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Research Paper

Influence of Physical Activity on Cognitive Failures of Information Technology Professionals with High Screen Time Usage, Chennai

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ABSTRACT

The present study investigated the relationship between levels of Physical activity on cognitive failure of Information Technology professionals exposed to high screen time usage. We conducted a survey in Hybrid mode, using convenient sampling technique and the participants (N=182) were given a self-report questionnaire to measure their screen time usage, physical activity level and cognitive failures using 3 scales. The study employs descriptive analysis, and inferential statistical tools such as independent sample t-test and One Way ANOVA. The findings of the study show significant difference between physical activity level and cognitive failures scores. Physical activity influences cognitive failures of IT professionals exposed to high screen time. We infer that as physical activity level increases, cognitive failures decrease. Cognitive failures are studied on university students and middle age population but not the working population that relies on screen time and this study can be effort in filling this research gap. Scope for further research may involve focusing on uncovering the direction of the relationship between the variables and its domains as well as checking the effectiveness of interventions.

Keywords: *Cognitive Failures, Screen time, physical activity, IT professionals*

Currently, about half of India's working population utilizes a computer at work. For an information technology employee, computers are essential. Globally, people are spending more and more time on screens every day, regardless of the device. A study into screen time at work has revealed office workers will spend an average of 6 and a half hours a day sat at their computer or laptop. (Howarth, J.,2022).

Three main issues are brought on by excessive screen time: disconnection, distractions, and breakdowns in communication. The term "computer-induced health problems" is broad and covers a variety of difficulties that a person using a computer may have as a result of excessive or inappropriate computer use. (Sharma, 2016). Using digital gadgets after dark impairs one's ability to concentrate, which leads to increased distraction and a lack of focus on work. (Lissak, 2018).

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Office workers will spend an average of 6.5 hours a day sitting at their computer or laptop, according to a study on screen time at work. Screen time causes sensory overload, focus problems, and mental exhaustion. According to experts, lack of attention is frequently the cause of explosive and aggressive conduct. Little demands become major ones when attention is compromised, as does the capacity to process one's internal and external world. Screen usage adds to poor reserves by draining mental energy with intense visual and cognitive input.

Country	**Total Screen Time**	**Mobile Screen Time %**	**Computer Screen Time %**
India	7 hours 18 mins	4 hours 5 mins 56%	3 hours 13 mins 44 %
Global Average	6 hours 57 mins	3 hours 43 mins 53%	3 hours 14 mins 47 %

The goal of the survey is to note effects of physical activity part of the participants lifestyle on cognitive failures, especially since the profession of IT employee is primarily working with screen. Cutting down on screen time is not a valid suggestion for working employees, hence this survey focuses on mitigating effects of physical activity on cognitive failures.

Small mistakes in memory and behavior, such as forgetting appointments, missing information, or inadvertently knocking objects over, are referred to as cognitive failures. These breakdowns are a normal byproduct of variations in several cognitive domains, such as memory, action control, and attention. According to a study, employers in India identified stress (55%) and a lack of physical activity (62%), as the two main lifestyle risk factors (The Indian express, 2019). Numerous benefits of physical activity have been demonstrated for the body and brain. Exercise can enhance cognitive function, including memory, attention, and decision-making, by increasing blood flow and oxygen to the brain.

Sun and colleagues (2009) investigated the connection between excessive Internet usage and decision-making along with response inhibition. Their study revealed that individuals classified within the high Internet use category were prone to reduced decision-making abilities. Particularly, the researchers observed that this decline wasn't attributed to making incorrect decisions but rather to a delay in executing the appropriate strategy. Moreover, numerous broader studies have underscored a correlation between electronic media usage and challenges associated with academic performance. Research has indicated a positive correlation between cognitive failures and incidental learning, short-term memory overload, decreased attention and alertness, and split attention (Broadbent et al., 1982; Pollina, Greene, Tunick, & Puckett, 1992). Greater cognitive failure scores were associated with slower reaction times than lower scores, both in the presence of distractions and in the absence of negative priming (Tipper & Baylis, 1987) as well as in low perceptual load scenarios (Forster & Lavie, 2007). According to Murphy and Dalton (2014), they were also more vulnerable to aural distractions. According to Bergman, O'Brien, Osgood, and Cornblatt (1995), being distracted occurs when one permits unrelated information to impede on the completion of a present task. It follows that attentional skills would probably have an impact on how frequently we make mistakes in our hectic, distractible lives.

Exercise can enhance cognitive function, including memory, attention, and decision-making, by increasing blood flow and oxygen to the brain. Exercise also releases endorphins, which are organic substances that lessen pain and elevate mood. Frequent exercise has also been connected to better sleep, which can enhance daytime energy and concentration. (Alkeaid

Alwaleed, 2023). In a study done by Arora et. al. 2021, students with a higher screen time had an increased CFQ score thereby indicating more chances of cognitive failure. The highest CFQ score was observed in individuals who had a screen time of more than 6 hours whereas the lowest CFQ score was recorded in subjects with a screen time of one to three hours. In a study involving middle-aged and older people from 47 low- and middle-income countries, Felez-Nobrega and colleagues (2020) found a strong correlation between a higher risk for severe cognitive failures and lower levels of physical exercise. Nemoto et al. (2018) discovered empirical evidence linking heightened physical activity and more cognitively active sedentary behavior to a decreased risk of developing cognitive failures (CF) among older persons living in the community. A recent randomized controlled experiment, Melis and colleagues found that increasing physical activity significantly reduced the incidence of cognitive failures (2023). Negative emotional components (fear, sadness, guilt, and aggression) were shown to be highly connected with both scores on the whole Cognitive failures Questionnaire, according to research by Tabitha W. Payne and Michael A. Schnapp.

An inverted U-shaped relationship between cognitive expenses and productivity has been seen (Aral, Brynjolfsson, & Van Alstyne, 2012). This demonstrates how a higher rate of cognitive errors results in worse corporate efficiency.

Objectives

- To investigate the relationship between physical activity and cognitive failures measured.
- To examine if physical activity mitigates cognitive failures in screen time exposed IT professionals.
- To assess demographic differences (age, gender, skipping meals, job titles etc.) in the relationships mentioned.
- To make suggestions on improvement for the population, depending on the results.

Method of Investigation:

The study included 182 participants between the age of 20-60+ of working population. The participants are residents of Chennai who work in IT companies. Convenient sampling method was utilized and the study was conducted on employees of various job titles. Adult Screen Time Questionnaire by Vizcaino & co; International Physical Activity Questionnaire (IPAQ); Cognitive Failures Questionnaire (CFQ) where the questionnaires used along with demographic questions. Scoring was done for each of the variables for 182 entries. SPSS was used for coding the variables and formatting. Independent sample t-test and One Way ANOVA with physical activity as independent variable and cognitive failures as the dependent variable was conducted.

Demographic Profile:

Totally 182 entries were collected from IT professionals of age 20-60+. The sample consisted of 138 male (75.82%), and 44 female (24.18%) out of which 106(58.24) were minimally active, 42(23.08%) were HEPA active (Health Enhancing Physical Activity) while only 34(16.68%) were inactive.

Table 1 shows frequency analysis for cognitive failures.

N		M	Median	Mode	SD
Valid	**Missing**				
182	0	40.22	40.00	50	18.091

40.22 is the mean value of cognitive failures score of all the 182 entries.

Data Analysis

Table 2 shows t-test results for gender and cognitive failures

	Gender	M	SD	t(182)	p
Cognitive	Female	46.61	17.875	2.74	0.07
Failures	Male	38.18	17.743		

This table shows significant difference in scores for males and females. Female participants had higher cognitive failures compared to male participants but there were 138 male participants and 44 female participants.

Table 3 shows t-test results for age and cognitive failures

Age	Gender	M	SD	t(182)	p
Cognitive	20 - 40yrs	41.41	17.893	1.975	0.050
Failures	41 -60yrs	34.42	18.222		

This data shows a significant difference in scores for 20- 40 years and 40- 60 years. Participants in the age range of 20-40 years had higher cognitive failures.

Participants who did not exercise had higher cognitive failures compared to those who did, but there was no significant difference in the scores among those who exercised with someone and not.

Table 4 shows ANOVA between job duration and cognitive failures

	M	SD	F	p
0-2 years	46.24	16.297	6.146	.001
2-4 years	44.54	18.250		
4-6 years	41.08	11.117		
6 years and above	34.28	18.526		

This table depicts a significant difference in cognitive failures between the job duration groups. Those in 0-2 years of job duration had higher cognitive failures and those who worked 6 years and above had lower cognitive failures.

Table 5 shows ANOVA between job title and cognitive failure

	M	SD	F	p
IT Specialist	34.00	14.640	1.140	.341
Software Engineer	40.66	17.208		
Systems Administrator	30.67	19.725		
Data Analyst	45.11	16.584		
Cybersecurity Professional	38.50	31.628		
IT Project Manager	43.44	22.445		
Other	38.93	18.443		

There was no statistically significant difference in Cognitive failure scores for the 7 job title groups listed in the above table telling us that the job titles the participants held did not influence their cognitive failures scores. There was no statistically significant difference in Cognitive failure scores for the 3 natures of job (Full time, Part-time & Contract).

Table 6 shows t-test results for do you skip your meals and cognitive failures

	Do you skip your meals	M	SD	t (182)	p
Cognitive Failures	yes	44.26	18.842	2.412	0.017
	no	37.70	17.214		

There was significant difference between the scores of Yes and No, thus indicating that people who have skipped at least 1 meal per day have higher cognitive failures compared to those who did not.

Table 7 shows ANOVA between BMI levels and cognitive failures

	M	SD	F	p
Underweight	39.67	16.870	1.362	.256
Healthy weight	38.78	17.988		
Overweight	43.92	18.418		
Obese	36.05	17.737		

Cognitive Failures scores of these BMI levels did not differ from each other, indicating that there is no relationship between BMI and cognitive failures.

Table 8 shows ANOVA between physical activity and cognitive failures.

	M	SD	F	p
Inactive	60.18	14.45	103.604	0.00
Minimally active	42.00	13.073		
HEPA active	19.57	7.991		

Cognitive failure scores of these 3 physically active groups significantly differed from each other:
Inactive > Minimally active > HEPA active. Thus, indicating that those who were inactive had higher cognitive failures while those who were HEPA active had least cognitive failures.

CONCLUSION & DISCUSSION

The study was to explore the relationship of physical activity and cognitive failures of IT professionals with high screen time use. Using SPSS data analysis has showed us that there is significant relationship and physical activity and cognitive failures. Indeed, physical activity decreases cognitive failures. The longer job duration and age group is also associated with low cognitive failures. We have also found that demographic variables like gender, job duration, age and skipping meals have effect on cognitive failures. There is significant difference of cognitive failures between male and female participants. Participants who skipped meals had higher cognitive failures than who did not. 76% of those who have worked for 4- 6 years engaged in higher levels of physical activity as well as had lower Cognitive failures.

The findings of this research confirms that there is a significant relationship that tells us that physical activity mitigates Cognitive failures of IT employees dealing with high screen time usage. The results of this study are in line with the study done by Nitin Kumar Arora, Karishma Chawla and Ishant Kumar Arora where duration of exercise was found to be directly correlated with a reduction in cognitive failures. People who exercised for more than 29 minutes had the lowest CFQ scores, indicating a lower risk of cognitive impairment. Indeed, physical activity increases cognitive abilities and reduces cognitive delays in youth.

Implications:

Good executive functioning is very important in work life. Many people who do not engage in physical activity have to be encouraged to do so, especially by employers to increase their productivity and many other cognitive skills.

Companies must bring in new ways that will facilitate employees to exercise effortlessly. Instead of gym subscriptions, they can bring out games that will make the employers get away from screen and use their brain as well as physically move around. More engagement in physical movement has to be encouraged.

Standing desks, pedaling underneath the table, treadmill with standing desk. These have to be introduced as everyday habits, rather than once in a while physical events that employees may not like. They need to build the habit to exercise and companies can give rewards for maximum pedals or walks to reinforce healthy behaviour.

Excessive computer use is an inevitable part of a professional's life. However, there are a number of steps that can be taken to manage, monitor, prevent and reduce screen addiction in the workplace. This requires a device-free meeting, employees taking a real lunch break at the desk and following the 20-20-20 rule. Every 20 minutes, look at an object about 20 meters away for a full 20 seconds. Dry eyes are caused by not blinking enough, so one must take a break to blink their eyes. Try yoga, keep the computer at an appropriate distance, support one’s back and not sit with bent knees. All of these things can help one’s attitude. Mindful meditation, deep breathing, guided visualization and progressive relaxation techniques can help reduce stress. (Sharma, 2016). If initiatives can be taken to help employees combat the potential harmful effects of computers and screen time, this is a commendable initiative by organizations. Entry-level employees can be encouraged to follow the 20-20-20 rule and take physical breaks. Employers can benefit from yoga programs to reduce stress on the musculoskeletal system. Mindfulness meditation programs can be used to prevent the negative effects of excessive screen use on the brain and cognitive

performance. Surveys and research are conducted at companies to improve programs and find out how they affect the lifestyles of employers. ("10 Tips to Reduce the Negative Effects of Too Much Screen Time", 2022).

Limitations

The results of the study cannot be generalized due to the limited sample size. Data collection was constrained to specific companies potentially limiting the breadth of the findings. The cognitive failure dimensions were not considered in this study. The study has been conducted within a specific timeframe, which could limit its ability to include potential changes or variations over time. The study may show more significant bias less results if every variable was controlled for. Longitudinal studies or studies conducted over a longer period could provide more comprehensive insights into the phenomena being investigated. There is a possibility of self-reporting bias, people may overestimate or underestimate their behaviours. It does not account confounding variables such as meditation or work environment.

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Conflict of Interest
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