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Hold the Horses: investigation into the impact of self-regulation on physical activity levels across BMI categories among college students

¡Alto en Seco!: investigación sobre el impacto de la autorregulación en los niveles de actividad física a través de las categorías de IMC entre estudiantes universitarios

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Abstract
The study aimed to compare self-regulation and physical activity levels across BMI categories and examine the predictive capability of self-regulation on physical activity across BMI and sex. A quantitative research design was employed, using validated tools to generate numerical data and predictive analysis. A random sample of 339 undergraduate students from Bulacan State University, categorized by BMI, participated, excluding graduate and law students. Self-regulation was measured using the 13-item Brief Self-Control Scale (BSCS), while subjective physical activity levels were assessed via the International Physical Activity Questionnaire (IPAQ). Ethical clearance was obtained before data collection. Analyses included mean and standard deviation calculations, linear regression, the Kruskal-Wallis H-test for non-normal data, and Welch's ANOVA for self-regulation differences across BMI groups, using SPSS version 30. Results showed no significant differences in physical activity levels across BMI categories, though self-regulation varied, with underweight individuals exhibiting lower scores than normal-weight individuals. Additionally, self-regulation did not significantly predict physical activity across BMI categories or sex. The findings align with SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), and SDG 11 (Sustainable Cities and Communities) by highlighting the need for active environments, structured health interventions, and institutional policies that support physical activity and self-regulation among university students. Universities should enhance walkability, recreational spaces, and policies promoting physical activity. Underweight individuals may benefit from structured exercise, goal-setting, and peer support. Future research should incorporate objective activity measures and diverse self-regulation scales for greater validity and generalizability.
Keywords: self-regulation, physical activity, body mass index, underweight, overweight

Resumen
Este estudio tuvo como objetivo comparar la autorregulación y los niveles de actividad física entre distintas categorías de IMC, además de analizar si la autorregulación predecía la actividad física según el IMC y el sexo. Se utilizó un diseño cuantitativo con herramientas validadas para generar datos numéricos y análisis predictivos. Participaron 339 estudiantes de pregrado de la Universidad Estatal de Bulacán, excluyendo a estudiantes de derecho y posgrado. La autorregulación se midió con la Escala Breve de Autocontrol (BSCS) de 13 ítems y la actividad física con el Cuestionario Internacional de Actividad Física (IPAQ). Se obtuvo aprobación ética previa a la recolección de datos. Se aplicaron análisis de media, desviación estándar, regresión lineal, prueba H de Kruskal-Wallis y ANOVA de Welch con SPSS versión 30. No se encontraron diferencias significativas en los niveles de actividad física entre las categorías de IMC. Sin embargo, la autorregulación fue menor en individuos con bajo peso comparado con los de peso normal. Además, la autorregulación no predijo significativamente la actividad física según IMC o sexo. Los hallazgos se alinean con los ODS 3 (Salud y Bienestar), ODS 4 (Educación de Calidad) y ODS 11 (Ciudades y Comunidades Sostenibles), al resaltar la importancia de ambientes activos e intervenciones estructuradas. Se recomienda a las universidades mejorar la caminabilidad, los espacios recreativos y las políticas que fomenten la actividad física. Estudiantes con bajo peso podrían beneficiarse de metas

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claras, ejercicios estructurados y apoyo entre pares. Futuros estudios deben incluir medidas objetivas y distintas escalas de autorregulación.
Palabras clave: autorregulación, actividad física, índice de masa corporal, bajo peso, sobrepeso

Introduction

Self-regulation

Self-regulation is a multifaceted process encompassing cognitive, behavioral, social, educational, systemic, and ethical dimensions, allowing individuals to control emotions, thoughts, and behaviors in response to internal and external stimuli (Baumeister et al., 2007). Psychologically, it involves managing impulses and actions to achieve long-term goals. At the same time, the neuroscientific perspective highlights executive functions like inhibition, working memory, and cognitive flexibility in regulating cognitive and emotional responses (Miller & Cohen, 2001). Cognitive science emphasizes metacognitive processes such as self-monitoring, self-evaluation, and self-reinforcement in decision-making and problem-solving (Flavell, 1979). Mindfulness fosters emotional balance and mental clarity through reflective awareness (Kabat-Zinn, 1990). Behaviorally, self-regulation involves modifying actions based on societal norms and reinforcement (Bandura, 1991), while developmentally, it supports impulse control and social navigation (Mischel et al., 1989). Socially, it helps individuals adapt to social expectations (Baumeister & Heatherton, 1996), and motivationally, it ensures persistence in goal attainment despite distractions (Deci & Ryan, 2000). In educational and professional settings, it enhances learning, productivity, and self-management (Zimmerman, 2002; Karoly, 1993). Systemically, self-regulation operates through feedback mechanisms, enabling individuals and AI systems to adjust behaviors for stability (Carver & Scheier, 1982; Russell & Norvig, 2021). Ethically and economically, it aligns actions with moral reasoning and financial responsibility (Aristotle, 4th century BCE, as adapted by MacIntyre, 1984; Thaler & Shefrin, 1981). In health and well-being, self-regulation is essential for maintaining physical and mental health through lifestyle choices and stress management (Tangney et al., 2004). Additionally, it plays a crucial role in sustaining high levels of physical activity by facilitating goal-setting, motivation,

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and time management and overcoming barriers like fatigue and distractions, ultimately promoting overall well-being.

Physical Inactivity

Physical inactivity is a growing global health concern, with a significant percentage of the population failing to meet the WHO-recommended 150 minutes of moderate-intensity activity per week (Stubbs et al., 2017). Alarmingly, over 80% of adolescents worldwide remain insufficiently active, largely due to screen-based activities and the decline of structured physical education (Aubert et al., 2021). Women consistently report lower physical activity levels than men across all regions (Çetinkaya & Gürhan, 2024), while high-income countries experience higher inactivity rates due to sedentary work environments, and low-income nations struggle with inadequate infrastructure (Can & Yokuş, 2024). The COVID-19 pandemic reduced physical activity by 30% in some regions, exacerbating the problem (Jagupilla et al., 2024). With rising chronic disease rates linked to inactivity, public health efforts must prioritize structured interventions to promote movement and exercise globally (Jagupilla et al., 2024). One of the many culprits of these statistics could be the behavioral aspect of an individual about physical activity. It was suggested that individuals who set goals, monitor progress, and adjust behaviors are more likely to maintain active lifestyles. Studies show that individuals with strong self-regulation engage in 40% more weekly physical activity (Aubert et al., 2021), while adolescents practicing goal setting and time management demonstrate a 20% increase in adherence (Jagupilla et al., 2024). Interventions focusing on self-regulation strategies, such as cognitive restructuring and habit formation, improve long-term engagement, particularly in sedentary populations (Can & Yokuş, 2024). Social support and self-rewarding behaviors enhance exercise consistency (Çetinkaya & Gürhan, 2024). Additionally, fitness-tracking technology improves self-regulation, leading to a 25% increase in daily step counts due to real-time feedback and self-monitoring (Yayli et al., 2024). Although physical inactiveness can be due to issues concerning Sedentary Lifestyles and Screen Time, Urbanization and Built Environment, Socioeconomic Barriers, Workplace and Occupational Changes, Health Conditions and Disabilities, Cultural and Social Norms, and Weather Climate Conditions, psychological barriers can

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also be a reason. This issue aligns with Sustainable Development Goals (SDG) 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities), emphasizing the need for health-promoting environments and policies that encourage active lifestyles.

BMI and Physical Activity levels

Literature, directly and indirectly, suggests that Body mass Index categories had different physical activity levels. Individuals with higher BMI levels tend to engage in less physical activity, with the relationship being stronger in obese individuals than in non-obese ones. Overweight and obese individuals perform significantly less moderate-to-vigorous activity and spend more time sedentary (Hemmingsson & Ekelund, 2007). Studies indicate that obese individuals engage in 19-25% less physical activity, especially on weekends (Hansen et al., 2013). Among older adults (60-64 years), higher BMI and prolonged obesity history are linked to lower daily activity levels (O'Connor et al., 2015). In children, BMI differences in physical activity are not evident at age six but become more pronounced as they grow, with overweight and obese children showing a greater decline in activity levels (Jago et al., 2019). It was the same case for self-regulation. Studies suggest that self-regulation may vary across BMI categories. Poor impulse control and difficulty delaying gratification contribute to increased weight gain over time (Francis & Susman, 2009). Intuitive eating mediates this relationship, as individuals with better self-regulation are more likely to rely on internal hunger cues and maintain a lower BMI (Ruzanska & Warschburger, 2019). Early childhood self-regulation deficits, particularly in emotional control and inhibitory response, are predictors of future obesity (Graziano et al., 2010). Gender differences also exist, as among girls, eating in the absence of hunger and poor delay of gratification predict BMI increases (Hughes et al., 2020).

Additionally, in individuals with severe obesity, better self-regulation is associated with more successful weight loss maintenance (Halberstadt et al., 2017). Self-regulation influences physical activity differently across BMI groups. In Malaysian adolescents, higher controlled regulation in females was linked to overweight status (Ganason et al., 2022). Among women, obesity was associated with lower physical function scores, indicating that BMI moderates self-regulation's impact on physical

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activity (Carraça et al., 2013). Additionally, normal-weight individuals demonstrated more accurate self-regulation in physical activity recall than overweight and obese individuals (Elliot et al., 2014). Body Mass Index (BMI) influences physical activity levels, with higher BMI associated with reduced activity and increased sedentary behavior. At the same time, self-regulation varies across BMI categories, affecting weight gain, physical activity engagement, and weight maintenance, with differences observed across age, gender, and obesity severity.

Self-regulation and Physical activity

It was established through existing literature, including studies and theories, that self-regulation is related to the physical activity of various populations. Dual-process theories highlight deliberate and habitual self-regulation mechanisms in maintaining physical activity (Strobach et al., 2020), with self-monitoring, goal-setting, and social support particularly effective (Umstattd et al., 2008). Among clinical populations, self-regulation significantly impacts physical activity in obese individuals (Annesi, 2011), patients with multiple sclerosis (Cederberg et al., 2018), and post-bariatric surgery patients (Bergh et al., 2016). Mobile-based self-monitoring enhances self-regulation in prediabetic individuals (MacPherson et al., 2018). Among adolescents, self-regulatory techniques mediate the motivation-activity relationship (Nurmi et al., 2014) and predict physical activity intentions (Biddle et al., 1999), with weather conditions influencing bidirectionality (Wilson & Spink, 2020). In young children, classroom-based movement interventions enhance self-regulation and physical activity (Ureña et al., 2020). Family influences also matter, as parental self-regulation shapes children's activity levels (Butson et al., 2014), while social support fosters self-regulation in older adults (Umstattd et al., 2006). Longitudinal studies confirm that self-regulation leads to sustained physical activity (Monge-Rojas et al., 2020) and supports academic performance in children (Vasilopoulos & Ellefson, 2019). Self-regulation in physical activity varies by gender, with men exhibiting higher intrinsic motivation and self-efficacy while women rely more on social support and external motivation (Lauderdale et al., 2015; Hohl et al., 2019; Chae et al., 2013). Among older adults, women's self-regulation correlates with social support, whereas men's self-regulation is more independent (Umstattd et al., 2006). Additionally,

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women tend to have lower self-confidence in physical activity, impacting their ability to self-regulate effectively (Lirgg, 1991). Gender-specific interventions, particularly structured programs, benefit college females by promoting self-regulation (Milroy et al., 2015). Self-regulation is essential for maintaining physical activity across populations, influencing behavior through goal-setting, self-monitoring, social support, and habit formation, with impacts seen in clinical groups, adolescents, children, and older adults while supporting long-term activity and academic performance.

Gaps and Aims

Self-regulation is crucial for maintaining physical activity across populations, influencing goal-setting, self-monitoring, social support, and habit formation. It varies by BMI, gender, and clinical conditions, with higher BMI linked to lower activity levels and men showing greater intrinsic motivation than women, who rely more on social support. Among adolescents and children, self-regulatory techniques enhance motivation and participation, while in clinical populations, it aids physical activity in obesity and chronic conditions. Structured interventions, cognitive strategies, and fitness tracking improve long-term engagement, confirming self-regulation's role in sustaining activity and overall well-being. Although the literature on self-regulation and physical activity is abundant, there are gaps. First, no studies have focused on investigating this variable among Filipino collegiate students. This population gap may give an incomplete view of the relationship of the variables. Secondly, the relationship between the two was not investigated across BMI categories and sex. This contextual gap can lead to a too-generalized idea of the relationship. With this, the aims of the study were developed. The study compared the level of self-regulation and physical activity across BMI categories. Also, it investigated the predictive capability of self-regulation to physical activity levels across BMI categories and sex. Lastly, hypotheses were developed by considering the existing literature.

H_1	Physical activity is different across BMI categories
H_2	Self-regulation is different across BMI categories
H_3	Self-regulation has a direct influence on physical activity level

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Methodology

Research Design

The study utilized a quantitative research approach, with variables assessed using validated and reliable tools that generated numerical data. Additionally, predictive analysis explored the relationship between self-regulation and perceived physical fitness level.

Sampling and respondents

The study population consisted of 339 students from various colleges at a state university enrolled during the second semester of the Academic Year 2024–2025. Inclusion criteria were applied to ensure the selection of qualified respondents. Eligible participants had to be bona fide students of Bulacan State University. Exclusion criteria were also established for students in graduate school and law school. These groups were excluded because their academic demands, age profiles, and physical activity patterns differ significantly from the general undergraduate population, which could introduce confounding variables into the analysis of self-regulation and physical activity. Additionally, participants retained the right to withdraw from the study at any time. These criteria were designed to ensure rigor in sampling. The sampling method employed was simple random sampling. The respondents were grouped based on their Body Mass Index (BMI) category. Respondents with a BMI of less than 18.5 were classified as underweight (N = 72) (Weir & Jan, 2019). Normal-weight respondents (N = 199) had BMIs within the range of 18.51 to 24.9 (Weir & Jan, 2019). As for the overweight group (N = 68), the BMI classification was 30.00 and above (Weir & Jan, 2019). Table 1 presents the demographic profile of the respondents, categorized by BMI classification into underweight, normal weight, and overweight. The data analysis used mean and standard deviation for age, weight, height, and BMI. The mean age for underweight respondents is 19.17 ± 1.36 years, for normal-weight respondents 19.84 ± 1.84 years, and for overweight respondents 19.96 ± 2.08 years, with an overall mean age of 19.72 ± 1.814 years. The mean weight for underweight respondents is 46.03 ± 7.22 kg, for normal-weight respondents 56.14 ± 8.65 kg, and for overweight respondents 77.44 ± 16.14 kg, with an overall mean weight of 58.27 ± 14.63 kg. The mean height for underweight respondents is 164.83 ± 15.89 cm,

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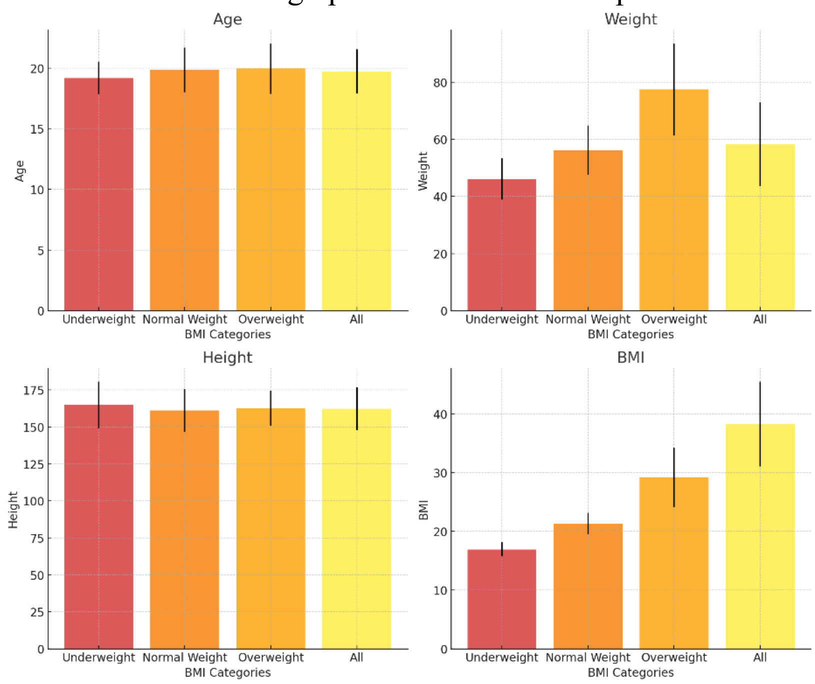
for normal-weight respondents 161.17 ± 14.47 cm, and for overweight respondents 162.67 ± 12.02 cm, with an overall mean height of 162.25 ± 14.35 cm. The mean BMI for underweight respondents is 16.93 ± 1.20, for normal-weight respondents 21.31 ± 1.84, and overweight respondents 29.21 ± 5.09, with an overall mean BMI of 38.30 ± 7.23.4

Table 1. Demographic Profile of the Respondents



BMI categories	Age	Weight	Height	BMI
Underweight	19.17±1.36	46.03±7.22	164.83±15.89	16.93±1.20
Normal Weight	19.84±1.84	56.14±8.65	161.17±14.47	21.31±1.84
Overweight	19.96±2.08	77.44±16.14	162.67±12.02	29.21±5.09
All	19.72±1.814	58.27±14.63	162.25±14.35	38.30±7.23

Research Instrument

13-item Brief Self-Control Scale (BSCS)

The 13-item Brief Self-Control Scale (BSCS) (Tangney et al., 2004) was used to measure assessing the self-regulation of the respondents. Adapted from the original 36-item Self-Control Scale, it evaluates behaviors such as goal-setting, habit regulation, and resistance to temptation (Tangney et al., 2004). The BSCS demonstrates good reliability, with Cronbach's alpha ranging from 0.70 to 0.85 and moderate to high test-retest reliability (de Ridder et al., 2012; Duckworth & Kern, 2011). It also exhibits strong

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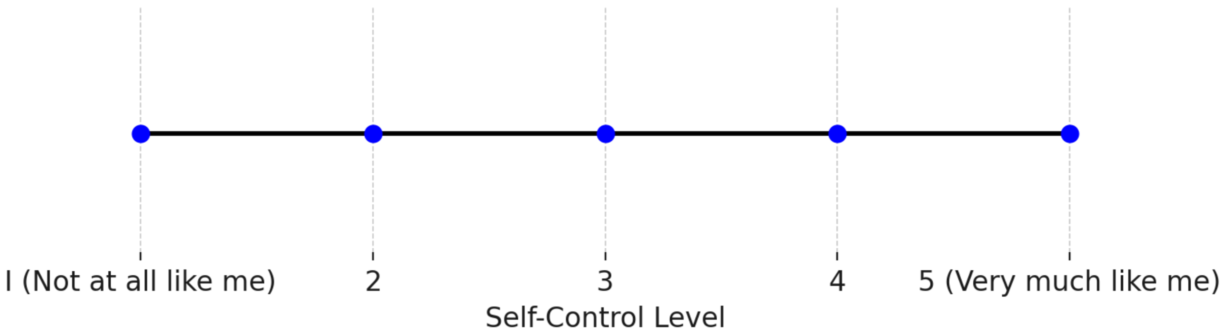
validity, with convergent validity through correlations with conscientiousness, executive function, and emotional regulation (Maloney et al., 2012), and predictive validity, as higher scores are associated with better academic performance, healthier lifestyles, and lower impulsivity (Tsukayama et al., 2012). Additionally, its construct validity aligns with theoretical models of self-control (Tangney et al., 2004), making it a valuable tool for research and practical applications. Figure 1 presents the instrument's rating scale, ranging from I (not at all like me) to 5 (very much like me).

Figure 1. Rating Scale of Brief Self-Control Scale (BSCS)



has demonstrated good reliability, with test-retest reliability coefficients ranging from 0.66 to 0.88, indicating consistency in responses over time (Booth, 2000; Craig et al., 2003). Its validity has been assessed through comparisons with accelerometer-based measures, showing moderate correlations (r = 0.30–0.50), which support its criterion validity (Ekelund et al., 2006). Additionally, the IPAQ has shown strong construct validity, as it effectively distinguishes between low, moderate, and high activity levels across different demographics (Helmerhorst et al., 2012). Despite some limitations, such as overestimating vigorous activity, it remains a valuable and globally recognized tool for epidemiological research and public health monitoring. Metabolic Equivalent Task was used in the study to measure physical activity level.

Data Gathering

The data gathering commenced with the ethical clearance from the Bulacan State University, College of Sports, Exercise and Recreation Local Research Ethics Committee.

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The Students were asked to accomplish two instruments that measure and quantify the study's variables: the 13-item Brief Self-Control Scale (BSCS) and the International Physical Activity Questionnaire. After this, data analysis commenced.

Data Analysis

Mean and standard deviation describe the respondents' physical activity and self-regulation levels. Linear regression analysis was conducted to determine whether self-regulation could predict subjective physical activity levels. As for the comparative analysis, the normality of the data was checked. Table 2 presented the results of the Shapiro-Wilk test for normality, which assessed whether Physical Activity Level and Self-Regulation across BMI categories as study variables were normally distributed. The p-values indicated that Physical Activity Levels significantly deviated from normality in all BMI groups ($p < .05$), justifying the use of the Kruskal-Wallis H-test, a non-parametric method.

In contrast, Self-Regulation data met the assumption of normality ($p > .05$ across all groups), allowing for Welch's ANOVA. Welch's ANOVA was chosen instead of standard ANOVA because the sample sizes across BMI groups were unequal, making it a more robust option for handling variance heterogeneity. This ensured that the statistical methods used accurately reflected the data distribution. Also, The Bonferroni correction used for the Kruskal-Wallis H-test ensured pairwise comparisons, while the Games-Howell test for Welch's ANOVA accounted for variance heterogeneity and unequal sample sizes. The data was analyzed using SPSS software, version 30.

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Table 2. Tests of Normality

Group	Shapiro-Wilk Statistic	df	Sig.	Statistical Analysis
		Physical Activity Level		
Underweight	0.914	72	<.001	Kruskal Wallis H-test
Normal weight	0.903	199	<.001	
Overweight	0.947	68	0.006	
		Self-Regulation		
Underweight	0.979	72	0.259	Welch's Analysis of Variance
Normal weight	0.987	199	0.057	
Overweight	0.99	68	0.855	

Potential Ethical Issues

The study received approval from the Local In-House Ethics Committee of the College of Sport, Exercise, and Recreation at Bulacan State University. Following ethical clearance, authorization to initiate data collection was obtained from the College's research coordinator. Informed consent was sought from participants prior to their involvement in the study. Access to the research findings was ensured for both participants and the administration of the study site upon request. Additionally, all collected data were handled with strict confidentiality.

Results

Table 3 presents the level of self-regulation and physical activity across BMI categories. The data analysis used mean and standard deviation for physical activity level and self-regulation. The mean physical activity level for underweight respondents is 4298.08 ± 3415.81, for normal-weight respondents 5351.79 ± 3981.05, and overweight respondents 5200.41 ± 3752.44, with an overall mean of 5097.63 ± 3828.74. The mean self-regulation score for underweight respondents is 36.79 ± 6.64, for normal-weight respondents 39.07 ± 7.19, and overweight respondents 37.66 ± 7.77, with an overall mean of 38.304 ± 7.23.

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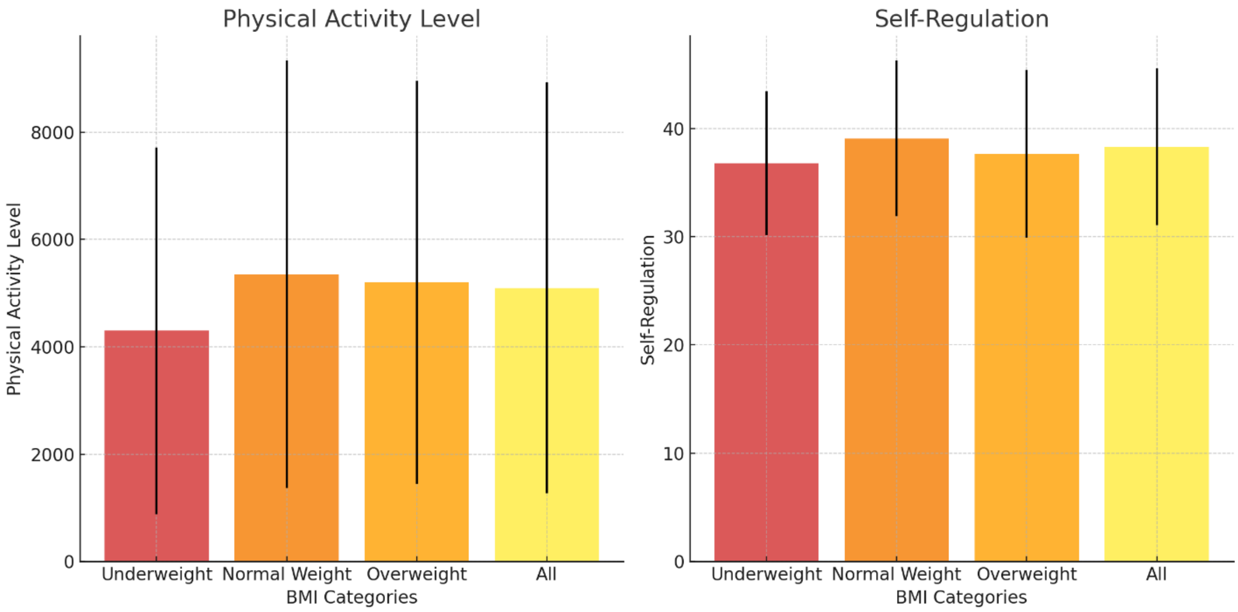
Table 3. Level of self-regulation and physical activity across body mass index (BMI) categories



BMI categories	Physical Activity Level	Self-Regulation
Underweight	4298.08±3415.81	36.79±6.64
Normal Weight	5351.79±3981.05	39.07±7.19
Overweight	5200.41±3752.44	37.66±7.77
All	5097.63±3828.74	38.304±7.23

Table 4 presents the comparative analysis between self-regulation and physical activity across BMI categories using H/F-values and p-values to determine statistical significance. The mean physical activity level for underweight, normal-weight, and overweight respondents was 4298.08 ± 3415.81, 5351.79 ± 3981.05, and 5200.41 ± 3752.44, respectively, with an H/F-value of 3.612 and a p-value of .164, indicating no statistically significant difference in physical activity levels across BMI categories. Bonferroni correction (for Kruskal-Wallis H-test) showed that none of the pairwise comparisons were statistically significant ($p > .05$). The mean self-regulation score for underweight, normal-weight, and overweight respondents was 36.79 ± 6.64, 39.07 ± 7.19, and 37.66 ± 7.77, respectively, with an H/F-value of 2.989 and a p-value of .043, indicating a statistically significant difference. Post hoc analysis using the Games-Howell test (for Welch's ANOVA) showed a significant difference between underweight and normal-weight respondents ($p = .042$) but no significant differences between underweight

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and overweight (p = .758) or normal weight and overweight (p = .390). The findings suggest that physical activity levels do not significantly differ across BMI categories, while self-regulation scores vary, particularly between underweight and normal-weight respondents. With this, H1 was rejected. However, H2 was accepted.

Table 4. Comparative analysis between self-regulation and physical activity across BMI categories

BMI categories	**UW**	**NW**	**OW**	**H/F-value**	**p-value**	**Bonferroni/Games-Howell**		
								Sig
[1]**Physical Activity Level**	4298.08 ±3415.81	5351.79 ±3981.05	5200.41 ±3752.44	3.612	.164	**UW**	**NW**	.067
						UW	**OW**	.135
						NW	**OW**	.996
[2]**Self Regulation**	36.79±6.64	39.07±7.19	37.66±7.77	2.989	.043	**UW**	**NW**	.042
						UW	**OW**	.758
						NW	**OW**	.390

Note. OW=Overweight; UW=underweight; NW=normal weight; [1]= analyzed by Kruskal-Wallis H-test; [2]= analyzed by Welch's ANOVA;

Linear regression examined the predictive relationship between self-regulation and physical activity levels across BMI categories and sex. Table 5 showed that for underweight respondents, self-regulation did not significantly predict physical activity level, explaining only 0.2% of the variance (R^2 = .002, F = .130, p = .719). For normal-weight respondents, self-regulation did not significantly predict physical activity, accounting for 1.1% of the variance (R^2 = .104, F = 2.160, p = .143). Among overweight respondents, self-regulation did not significantly predict physical activity, explaining 0.2% of the variance (R^2 = .002, F = .125, p = .725). For sex-based analysis, self-regulation did not significantly predict physical activity for female respondents, explaining 0.3% of the variance (R^2 = .003, F = .539, p = .464). Similarly, for male respondents, self-regulation did not significantly predict physical activity, accounting for 0.7% of the variance (R^2 = .007, F = 1.052, p = .307). When considering all respondents, self-regulation did not significantly predict physical activity, explaining 0.3% of the variance (R^2 = .003, F = .900, p = .343). This concludes that H3 was rejected.

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Table 5. Predictive analysis of Self-regulation on Physical activity levels across BMI categories and sex

	H		Beta Coefficient	R^2	*F*	*t*-value	*p*-value	Decision
			BMI categories					
Underweight	**H3**	SR→PA	22.182	.002	.130	.361	.719	Rejected
Normal Weight	**H3**	SR→PA	-57.691	.011	2.160	-1.470	.143	Rejected
Overweight	**H3**	SR→PA	-20.970	.002	.125	-.353	.725	Rejected
			Sex					
Female	**H3**	SR→PA	-24.083	.003	.539	-.734	.464	Rejected
Male	**H3**	SR→PA	-48.260	.007	1.052	-1.26	.307	Rejected
			All					
All	**H3**	SR→PA	-27.37	.003	.900	-.949	.343	Rejected

Note. SR=Self-regulation; PA=Physical Activity Level

Discussion

Comparative analysis of Physical Activity across BMI categories

The comparative analysis found no significant difference in physical activity levels across BMI categories. With this, H1 was rejected. The result of the present study contradicts the previous literature about the differences in physical activity across BMI categories. Literature suggests that BMI categories influence physical activity levels, with higher BMI linked to less activity, particularly in obese individuals (Hemmingsson & Ekelund, 2007). Overweight and obese individuals engage in significantly less moderate-to-vigorous activity and more sedentary time (Hansen et al., 2013), with older adults showing lower daily activity levels when BMI is high (O'Connor et al., 2015). In children, BMI differences in activity emerge over time, with overweight and obese children experiencing a greater decline (Jago et al., 2019). Certain literature explains the absence of differences in physical activity across BMI categories. The lack of significant differences in physical activity across BMI categories may stem from self-reported data inaccuracies, where overweight individuals overestimate, and normal-weight individuals underestimate activity levels (Graves, 2011). Overweight and obese individuals may engage in structured activity but compensate with more sedentary behavior, balancing overall activity levels (Hansen et al., 2013). Differences in activity intensity and duration

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could also mask variations, as obese individuals perform less vigorous but similar low-intensity activity (Hemmingsson & Ekelund, 2007).

Additionally, age and lifestyle factors play a role, with BMI-related activity differences emerging later in childhood (Jago et al., 2019). This implies that fitness programs should debunk BMI-based fitness recommendations and instead offer personalized and specified fitness initiatives based on students' needs and motivation. Public fitness campaigns on campus should emphasize holistic well-being rather than focusing solely on weight, particularly lost weight. Additionally, universities should promote active environments by designing walkable campuses, improving access to recreational facilities, and implementing policies encouraging physical activity for all students, regardless of BMI. Limitations in these studies should be considered when interpreting the results. Independent variable was measured through a questionnaire, which is prone to bias. Future studies should focus on measuring physical activity through objective approaches such as wearables.

Comparative analysis of Self-regulation across BMI categories

As for self-regulation, scores varied, with a notable difference between underweight and normal-weight respondents suggesting that underweight individuals have lower self-regulation than normal-weight individuals. With this, H2 was accepted. The result of the present study supports the previous literature about the differences in self-regulation across BMI categories. It was established that poor impulse control and difficulty delaying gratification contribute to weight gain (Francis & Susman, 2009), while better self-regulation supports intuitive eating and lower BMI (Ruzanska & Warschburger, 2019). Early deficits in emotional control predict future obesity (Graziano et al., 2010), with gender differences showing that girls who eat in the absence of hunger and struggle with delayed gratification experience BMI increases (Hughes et al., 2020). In severe obesity, stronger self-regulation aids weight loss maintenance (Halberstadt et al., 2017). BMI moderates self-regulation's impact on physical activity, as higher controlled regulation in Malaysian adolescent females was linked to overweight status (Ganason et al., 2022), and obese women had lower physical function scores (Carraça et al., 2013).

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Additionally, normal-weight individuals demonstrated more accurate self-regulation in recalling physical activity than overweight and obese individuals (Graves, 2011). The result demands that Underweight individuals enhance self-regulation and increase BMI through structured exercise, goal-setting, and self-monitoring, as consistent physical activity improves self-discipline and accountability (Ganason et al., 2022). Supervised strength training, mindful movement, and peer support(Lobo et al., 2025) further promote self-regulation and gradual BMI increase through muscle gain and sustained activity (Graves, 2011; Hergenroeder et al., 2011; Halberstadt et al., 2017; Francis & Susman, 2009). However, the research instrument limited the study's findings, and future studies should use alternative scales for validation. Future studies are recommended to consider this limitation.

Relationship between Self-regulation and Physical Activity

On the predictive analysis, self-regulation did not significantly predict physical activity levels across BMI categories or sex, leading to rejecting H2 and H3. These results contradict the literature that established the relationship between self-regulation and physical activity. Dual-process theories emphasize deliberate and habitual self-regulation in physical activity, with self-monitoring, goal-setting, and social support being key factors (Strobach et al., 2020; Umstattd et al., 2008). Self-regulation influences physical activity in obese individuals (Annesi, 2011), multiple sclerosis patients (Cederberg et al., 2018), post-bariatric patients (Bergh et al., 2016), and prediabetic individuals using mobile self-monitoring (MacPherson et al., 2018). Among adolescents, it mediates motivation-activity relationships (Nurmi et al., 2014) and predicts physical activity intentions (Biddle et al., 1999), while weather conditions influence bidirectionality (Wilson & Spink, 2020). Classroom-based movement enhances self-regulation in young children (Ureña et al., 2020), parental self-regulation shapes children's activity (Butson et al., 2014), and social support aids older adults (Umstattd et al., 2006). Longitudinal studies confirm that self-regulation sustains physical activity (Monge-Rojas et al., 2020) and supports academic performance (Vasilopoulos & Ellefson, 2019). Gender differences exist, with men showing higher intrinsic motivation and self-efficacy while women rely more on social support (Lauderdale et al., 2015; Hohl et al., 2019; Chae et al., 2013).

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Women's self-regulation links to social support, while men's is more independent (Umstattd et al., 2006), with lower female self-confidence affecting activity (Lirgg, 1991). As for causal relationships, structured programs enhance self-regulation in college females (Milroy et al., 2015). Other factors may explain the insignificant relationship between the two variables. Intrinsic motivation and external influences, rather than self-regulation alone, drive physical activity, with normal-weight individuals relying more on internal regulation, while overweight individuals depend on external motivation (Hwang & Kim, 2013). Self-efficacy is a more direct predictor of exercise behavior, with self-regulation impacting activity primarily through its effect on self-efficacy (Annesi & Gorjala, 2010). Among obese individuals, structured interventions incorporating behavioral support are more effective than self-regulation alone (Annesi, 2018). Gender differences also influence activity (Masagca, 2025), with men exhibiting higher intrinsic motivation and self-efficacy while women rely more on social support (Gençay et al., 2016). Among overweight and obese women, social support plays a key role in activity regulation, indicating that external factors are often more impactful than self-regulation alone (Umstattd et al., 2006). Environmental constraints, including access to facilities and lifestyle factors, further weaken the predictive power of self-regulation (Muti et al., 2023). The result implies that the relationship between self-regulation and physical activity has variables that need to be considered, such as motivation, self-efficacy, social support, and environmental constraints. Limitations of the study, such as the generability of the data, can be improved through future studies by using objective measures of physical activity and a variation scale of self-regulation.

Conclusion

The study found no significant difference in physical activity levels across BMI categories, but self-regulation scores varied, with underweight individuals exhibiting lower self-regulation than normal-weight individuals. Additionally, self-regulation did not significantly predict physical activity across BMI categories or sex, suggesting that factors like motivation, self-efficacy, social support, and environmental constraints may influence this relationship. These findings highlight the need for universities to create active environments by improving campus walkability, expanding recreational facilities,

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and implementing policies that encourage physical activity for all students. Underweight individuals should enhance self-regulation and increase BMI through structured exercise, goal-setting, and self-monitoring, while supervised strength training, mindful movement, and peer support can further promote self-discipline and gradual BMI increase (Ganason et al., 2022; Graves, 2011; Hergenroeder et al., 2011; Halberstadt et al., 2017; Francis & Susman, 2009). Future research should address the study's limitations by incorporating objective measures of physical activity, such as wearables, and using varied self-regulation scales to enhance the generalizability and validity of findings.

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