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Research Paper

Multitasking Performance, Working Memory and Wellbeing among College Students

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ABSTRACT

This study examined gender differences in multitasking performance, working memory, and well-being in 18–26-year-old Delhi NCR residents. The study included 100 students, 50 male and 50 female. Participants took a series of tests to assess their multitasking, working memory, and wellbeing. Correlation analyses and t-test was used to examine the relationships between wellbeing, multitasking and working memory, and gender mean scores. Women outperform males in working memory and Visuospatial. Men outperform women in arithmetic and central executive function. Wellbeing indicators, auditory tasks, visual monitoring, and reverse digit recall were gender neutral. The correlation between working memory and multitasking performance, (r=-0.128, p=0.203), multitasking and wellbeing (r = 0.058, p = 0.567), working memory and wellbeing (r = 0.148, p = 0.141) were significant. The results show that men are stronger at central executive functions and mathematical problem-solving and women are better at working memory and Visuospatial. The lack of gender differences in visual monitoring, auditory tasks, Phonological loop recall, and wellbeing shows the complexity and diversity of cognitive capacities and wellness.

Keywords: *Gender Differences, Multitasking Performance, Wellbeing, College students, Digital*

Multitasking is effectively completing numerous tasks in each period. Dual task paradigms include switching between tasks, not doing them simultaneously. Technology and the pressures of modern work and daily life have made multitasking a hallmark of modern life. It includes the complex cognitive mechanisms that allow multitasking. Multitasking, whether good or bad, is essential in today's high-tech world (Redrick, 2016). The employment assessments of firefighting supervisors, school bus drivers, and aircraft pilots emphasise multitasking (Weber, 2016). Multitasking performance is the ability to transition between many task goals, according to Delbridge (2000). Some scholars call two tasks "dual tasking" or "task switching" instead of multitasking (Logan, 2004). Multitasking typically causes disputes, according to Monsell (2003). How people distribute cognitive resources, use cognitive control, and prioritise tasks affects their capacity to multitask. These changes depend on task complexity, age, cognitive aptitude, and familiarity. Multitasking improves with better working memory and cognitive control (Alzahabi &

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Becker, 2013). It is also to be noted that Personal, cultural, and other factors may affect multitasking.

Working memory helps people think, understand, and make decisions by briefly storing and changing information (Baddeley, 2020). Recent research has presented that working memory's complexity and susceptibility to disruption (Conway et al., 2022). Working memory capacity varies, affecting cognitive processing and retrieval (Unsworth & Robison, 2023). Kane et al. (2023) found that high-working memory people perform better academically. Lower working memory capacity can make learning and comprehending challenging. Many college students multitask (Adams & Ahn, 2023). Multitasking may seem helpful, but it often creates cognitive overload, which reduces working memory efficiency and focus (Ophir et al., 2009). Frequent task switching reduces working memory and increases cognitive fatigue (Lin et al., 2023). Multitasking can also increase anxiety, and students' quality of life (Lepp et al., 2019). Working memory issues increase this difficulty, making it harder for students to succeed academically (Lin et al., 2023). Ophir et al. (2009) found that regular multitaskers have poor working memory and attention management. Unsworth and Robison (2023) found working memory capacity strongly predicts multitasking avoidance. This paper explores college students' complicated working memory, multitasking, and well-being relationships. We want to see how frequent multitasking affects working memory and well-being. Understanding these dynamics helps us find ways to help kids multitask and maintain cognitive performance and well-being. Well-being encompasses physical, mental, and emotional health. College students' academic achievement, personal progress, and quality of life depend on their well-being (Smith & Johnson, 2023). Stress, sleep, social ties, and emotional control affect a student's well-being and academic performance. Students undergo academic and social changes that might increase stress and anxiety in college (Peterson & Williams, 2023). Poor mental health can affect motivation, focus, and academic performance (Nguyen & Brown, 2022). Multitasking may compound these issues by increasing cognitive demands on students, harming their emotional well-being. Students may struggle to focus and participate in their academic and personal lives due to these mental loads. Multitasking may also harm students' social lives. As students struggle to balance their many responsibilities, frequent task switching may reduce peer relationships and isolate them (Lepp et al., 2019). Multitasking and well-being are mediated by working memory. Students with poor working memory performance can struggle to complete several tasks, causing tension and worry (Lin et al., 2023). Students can multitask and feel better by improving working memory through cognitive training or mindfulness (Jones & Carter, 2023).

College students must balance academic, social, extracurricular, and personal demands in an unprecedented way. The complicated network of tasks sometimes involves multitasking, Student’s ability to multitask depends on working memory, which stores and manipulates information. Understanding the relationship between cognitive performance and well-being may help create college student-specific wellness initiatives. This study seeks to better understand how multitasking, working memory, and college student well-being are linked.

Objectives:

To see the multitask ability, working memory and wellbeing and the inter relationship among the variables among male and female college students.

Hypothesis:

1. There would be differences in the multitask performance of male and female college students.
2. There would be differences in the working memory of male and female college students.
3. There would be differences in the level of wellbeing of males and females' college students.
4. There would be relationship among Working memory, Multitasking and wellbeing of males and females college students.

METHODOLOGY

Design:

Correlational design was used in the study.

Sample:

The research was conducted on 100 college students. 50 Males and 50 females' participants were taken purposively form JMI, Delhi. The age range was 18 to 26 years.

Measures used:

Three different tools were used for the measurement of multitasking, wellbeing and working memory. This evaluation uses Elsmore's 1994 SYNWIN multitask Performance model. Working memory was examined utilising the phonological loop, central executive, and visuospatial abilities. Owen et al. (2005), Redrick et al. (2012), and Kane et al. (2004). Well-being was assessed using the Warwick-Eidelberg scale.

Procedure:

Before initiating any procedures, explicit verbal consent was obtained from each participant, ensuring a transparent understanding of their involvement in the study.

RESULTS AND DISCUSSION

The obtained data was analysed with the help of various statistical tools and the results were presented in different tables.

In order to test hypothesis no I presuming the difference in Multitasking Performance for males and females, the obtained data were analysed for two different genders separately and the results were presented in the table to follow:

Table 1.a: Mean and Standard deviation of Males and Females scores on Multitasking Performance, and "t" value for the difference between groups.

Measure	**Gender**	**n**	**Mean**	**SD**	**t-test**	**p-value**
Multitasking Performance	Male	50	105	8.14	2.27	0.026
	Female	50	101	7.73		

The results showed there was a statistically significant difference in Multitasking performance scores in men and women. Men (M = 105, SD = 8.14) scored more than women (M = 101, SD = 7.73); *t*=2.2, p=0.026. In this case, it means that men did much better multitasking performance than women did. Similar results were found by Colom et.al (2010), which was mentioned in their paper Intelligence, working memory, and multitasking performance, and by liu et al. (2020) in their paper "Gender difference in multitasking experience and performance." Hypothesis 1 was accepted.

Table 1.b Mean and Standard deviation of Males and Females scores on components of Multitasking performance

Measure	Gender	N	Mean	SD	t-test	p-value
Memory search	male	50	26.4	5.25	2.35	0.021
	female	50	28.6	4.05		
Visual Monitoring	male	50	24.4	6.75	1.47	0.146
	female	50	23.6	8.51		
Auditory	male	50	27.0	5.80	0.521	0.604
	female	50	25.2	6.46		
Arithmetic problem	male	50	27.0	4.63	3.21	0.002
	female	50	23.8	5.30		

In this section, we'll look at in more depth how men and women performed differently on five cognitive tests: Multitasking Performance, Memory Search, Visual Monitoring, Auditory, and Arithmetic Problem. There was a big difference in how well people searched their memories. Women (M = 28.6, SD = 4.05) did better than men (M = 26.4, SD = 5.25), t (98) =2.35 t (98) =2.35, p=0.021p=0.021. The result is statistically significant with t= 2.25 at p= 0.021. Similar results were found in a study Research indicates that women excel in verbal memory skills and males in spatial memory tasks. Gender schema theory indicates that prejudices significantly affect memory. Females outperform males in item identification and spatial skills (Baer et al., 2006)**.** The results for visual monitoring, on the other hand, were not very different between men and women. The average score for men (M = 24.4, SD = 6.75) and females (M = 23.6, SD = 8.51) on visual monitoring tasks was the same, with a p-value of 0.146 and a t-value of 1.47. There were no significant changes in how well males and females did on the auditory task; males (M = 27.0, SD = 5.80) and females (M = 25.2, SD = 6.46) did about the same, t (98) =0.521t (98) =0.521, O=0.604p=0.604. This shows that the ability to process sounds is about the same for both men and women. Unlike this study, J. Norbet et al. (2009) in their study "Gender related differences in visual and auditory processing of verbal and figural tasks" found that women are better at putting visual events into groups than men. Like this study, Shankaregowda, N.S.K., et al., (2022) in their study "A pilot study to compare auditory and visual reaction time in male and female young adults" found no statistical difference between males and females. On the arithmetic problem-solving task, there was a significant difference between the groups. Men (M = 27.0, SD = 4.63) did better than women (M = 23.8, SD = 5.30); t(98)=3.21, p=0.002. When it came to solving arithmetic problems, the finding showed that men did better than women. The study found statistically significant differences between men and women on three of the five tests: Multitasking Performance (where men scored higher), Memory Search (where women scored higher), and Arithmetic Problem (where men scored higher). There were no significant changes between men and women in the Visual Monitoring and Auditory measures, which means that both men and women did about the same amount of work on these tasks. Based on these results, it seems that while men and women do better at some things than others, they are about the same on other cognitive tasks.

To test hypothesis no 2 presuming the difference in working memory for males and females, the obtained data were analysed for two different genders separately and the results were presented in the table to follow:

Table II.a: Mean and Standard deviation of Males and Females scores on Working Memory, and 't" value for the difference between groups.

Measure	Gender	n	Mean	SD	t-vale	Level of significance
Working Memory	Male female	50 50	44.6 48.2	6.76 10.4	2.04	0.043

In this section, we look at differences between men and women on working memory. A statistically significant difference was found between the working memory results of men and women. It was found that women (M = 48.2, SD = 10.4) did better than men (M = 44.6, SD = 6.76); t= 2.04; p = 0.043. This means that women did better on tasks that tested their working memory than men did. Same results were found in memory tasks in multitasking performance in this study where the women outperformed women. While the reason for performing well on memory cannot be pointer, one research titled "sex differences in working memory" by Harness. A et al., (2008) found that men and women performed similarly on the verbal working-memory task without distraction. Women's memory was much lower in the distraction condition than in the no-distraction condition. We found a difference in the working memory of male and female, thus hypothesis 2 was also accepted.

Table 1I.b Mean and Standard deviation of Males and Females scores on components of Working memory.

Measure	Gender	n	Mean	SD	t-vale	Level of significance
Visuospatial	Male	50	14.6	5.79	4.06	0.001
	Female	50	20.4	8.32		
Phonological loop	Male	50	13.2	4.71	0.59	0.551
	Female	50	13.8	5.30		
Central executive	Male	50	16.8	5.51	2.49	0.014
	Female	50	14.0	5.71		

In this section, we look at differences between men and women, the subcomponents of working memory: Visuo spatial (reading span), Phonological loop (backward digit span), and central executive reading span+backward digit). There was a big difference in Visuospatial performance. Women (M = 20.4, SD = 8.32) did better than men (M = 14.6, SD = 5.79), (t = 4.06), (p = 0.001), which suggests that women are better at Visuo spatial than men. The reading span test is not only to test the speed but it's also important to comprehend the sentence perfectly. When reading a passage, women take longer than men to go between successive segments and to finish each one. Males may have read quickly without necessarily understanding, while females can take a long time to focus on understanding the subject (Emam.A, 2012). This may have resulted in women scoring higher in Visuo spatial tests than males. In Phonological loop scores, on the other hand, did not vary significantly between men and women. The performance scores of males (M = 13.2, SD = 4.71) and females (M = 13.8, SD = 5.30) were similar, with t = 0.59 and p = 0.551. This shows that gender doesn't make a big difference in jobs that require you to remember numbers backwards. On the other hand, there was a big difference in the central executive measure. Men (M = 16.8, SD = 5.51) scored higher than women (M = 14.0, SD = 5.71), (t = 2.49), (p = 0.014), showing that men were better at central executive tasks. This further add to the multitasking ability of the men.

Table III : Mean and Standard deviation of Males and Females scores on wellbeing and "t" value for the difference between two groups.

Measure	Gender	n	Mean	SD	t-vale	Level of significance
Wellbeing	Male	50	58.9	7.70	1.83	0.030
	Female	50	61.6	6.92		

This part looks at how the wellbeing scores vary for men and women. There are mean scores, standard deviations (SD), t-test values, and levels of significance for both men and women in the statistics.The study of wellbeing scores did find a difference between men and women that was statistically significant. Males (M = 58.9, SD = 7.70) and girls (M = 61.6, SD = 6.92) performed about the same, t=1.83, p=0.030 The average number for women was a little higher,and the difference was statistically significant at the 0.05 level.

Like the current study, Matud et al. (2019) in their study found that Traditional gender norms affect psychological well-being, and women and men with a masculine-instrumental and feminine-expressive self-concept are happier. The study found a difference between men and women in their health scores that was statistically significant. Hypothesis 3 was accepted.

Correlation

To test hypothesis no. 4,5,6 presuming the relationship between three variables namely Multitasking Performance, Working Memory and Wellbeing, the results were presented in the table to follow:

Table IV: Coefficient of correlation between the score of multitasking and Fluid Intelligence of the total sample.

Variables	n	correlation	p value
Multitasking Performance and Working memory	100 (50 males, 50 females)	-0.128	0.203
Multitasking Performance and Wellbeing	100	0.058	0.567
Working memory and Wellbeing	100	0.148	0.141

Correlation study in working memory wellbeing, and multitasking performance is shown in the following section. To evaluate the importance of the correlations between these variables, the data provides correlation coefficients and p-values. Multitasking Performance and Working memory showed a negative connection that was statistically significant (r = -0.128, p = 0.203). This shows that working memory and multitasking performance in this group significantly correlated. Likewise, there was moderately significant correlation found between multitasking performance and wellbeing (r = 0.058, p = 0.567) in the positive correlation between Multitasking Performance and Wellbeing. In an article published by stanford university (2024) titled "why multitasking does more harm than good" it was mentioned that engaging in multitasking can significantly decrease our memory retention. We see a positive relationship between multitasking and well-being, it can be attributed to the fact that the effect of multitasking is seen as we age and since the test was done on college students, the age factor cannot be functional. Although it did not achieve the traditional level of statistical significance, the positive correlation between working memory and wellbeing (r=0.148, p=0.141) neared significance. This suggests a tendency towards a favourable association between working memory and wellbeing. As a result, we found correlation between the three variables, hence, hypotheses 4,5 and 6 were also accepted.

CONCLUSION AND IMPLICATIONS

The current study examined gender differences in the ability to multitask, working memory, and overall wellbeing in a sample of 100 students from the Delhi NCR region, 50 of whom were male and the other 50 were female, ages 18 to 26. To comprehend the connections between various measures of wellbeing and cognition, the analysis comprised correlation coefficients, t-test results, mean scores, standard deviations, and significant levels. The findings presented that while males outperformed than females in mathematical problem-solving and central executive tests, females scored significantly higher than males in working memory and Visuospatial tasks. In terms of visual monitoring, auditory tasks, Phonological loop recall, and wellbeing indicators, there were no discernible gender differences, indicating similar performance in these domains for both sexes. Furthermore, there were no significant correlations found in the correlation study in working memory and wellbeing, multitask ability and working memory, or working memory and wellbeing, suggesting that these factors are essentially independent in this population. In conclusion, this study identifies distinct cognitive strengths in men and women, with men performing better on central executive and arithmetic problem-solving tasks and women exhibiting higher working memory and Visuospatial abilities. The intricacy and diversity of cognitive capacities and wellness are shown by the lack of discernible gender differences in visual monitoring, auditory tasks, Phonological loop recall, and wellbeing. These results advance our knowledge of the gender variations in wellbeing and cognition among Delhi NCR's young adult population. This study will help the current generation to understand the impact of multitasking performance on their working memory, which is important in tasks that need prompt information. This study can also help to understand the relationship between multitasking and wellbeing, as being stuck in the culture of toxic competition can be a call for paying attention to their wellbeing.

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Conflict of Interest

The author(s) declared no conflict of interest.

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