

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 11; November 2025; Page No. 236-244

Received: 19-09-2025

Accepted: 21-10-2025

Indexed Journal

Peer Reviewed Journal

Impact of physical activity on cognition and interpersonal intelligence

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DOI: <https://www.doi.org/10.33545/26180723.2025.v8.i11c.2642>

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Abstract

Context: Cognitive functions encompass a range of processes, including perception, attention, action, memory, problem-solving, concept creation, categorization, and generalization. However, errors in these processes are known as cognitive failures. Interpersonal intelligence, which includes the capability to understand others, is closely connected to cognitive functions as it requires accurate perception and interpretation of social cues. Incidental physical activity, such as unstructured daily movements during work and leisure, and physical exercise, which includes structured routines aimed at enhancing fitness, can impact cognitive processes and interpersonal intelligence.

Aim: This study examines the impact of physical activity on cognition and interpersonal intelligence.

Settings and Design: A sample of 331 adults from urban and rural areas of Lucknow was selected using convenience random sampling techniques, of which 165 were male and 166 were female.

Materials and Methods: Tools were a self-made socio-demographic questionnaire for respondents' profiles, the Cognitive Assessment Questionnaire by Broadbent *et al.* (1982), and the Interpersonal Intelligence Questionnaire by Neeta & Sameer (2021).

Results: The results show significant negative correlations between interpersonal intelligence and cognitive failure. Physical activity is negatively correlated with cognitive failure and interpersonal intelligence. Rural respondents indicated a higher level of distraction, forgetfulness, and false-triggering. Respondents from urban areas generally had higher interpersonal intelligence. Female respondents exhibit better interpersonal intelligence.

Conclusions: The findings underscore the importance of integrating physical activity into daily routines for cognitive wellness. Higher interpersonal intelligence and regular physical activity reduce cognitive failures. Gender and the living area influence cognitive outcomes, highlighting the need for strategies to enhance cognitive well-being.

Keywords: Physical activity, cognitive failure, interpersonal intelligence, cognition

1. Introduction

"Cognition" refers to the act of gathering information from the environment, processing that information, retaining beliefs, desires, and knowledge, as well as some type of internal representation of that information. Among the basic processes that comprise several thought and cognitive functions linked with information processing are attention, memory, visuospatial, and executive processes. Even though the word "cognition" seems simple and natural, it can actually mean different things to different people, which makes it difficult to explain. People's behavior is thought to be greatly influenced by cognitive processes (Dixit *et al.*, 2022) ^[22]. Perception, attention, action, memory, problem-solving, concept creation, categorization, and generalization are examples of fundamental cognitive mechanisms (Brosnan *et al.*, 2010) ^[12]. Cognition is the internal mental embodiment of an idea or notion. Information processing during cognition integrates a variety of cognitive areas, like executive, memory, and visuospatial processes (Nazrien *et*

al., 2024) ^[53]. (Broadbent *et al.*, 1982) ^[11] coined the term "cognitive failures." He defines it as a slip that prevents desired physical or mental behavior from proceeding as planned and flawlessly. They showed three categories of cognitive impairments According to the findings of the Broadbent Cognitive Assessment Questionnaire. According to their definition, forgetting is "the tendency to let go of what is actually known or planned, such as names, intentions, appointments, words, etc." The next component is distractibility, which is "easily disturbed or distracted by something". False triggering is the third and last component, are defined as "a series of disruptive processes of cognitive and motor performance." Cognitive impairment is a mild thinking error and reasoning deficit that both nonclinical and clinical people report experiencing on a regular basis (Carrigan *et al.*, 2016) ^[13].

Intelligence is defined as "a fundamental ability that causes a person to function efficiently in a certain situation. The capacity to identify and distinguish between other people's

goals, motivations, emotions, and moods is known as interpersonal intelligence. This can involve the evolution of gestures, voices, and facial expressions. Interpersonal intelligence refers to the capacity to interact and comprehend with people, together with empathy, which are qualities that make someone interpersonally intelligent. It also refers to the capacity to see, interpret, and draw lessons from experience (Behjat, 2012)^[6]. Dimensions of interpersonal intelligence are communication, empathy, understanding of others, cooperation, conflict resolution in relationships, and adaptation (Neeta & Sameer, 2021). Students who have difficulty with interpersonal intelligence are more likely to be isolated, disregarded, and unable to give important inputs to group activities and discussions in class. Interpersonal intelligence is an important factor in a child's growth and societal adaption. However, without instruction, a lack of interpersonal intelligence can result in disruptive behaviors.

(Suwardi & Susanti, 2023)^[63]. Additionally, a significant study area in earlier studies was whether or not college students' emotional intelligence varied according to their gender (Wan, 2012). Although others find no significant differences (Pan and Qian, 2012). Empathy is an interpersonal quality (Decety & Mason, 2011; Cox *et al.*, 2012)^[20, 17] that involves comprehending the thoughts, feelings, and experiences of others (Khanjani *et al.*, 2020)^[43]. Empathy is an extremely adaptable process that allows prosocial behavior to function in a variety of social conditions. It appears to be a highly situated cognitive process, with unique contextual signals embedded in it that cause different natural and controlled reactions (Melloni *et al.*, 2013)^[50]. Empathy is an essential component of the human emotional experience since social cognition influences emotions and action (Melloni *et al.*, 2013)^[50]. Many studies showed that compared to younger persons, older adults experienced decreased cognitive empathy (Bailey, Henry, & Von Hippel, 2008; Isaacowitz & Stanley, 2011)^[3, 37]. Few studies revealed that as people aged until late adulthood, cognitive empathy increased (Happé, Winner, & Brownell, 1998)^[30], however, some others (MacPherson, Phillips, & Della Sala, 2002; Keightley, Winocur, Burianova, Hongwanishkul, & Grady, 2006)^[46, 41] discovered no age-related variations in cognitive empathy in late adulthood (Khanjani *et al.*, 2020)^[43]. Successful social functioning is facilitated by empathy (Davis, 1994)^[19]. This is because prosocial behavior, activity coordination, interpersonal relationships and collaboration toward common goals, and altruistic behavior all depend on empathy (Bailey *et al.*, 2008; de Waal, 2008; Eisenberg & Fabes, 1990; Eslinger, 1998; Khanjani *et al.*, 2020)^[3, 24, 25, 43]. Scholars that support this method cite data derived from neurological and evolutionary mechanisms suggesting a connection between Emotional and cognitive degrees of empathy (Yalçın & DiPaola, 2019)^[69]. Studies on various aspects of empathic conduct that blend emotional and cognitive processes are starting to come together (Yalçın & DiPaola, 2019)^[69].

Cognitive losses linked to normal adult aging, such as diminished cognitive empathy, may exacerbate the effects of decreased social interaction by impeding older adults' capacity to navigate intricate social connections (von Hippel, Henry, & Matovic, 2008; Khanjani *et al.*, 2020)^[65].

^{43]}. Cognitive models of information processing involve selection, organization, and integration of information, with working memory as the bottleneck due to its limited capacity (Mayer, 2005; Mayer & Moreno, 2003). Research shows working memory is connected to intelligence, learning, executive function, information processing, understanding, and problem solving in individuals from infancy to old age (Dikshit & Kiran, 2023; Cowan, 2014)^[21, 16]. The relationship between behavior, environment, and cognition during development is highlighted by social-cognitive theory. The environment is influenced by human cognitive activity, and this can change people's perceptions and behaviors. The ability to behave sensibly in social communications can be summed up as social cognition, which focuses on processes in interpersonal, group, and social interactions. Social cognitive theory established interpersonal communication "(Morton & Duck, 2001). The basis for interpersonal communication includes theories of cognitive consistency. Hewes and Planalp (1987)^[33] and Poole *et al.* (1986) consider "impact" and "intersubjectivity" as crucial markers of successful communication between people (Hewes, 2016). Evidences support Cognitive similarity has been shown to be a strong predictor of liking and efficacy in interpersonal communication (Triandis, 1959)^[64]. In terms of workplace dynamics and leadership behavior, memory and forgetting in interpersonal interactions constitute an understudied area. An organization's results and relationships at work can be greatly impacted by memory and forgetfulness displays. The documented connection in interpersonal settings between memory and proximity (Ray *et al.*, 2019) may apply to professional connections. As with connections outside the office, improved recollection for co-workers or subordinates is probably going to improve interpersonal closeness in the workplace (Kaminska & Ray, 2023)^[40]. People with episodic memory are able to quickly and accurately recall specific elements of their experiences when needed. This skill might serve as "social glue," making it easier for relationships to establish and stay strong over time. Research has demonstrated the significance of memory for intimate interpersonal relationships (Davidson *et al.*, 2012)^[18]. Recalling a conversation partner's comments was found to be positively correlated with interpersonal skills by Miller, deWinstanley, and Carey (1996)^[51]. Similarly, a positive correlation was observed between self-schemata for sociability and retention of the social content of a conversation according to Dworkin & Goldfinger (1985). These results were confirmed by another study conducted by Miller and Winstanley (2002)^[51], which revealed a favorable relationship between total recall and interpersonal competency. There is a correlation between behavior and intellect (Bercht & Wijermans, 2018)^[7]. Moreover, coordinated brain activity promotes coordinated communication and social interaction, which results in smoother interpersonal dynamics and adaptive behavior, which is why recent neuroscientific research supports the involvement of cognitive processes in interpersonal adaptation (Hasson *et al.* 2012)^[32].

The terms "physical activity" (PA) and "physical exercise" (PE) refer to skeletal muscular movements that require energy expenditure. According to Caspersen *et al.* (1985)^[14] incidental PA results from daily activities that aren't

structured, such as work, cleaning, strolling, leisure, etc., whereas PE consists of planned and structured activities that are typically performed to improve or keep physical fitness (Bherer *et al.*, 2013; Pucci *et al.*, 2023)^[18, 57]. Participating in physical activity is a multifaceted, intricate behavior. Total physical activity is influenced by a wide variety of activities, including work-related, domestic (Like cleaning and caring for others), transportation (such as riding a bike or walking to work), and recreational (such as dancing and swimming) activities. Physical activities done during leisure time are exercise that falls under the definition of "physical activity that involves repetitive, structured, and planned bodily movements to maintain or improve one or more aspects of physical fitness" (Hardman & Stensel 2003)^[31]. Throughout a person's lifetime, Several results related to physical and mental health, such as cancer, heart disease, type 2 diabetes, hypertension, and cognitive health, have been demonstrated to be improved by physical activity (PA) (Aakvik *et al.*, 2023)^[1]. Various types of evidence continuously show that Physical activity is a significant health behaviour that leads to a decreased risk of chronic diseases linked to aging, Functional impairment as well as cognitive decline or impairment for others (Miller *et al.*, 2000)^[51]. The majority of research found that exercise training enhanced cognitive abilities, with executive skills showing the most improvements. (Liu-Ambrose *et al.*, 2010), episodic memory and processing speed (Audiffren & André, 2019). Several studies have demonstrated a significant negative link between negative emotional evaluations and physical activity: the more physically active persons are, the lower their negative emotional ratings (Xu *et al.*, 2003). According to a meta-analysis, specific psychological traits become more prominent following physical activity, and physical activity is strongly correlated with emotional intelligence (Ubago-Jimenez *et al.*, 2019). Many research investigations have looked at how physical activity affects cognitive and interpersonal intelligence, as well as the relationship between the two. However, Most of the investigations were conducted on older people. Less research has focused on adults. Understanding these dynamics in adults is crucial, as they face unique cognitive and social challenges. The present study aims to investigate the influence of physical activity on the cognition and interpersonal intelligence of adult students, with the goal of understanding how it impacts their cognitive functions, social communication skills, empathy, and conflict resolution abilities.

1.1 Hypothesis

H₀- There is no significant difference in physical activity levels across different demographic variables.

H₀-There is no difference in cognitive performance between people who exercise on a regular basis and those who do not.

H₀-There is no relationship between physical activity and interpersonal intelligence.

H₀-There is no connection between interpersonal intelligence and cognition.

H₁- There is a significant difference in physical activity levels across different demographic variables.

H₂-Regular physical activity positively impacts cognitive function.

H₃-Engaging in physical activity is positively correlated with interpersonal intelligence.

H₄- There is Positive correlation exists between interpersonal intelligence and cognition.

2. Materials and Methods

2.1 Selection of subject

For this study, sample was chosen from Lucknow City. Convenience random sampling procedures were used in the selection of respondents. The entire Lucknow is divided into urban and rural Lucknow. Using random sampling techniques, 331 college-going students were selected, of which 165 were male and 166 were female.

2.2. Tools

Three tools were utilized, including the Cognitive Assessment Questionnaire by Broadbent *et al.* (1982)^[11], the Interpersonal Intelligence Questionnaire by Neeta & Sameer (2021), and a self-made socio-demographic questionnaire for determining the respondents' demographic profile.

2.2.1 The Cognitive Assessment Questionnaire

The CFQ is a self-report assessment tool used for evaluating impairments in motor, memory, and perception. The twenty-five items of the CFQ are answered by the subjects on a five-order scale that ranges from "never" to "always". The following are the five options for responses: (0) never, (1) very rarely, (2) occasionally, (3) quite often, and (4) very often. An example of a question is, 'Do you fail to listen to people's names when you are meeting them?' The CFQ has a score range of 0 to 100. A high score shows a greater likelihood for cognitive failure. CFQ has a reliable and valid tool. (Wallace & Vodanovich, 2003; Broadbent *et al.*, 2003; Attree *et al.*, 2014; Bridger *et al.*, 2013)^[66, 11, 2, 10].

2.2.2 Interpersonal intelligence scale

A scale developed by Neeta and Sameer in 2021 was used to analyse interpersonal intelligence. It contains 28 items with multiple-choice questions related to communication, empathy, understanding of others, cooperation, conflict resolution in relationships, and adaptation. Their Alpha Chronbach's reliability coefficient is 0.76, Spearman Brown prophecy is 0.80, and Guttman Split Half is 0.79.

2.3 Data collection

With Respondent consent, data was collected personally through the questionnaire method, along with observations that include the degree of physical activity linked with their cognition and interpersonal intelligence. A correlational research design was used for the study. The study was carried out from February to April 2024. Age, gender, and place of residence (rural vs. urban) are taken as independent variables, and cognition and interpersonal intelligence are taken as dependent variables.

2.4 Statistical analysis

IBM SPSS Statistics version 20 was utilised for the statistical analysis. With the use of the t-test for test significance, frequency%, mean, standard deviation, and correlation coefficient, utilizing Pearson's correlation,

Physical activity's impact on cognition and interpersonal intelligence and the relation between them are assessed.

3. Results and Discussion

Table 1: Socio-demographic Profile of the Respondents

S. No.	Category	Frequency (%)
Gender	Male	166(50.2%)
	Female	165(49.8%)
Area	Rural	180(54.4%)
	Urban	151(45.6%)
Family type	Nuclear	257(77.6%)
	Joint	74(22.4%)

The above table 1 shows out of 331 respondents, {166 (50.2%)} males and {165 (49.8%)} females living in Lucknow contributed to this study. Regarding the area, 180 (54.4%) belong to rural areas, and 151 (45.6%) belong to urban areas. In terms of family type, 74 respondents (22.4%) belong to a combined family, and 257 respondents (77.6%) belong to nuclear family.

Table 2: Distribution of Physical activity levels on the basis of demographic variables.

		Sedentary physical activity	Light physical activity	Moderate physical activity	Vigorous physical activity
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Gender	Male	14 (8.4%)	56(33.7%)	79(47.6%)	17(10.2%)
	Female	25 (15.2%)	93(56.4%)	43(26.1%)	4(2.4%)
Area	Rural	24 (13.3%)	80(44.4%)	68(37.8%)	8(4.4%)
	Urban	15 (9.9%)	69(45.7%)	54(35.8%)	13(8.6%)
Family type	Nuclear	30 (11.7%)	130(50.6%)	82(31.9%)	15(5.8%)
	Joint	9 (12.2%)	19(25.7%)	40(54.1%)	6(8.1%)

Above table 2 depicts that among male respondents, majority (47.6%) opt for moderate physical activity, followed by light activity (33.7%) and vigorous activity (10.2%), and the fewest choose a sedentary lifestyle (8.4%). Conversely, among females, the highest participation is in light activity (56.4%), followed by moderate activity (26.1%) and sedentary behavior (15.2%), with the least

engagement in vigorous activity (2.4%).

In rural regions, the majority of people engage in light (44.4%) and moderate (37.8%) activity, while a smaller percentage choose a sedentary lifestyle (13.3%) and a very small percentage choose vigorous activity (4.4%). Similar trends are seen in the urban respondents, who preferred light activity (45.7%), moderate activity (35.6%), sedentary behavior (15%), and vigorous activity (5.6%).

Regarding family type, in nuclear families, over half prefer light activity (50.6%) and moderate activity (31.9%); 11.7% of respondents engage in a sedentary lifestyle, while a small percentage opt for vigorous activity (5.8%). In joint families, the majority prefer moderate activity (54.1%), followed by light activity (25.7%), sedentary behavior (12.2%), and a small proportion engaging in vigorous activity (8.1%).

Table 3: t-test (Distribution of gender on the basis of cognitive failure)

	Gender	Mean	Std. Deviation	T	P
False-triggering	Male	14.4788	6.56820	-.904	.367.
	Female	15.1273	6.46111		
Distractibility	Male	16.4667	6.59872	-1.361	.175
	Female	17.4242	6.17938		
Forget-fullness	Male	16.2229	6.44452	-.758	.449
	Female	16.7394	5.93861		

Above table 3 shows that the t-values for false-triggering (-.904), distractibility (-1.361), and forgetting (-.758) are non-significant at the 0.05 level. Therefore, the null hypothesis is accepted.

Table 4 also demonstrates that the respondents' gender has an impact on the domain of cognitive failure. The highest mean is found among female respondents, who also exhibited higher levels of distractibility ($\mu = 17.4242$), forgetfulness ($\mu = 16.7394$), and false-triggering ($\mu = 15.1273$), indicating higher cognitive failure resulting in lower cognition compared to male respondents, who show higher levels of distractibility ($\mu = 16.4667$), forgetfulness ($\mu = 16.2229$), and false-triggering ($\mu = 14.4788$). Significant differences between the means exist in domains such as false-triggering, distractibility, and forgetfulness, but the t value is not significant at the level of 0.05.

Table 4: Distribution of living area on the basis of cognitive failure

	Area	Mean	Std. Deviation	T	P
False-triggering	Rural	15.3944	6.53183	1.813	.071
	Urban	14.0933	6.44059		
Distractibility	Rural	17.4022	6.18672	1.414	.158
	Urban	16.4040	6.62538		
Forget-fullness	Rural	16.9722	6.14120	1.581	.115
	Urban	15.8940	6.22485		

The details of the t test calculation are shown in Table 4 above. The results show that the t-values for false-triggering (1.813), distractibility (1.414), and forgetting (1.581) are non-significant at the 0.05 level. Therefore, the null hypothesis is accepted.

Table 4 also demonstrates how respondents' living places (rural and urban) influence the domain of cognitive failure. The mean is highest for rural respondents, indicating a higher level of distractibility ($\mu = 17.4022$), forgetfulness (μ

$= 16.9722$), and false-triggering ($\mu = 15.3944$), which results in lower cognition in urban respondents compared to rural respondents, which show a higher a higher level of distractibility ($\mu = 16.4040$), forgetfulness ($\mu = 17.4022$), and false-triggering ($\mu = 15.3944$).

Mean differences between the means exist in domains such as false-triggering, distractibility, and forgetfulness, but the t value is not significant at the level of 0.05.

Table 5: Interpersonal intelligence on the basis of their living area and gender

	Gender	Mean	Std. Deviation	T	P
Interpersonal intelligence	Male	63.0909	11.71710	-2.371	.018
	Female	65.7212	8.10946		
	Area				
	Rural	63.2333	10.31303	-2.315	.021
	Urban	65.8133	9.79274		

The details of the t test calculation are shown in Table 5

Table 6: Comparison of cognitive failure and its domains among level of Physical activity -

	Sedentary physical activity	Light physical activity	Moderate physical activity	Vigorous physical activity	F	Sig
False-triggering	15.4615±7.11132	14.8926±6.01703	14.7213±6.91299	13.3500±6.61955	.478	.698
Distractibility	17.6923±7.28789	17.1275±6.01495	16.8279±6.54254	14.8500±6.53150	.945	.419
Forget-fullness	17.0513±6.84009	16.3087±5.48327	16.7295±6.73714	15.1905±6.63038	.516	.672
cognitive failure	51.9231±20.80914	50.0067±16.74107	49.9672±19.52406	43.0500±18.55426	1.078	.359

The details of the calculation are shown in Table 6 above. The results show that the F values for false-triggering (.478), distractibility (.945), forgetting (.516), and total cognitive failure (1.078) are not significant at the 0.05 level, hence the null hypothesis is accepted.

Table 6 also shows that respondents who are sedentary have a higher frequency of false triggering ($\mu=15.4615$) than do those who participate in light, moderate, and strenuous physical activity ($\mu=14.8926$, 14.7213 , and 13.3500). Likewise, respondents who lead sedentary lifestyles ($\mu=17.6923$) report higher levels of distraction than respondents who engage in light ($\mu=17.1275$), moderate

above. The results show that the t-values. Interpersonal intelligence on the basis of gender is -2.371 and on the basis of living area is -2.315, and both values are significant at a level of 0.05, hence the null hypothesis is rejected.

Table 5 also demonstrates that respondents from urban areas generally had higher interpersonal intelligence ($\mu = 65.8133$) than respondents from rural areas. In addition, when compared between male and female respondents, female respondents exhibit better interpersonal IQ ($\mu = 65.7212$) on average.

($\mu=16.8279$), and intense ($\mu=14.8500$) physical activity. Furthermore, forgetfulness is more likely in those who are sedentary active ($\mu=17.0513$) than in those who are physically moderately active ($\mu=16.7295$), lightly ($\mu=16.3087$), and vigorously ($\mu=15.1905$).

Significant differences between the means exist in the domain of cognitive failure, such as false-triggering, distractibility, and forgetfulness, but the t value is not significant at the level of 0.05. Significant differences between the means exist in the domain of cognitive failure, such as false-triggering, distractibility, and forgetfulness, but the F value is not significant at the level of 0.05.

Table 7: Comparison of interpersonal intelligence among Levels of Physical Activity

	Sedentary physical activity	Light physical activity	Moderate physical activity	Vigorous physical activity	F	Sig
Interpersonal Intelligence	64.4615±9.53069	65.3446±9.38715	63.1721±11.15088	64.8571±10.24834	1.038	.376

The details of the calculation are shown in Table 7 above. The results show that the F values of interpersonal intelligence are 1.038 and values are not significant at a level of 0.05, hence the null hypothesis is accepted.

Table 7 shows that interpersonal intelligence is higher in respondent who do light physical activity ($\mu=65.3446$) than

vigorous physical activity ($\mu=64.8571$) than sedentary life style ($\mu=64.4615$) and moderate physical activity ($\mu=63.1721$).

Significant differences between the means exist in interpersonal intelligence, but the F value is not significant at the level of 0.05.

Table 8: Correlation between Physical activity cognitive failure and its domains

	physical activity level	cognitive failure	False-triggering	Distractibility	Forget-fullness
physical activity level	1				
cognitive failure	-.071	1			
False-triggering	-.057	.928**	1		
Distractibility	-.078	.922**	.764**	1	
Forget-fullness	-.029	.912**	.873**	.765**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Table 8 shows that the Pearson product correlation results indicate a negative connection between physical activity and cognitive failure ($r = -.071$, $p<.001$), which means that with an increasing level of physical activity, cognitive failure decreased and cognition increased.

The result also shows that physical activity is negatively correlated with false-triggering ($r = -.057$, $p<.001$), distractibility ($r = -.078$, $p<.001$), and forgetfulness ($r = -$

.029, $p<.001$).

Table 9: Correlation between of physical activity and interpersonal intelligence

	Physical activity level	Interpersonal Intelligence
Physical activity level	1	
Interpersonal Intelligence	-.052	1

Table 9 shows that the correlation between physical activity and cognition is negative, which indicates that as physical

activity increases, the interpersonal intelligence of respondents decreases ($r = -.052, p < .001$).

Table 10: Correlations between cognitive failure and interpersonal intelligence

	Cognitive failure	False-triggering	Distractibility	Forget-fullness	Interpersonal Intelligence
Cognitive failure	1				
False triggering	.928**	1			
Distractibility	.922**	.764**	1		
Forgetfulness	.912**	.873**	.765**	1	
Interpersonal Intelligence	-.331**	-.321**	-.280**	-.279**	1
**. Correlation is significant at the 0.01 level (2-tailed).					
*Correlation is significant at the 0.05 level (2-tailed)					

Table 10 summarizes the Pearson product correlation of different variables. The result shows interpersonal intelligence and cognitive failure have a negative correlation ($r = -.331, p < .001$), which is statistically significant. The result also concluded that interpersonal intelligence negatively correlates with forgetfulness ($r = -.0279, p < .001$), distraction ($r = -.280, p < .001$), and false triggering ($r = -.321, p < .001$), which is statistically significant. This shows that with an increase in interpersonal intelligence, there is a decrease in false triggering, distraction, and forgetfulness. A decrease in cognitive failure leads to an increase in overall cognition.

4. Discussion

This cross-sectional study aims to evaluate the link between physical activity, cognition, and interpersonal intelligence in adults (college-going students). Demographic variables show an impact on cognition and interpersonal intelligence. Long and torturous, the history of study on gender variations in cognitive capacities is replete with assertions of biological determinism and feminine inferiority (Janet and Nita, 1997). Results show female respondent's exhibit a higher mean score, indicating elevated levels of distraction, forgetfulness, and false triggering. These findings imply a higher propensity for cognitive failure and lower cognitive function among female participants compared to male participants. The present study's results replicate the finding of earlier research, suggesting Females were discovered to suffer greater cognitive errors and behavioral issues in comparison to males (Dixit *et al.*, 2022) ^[22]. In addition, when comparing the interpersonal intelligence of male and female respondents, female respondents exhibit better interpersonal intelligence and assert that women eventually leave their families, invest more time in maintaining and interacting with others, which inadvertently increases their chances of doing so and helps them gain a competitive edge over Interpersonal intelligence (Fang *et al.*, 2017). When respondents from rural and urban areas are compared for living area cognition, it is shown that urban respondents have a greater tendency to be distracted, forgetful, and to suffer from false triggers. This could result in more cognitive failures and lower cognition overall (Xin *et al.*, 2021). This may indicate that respondents from urban areas have better cognitive abilities. Since urbanization promotes beneficial, long-lasting changes in the environment, it may help close the cognitive gap (Xin *et al.*, 2021). The reduction of cognitive differences between urban and rural populations may also be greatly aided by treatments that focus on lifestyle, social support networks, physical health,

and socioeconomic levels. While comparing interpersonal intelligence, respondents from urban areas generally had higher interpersonal intelligence than respondents from rural areas. A similar result was found when the emotional intelligence of rural and urban adults (college-going students) is compared, i.e., urban respondents have better emotional intelligence than rural respondents (Joiceswarnalatha, R. 2015) ^[39]. Physical activity is a multifaceted and intricate behavior that can be classified according to its frequency, duration, intensity, and mode (Miles, 2007). Physical activity and cognitive failure are negatively correlated (Gajewski *et al.*, 2023; Northey *et al.*, 2018) previous literature Affirm the hypothesis that physical activity influences cognitive ability. This suggests that as physical activity increases, cognitive abilities improve and false-triggering, distractibility, and forgetfulness decrease. All cognitive domains were positively related to high levels of physical activity (Huang *et al.*, 2020) ^[34]. Fox and Hillsdon (2007) ^[27] have claimed that Promoting Physical activity must be an essential element of urban design and planning. Town planners ought to provide neighborhoods with areas like parks where residents can engage in physical activity. Evaluating the association between physical activity and interpersonal intelligence, get a negative correlation and a positive correlation with emotional intelligence was obtained (Wang *et al.*, 2020) ^[68]. People who live sedentary lives are more likely to be falsely triggered, easily distracted, and forgetful than those who participate in moderate-to-intense physical activity. This implies that sedentary lifestyles are associated with impaired cognitive function, which improves with increased physical exercise. When we examine the degree of physical activity among older people, we find a similar pattern: as we increase the frequency of physical activity, their cognitive abilities increase (Manish *et al.*, 2022). This finding indicates that one risk factor that can be changed to either prevent or postpone the development of cognitive impairment is physical activity. A statistically significant result was found in the connection between interpersonal intelligence and cognitive failure and its domain. The negative correlation indicated that people with high interpersonal intelligence have low cognitive failure, false triggering, distraction, and better cognition.

5. Conclusion

Through this study, the connection between adults' cognitive abilities, physical exercise, and interpersonal intelligence was explored. Female respondents showed greater interpersonal intelligence, but they also displayed higher

levels of cognitive failure. Though urbanization may close this gap, urban inhabitants typically encounter greater cognitive barriers. Better cognitive performance and fewer cognitive failures are connected with increased physical activity. To improve cognitive health, physical activity areas should be given priority in urban development. Higher emotional intelligence, interpersonal intelligence, and cognitive decline are both associated with sedentary lifestyles. This emphasizes the value of exercise for cognitive health and provides guidance for interventions and urban design for college students. Encouraging physical activity is essential. To raise public awareness of the benefits exercise provides for the cognitive system, educational activities should be put into place. Priority should be given when designing urban areas to locations that encourage physical activity, such as playgrounds, green paths, and bike lanes. Through seminars, workshops, and educational initiatives, students could learn about the cognitive advantages of regular exercise.

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