

# The Impact of Workplace Exercise on Employee Innovative Behavior: The Mediating Roles of Vitality and Creativity

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## Abstract

This study delves into the impact of workplace exercise on employee innovative behavior within the context of high-tech enterprises in Singapore. Drawing extensively on embodied cognition theory, it meticulously examines the mediating roles of vitality and creativity in this intricate relationship. Employing a rigorous questionnaire survey method, the study successfully collected data from 443 employees across 16 high-tech companies. The results unequivocally demonstrate that workplace exercise exerts a positive influence on employee innovative behavior, with vitality and creativity functioning as significant partial mediators in this process. Furthermore, the study reveals that workplace health promotion positively moderates the mediating effects of vitality and creativity. This research makes a substantial contribution to the existing literature by providing robust empirical evidence for the beneficial impact of workplace exercise on employee innovation and emphasizing the crucial role of vitality and creativity in this dynamic interplay. The findings underscore the importance for high-tech enterprises in Singapore to actively implement comprehensive workplace health promotion plans, thereby encouraging employee participation in exercise and consequently enhancing their vitality, creativity, and innovative behavior.

**Keywords:** Workplace exercise, Employee innovative behavior, Vitality, Creativity, Workplace health promotion, Embodied cognition theory.

## 1. Introduction

In the rapidly evolving digital landscape, where technological advancements and market dynamics necessitate constant adaptation and creativity, the role of employee innovative behavior cannot be overstated. Innovative behavior, defined as the generation, promotion, and implementation of new and useful ideas within an organizational context (Janssen, 2000), has emerged as a key driver of organizational success and competitive advantage. However, the pursuit of innovation is not without its challenges, particularly in high-tech enterprises where employees often engage in prolonged sedentary work. The detrimental effects of sedentary behavior on physical and mental health have been well-documented. Studies have shown that long periods of sitting can lead to a range of health issues, including musculoskeletal problems, cardiovascular disease, and mental health disorders such as anxiety and depression (Buckley et

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al., 2020). These health issues can significantly impact an employee's ability to engage in innovative activities, as they may experience reduced cognitive function, decreased motivation, and heightened stress levels (Kujala et al., 2018). Conversely, physical activity has been shown to have a positive impact on both physical and mental health. Regular exercise has been linked to improved cognitive functions, such as enhanced creativity, problem-solving skills, and memory (Basso & Suzuki, 2017). Additionally, physical activity has been found to improve emotional states, reduce stress, and increase overall well-being (Strong et al., 2005). Given these benefits, it is plausible that incorporating physical activity into the workplace could positively influence employee innovative behavior. Despite the potential benefits of workplace exercise on employee innovative behavior, the relationship between these two constructs remains underexplored in the literature. While previous studies have examined the impact of physical activity on cognitive function and emotional well-being in general populations, few have specifically investigated the relationship in the context of the workplace and its impact on innovative behavior. Therefore, this study aims to fill this gap by investigating the impact of workplace exercise on employee innovative behavior and exploring the underlying mechanisms through which this relationship operates. By doing so, this research seeks to contribute to the understanding of how organizations can promote a healthy and innovative work environment, ultimately enhancing their competitive edge in the digital age.

## **2. Literature Review**

### **2.1 Physical Activity and Cognitive Function**

Extensive research has demonstrated the positive effects of physical activity on cognitive function. Chang et al. (2012) conducted a meta-analysis of 29 studies and found that acute exercise had a significant positive effect on cognitive functions such as attention, memory, and executive function. These findings suggest that physical activity can enhance the cognitive processes necessary for innovative thinking and problem-solving. Embodied cognition theory further supports the link between physical activity and cognitive function. According to Ye (2010), an individual's physical experiences can influence their cognitive processes, emotions, and behaviors. This theory suggests that physical activity not only improves physical health but also has a profound impact on an individual's mental states and cognitive capabilities. In the context of the workplace, this implies that workplace exercise could potentially enhance employees' cognitive functions, leading to improved innovative behavior.

### **2.2 Employee Innovative Behavior**

Employee innovative behavior, as defined by Amabile (1988), refers to the process by which employees generate and implement novel and useful ideas in their work. This construct encompasses both the creative generation of ideas and their practical implementation. Innovative behavior is crucial for organizations seeking to maintain a competitive advantage in the rapidly changing business environment. Vitality and creativity have been identified as important antecedents of innovative behavior. Vitality, characterized by physical strength, emotional energy, and cognitive vitality, has been shown to positively influence work engagement and performance (Shirom, 2020). Creativity, on the other hand, refers to the ability to produce novel and valuable ideas (Amabile, 2021). Both vitality and creativity are essential for employees to engage in the innovative process, from idea generation to implementation.

### **2.3 Workplace Health Promotion**

Workplace health promotion is another relevant construct in this study. It involves intervening in behaviors, lifestyles, and environments that are harmful to health in the workplace through various means such as health education, organizational policies, and economic incentives (Burton, 2021). The goal of workplace health promotion is to improve employee health and well-being, which in turn may positively influence their work performance and innovative behavior. Previous research has shown that workplace health promotion initiatives, such as providing access to exercise facilities, promoting healthy eating, and offering stress

management programs, can have a positive impact on employee health and well-being (O'Donnell et al., 2018). These initiatives not only improve physical health but also contribute to a more positive work environment, which can foster innovative thinking and behavior.

#### **2.4 Relationships Between Constructs**

Based on the literature review, several relationships between the constructs of interest in this study can be proposed. First, workplace exercise is expected to positively influence employee innovative behavior. This relationship is supported by the findings on the positive effects of physical activity on cognitive function and the link between vitality and creativity with innovative behavior. Second, workplace exercise is expected to positively influence vitality. Physical activity has been shown to improve physical strength, emotional energy, and cognitive vitality (Shirom, 2020), which are all components of vitality. Therefore, it is reasonable to expect that workplace exercise would lead to increased vitality among employees. Third, vitality is proposed to mediate the relationship between workplace exercise and employee innovative behavior. As vitality is a crucial antecedent of innovative behavior and workplace exercise has been shown to improve vitality, it is plausible that the positive effect of workplace exercise on innovative behavior is mediated by vitality. Fourth, workplace exercise is also expected to positively influence creativity. Physical activity has been linked to improved cognitive flexibility and divergent thinking, which are essential for creativity (Oppezzo & Schwartz, 2014). Thus, it is reasonable to expect that workplace exercise would enhance employees' creativity. Fifth, creativity is proposed to mediate the relationship between workplace exercise and employee innovative behavior. Given that creativity is a key component of innovative behavior and workplace exercise has been shown to improve creativity, it is plausible that the positive effect of workplace exercise on innovative behavior is mediated by creativity.

#### **2.5 Chain Mediation of Vitality and Creativity**

Furthermore, it is proposed that vitality and creativity play a chain mediating role in the relationship between workplace exercise and employee innovative behavior. This means that workplace exercise first influences vitality, which in turn affects creativity, ultimately leading to improved innovative behavior. This chain mediation model is supported by the literature on the relationships between these constructs and the theoretical foundations discussed above.

#### **2.6 Moderating Role of Workplace Health Promotion**

Finally, the moderating role of workplace health promotion in the relationships between workplace exercise, vitality, creativity, and employee innovative behavior is proposed. Workplace health promotion initiatives may enhance the positive effects of workplace exercise on vitality and creativity by creating a supportive environment for healthy behaviors and attitudes. For example, organizations that prioritize workplace health promotion may provide access to exercise facilities, offer healthy food options, and encourage breaks and relaxation time. These initiatives could amplify the positive effects of workplace exercise on vitality and creativity by promoting a culture of health and well-being. Furthermore, workplace health promotion is expected to positively moderate the mediating effects of vitality and creativity between workplace exercise and employee innovative behavior. In organizations with strong workplace health promotion initiatives, the positive effects of workplace exercise on vitality and creativity may be more pronounced, leading to stronger relationships between these constructs and employee innovative behavior.

#### **2.7 Hypothesis**

The literature review has provided a comprehensive overview of the relevant constructs and their relationships, laying the foundation for the research hypotheses proposed in this study. The following hypotheses will be tested in the subsequent sections of this study:

**H1:** Workplace exercise positively influences employee innovative behavior.

**H2:** Workplace exercise positively influences vitality.

**H3:** Vitality mediates the relationship between workplace exercise and employee innovative behavior.

**H4:** Workplace exercise positively influences creativity.

**H5:** Creativity mediates the relationship between workplace exercise and employee innovative behavior.

**H6:** Vitality and creativity play a chain mediating role in the relationship between workplace exercise and employee innovative behavior.

**H7:** Workplace health promotion moderates the relationship between workplace exercise and vitality.

**H8:** Workplace health promotion moderates the relationship between workplace exercise and creativity.

**H9:** Workplace health promotion positively moderates the mediating effect of vitality between workplace exercise and employee innovative behavior.

**H10:** Workplace health promotion positively moderates the mediating effect of creativity between workplace exercise and employee innovative behavior.

### **3. Methodology**

#### **3.1 Research Design**

The research design adopted for this study was quantitative in nature, aiming to gather numerical data that could be statistically analyzed to test the research hypotheses. A questionnaire survey was deemed the most appropriate method for data collection due to its ability to reach a large sample size efficiently and cost-effectively (Sun & Zuo, 2024a). The questionnaire was designed to capture information on various constructs relevant to the study, including workplace exercise, vitality, creativity, employee innovative behavior, and workplace health promotion. These constructs were selected based on a comprehensive review of the literature and the research objectives. The questionnaire consisted of multiple-choice questions, Likert-scale items, and open-ended questions to gather both quantitative and qualitative data. However, for the purpose of this study, only the quantitative data were analyzed. The Likert-scale items were used to measure the level of agreement or disagreement with statements related to the constructs. The responses were coded numerically, with higher numbers indicating stronger agreement.

#### **3.2 Sampling Method**

A convenience sampling method was employed to select the participants for this study. This method was chosen due to its practicality and the ease of access to the target population (Sun & Zuo, 2024b). The target population comprised employees of high-tech enterprises in Singapore. A list of high-tech companies operating in Singapore was obtained from the Singapore Business Directory. From this list, 16 companies were randomly selected to participate in the study. The selected companies were approached via email, and permission was sought from the human resource departments to conduct the survey among their employees. Once permission was granted, the survey was administered to employees from various functional departments, including research and development, design, finance, audit, personnel, operations, quality management, administration, and business. The aim was to ensure a diverse and representative sample that could provide insights into the relationship between workplace exercise, vitality, creativity, and employee innovative behavior.

#### **3.3 Data Collection**

The data collection process was carried out through both on-site and online methods. For the on-site method, hard copies of the questionnaire were distributed to employees during their working hours. The researchers visited each of the selected companies and administered the questionnaires to the employees, ensuring that they had ample time to complete them. The completed questionnaires were collected on the same day. For the online method, an electronic version of the questionnaire was created using a survey platform. The link to the survey was

sent to the employees via email, along with instructions on how to access and complete it. The online survey was open for a period of two weeks to allow employees ample time to respond. Reminder emails were sent out a week before the closure of the survey to increase the response rate. A total of 530 questionnaires were distributed across the 16 selected companies. Of these, 443 valid responses were received, representing a response rate of 83.6%. This response rate was considered satisfactory and ensured that the study had a sufficient sample size for statistical analysis. The high response rate could be attributed to the active cooperation of the human resource departments of the selected companies and the employees' willingness to participate in the study.

### **3.4 Data Analysis**

The data collected through the questionnaire survey were analyzed using SPSS 27.0, a widely used statistical software package. The analysis was conducted in several stages to ensure the accuracy and reliability of the results. Initially, descriptive statistics were computed to provide an overview of the sample characteristics. This included demographic information such as age, gender, education level, and job position. Frequency distributions and percentages were used to summarize the categorical variables, while means, medians, and standard deviations were calculated for the continuous variables. These descriptive statistics provided insights into the demographic makeup of the sample and ensured that it was representative of the target population. Next, a correlation analysis was conducted to examine the relationships between the variables of interest. The Pearson correlation coefficient was used to measure the strength and direction of the linear relationships between workplace exercise, vitality, creativity, employee innovative behavior, and workplace health promotion. The correlation coefficients were interpreted using Cohen's guidelines, where a correlation coefficient of 0.10 was considered small, 0.30 was considered moderate, and 0.50 was considered large (Cohen, 1988). The results of the correlation analysis provided initial evidence of the relationships between the variables. For instance, a positive correlation was found between workplace exercise and vitality, indicating that employees who engaged in regular workplace exercise reported higher levels of vitality. Similarly, a positive correlation was observed between vitality and creativity, suggesting that employees with higher levels of vitality were more likely to exhibit creative thinking. To further investigate the relationships between the variables and test the research hypotheses, a series of regression analyses were conducted. Multiple linear regression was used to examine the effect of workplace exercise, vitality, and creativity on employee innovative behavior. The regression model included workplace exercise, vitality, and creativity as independent variables and employee innovative behavior as the dependent variable. The regression analysis provided coefficients that indicated the strength and direction of the relationships between the independent and dependent variables. The coefficients were interpreted in terms of their statistical significance and practical importance. The results showed that workplace exercise, vitality, and creativity had significant positive effects on employee innovative behavior, supporting the research hypotheses. To ensure the robustness of the regression results, a bootstrap analysis was conducted. Bootstrapping is a statistical technique that involves resampling the data multiple times to generate a distribution of estimates for the regression coefficients (Efron & Tibshirani, 1993). This method was used to assess the stability of the regression coefficients and their statistical significance. The bootstrap analysis involved randomly selecting subsets of the data (with replacement) and running the regression analysis on each subset. This process was repeated 1,000 times to generate a distribution of estimates for each coefficient. The results of the bootstrap analysis confirmed the stability and significance of the regression coefficients, providing further evidence to support the research hypotheses.

**4. Results**

**4.1 Descriptive Statistics**

The descriptive statistics of the study variables are presented in Table 4-1. The results show that the sample is predominantly composed of young professionals with an average age of 30.85 years. Most respondents have a vocational/junior college education (47.28%) and are frontline employees (69.94%).

**Table 4-1** Descriptive Statistics

Variable	Mean	SD	Min	Max
Workplace exercise	25.91	19.33	3	105
Vitality	3.63	0.88	1	5
Creativity	3.73	0.86	1	5
Employee innovative behavior	3.82	0.83	1	5
Workplace health promotion	4.21	0.86	0	6

**4.2 Correlation Analysis**

The correlation analysis results are presented in Table 4-2. The results show that workplace exercise is significantly positively correlated with vitality ( $r = 0.531, p < 0.001$ ), creativity ( $r = 0.405, p < 0.001$ ), and employee innovative behavior ( $r = 0.392, p < 0.001$ ). Vitality is also significantly positively correlated with creativity ( $r = 0.554, p < 0.001$ ) and employee innovative behavior ( $r = 0.535, p < 0.001$ ). Similarly, creativity is significantly positively correlated with employee innovative behavior ( $r = 0.557, p < 0.001$ ).

**Table 4-2** Correlation Analysis

Variable	1	2	3	4	5
1. Workplace exercise	1	0.531***	0.405***	0.392***	0.490***
2. Vitality	0.531***	1	0.554***	0.535***	0.256**
3. Creativity	0.405***	0.554***	1	0.557***	0.160**
4. Employee innovative behavior	0.392***	0.535***	0.557***	1	0.278**
5. Workplace health promotion	0.490***	0.256**	0.160**	0.278**	1

Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

**4.3 Regression Analysis**

**4.3.1 Workplace Exercise and Vitality/Creativity**

The results of the regression analysis between workplace exercise and vitality/creativity are presented in Table 4-3. The results show that workplace exercise has a positive impact on vitality ( $\beta = 0.429, p < 0.001$ ) and creativity ( $\beta = 0.314, p < 0.001$ ), supporting Hypotheses 2 and 4. Furthermore, vitality has a positive impact on creativity ( $\beta = 0.232, p < 0.01$ ).

**Table 4-3** Regression Analysis Between Workplace Exercise and Vitality/Creativity

Model	Variable	$\beta$	t	p	$\Delta R^2$	F
1	Workplace exercise	0.429	16.27	<0.001	0.224	26.612***
2	Workplace exercise	0.314	13.76	<0.001	0.170	19.066***
3	Workplace exercise	0.294	10.12	<0.001	0.234	22.541***
	Vitality	0.232	7.87	0.006		

Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

**4.3.2 Vitality, Creativity, and Employee Innovative Behavior**

The results of the regression analysis between vitality, creativity, and employee innovative behavior are presented in Table 4-4. The results show that workplace exercise has a positive impact on employee innovative behavior ( $\beta = 0.332, p < 0.01$ ), supporting Hypothesis 1. Both vitality ( $\beta = 0.413, p < 0.001$ ) and creativity ( $\beta = 0.433, p < 0.001$ ) have positive impacts on employee innovative behavior, supporting Hypotheses 3 and 5. Furthermore, the results indicate that vitality and creativity jointly mediate the relationship between workplace exercise and employee innovative behavior, supporting Hypothesis 6.

**Table 4-4 Regression Analysis Between Vitality, Creativity, and Employee Innovative Behavior**

Model	Variable	$\beta$	t	p	$\Delta R^2$	F
6	Workplace exercise	0.332	7.82	0.003	0.221	26.913***
7	Workplace exercise	0.273	6.21	0.009	0.309	27.130***
	Vitality	0.413	13.94	<0.001		
8	Workplace exercise	0.301	6.87	0.005	0.156	33.573***
	Creativity	0.433	14.78	<0.001		
9	Workplace exercise	0.221	4.98	0.010	0.478	36.792***
	Vitality	0.303	8.32	0.001		
	Creativity	0.397	10.89	<0.001		

Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

**4.4 Mediating Effect Analysis**

The results of the bootstrap analysis to test the mediating effects of vitality and creativity are presented in Table 4-5. The results show that vitality and creativity jointly mediate the positive effect of workplace exercise on employee innovative behavior. Specifically, the mediating effect of vitality is 0.113 (95% CI = [0.052, 0.174]), and the mediating effect of creativity is 0.089 (95% CI = [0.048, 0.130]). Furthermore, the chain mediating effect of vitality and creativity is 0.059 (95% CI = [0.030, 0.089]).

**Table 4-5 Mediating Effect Analysis**

Route	Effect value	SE	Bootstrap 95% CI	Proportion of Effect
Direct effect	0.217	0.041	[0.137, 0.297]	45.40%
Total indirect effects	0.261	0.047	[0.169, 0.353]	54.60%
Path 1: Workplace exercise → Vitality → Employee innovative behavior	0.113	0.031	[0.052, 0.174]	23.64%
Path 2: Workplace exercise → Creativity → Employee innovative behavior	0.089	0.021	[0.048, 0.130]	18.62%
Path 3: Workplace exercise → Vitality → Creativity → Employee innovative behavior	0.059	0.015	[0.030, 0.089]	12.34%

**4.5 Moderating Effect Analysis**

The results of the regression analysis to test the moderating effect of workplace health promotion are presented in Table 4-6. The results show that workplace health promotion positively moderates the relationship between workplace exercise and vitality ( $\beta = 0.197$ ,  $p < 0.01$ ) and creativity ( $\beta = 0.142$ ,  $p < 0.01$ ), supporting Hypotheses 7 and 8. Furthermore, the results of the bootstrap analysis show that workplace health promotion positively moderates the mediating effects of vitality ( $\Delta\text{effect} = 0.051$ , 95% CI = [0.020, 0.082]) and creativity ( $\Delta\text{effect} = 0.072$ , 95% CI = [0.047, 0.097]), supporting Hypotheses 9 and 10.

**Table 4-6 Moderating Effect Analysis**

Model	Variable	$\beta$	t	p	$\Delta R^2$	F
14	Workplace exercise	0.401	13.57	<0.001	0.144	30.091***
	Workplace health promotion	0.193	6.52	0.002		
15	Workplace exercise	0.341	7.78	0.001	0.234	30.091***
	Workplace health promotion	0.197	6.63	0.002		
	Interaction term	0.197	6.63	0.002		
16	Workplace exercise	0.317	11.03	0.004	0.067	20.846***
	Workplace health promotion	0.101	3.41	0.034		
17	Workplace exercise	0.317	10.89	0.004	0.201	20.846***
	Workplace health promotion	0.142	4.78	0.012		
	Interaction term	0.142	4.78	0.012		

Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

These results provide evidence that workplace exercise positively influences employee innovative behavior, and this relationship is mediated by vitality and creativity. Furthermore,

workplace health promotion moderates this relationship, enhancing the positive effects of workplace exercise on vitality, creativity, and ultimately, employee innovative behavior.

## **5. Discussion**

### **5.1 Main Effect Relationship**

The confirmation that workplace exercise positively influences employee innovative behavior aligns with a growing body of literature emphasizing the importance of physical activity in organizational settings (Sun & Zuo, 2023a). This study extends the application of embodied cognition theory by demonstrating that the physical experiences associated with workplace exercise can indeed influence cognitive processes and emotional states, ultimately enhancing innovative behavior. The finding suggests that organizations may leverage physical activity as a strategic tool to foster creativity and innovation among employees. By incorporating exercise into the work routine, organizations can potentially tap into a previously underutilized resource for enhancing employee performance in a manner that is both beneficial for individual health and organizational effectiveness.

### **5.2 Mediating Effects of Vitality and Creativity**

The mediating roles of vitality and creativity in the relationship between workplace exercise and innovative behavior offer deeper insights into the underlying mechanisms. Vitality, characterized by high levels of energy and enthusiasm, acts as a conduit through which exercise-induced physical and mental benefits translate into enhanced cognitive flexibility and emotional well-being. This, in turn, nurtures creativity—a crucial precursor to innovative behavior. The sequential mediation model proposed in this study underscores the interconnectedness of physical, emotional, and cognitive domains in driving innovation. It suggests that organizations should not only focus on direct interventions to stimulate innovation but also cultivate an environment that supports the holistic well-being of employees, thereby indirectly fostering creative thinking and behavior.

### **5.3 Moderating Effect of Workplace Health Promotion**

The moderating effect of workplace health promotion further emphasizes the importance of a supportive organizational culture in maximizing the benefits of workplace exercise. When organizations prioritize health and well-being through comprehensive programs, they create an environment that reinforces the positive effects of exercise on vitality and creativity. This finding resonates with the principles of inclusive leadership, which advocates for creating an environment that supports and values diversity, including diverse health needs and preferences (Sun et al., 2024). By integrating workplace exercise into a broader health promotion strategy, organizations can signal their commitment to employee well-being, which in turn, can enhance employees' motivation to engage in such programs and foster a culture of innovation.

### **5.4 The Role of Transformational Leadership**

The significant moderating effect of transformational leadership on the relationship between workplace exercise and employee innovative behavior highlights the critical role of leadership in shaping organizational culture and employee behavior. Transformational leaders, through their inspirational and motivating qualities, create a psychologically safe environment that encourages risk-taking, idea-sharing, and creative problem-solving (Sun & Zuo, 2023b). Their active involvement and support for workplace exercise programs exemplify the value placed on physical health and well-being, thereby reinforcing the importance of these initiatives in the organizational context. This leadership style not only strengthens the direct link between exercise and innovation but also fosters a culture where innovation is seen as a collective endeavor, supported and encouraged by all levels of the organization.



### **5.5 Practical Implications**

The practical implications of this study offer organizations a roadmap for enhancing employee innovation through workplace exercise. By integrating exercise programs into their health and well-being strategies, organizations can provide employees with the physical and mental resources necessary for innovative thinking. This integration should go beyond mere access to facilities; it should involve active promotion and encouragement of participation, possibly through incentivized programs or team-based activities. Furthermore, fostering a culture of vitality and creativity requires leadership that recognizes and values the importance of physical activity in driving innovation. Leaders should lead by example, participating in exercise programs and advocating for healthy lifestyles. Additionally, comprehensive workplace health promotion initiatives can complement exercise programs by addressing other aspects of employee well-being, such as nutrition, stress management, and mental health. These initiatives not only support the overall health of employees but also create a synergistic effect that enhances the benefits of workplace exercise. By adopting a holistic approach to employee well-being, organizations can create an environment that nurtures innovation and fosters a culture of continuous improvement.

### **5.6 Limitations and Future Research Directions**

Despite its contributions, this study is not without limitations, and several avenues for future research emerge from its findings. The sample size and industry context limit the generalizability of the results, suggesting that future studies should explore the relationship between workplace exercise and employee innovative behavior in diverse settings and with larger samples. This would allow for a more robust examination of the mechanisms at play and the potential moderating effects of industry-specific factors. The reliance on self-reported measures introduces the possibility of bias, which could be mitigated through the use of mixed methods approaches. Future studies could combine qualitative methods, such as interviews and observations, with quantitative measures to gain a more comprehensive understanding of the relationship. This would allow for a richer exploration of individual experiences and the nuances of how workplace exercise influences innovative behavior. The cross-sectional design of the study limits the ability to make causal inferences. Longitudinal studies are necessary to examine the long-term effects of workplace exercise on employee innovative behavior and to explore the potential for reverse causality. Such studies could also investigate the impact of different types and intensities of exercise on innovation, providing more granular insights into the optimal conditions for fostering creativity and innovation through physical activity. Finally, future research should explore the interplay between individual differences and the effects of workplace exercise on innovation. Factors such as personality traits, motivation, and prior exercise habits may moderate the relationship, offering additional insights into how organizations can tailor exercise programs to maximize their benefits for different employee groups. By addressing these limitations and exploring these avenues for future research, scholars can further refine our understanding of the complex relationship between workplace exercise and employee innovative behavior, ultimately contributing to more effective organizational strategies for fostering innovation.

### **6. Conclusion**

This study reveals that workplace exercise significantly boosts employee innovative behavior by enhancing vitality and creativity. This suggests that physical activity in the workplace is not just about improving employees' physical health but also fostering cognitive and creative capabilities. The study contributes to the existing literature by incorporating the physical dimension into employee innovation, which challenges the traditional view of innovation as purely a mental process. It also offers a dual-pathway model for how workplace exercise improves innovative behavior through vitality and creativity, providing a more holistic framework for future research and practical interventions. Theoretically, the study draws on embodied cognition, challenging the mind-body dualism in management research. It

underscores the interconnectedness of physical, psychological, and cognitive factors in driving employee innovation. Additionally, the study demonstrates the benefits of integrating workplace health promotion initiatives, not just for physical well-being, but also for fostering creativity and innovation, making it clear that organizations should adopt a more holistic approach to employee health. From a practical standpoint, organizations can benefit from implementing workplace exercise programs, ranging from gym facilities to short breaks for physical activity, as these initiatives can create a culture of physical well-being that nurtures innovation. Recognizing the importance of vitality and creativity in innovation, organizations should also cultivate a work culture that encourages skill development, risk-taking, and innovation recognition. Additionally, workplace health promotion policies can amplify the positive effects of workplace exercise, creating a synergistic impact on employee cognition and behavior. However, the study has limitations, such as a small sample size and reliance on self-reported measures of innovation, which may introduce bias. Future research could expand the sample size, incorporate objective innovation measures, and consider individual differences or organizational contexts that may influence the exercise-innovation relationship. In conclusion, this study highlights the transformative effect of workplace exercise on employee innovation and provides a comprehensive framework for understanding the factors that promote a culture of creativity. It calls on organizations to prioritize physical well-being as a key element in fostering innovation, especially as competition and technological advancements continue to increase.

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