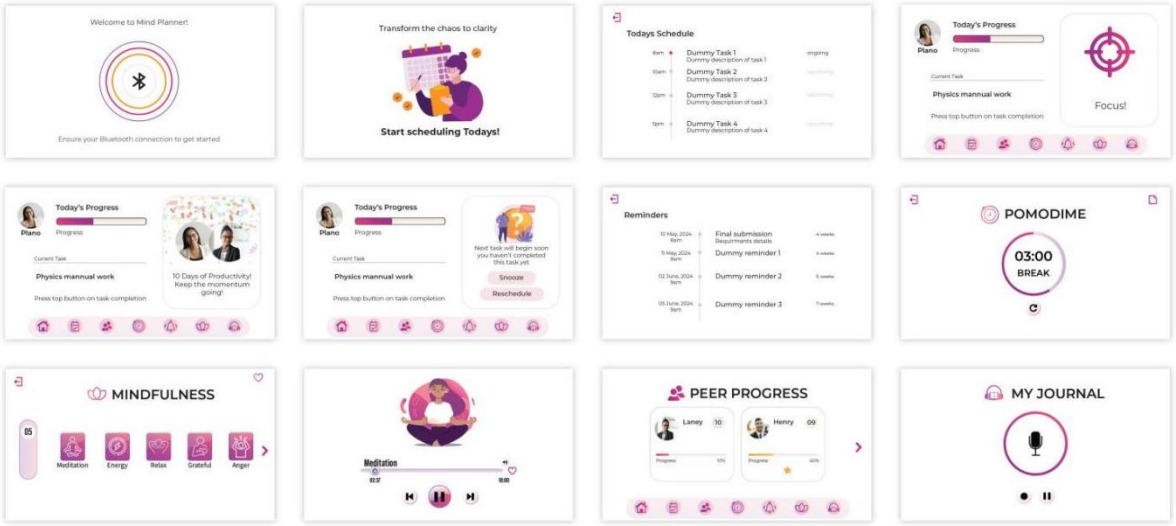


Figure 2: Mind Planner User Interface

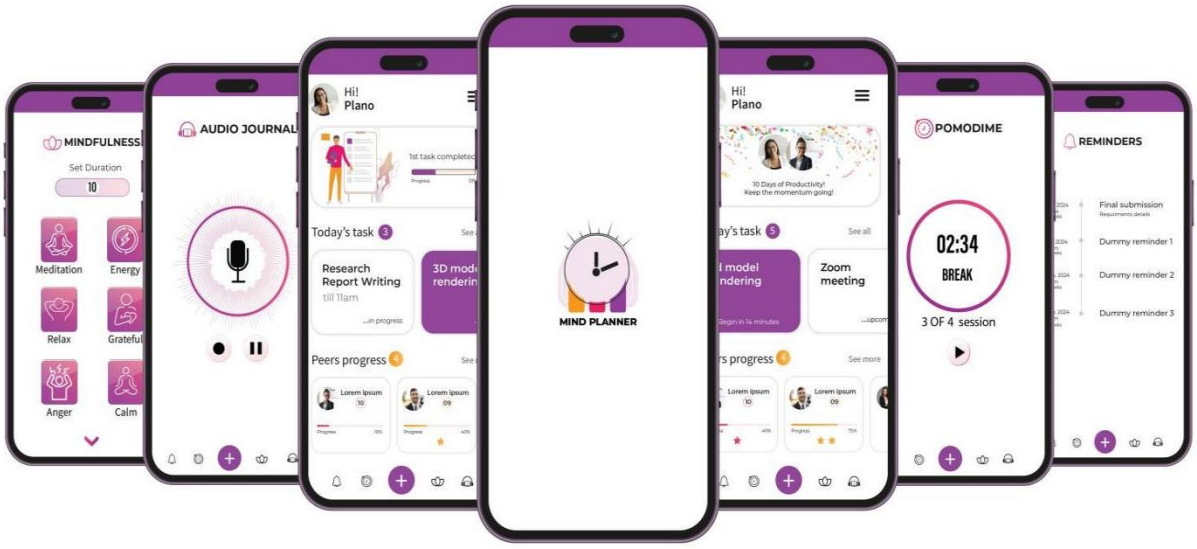


Figure 3: Mind Planner companion app User Interface

Discussion

While the existing app offers various tools to aid students in time management, focus development, and procrastination reduction, it inadvertently contributes to one of the main causes of procrastination today: digital distraction. Therefore, tangible solutions are needed that help students by providing intrinsic motivation, which is more enduring. A survey conducted with over 100 students across different educational levels highlighted the prevalence, causes, and intervention methods for procrastination, along with students' desire to use device-based solutions.

The study showed no significant difference in procrastination rates between genders or educational levels. It confirmed the 13 reasons for procrastination identified by Solomon and Rothblum, while also identifying additional reasons cited by students. Various intervention methods were noted, with students expressing multiple opinions on how and why a device like the Mind Planner could be effective.

Many students appreciated the idea of a gamified digital reward system, but they also recognized its limited real-world value and temporary effectiveness. The study revealed students' willingness to address procrastination and their need for effective tools to assist them. These insights informed the development of the Mind Planner and its features. The device aims to foster intrinsic motivation, enabling students to become genuinely interested in their tasks and strive to achieve personal goals and standards of excellence. This intrinsic motivation is associated with greater psychological well-being and satisfaction.

The Mind Planner also includes a companion app for added accessibility, allowing students to manage tasks and perform other actions even when away from their primary device. Parents can track their children's daily progress and routines. The device's design is kept simple and welcoming, with an easy-to-understand workflow. Its portable design allows users to take it anywhere with them place it at any height according to their seating level. The chosen color palette promotes a relaxed, focused mindset, with warm tones symbolizing compassion and love, and vibrant energy inspiring enthusiasm and motivation.

Despite its potential, there is room for improvement in the Mind Planner. Future enhancements could include incorporating voice assistance and voice commands to improve accessibility and user experience, and integrating AI-generated predictive analysis and personal recommendations based on users' learning pace. These improvements would help the device keep pace with technological advancements.

Conclusion

Procrastination isn't just a harmless delay; it's a quiet thief that steals our valuable time, potential, and peace of mind. This study actively involves students to gather their perceptions and opinions. Students shared their insights on the causes and interventions for procrastination, as well as their views on the overall purpose, functionality, and features of the proposed concept. Following this, the design for the Mind Planner was developed, and a series of initial high-fidelity wire frame mock-ups were refined for future development and broader testing.

With its perceived acceptability and usability, the project holds the potential to significantly impact students' productivity, and overall well-being. The Mind Planner aims to offer a proactive solution, designed as an assisting tool for students. It encourages a deeper understanding of one's motivations, priorities, and behavioral patterns, providing users with the necessary tools to address procrastination at its core.

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