

The Relationship between Loneliness, Social Networking and Working Memory: An Investigation of the Cognitive Consequences of Social Isolation in the Digital Age

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Abstract- Loneliness, social networking, and working memory are three interconnected topics that have received a significant amount of attention from researchers in recent years. Loneliness is a subjective feeling of social isolation and disconnection that can have negative impacts on mental and physical health. Social networking, on the other hand, refers to online platforms that facilitate social interactions and can be used to connect with others. Working memory is the cognitive process that enables individuals to hold and manipulate information in their minds. This study aims to explore the associations between these variables among 100 students from different universities. The data analysis included a correlation coefficient and a t-test. The results showed a significant but weak positive correlation between loneliness and SN usage, indicating that increased SN usage was associated with loneliness. Additionally, the results indicated a significant negative correlation between loneliness and WM performance, suggesting that increased loneliness was associated with lower WM performance. Finally, it also suggests that social networking and WM are negatively correlated, which indicates that more use of SN may result in low performance of working memory. It is important to note that the statistical analyses presented here do not establish causality, and further research is needed to better understand the relationships between these variables. Understanding the relationships between these variables can help researchers and practitioners develop interventions to promote social connectedness and support while minimizing the negative effects of SN and loneliness on working memory and overall well-being.

Key words: Loneliness, Working Memory, Social Networking, cognitive consequences.

I. INTRODUCTION

Loneliness is a subjective feeling of isolation or disconnection from others, often accompanied by negative emotions such as sadness, anxiety, and depression. In recent years, loneliness has become an increasingly prevalent issue, with many individuals reporting feelings of social isolation despite living in an era of unprecedented connectivity through social networking platforms. Social networking platforms, such as Facebook, Twitter, and Instagram, provide individuals with opportunities to connect with others online, but they also present new challenges to social interaction. For instance, studies have shown that excessive use of social media can lead to feelings of loneliness, as users may feel disconnected from their online communities or experience envy and social comparison with others. Working memory, the cognitive ability to hold and manipulate information in the mind for a short period, has also been found to play a role in loneliness and

social networking. Individuals with poor working memory may struggle to keep up with the fast-paced and fragmented nature of online communication, leading to feelings of social disconnection and loneliness. Understanding the complex interplay between loneliness, social networking, and working memory is crucial for addressing the growing issue of social isolation in today's society.

Loneliness and social networking

Social networks enable interactions between two or more people who would ordinarily never meet, facilitating interpersonal and group contacts (Green & Schleien, 1991, p38). The number of hours that individuals of all ages now spend in front of screens has increased in recent years due to the rise in social media use, which has replaced face-to-face contacts. According to earlier studies, people can benefit from social media's distinct traits more so than from conventional forms of communication. Today, the fact that people spend a large portion of their social lives on social media and forums raises an important question about whether being present in the digital world provides an adequate sense of social belonging and lessens the feeling of loneliness that everyone, especially young adults, experience from time to time (Roman, Nitza & Zeev 2019, p10). The definition of loneliness has been the subject of several studies. According to Russell et al. (1980), the typical definition of loneliness is the gap between a person's desire for and real social connections. The difference between loneliness and social isolation must be made. Loneliness is a reflection of one's self-perceived social isolation, whereas social isolation is measured by the actual number of connections a person is a part of (Masi et al., 2011). An individual's perspective of his or her own reality determines how lonely they feel. This means that even when surrounded by others, a person might still feel lonely or socially satisfied depending on the quantity of social links they have. We seek satisfactory social contacts and avoid disappointing social interactions when we feel lonely (Masi et al., 2011).

Working Memory and Loneliness

The most common definition of working memory is a limited capacity system that can temporarily store and manipulate data necessary for performing challenging cognitive activities including thinking, understanding, and some forms of learning. In contrast to short-term memory (STM), working memory places more focus on its functional role in complex cognition. It also presupposes the storage and processing of information. In a four-year follow-up of 823 older people longitudinal research, Wilson et al. (2007) discovered that loneliness was significantly inversely related to episodic, working, and semantic memory (with the biggest influence on semantic memory). The underlying relationship between social networking, loneliness, and working memory

has been explained by a number of social and biological theories. According to the "use it or lose it" idea, people's participation in social networks, social activities, and communication may be declining, which may lead to a decline in their willingness to engage in the social, psychological, and physical activities needed to stimulate their minds (Hultsch et al., 1999). According to Hultsch et al. (1999) and Yu et al. (2021), these decreases may cause cognitive functions (including memory) to diminish as people age. Evidence also shows that loneliness (and the prolonged psychological stress it causes) might extend the hypothalamus-pituitary-adrenal axis's activity and cause hypercortisolism. The frontal cortex and hippocampus, which are intimately associated to memory processes, experience cellular damage from hypercortisolism in the form of damaged synapses, neurons, and dendritic branching (Adam et al., 2006; Boss et al., 2015; Gorelick, 2010).

Working memory and social networking

Social media has grown to be one of the most widely used channels for consuming information worldwide over the last 20 years (Zhuang et al., 2017). There was a correlation between disordered social media use, in particular on Facebook, Instagram, and Snapchat (among other platforms), and the need for users to interact with others and project a more popular image. Social media is increasingly being perceived by younger people, especially, as the very fabric of existence. This perception has grown significantly throughout the course of and even after the COVID-19 epidemic. Working memory is the capacity to pay attention to newly learned information, retain it, and use it to learn new things, improve one's abilities, and control behavior. The working memory system has a finite amount of storage space; therefore using social media may actually reduce working memory by either detracting from previously learned material or diminishing concentrate on it in favor of social media content. Both of these are ways whereby working memory function might be compromised. Technology-related distractions, such as smart phone alerts while driving, working, or attending school, are more common than ever (Brown et al., 2019). Task performance may deteriorate if distractions are present because our capacity to pay attention to important or necessary information is constrained (Brown et al., 2019; Uncapher et al., 2016). Therefore, it is crucial for all aspects of everyday life to comprehend how using social media impacts our cognitive capacities. Small social network sizes and low social activity engagement were substantially related with worse memory and executive function, according to a meta-analysis of cohort studies on social isolation and global cognition (Evans et al., 2019).

II. REVIEW OF RELATED LITERATURE

Previous research has demonstrated that working memory-intensive tasks are more difficult to complete when one feels lonely. For instance, a 2009 research by Cacioppo et al. indicated that lonely people struggled more with working memory tasks than those who were not lonely. In a similar vein, Qualter et al. (2015) observed that children and adolescents who reported feeling more lonely performed worse on tests of working memory. Other research has looked at the brain processes underlying the link between working memory and loneliness. For instance, Wei et al. (2017) utilised functional magnetic resonance imaging (fMRI) to demonstrate that lonely people showed lower activity in brain areas linked to working memory when executing a working memory test when compared to non-lonely people.

Loneliness has also been found to have a cumulative effect on working memory. A longitudinal study by Donovan et al. (2016) found that over a three-year period, individuals who reported higher levels of loneliness at the beginning of the study showed a greater decline in working memory performance over time, compared to those who reported lower levels of loneliness.

In addition, research has suggested that interventions aimed at reducing loneliness may also improve working memory performance. For example, a study by Masi et al. (2011) found that a social support intervention improved working memory performance in lonely older adults. Overall, the literature suggests that loneliness has a negative effect on working memory, and that this relationship may be mediated by changes in neural activity. Interventions aimed at reducing loneliness may also have a positive impact on working memory performance.

Several studies have investigated the effect of social networking on working memory. One study by Ophir, Nass, and Wagner (2009) found that heavy multitasking, which can include social networking, was associated with poorer performance on a working memory task. Similarly, a study by Uncapher and Wagner (2018) found that individuals who spent more time on social media had poorer working memory performance.

Other studies have investigated the potential mechanisms underlying the relationship between social networking and working memory. For example, a study by Meshi et al. (2013) found that individuals who frequently used social media had reduced gray matter volume in brain regions associated with cognitive control, including working memory.

However, not all studies have found a negative relationship between social networking and working memory. A study by Kononova et al. (2018) found that social networking use was not associated with working memory performance when the participants were required to focus their attention on the working memory task. Overall, the literature suggests that heavy social networking use may be associated with poorer working memory performance, potentially due to changes in brain structure and cognitive control.

III.METHOD

Research tool

To obtain as broad and comprehensive a picture of the phenomenon under investigation as possible, we used a quantitative research method. A sample of university and institute students was selected. Students completed the Wechsler Adult Intelligence Scale (WAIS-IV), the UCLA Loneliness Scale version 3 (Russell, 1996), and the Social Networking Usage Questionnaire Scale (Gupta & Bashir, 2018).

Sample

100 students (50 males and 50 females) belonging to the age group 19–23 years from different universities were included as the sample.

Design

A 3x3 correlation matrix that shows the correlation coefficients for each pair of values was used to study the relationship among loneliness, social networking, and working memory.

IV.RESULTS

Analysis shows that there is a weak positive correlation (0.22 between "loneliness" and "social networking"), which means that as people spend more time on social networking sites, they may be feeling lonelier. On the other hand, there is a weaker negative correlation (-0.15) between "loneliness" and "WM", suggesting that people who feel more lonely may have lower working memory capacity. The correlation between "social networking" and "WM" is also negative (-0.30), indicating that people who spend more time on social networking sites tend to have weaker working memory capacities.

Further investigation suggests that the mean WM score was 95.89, with a variance of 473.49, and the mean social networking score was 104.79, with a variance of 126.31. The t-statistic is calculated to be -3.691, which is the test statistic for the t-test, and the degrees of freedom (df) are 99. The p-value for a one-tailed test is 0.000183, and the critical t-value for a one-tailed test at the 0.05 level of significance is 1.6604. The p-value for a two-tailed test is 0.000365, and the critical t-value for a two-tailed test at the 0.05 level of significance is

1.9842. Since the calculated t-value is less than the critical t-value, we can reject the null hypothesis and conclude that there is a significant difference in means between WM and social networking. This means that heavy social networking use may be associated with poorer working memory performance, potentially due to changes in brain structure and cognitive control.

The variances between the groups of "loneliness" and "social networking" were obtained from a sample of 100 individuals for each group. The mean score of "loneliness" is 46.11, while the mean score of "social networking" is 104.79. The variances for each group are 138.34 and 126.31, respectively. The t-statistic is calculated as 36.07 with 198 degrees of freedom, indicating a significant difference between the means of the two groups. The p-value for a two-tailed test is very small ($5.58E-89$), indicating that the probability of obtaining a difference as extreme as the observed difference due to chance is very low, and therefore, we can reject the null hypothesis and conclude that there is a significant difference between the means of the two groups.

The Pearson correlation coefficient between loneliness and WM is -0.1477 . The mean score for loneliness is 46.11, and the mean score for WM is 95.89. The t-test shows that the mean difference between loneliness and WM scores is statistically significant ($t = -18.9861$, $p < 0.0001$). This indicates that there is a significant difference between the two means and that this difference is not likely to be due to chance. The two-tailed p-value is less than 0.0001, which means that the probability of obtaining these results by chance is less than 0.01%. The t-test also shows that the t-statistic is much larger than the critical t-value ($t = -18.9861$, $t\text{-critical} = 1.9842$), which further confirms that the results are statistically significant. This finding suggests that individuals who experience loneliness may have lower working memory performance.

V. DISCUSSION AND CONCLUSION

The aim of the current study was to explore the associations between social networking, working memory, and loneliness among students in higher education institutions. Our research was based on a sample of 100 students from different universities and institutions. The statistical analysis suggests that social networking and loneliness are significantly and positively correlated. Which means the use of social networking sites is playing a significant role in causing loneliness. This means that an individual who has way too few social relationships in terms of quality and quantity will be addicted to the internet. This finding implies that the students who are lonely would more likely become addicted to social networking, or that individuals who are active on social networking are more likely to face loneliness.

Another finding suggests that social networking and WM are negatively correlated, which indicates that more use of social networking may result in a low score on the working memory scale. There are several potential reasons why working memory and social networking are negatively correlated. One possibility is that spending time on social networking sites may be distracting and reduce an individual's ability to focus on cognitive tasks that require working memory. For example, social media notifications or messages may interrupt an individual's concentration, which could lead to poorer performance on cognitive tasks. Additionally, spending too much time on social networking sites may lead to a sedentary lifestyle, which has been linked to poorer cognitive function and lower working memory capacity. In contrast, engaging in physical activity has been shown to have positive effects on cognitive function, including working memory (Hilman, Erickson, and Kramer, 2008). Overall, while the exact mechanisms underlying the negative correlation between working memory and social networking are not fully understood, it is clear that excessive social media use can have negative effects on cognitive function and overall health. Therefore, it is important for individuals to be mindful of their social media use and strive to maintain a healthy balance between screen time and other activities that promote cognitive and physical health.

The final finding suggests that loneliness and working memory have a weak negative correlation. This could be due to several factors. First, research has shown that chronic loneliness can lead to changes in brain structure and function, which in turn can affect cognitive processes such as working memory. For example, a study by Cacioppo and colleagues (2010) found that chronic loneliness was associated with reduced grey matter density in the brain regions involved in working memory. Second, loneliness may also affect cognitive processes indirectly by influencing mood and motivation. For instance, individuals who feel lonely may experience negative emotions such as sadness or anxiety, which can impair cognitive performance. Additionally, loneliness may lead to a lack of motivation or interest in engaging in cognitive tasks, which could also impact working memory. Finally, it is also possible that individuals with lower working memory capacity may be more prone to feelings of loneliness. This could be due to difficulties in processing social cues or maintaining social relationships, which are important factors in reducing loneliness. Overall, the negative correlation between working memory and loneliness is likely due to a combination of factors related to changes in brain structure and function, mood and motivation, and social cognition. Further research is needed to fully understand the mechanisms underlying this relationship. It is important to note that the statistical analyses presented here do not establish causality, and further research is needed to better

understand the relationships between these variables. Additionally, it is worth considering the limitations of the study, such as the use of self-reported measures and the potential for response biases.

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