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Filipino resilience: investigating Physical Activity and fitness as indicators of stress and resilience among state university collegiate students

Resiliencia filipina: Investigación de la actividad y la condición físicas como indicadores de estrés y resiliencia en estudiantes universitarios de una universidad estatal

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Abstract
This study explored the associations between physical activity, self-perceived physical fitness, stress reactivity, and resilience among 269 university students (91 females, 178 males) from a Philippine state university. Employing a quantitative, cross-sectional design, data were collected through an online survey using validated instruments that assessed physical activity, perceived fitness, stress reactivity, and resilience. Results showed that males reported significantly higher levels of physical activity and self-perceived fitness, whereas females exhibited greater stress reactivity. Regression analyses indicated that total physical activity positively predicted resilience, particularly among females, but was not significantly associated with stress reactivity. In contrast, self-perceived physical fitness emerged as a stronger and more consistent predictor of resilience and selected stress reactivity outcomes, with effects more pronounced among males. These findings suggest that individuals' perceptions of their fitness may play a more influential role in psychological well-being than the actual volume of physical activity performed. The results also emphasize the importance of sex-responsive health interventions that not only encourage physical engagement but also promote confidence and self-perception of physical competence. Overall, the study contributes to the understanding of how perceived physical fitness shapes resilience and stress responses among young adults in higher education settings. Future research utilizing longitudinal or mixed-method approaches is recommended to establish causality and further explore sex-based psychological mechanisms underlying these associations.

Keywords: physical fitness, physical activity, stress, resilience, Filipino

Resumen
Este estudio exploró las asociaciones entre la actividad física, la condición física autopercibida, la reactividad al estrés y la resiliencia en 269 estudiantes universitarios (91 mujeres y 178 hombres) de una universidad estatal filipina. Mediante un diseño cuantitativo y transversal, se recopilaron datos a través de una encuesta en línea que utilizó instrumentos validados para evaluar la actividad física, la condición física percibida, la reactividad al estrés y la resiliencia. Los resultados mostraron que los hombres reportaron niveles significativamente más altos de actividad física y condición física percibida, mientras que las mujeres presentaron una mayor reactividad al estrés. Los análisis de regresión indicaron que la actividad física total predijo positivamente la resiliencia, especialmente en las mujeres, aunque no se asoció significativamente con la reactividad al estrés. En cambio, la condición física autopercibida emergió como un predictor más sólido y constante de la resiliencia y de ciertos aspectos de la reactividad al estrés, con efectos más pronunciados en los hombres. Estos hallazgos sugieren que la percepción de la propia condición física puede desempeñar un papel más influyente en el bienestar psicológico que el volumen real de actividad física realizada. Los resultados también destacan la importancia de implementar intervenciones en salud sensibles al género que fomenten tanto la participación física como la autoconfianza y la percepción positiva de la competencia física. Se recomienda que futuras investigaciones longitudinales o con métodos mixtos profundicen en los mecanismos psicológicos de género subyacentes a estas asociaciones.

Palabras clave: condición física, actividad física, estrés, resiliencia, filipino

Introduction

Around the world, and increasingly within the Philippines, two concerning public health trends appear to be converging: a steady decline in physical activity and a sharp rise in mental health challenges. Globally, 31% of adults and more than 80% of adolescents fall short of the World Health Organization's recommended physical activity levels, with estimates projecting this inactivity could reach 35% by 2030 (WHO, 2024; PAHO, 2024). In the Philippines, similar concerns have emerged. Recent data show that 82.7% of Filipino adolescents aged 10–17 do not meet basic activity benchmarks, and the nation has received an "F" grade for overall child activity and a "D" in active transportation (Cayaban et al., 2023; Tanchoco et al., 2022). Among university students, only 37% report high levels of physical activity, while 15% fall into the low activity range (Largoza et al., 2021). At the same time, mental health conditions are on the rise: depression now affects 5% of adults globally, while anxiety disorders impact up to 30% over a lifetime (World Health Organization, 2022). The COVID-19 pandemic further accelerated these patterns, with global cases of depression and anxiety surging by 25% in 2020 alone, leading to a staggering loss of 12 billion workdays and over US $1 trillion annually (Santomauro et al., 2021; WHO, 2019). In the Philippines, over 6 million people are estimated to live with depression or anxiety, placing mental illness among the top three causes of disability in the country (Dayrit et al., 2021). Particularly alarming is the growing vulnerability among Filipino youth aged 15–24, where the prevalence of moderate to severe depression more than doubled from 9.6% in 2013 to 20.9% in 2021 (Lagman et al., 2022), with females showing a slightly higher risk than males (Tuliao et al., 2020).

This mental health burden has renewed interest in the concept of resilience, broadly defined as the capacity to maintain or regain well-being in the face of adversity (Herrman et al., 2011). Far from being static, resilience evolves over the lifespan and is shaped by neurobiological processes—such as genetic predispositions and hormonal regulation—as well as by social and environmental influences (Windle, 2011; Pooley &

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Cohen, 2010). In health contexts, resilience enables recovery from illness and the preservation of well-being, even under persistent strain (Babić et al., 2020). On a broader scale, resilience can also reflect community or systemic capacities to remain functional in times of social or economic hardship (Krell, 2019). For this study, resilience is defined as the personal capacity to cope with stress, adapt to adversity, and bounce back from hardship—drawing from individual strengths such as emotional endurance, optimism, and social connectedness (Connor & Davidson, 2003).

Equally important is understanding stress, a complex and multi-layered concept involving biological, psychological, and contextual responses. At the physiological level, stress is regulated by systems such as the hypothalamic-pituitary-adrenal (HPA) axis, which plays a central role in maintaining internal balance during challenging conditions (Fink, 2009; McEwen, 2007; Fink, 2016). Psychological stress arises when perceived demands exceed one's coping resources, often triggering anxiety, fear, or emotional distress (Patel, 1991). Social environments can either cushion or intensify this response, depending on the availability of support and the nature of external pressures (Levine, 1985; Korchin, 1962). From a developmental standpoint, stress is dynamic and shaped by early experiences, coping history, and individual traits (Martin, 2014). Because the term "stress" is frequently applied in ambiguous ways, it is necessary to define it precisely: here, stress is understood as a disruption to psychological and physiological equilibrium, characterized by emotional regulation challenges, reduced adaptability, and strain on support systems and coping mechanisms (Connor & Davidson, 2003; Charlton, 1992).

Research consistently supports that physical activity and physical fitness can mitigate stress and enhance resilience. Physical activity—any bodily movement that requires energy expenditure—and physical fitness—the ability to carry out tasks with vigor and minimal fatigue—are not only essential for physical health but also for psychological well-being (Caspersen et al., 1985; Schomer & Drake, 2001). Higher levels of fitness are associated with reduced psychological distress and enhanced self-esteem (Kumar, 2016; Muniyappa, 2024). Those who are physically active also tend to show improved emotional regulation, better social functioning, and overall higher psychological well-being (Appelqvist-Schmidlechner et al., 2017; Wheatley et al., 2020).

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Physiologically, physical activity supports mental health by modulating the HPA axis and sympathetic nervous system, promoting neuroplasticity, and decreasing chronic inflammation—all of which enhance resilience and emotional regulation (Silverman & Deuster, 2014; Begega et al., 2024). Moreover, fitness—especially aerobic and muscular—has been linked to reduced emotional reactivity and higher self-efficacy, which are key components of stress resilience (Neumann et al., 2021; Ochmann et al., 2021). Intervention-based studies further validate that fitness can reduce cortisol levels and improve stress management capacity (Ochmann et al., 2021; Lines et al., 2021; Ueno et al., 2024; Hegberg & Tone, 2015). A longitudinal study from Sweden found that youth with low fitness and low resilience were at significantly greater risk of developing heart disease later in life (Bergh et al., 2015). In the Philippine context, local studies echo these findings, showing that physical activity is positively associated with psychological well-being, resilience, and lower perceived stress among Filipino university students (Largoza et al., 2021; Cayaban et al., 2023).

Despite growing evidence, critical gaps in the literature remain. First, a population-specific gap exists: most research on physical activity, fitness, and mental health is based on Western populations, with limited data on Filipino state university students—a group exposed to unique academic, economic, and cultural pressures (Silverman & Deuster, 2014; Bergh et al., 2015; Neumann et al., 2021). Second, a conceptual gap persists as many studies treat stress and resilience as separate constructs, rather than examining how they interact as psychological outcomes influenced by physical health (Lines et al., 2021). Third, there is a methodological gap due to the reliance on objective fitness measures, which are often impractical in resource-limited academic settings and neglect the role of subjective fitness perceptions (Neumann et al., 2021). Lastly, a measurement gap is evident in the underuse of validated tools like the Perceived Stress Reactivity Scale (PSRS) in Philippine research, which can provide a more nuanced understanding of individual stress responses.

This study aims to address these gaps by examining the associations between physical activity (measured using the International Physical Activity Questionnaire [IPAQ]), subjective physical fitness (via the Subjective Physical Fitness Scale), stress

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reactivity (via the Perceived Stress Reactivity Scale [PSRS]), and resilience (via the Connor-Davidson Resilience Scale [CD-RISC]) among collegiate students at a Philippine state university. By integrating behavioral and perceptual metrics with culturally appropriate psychological tools, this research offers a grounded, context-specific contribution to understanding how physical health relates to stress and resilience in youth navigating academic life in a low-resource environment.

The following hypotheses guide this study:

- **H1**: Physical activity has a significant influence on stress reactivity.
- **H2**: Physical activity has a significant influence on resilience.
- **H3**: Physical fitness has a significant influence on stress reactivity.
- **H4**: Physical fitness has a significant influence on resilience.

Methodology

Research Design

This study adopted a quantitative, cross-sectional design to investigate the extent to which physical activity and perceived fitness predict stress reactivity and resilience in a college student population. Utilizing validated assessment tools and predictive modeling, the analysis quantified the contribution of these physical health variables to individual differences in stress response and resilience.

Sampling and respondents

A total of 269 students (91 females and 178 males) were selected using simple random sampling from a state university located in Region 3, Philippines. All participants were officially enrolled in the Physical Activity Towards Health and Fitness 1 course during the first semester of the 2025–2026 academic year. To ensure methodological consistency, the study applied clear inclusion and exclusion criteria: only bona fide students formally registered in the course were included, while those with prior formal athletic training or from satellite campuses were excluded to ensure uniformity in baseline fitness exposure and institutional context. The final sample of 269 exceeds the minimum requirement for regression analysis involving two predictors, surpassing the

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recommended threshold of 10 to 15 participants per variable (Green, 1991; Tabachnick & Fidell, 2019), thereby improving the statistical power and reliability of coefficient estimates. Additionally, the substantial representation of both sexes allows for robust sex-based subgroup analyses, supporting generalizability across male and female university students. Table 1 presents the demographic characteristics of the respondents. The sample comprised a larger proportion of males than females, with both groups showing a relatively similar mean age of around 19 years. As expected, males were generally taller and heavier than females, resulting in a higher average body mass index (BMI). Overall, the participants represented a young and physically varied population, providing a balanced sample for examining relationships among physical activity, perceived fitness, stress reactivity, and resilience.

Table 1

Demographic profile of the respondents

Sex	Age	Height	Weight	BMI
Female (91)	19.52 ± 2.02	155.97 ± 5.71	54.40 ± 16.47	13.24 ± 3.98
Male (178)	19.26 ± 1.72	168.86 ± 7.77	66.73 ± 18.73	19.19 ± 6.02
All (269)	19.35 ± 1.83	164.50 ± 9.39	62.56 ± 18.92	17.18 ± 6.11

Note: Values represent mean ± standard deviation. BMI = body mass index.

Research Instrument

Perceived stress reactivity was measured using the 23-item Perceived Stress Reactivity Scale (PSRS), which captures individuals' typical behavioral and emotional responses to everyday stressors across five subdomains: *Prolonged Reactivity*, *Reactivity to Work Overload*, *Reactivity to Social Conflict*, *Reactivity to Failure*, and *Reactivity to Social Evaluation*. Each item describes a stress-inducing scenario accompanied by three response options, rated on a 3-point Likert scale (0 = low reactivity to 2 = high reactivity). Subscale and total scores were computed by summing relevant items, with reverse scoring applied where specified. The PSRS has shown robust psychometric properties, including acceptable internal consistency (α = 0.62–0.89), moderate to high test–retest reliability (r = .67–.85), and strong construct validity, demonstrated through associations with neuroticism, self-efficacy, chronic stress, depressive symptoms, and sleep disturbances

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(Schlotz et al., 2011). To evaluate its factorial validity, a confirmatory factor analysis (CFA) was conducted. Applying a standardized loading cutoff of .50, one item ("I take criticism personally") was removed from the *Reactivity to Social Conflict* subscale due to insufficient loading. All remaining items produced acceptable to strong standardized factor loadings, ranging from 0.573 to 0.801, and were statistically significant ($p < .001$). The overall model demonstrated good fit: $\chi^2(199) = 427$, $p < .001$; CFI = 0.910; TLI = 0.896; SRMR = .0482; and RMSEA = .0653, 90% CI [.0568, .0738]. Internal consistency was also acceptable across all subscales, with Cronbach's alpha values of .731 for *Prolonged Reactivity*, 0.773 for *Reactivity to Work Overload*, .766 for *Reactivity to Social Conflict*, .825 for *Reactivity to Failure*, and .853 for *Reactivity to Social Evaluation*

Resilience was assessed using the Connor-Davidson Resilience Scale (CD-RISC), a 25-item self-report measure designed to capture individuals' capacity to adapt to stress and adversity. Items are rated on a 5-point Likert scale ranging from 0 ("not true at all") to 4 ("true nearly all the time"), with total scores ranging from 0 to 100—higher scores indicating greater resilience. The CD-RISC reflects several dimensions of resilience, including adaptability, emotional regulation, self-efficacy, and perceived control. Psychometric evaluation of the instrument has demonstrated strong internal consistency ($\alpha = 0.89$), excellent test–retest reliability (ICC = 0.87), and evidence of convergent validity through correlations with hardiness, perceived stress, stress vulnerability, and social support (Connor & Davidson, 2003). CFA was conducted to examine the factorial validity of the scale. All items yielded statistically significant standardized loadings, ranging from 0.596 to 1.000, exceeding the .50 threshold. Factor loadings by subscale were: *Personal Competence* (0.614–0.789), *Trust in One's Instincts* (0.596–0.785), *Positive Acceptance of Change* (0.701–.811), *Control* (0.736–.817), and *Spiritual Influences* (1.000). The model demonstrated acceptable fit: $\chi^2(266) = 993$, $p < .001$; CFI = 0.833; TLI = 0.811; and RMSEA = 0.101, 90% CI [0.0942, 0.108]. Reliability across subscales was high, with Cronbach's alpha coefficients of .891 for *Personal Competence*, .899 for *Trust in One's Instincts*, 0.859 for *Positive Acceptance of Change*, and 0.750 for *Control*. Alpha was not calculated for *Spiritual Influences* due to the subscale comprising a single item.

Physical activity was measured using the International Physical Activity Questionnaire (IPAQ), a globally recognized self-report instrument with strong psychometric credentials. The IPAQ has demonstrated good test–retest reliability (r = 0.66–0.88) (Booth, 2000; Craig et al., 2003) and acceptable criterion validity, with moderate correlations observed between self-reported activity and objective accelerometer-based measures (r = 0.30–0.50; Ekelund et al., 2006). It has also shown construct validity across diverse populations, effectively distinguishing between low, moderate, and high physical activity levels (Helmerhorst et al., 2012). In this study, responses were converted into Metabolic Equivalent of Task (MET) scores to enable standardized comparison across physical activity intensities.

Subjective physical fitness was evaluated using the Self-Perception of Physical Fitness Scale, a validated tool developed for adolescents aged 11 to 18.9 years. The scale measures four domains of fitness: *morphological fitness*, *muscular strength*, *motor fitness*, and *cardiovascular fitness*. Participants responded using a 3-point Likert scale (1 = Strongly Disagree, 2 = Neutral, 3 = Strongly Agree), with higher scores indicating more positive self-perceptions. The scale has been validated for adolescent populations, showing strong internal consistency and construct validity (Cossio-Bolaños et al., 2016). To examine its factorial structure, a CFA was performed using a .50 loading threshold, with all items retained. Standardized factor loadings ranged from 0.595 to 0.821, and all were statistically significant ($p < 0.001$), reflecting moderate to strong associations with their respective factors. Model fit statistics indicated adequate fit: $\chi^2(129) = 407$, $p < 0.001$; CFI = 0.897; TLI = .877; SRMR = 0.0580; RMSEA = 0.0895, 90% CI [0.0798, 0.0994]; AIC = 6738; and BIC = 6954. Internal consistency was acceptable across subscales, with Cronbach's alpha values of 0.811 for *Morphological Fitness*, 0.851 for *Muscular Strength*, 0.847 for *Motor Fitness*, and 0.793 for *Cardiovascular Fitness*.

Data Gathering

Following ethical approval from a state university in Region III, Philippines, data were collected using an online survey hosted on Google Forms. Participants were randomly selected and invited to voluntarily complete the survey, which included all

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validated measurement instruments. The online format allowed for broad accessibility and standardized administration, contributing to consistent and reliable data quality across the sample.

Data Analysis

To examine whether physical activity and perceived physical fitness significantly predicted stress reactivity and resilience, multiple linear regression analysis was conducted. All statistical procedures were performed using IBM SPSS Statistics version 30, ensuring methodological rigor and consistency in analyzing the predictive relationships among the study variables.

Potential Ethical Issues

The study was conducted in full compliance with ethical research standards, following formal approval from the ethics committee of a state university college in Region III, Philippines. Data collection was coordinated through the College's research office to ensure proper oversight. Prior to participation, all individuals were thoroughly informed about the study's objectives, procedures, and confidentiality safeguards. Informed consent was obtained electronically. To promote transparency and uphold research integrity, participants were also notified that study findings would be made available to both them and the university administration upon request.

Results

Figure 1 presents the self-perceived physical fitness of the respondents across five dimensions. For the morphological dimension (MORPH), females reported a mean of 2.21 ± 0.53, whereas males reported a slightly higher mean of 2.32 ± 0.44, with the overall mean being 2.28 ± 0.48; the difference was not statistically ACCEPTED, $t(155.36) = -1.80$, $p = .074$, $d = -0.246$. In terms of muscular strength (MUSCST), females scored 1.97 ± 0.50 while males scored 2.39 ± 0.43, yielding an overall mean of 2.25 ± 0.50; this difference was ACCEPTED, $t(160.15) = -6.91$, $p < .001$, $d = -0.933$. For the motor dimension (MOTOR), females obtained a mean of 2.07 ± 0.48 and males 2.37 ± 0.45, with an overall mean of 2.27 ± 0.48, showing an ACCEPTED difference, $t(170.74) = -$

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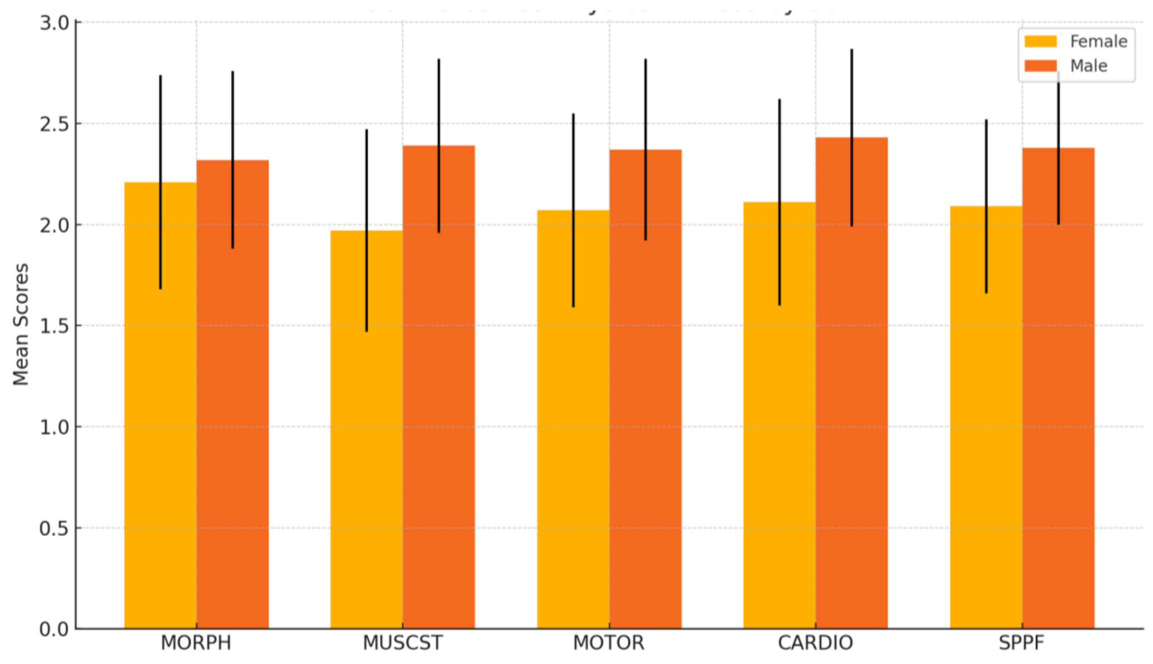
4.95, *p* < .001, *d* = -0.652. The cardiovascular dimension (CARDIO) mean for females was 2.11 ± 0.51, compared to 2.43 ± 0.44 for males, with an overall mean of 2.32 ± 0.49; this difference was also ACCEPTED, *t*(160.09) = -5.14, *p* < .001, *d* = -0.695. Lastly, in overall self-perceived physical fitness (SPPF), females reported 2.09 ± 0.43 and males 2.38 ± 0.38, with an overall mean of 2.28 ± 0.42, again showing a ACCEPTED difference, *t*(161.18) = -5.41, *p* < .001, *d* = -0.728.

Figure 1

Self-perceived physical fitness of the respondents



	Female	Male	All	t-value	p-value	*d*
MORPH	2.21 ± 0.53	2.32 ± 0.44	2.28 ± 0.48	-1.8	0.074	-0.246
MUSCST	1.97 ± 0.50	2.39 ± 0.43	2.25 ± 0.50	-6.909	< .001	-0.933
MOTOR	2.07 ± 0.48	2.37 ± 0.45	2.27 ± 0.48	-4.947	< .001	-0.652
CARDIO	2.11 ± 0.51	2.43 ± 0.44	2.32 ± 0.49	-5.143	< .001	-0.695

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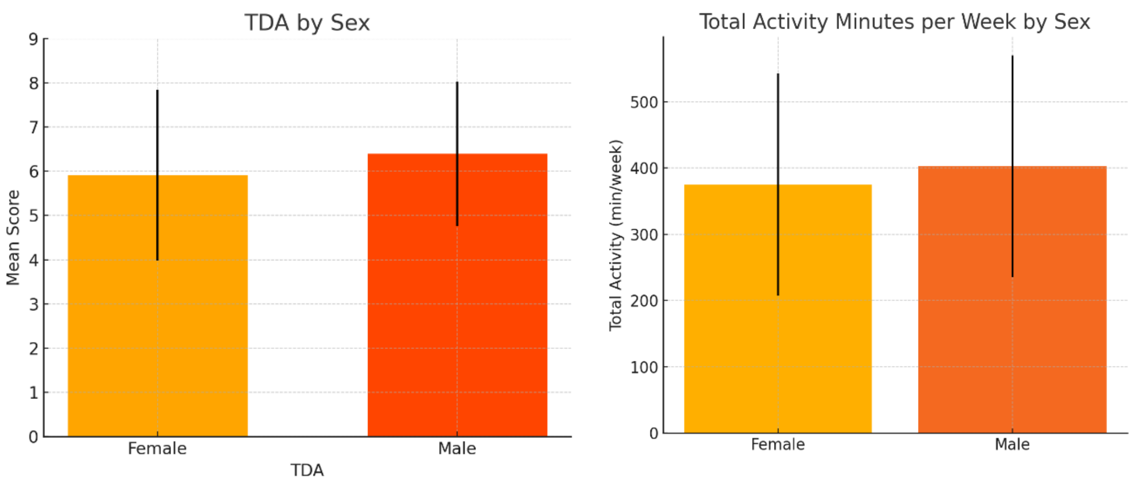
SPPF	2.09 ± 0.43	2.38 ± 0.38	2.28 ± 0.42	-5.408	< .001	-0.728

Note. *MORPH* = Morphological Dimension, *MUSCST* = Muscular Strength, *MOTOR* = Motor Dimension, *CARDIO* = Cardiovascular Dimension, *SPPF* = Self-Perceived Physical Fitness. Values reflect comparisons between male and female respondents using Welch's *t*-test.

Figure 2 presents the physical activity levels of the respondents. For total days of activity (TDA), females reported a mean of 5.91 ± 1.93, while males reported 6.39 ± 1.63, with an overall mean of 6.23 ± 1.75; t(156.87) = –2.01, p = .047, d = –0.273. In total activity minutes per week (TMW), females scored 375.16 ± 168.21 compared to males at 402.81 ± 167.09, yielding an overall mean of 393.46 ± 167.98; t(179.94) = –1.27, p = .205, d = –0.164. For vigorous MET-minutes per week (VIGMET), females averaged 3201.76 ± 2631.05 and males 3866.97 ± 2884.81, with an overall mean of 3641.93 ± 2819.16; t(196.36) = –1.89, p = .060, d = –0.237. In moderate MET-minutes per week (MODMET), females obtained a mean of 1498.02 ± 1240.89 compared to 1967.19 ± 1457.21 in males, with an overall mean of 1808.48 ± 1405.45; t(208.37) = –2.75, p = .006, d = –0.337. Walking MET-minutes per week (WALKMET) was 1718.90 ± 1196.99 for females and 2006.70 ± 1231.58 for males, with an overall mean of 1909.34 ± 1227.56; t(185.62) = –1.84, p = .068, d = –0.235. Finally, total MET-minutes per week (TOTMET) averaged 6418.68 ± 4542.18 for females and 7840.85 ± 4858.56 for males, with an overall mean of 7359.75 ± 4801.27; t(192.12) = –2.36, p = .019, d = –0.298.

Figure 2

Physical activity levels of the respondents



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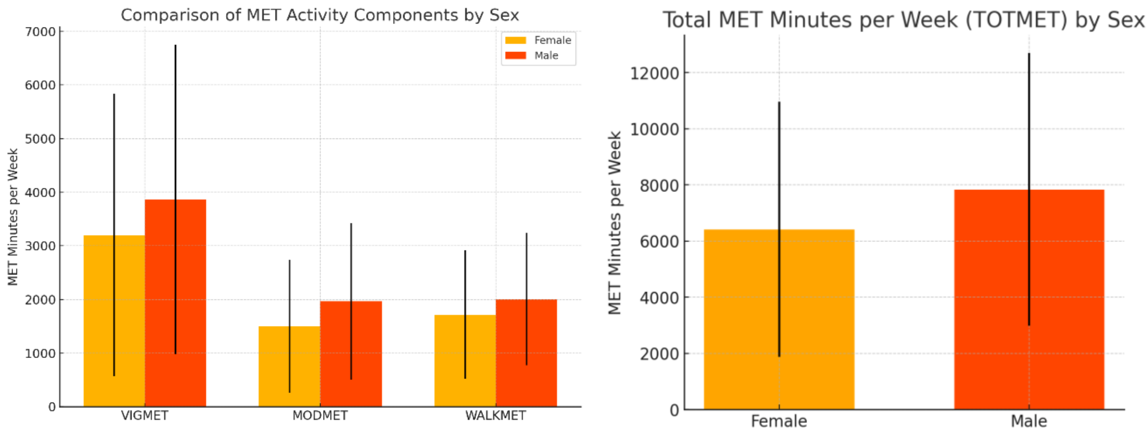

	Female	Male	All	t	p	*d*
TDA	5.91 ± 1.93	6.39 ± 1.63	6.23 ± 1.75	-2.006	0.047	-0.273
TMW	375.16 ± 168.21	402.81 ± 167.09	393.46 ± 167.98	-1.272	0.205	-0.164
VIGMET	3201.76 ± 2631.05	3866.97 ± 2884.81	3641.93 ± 2819.16	-1.89	0.060	-0.237
MODMET	1498.02 ± 1240.89	1967.19 ± 1457.21	1808.48 ± 1405.45	-2.75	0.006	-0.337
WALKMET	1718.90 ± 1196.99	2006.70 ± 1231.58	1909.34 ± 1227.56	-1.839	0.068	-0.235
TOTMET	6418.68 ± 4542.18	7840.85 ± 4858.56	7359.75 ± 4801.27	-2.362	0.019	-0.298

Note. *TDA* = Total Days of Activity, *TMW* = Total Activity Minutes per Week, *VIGMET* = Vigorous MET-Minutes per Week, *MODMET* = Moderate MET-Minutes per Week, *WALKMET* = Walking MET-Minutes per Week, *TOTMET* = Total MET-Minutes per Week. Values reflect comparisons between male and female respondents using Welch's *t*-test.

Figure 3 presents the comparison of stress reactivity scores between female and male respondents across six subscales: Prolonged Reactivity (PR), Reactivity to Work Overload (RWO), Reactivity to Social Conflict (RSC), Reactivity to Failure (RF), Reactivity to Social Evaluation (RSE), and Perceived Stress Reactivity (PSR). Independent-samples *t*-tests indicated significant sex differences across all subscales. Specifically, females demonstrated higher stress reactivity than males in PR, $t(183.27)$ =

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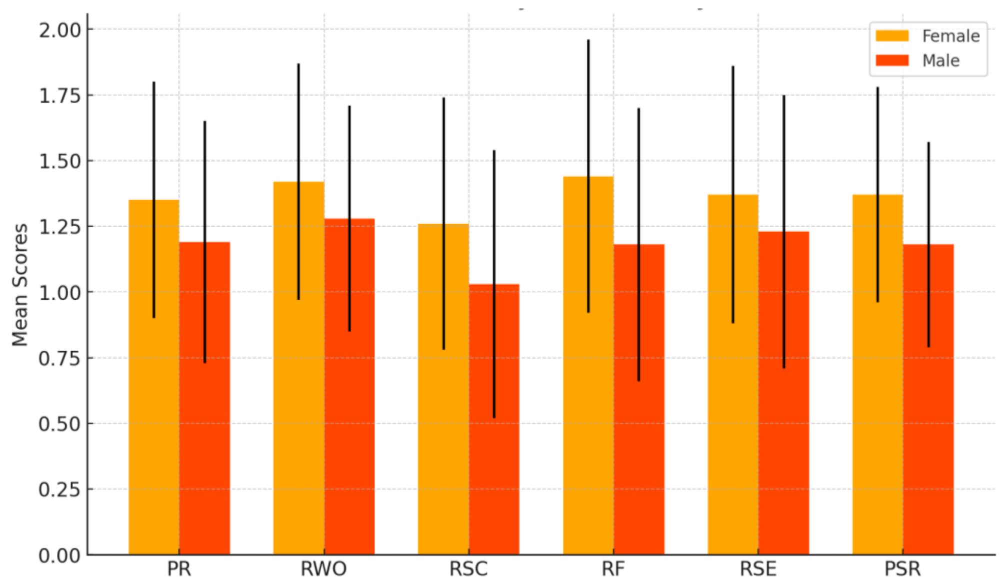
2.68, p = .008, d = 0.34; RWO, $t(176.25) = 2.48$, p = .014, d = 0.32; RSC, $t(191.07)$ = 3.61, $p < .001$, d = 0.46; RF, $t(181.66) = 3.80$, $p < .001$, d = 0.49; RSE, $t(189.91) = 2.12$, p = 0.036, d = 0.27; and PSR, $t(174.01) = 3.54$, $p < .001$, d = 0.46. Across all domains, female respondents consistently exhibited higher mean scores, indicating stronger and more prolonged stress responses. The effect sizes ranged from small to moderate, suggesting meaningful sex differences in stress reactivity. Overall, these findings imply that female students tend to experience higher physiological and emotional reactivity to stressors than males, aligning with prior research that links sex-related differences to coping styles, emotional regulation, and perceived stress sensitivity.

Figure 3

Stress reactivity levels of the respondents



	Female	Male	Total	t-value	p-value	*d*
PR	1.35 ± 0.45	1.19+0.46	4.97 ± 1.84	2.68	.008	0.344
RWO	1.42 ± 0.45	1.28 ± 0.43	1.33 ± 0.44	2.484	.014	0.324
RSC	1.26 ± 0.48	1.03 ± 0.51	1.11 ± 0.51	3.606	<.001	0.456
RF	1.44 ± 0.52	1.18 ± 0.52	1.27 ± 0.53	3.804	<.001	0.49
RSE	1.37 ± 0.49	1.23 ± 0.52	1.28 ± 0.52	2.116	0.036	0.268
PSR	1.37 ± 0.41	1.18 ± 0.39	1.25 ± 0.41	3.544	<.001	0.46

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Note. *PR* = Prolonged Reactivity, *RWO* = Reactivity to Work Overload, *RSC* = Reactivity to Social Conflict, *RF* = Reactivity to Failure, *RSE* = Reactivity to Social Evaluation, *PSR* = Perceived Stress Reactivity. Values reflect comparisons between male and female respondents using Welch's *t*-test.

Figure 4 presents the comparison of resilience scores between female and male respondents across six domains: Personal Competence, High Standards, and Tenacity (PCHST); Trust in One's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress (TINST); Positive Acceptance of Change and Secure Relationships (PACSR); Control (CTRL); Spiritual Influences (SPI); and Total Resilience (TR). Independent-samples *t*-tests revealed no statistically significant sex differences across any of the resilience domains. Specifically, the analyses showed the following results: PCHST, $t(267) = 0.44$, $p = 0.664$, $d = 0.06$; TINST, $t(267) = -0.85$, $p = 0.397$, $d = -0.12$; PACSR, $t(267) = 0.32$, $p = 0.748$, $d = 0.04$; CTRL, $t(267) = -0.10$, $p =0 .923$, $d = -0.01$; SPI, $t(267) = 0.82$, $p = 0.415$, $d = 0.11$; and TR, $t(267) = 0.17$, $p = 0.866$, $d = 0.02$. Although females had slightly higher mean scores across most subscales, the differences were minimal and statistically nonsignificant. These findings suggest that male and female students demonstrated comparable levels of resilience, indicating similar capacities to cope with stress, maintain emotional stability, and adapt to challenges. The absence of significant sex differences aligns with prior research suggesting that resilience may be influenced more by individual psychological factors and coping mechanisms than by sex alone.

Figure 4

Resilience levels of the respondents

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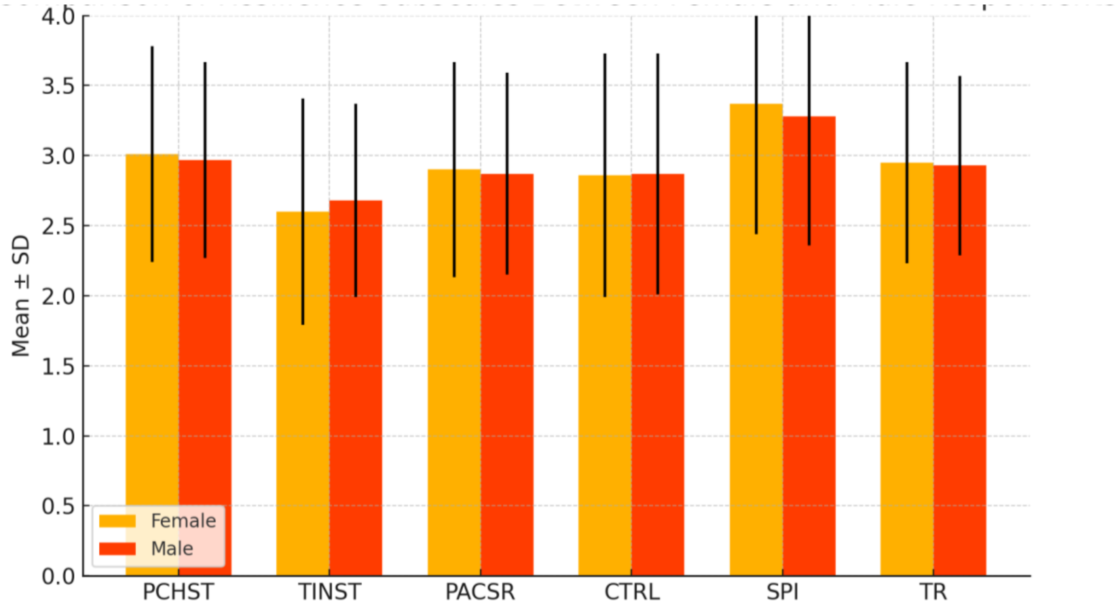

	Female	Male	Total	t-value	p-value	*d*
PCHST	3.01 ± 0.77	2.97 ± 0.70	2.98 ± 0.72	0.435	0.664	0.058
TINST	2.60 ± 0.81	2.68 ± 0.69	2.65 ± 0.73	-0.849	0.397	-0.115
PACSR	2.90 ± 0.77	2.87 ± 0.72	2.88 ± 0.73	0.322	0.748	0.043
CTRL	2.86 ± 0.87	2.87 ± 0.86	2.86 ± 0.87	-0.096	0.923	-0.012
SPI	3.37 ± 0.93	3.28 ± 0.92	3.31 ± 0.93	0.817	0.415	0.106
TR	2.95 ± 0.72	2.93 ± 0.64	2.94 ± 0.67	0.169	0.866	0.023

Note. *PCHST* = Personal Competence, High Standards, and Tenacity; *TINST* = Trust in One's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress; *PACSR* = Positive Acceptance of Change and Secure Relationships; *CTRL* = Control; *SPI* = Spiritual Influences; *TR* = Total Resilience. Values reflect comparisons between male and female respondents using Welch's *t*-test.

Multiple regression analyses revealed that total physical activity (TOTMET) did not significantly predict any of the stress reactivity variables, including prolonged reactivity (PR), reactivity to work overload (RWO), reactivity to social conflict (RSC),

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reactivity to failure (RF), reactivity to social evaluation (RSE), and perceived stress reactivity (PSR), all ps > 0.05. In contrast, TOTMET significantly predicted several resilience dimensions, including personal competence, high standards, and tenacity (PCHST; $\beta = 0.212$, $R^2 = 0.045$, $p < 0.001$), trust in one's instincts, tolerance of negative affect, and strengthening effects of stress (TINST; $\beta = 0.318$, $R^2 = 0.101$, $p < 0.001$), positive acceptance of change and secure relationships (PACSR; $\beta = 0.251$, $R^2 = 0.063$, $p < 0.001$), control (CTRL; $\beta = 0.273$, $R^2 = 0.074$, $p < 0.001$), and total resilience (TR; $\beta = 0.252$, $R^2 = 0.063$, $p < 0.001$). These results indicate that TOTMET accounted for approximately 4.5% to 10.1% of the variance in these outcomes. Spiritual influences (SPI) were not significantly predicted by TOTMET ($p = 0.492$). Regarding self-perceived physical fitness (SPPF), nonsignificant associations were found with most stress reactivity outcomes, except for reactivity to social conflict (RSC; $\beta = –0.130$, $R^2 = 0.017$, $p = 0.033$), where SPPF explained 1.7% of the variance. In contrast, SPPF significantly predicted all resilience dimensions: PCHST ($\beta = 0.349$, $R^2 = 0.122$, $p < 0.001$), TINST ($\beta = 0.418$, $R^2 = 0.175$, $p < 0.001$), PACSR ($\beta = 0.372$, $R^2 = 0.139$, $p < 0.001$), CTRL ($\beta = 0.336$, $R^2 = 0.113$, $p < 0.001$), SPI ($\beta = 0.244$, $R^2 = 0.060$, $p < 0.001$), and TR ($\beta = 0.402$, $R^2 = 0.162$, $p < 0.001$), accounting for 6.0% to 17.5% of the variance in resilience.

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Table 2

Hypothesis testing on the variables among all the respondents

		Beta Coefficient	R^2	*F*	*t*-value	*p*-value	Decision
H1	TOTMET→PR	0.071	0.005	1.336	1.156	0.249	REJECTED
	TOTMET→RWO	0.012	0	0.041	0.203	0.839	REJECTED
	TOTMET→RSC	-0.015	0	0.057	-0.24	0.811	REJECTED
	TOTMET→RF	0.008	0	0.018	0.134	0.894	REJECTED
	TOTMET→RSE	-0.064	0.004	1.111	-1.054	0.293	REJECTED
	TOTMET→PSR	0.001	0	0	0.012	0.99	REJECTED
H2	TOTMET→PCHST	0.212	0.045	12.558	3.544	<.001	ACCEPTED
	TOTMET→TINST	0.318	0.101	29.991	5.476	<.001	ACCEPTED
	TOTMET→PACSR	0.251	0.063	17.884	4.229	<.001	ACCEPTED
	TOTMET→CTRL	0.273	0.074	21.463	4.633	<.001	ACCEPTED
	TOTMET→SPI	0.042	0.002	0.473	0.688	0.492	REJECTED
	TOTMET→TR	0.252	0.063	18.07	4.251	<.001	ACCEPTED
H3	SPPF→PR	0.005	0	0.007	0.085	0.932	REJECTED
	SPPF→RWO	0.114	0.013	3.542	1.882	0.061	REJECTED
	SPPF→RSC	-0.13	0.017	4.583	-2.141	0.033	ACCEPTED
	SPPF→RF	-0.009	0	0.021	-0.144	0.886	REJECTED
	SPPF→RSE	-0.093	0.009	2.328	-1.526	0.128	REJECTED

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	SPPF→PSR	-0.033	0.001	0.287	-0.535	0.593	REJECTED
H4	**SPPF→PCHST**	0.349	0.122	37.054	6.087	< .001	ACCEPTED
	SPPF→TINST	0.418	0.175	56.677	7.528	< .001	ACCEPTED
	SPPF→PACSR	0.372	0.139	42.931	6.552	< .001	ACCEPTED
	SPPF→CTRL	0.336	0.113	34.081	5.838	< .001	ACCEPTED
	SPPF→SPI	0.244	0.06	16.922	4.114	< .001	ACCEPTED
	SPPF→TR	0.402	0.162	51.489	7.176	< .001	ACCEPTED

Note. *PR* = Prolonged Reactivity, *RWO* = Reactivity to Work Overload, *RSC* = Reactivity to Social Conflict, *RF* = Reactivity to Failure, *RSE* = Reactivity to Social Evaluation, *PSR* = Perceived Stress Reactivity; *PCHST* = Personal Competence, High Standards, and Tenacity; *TINST* = Trust in One's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress; *PACSR* = Positive Acceptance of Change and Secure Relationships; *CTRL* = Control; *SPI* = Spiritual Influences; *TR* = Total Resilience; *TOTMET* = Total MET-Minutes per Week

Among female respondents, total physical activity (TOTMET) did not significantly predict any of the stress reactivity variables, including prolonged reactivity (PR), reactivity to work overload (RWO), reactivity to social conflict (RSC), reactivity to failure (RF), reactivity to social evaluation (RSE), and perceived stress reactivity (PSR), all ps > 0.05. In contrast, TOTMET significantly predicted several resilience dimensions, including personal competence, high standards, and tenacity (PCHST; $\beta = 0.357$, $R^2 = 0.127$, $p = 0.001$), trust in one's instincts, tolerance of negative affect, and strengthening effects of stress (TINST; $\beta = 0.368$, $R^2 = 0.135$, $p = 0.001$), positive acceptance of change and secure relationships (PACSR; $\beta = 0.278$, $R^2 = 0.077$, $p = 0.008$), control (CTRL; $\beta = 0.418$, $R^2 = 0.175$, $p = 0.001$), and total resilience (TR; $\beta = 0.337$, $R^2 = 0.114$, $p = 0.001$), with explained variance ranging from 7.7% to 17.5%. Spiritual influences (SPI) were not significantly predicted by TOTMET ($p = 0.501$).Regarding self-perception of physical fitness (SPPF), no significant associations were observed with PR, RSC, RSE, or SPI (all

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ps > 0.05). However, SPPF significantly predicted RWO (β = 0.295, R^2 = 0.087, p = 0.005), RF (β = 0.240, R^2 = 0.058, p = 0.022), and PSR (β = 0.229, R^2 = 0.053, p = 0.029), accounting for 5.3% to 8.7% of variance in stress reactivity. Furthermore, SPPF significantly predicted all resilience dimensions except SPI, including PCHST (β = 0.376, R^2 = 0.142, p < 0.001), TINST (β = 0.435, R^2 = 0.189, p < 0.001), PACSR (β = 0.408, R^2 = 0.166, p < 0.001), CTRL (β = 0.407, R^2 = 0.166, p < 0.001), and TR (β = 0.413, R^2 = 0.170, p < 0.001), with explained variance ranging from 14.2% to 18.9%.

Table 3

Hypothesis testing on the variables among all the female respondents

		Beta Coefficient	***R^2***	***F***	***t-value***	***p-value***	**Decision**
H1	**TOTMET→PR**	0.161	0.026	2.37	1.54	0.127	REJECTED
	TOTMET→RWO	0.096	0.009	0.834	0.913	0.364	REJECTED
	TOTMET→RSC	0.076	0.006	0.519	0.72	0.473	REJECTED

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	TOTMET→RF	0.126	0.016	1.426	1.194	0.236	REJECTED
	TOTMET→RSE	0.081	0.007	0.59	0.768	0.445	REJECTED
	TOTMET→PSR	0.126	0.016	1.436	1.198	0.234	REJECTED
H2	**TOTMET→PCHST**	0.357	0.127	12.984	3.603	0.001	ACCEPTED
	TOTMET→TINST	0.368	0.135	13.95	3.735	0.001	ACCEPTED
	TOTMET→PACSR	0.278	0.077	7.466	2.732	0.008	ACCEPTED
	TOTMET→CTRL	0.418	0.175	18.848	4.341	0.001	ACCEPTED
	TOTMET→SPI	0.071	0.005	0.456	0.675	0.501	REJECTED
	TOTMET→TR	0.337	0.114	11.41	3.378	0.001	ACCEPTED
H3	**SPPF→PR**	0.186	0.035	3.183	1.784	0.078	REJECTED
	SPPF→RWO	0.295	0.087	8.495	2.915	0.005	ACCEPTED
	SPPF→RSC	0.175	0.031	2.811	1.677	0.097	REJECTED
	SPPF→RF	0.24	0.058	5.437	2.332	0.022	ACCEPTED
	SPPF→RSE	0.089	0.008	0.711	0.843	0.401	REJECTED
	SPPF→PSR	0.229	0.053	4.938	2.222	0.029	ACCEPTED
H4	**SPPF→PCHST**	0.376	0.142	14.691	3.833	<.001	ACCEPTED
	SPPF→TINST	0.435	0.189	20.77	4.557	<.001	ACCEPTED
	SPPF→PACSR	0.408	0.166	17.753	4.213	<.001	ACCEPTED
	SPPF→CTRL	0.407	0.166	17.709	4.208	<.001	ACCEPTED
	SPPF→SPI	0.192	0.037	3.408	1.846	0.068	REJECTED
	SPPF→TR	0.413	0.17	18.256	4.273	<.001	ACCEPTED

Note. *PR* = Prolonged Reactivity, *RWO* = Reactivity to Work Overload, *RSC* = Reactivity to Social Conflict, *RF* = Reactivity to Failure, *RSE* = Reactivity to Social Evaluation, *PSR* = Perceived Stress Reactivity; *PCHST* = Personal Competence, High Standards, and

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Tenacity; *TINST* = Trust in One's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress; *PACSR* = Positive Acceptance of Change and Secure Relationships; *CTRL* = Control; *SPI* = Spiritual Influences; *TR* = Total Resilience; *TOTMET* = Total MET-Minutes per Week

Among male respondents, total physical activity (TOTMET) did not significantly predict any of the stress reactivity variables, including prolonged reactivity (PR), reactivity to work overload (RWO), reactivity to social conflict (RSC), reactivity to failure (RF), reactivity to social evaluation (RSE), and perceived stress reactivity (PSR), all ps > 0.05. For resilience dimensions, TOTMET significantly predicted trust in one's instincts, tolerance of negative affect, and strengthening effects of stress (TINST; $\beta = 0.286$, $R^2 = 0.082$, $p < 0.001$), positive acceptance of change and secure relationships (PACSR; $\beta = 0.245$, $R^2 = 0.060$, $p = 0.001$), control (CTRL; $\beta = 0.206$, $R^2 = 0.042$, $p = 0.006$), and total resilience (TR; $\beta = 0.214$, $R^2 = 0.046$, $p = 0.004$), accounting for 4.2% to 8.2% of the variance. However, TOTMET was not a significant predictor of personal competence, high standards, and tenacity (PCHST; $p = 0.051$) or spiritual influences (SPI; $p = 0.604$). Regarding self-perception of physical fitness (SPPF), no significant effects were found for PR, RWO, RF, RSE, or PSR (all ps > 0.05). SPPF significantly predicted reactivity to social conflict (RSC; $\beta = -0.199$, $R^2 = 0.039$, $p = 0.008$), accounting for 3.9% of its variance. In terms of resilience, SPPF significantly predicted all dimensions, including PCHST ($\beta = 0.381$, $R^2 = 0.145$, $p < 0.001$), TINST ($\beta = 0.417$, $R^2 = 0.174$, $p < 0.001$), PACSR ($\beta = 0.397$, $R^2 = 0.157$, $p < 0.001$), CTRL ($\beta = 0.323$, $R^2 = 0.105$, $p < 0.001$), spiritual influences (SPI; $\beta = 0.326$, $R^2 = 0.107$, $p < 0.001$), and TR ($\beta = 0.440$, $R^2 = 0.194$, $p < 0.001$), with explained variance ranging from 10.5% to 19.4%.

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Table 4

Hypothesis testing on the variables among all the male respondents

		Beta Coefficient	R^2	*F*	*t*-value	*p*-value	Decision
H1	**TOTMET→PR**	0.064	0.004	0.733	0.856	0.393	REJECTED
	TOTMET→RWO	0.004	0	0.003	0.054	0.957	REJECTED
	TOTMET→RSC	-0.012	0	0.024	-0.156	0.876	REJECTED
	TOTMET→RF	0.001	0	0	0.019	0.985	REJECTED
	TOTMET→RSE	-0.106	0.011	1.99	-1.411	0.16	REJECTED
	TOTMET→PSR	-0.015	0	0.04	-0.2	0.842	REJECTED
H2	**TOTMET→PCHST**	0.146	0.021	3.847	1.961	0.051	REJECTED
	TOTMET→TINST	0.286	0.082	15.691	3.961	<.001	ACCEPTED
	TOTMET→PACSR	0.245	0.06	11.278	3.358	0.001	ACCEPTED
	TOTMET→CTRL	0.206	0.042	7.778	2.789	0.006	ACCEPTED
	TOTMET→SPI	0.039	0.002	0.271	0.52	0.604	REJECTED
	TOTMET→TR	0.214	0.046	8.428	2.903	0.004	ACCEPTED
H3	**SPPF→PR**	-0.009	0	0.014	-0.118	0.906	REJECTED
	SPPF→RWO	0.104	0.011	1.923	1.387	0.167	REJECTED
	SPPF→RSC	-0.199	0.039	7.225	-2.688	0.008	ACCEPTED
	SPPF→RF	-0.027	0.001	0.13	-0.361	0.719	REJECTED

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	SPPF→RSE	-0.135	0.018	3.281	-1.811	0.072	REJECTED
	SPPF→PSR	-0.075	0.006	0.988	-0.994	0.322	REJECTED
H4	**SPPF→PCHST**	0.381	0.145	29.86	5.464	<.001	ACCEPTED
	SPPF→TINST	0.417	0.174	37.143	6.095	<.001	ACCEPTED
	SPPF→PACSR	0.397	0.157	32.893	5.735	<.001	ACCEPTED
	SPPF→CTRL	0.323	0.105	20.566	4.535	<.001	ACCEPTED
	SPPF→SPI	0.326	0.107	21	4.583	<.001	ACCEPTED
	SPPF→TR	0.44	0.194	42.284	6.503	<.001	ACCEPTED

Note. *PR* = Prolonged Reactivity, *RWO* = Reactivity to Work Overload, *RSC* = Reactivity to Social Conflict, *RF* = Reactivity to Failure, *RSE* = Reactivity to Social Evaluation, *PSR* = Perceived Stress Reactivity; *PCHST* = Personal Competence, High Standards, and Tenacity; *TINST* = Trust in One's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress; *PACSR* = Positive Acceptance of Change and Secure Relationships; *CTRL* = Control; *SPI* = Spiritual Influences; *TR* = Total Resilience; *TOTMET* = Total MET-Minutes per Week

Discussion

This study examined sex differences in physical fitness, physical activity, stress reactivity, and resilience, and assessed how total physical activity and self-perceived fitness predicted stress reactivity and resilience. Overall, consistent sex-based differences emerged in fitness, activity, and stress reactivity, while resilience was largely comparable between males and females. Notably, self-perceived fitness was a stronger and more consistent predictor of resilience than total physical activity, with neither variable strongly linked to stress reactivity. Male participants reported significantly higher self-perceived fitness in muscular strength, motor, cardiovascular, and overall dimensions, though not in morphological fitness. Males also engaged in more activity days, moderate METs, and total METs, while both sexes showed similar minutes per week, vigorous METs, and

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walking METs. These findings align with prior studies showing males generally outperform females in strength, cardiovascular, and motor fitness (Fernández-Rodríguez et al., 2024; Hunter et al., 2023; Hunter & Senefeld, 2024; Nuzzo, 2022; Román et al., 2017) and engage more in physical activity (Brazo-Sayavera et al., 2021; Marçal et al., 2024; Owen et al., 2024; Romero-Parra et al., 2022; Whipple et al., 2022; Masagca, 2024). In Filipino contexts, these disparities may reflect cultural norms limiting female participation, highlighting the need for inclusive, gender-sensitive activity programs.

Females exhibited higher stress reactivity across all subscales—prolonged reactivity, work overload, social conflict, failure, social evaluation, and overall perceived stress—consistent with evidence that females show greater emotional sensitivity to stress (Bangasser et al., 2018; Goldfarb et al., 2019; Handa et al., 2022; Herman et al., 2024). These differences may stem from heightened corticotropin-releasing factor sensitivity and stronger hypothalamic-pituitary-adrenal (HPA) activation (Bangasser et al., 2018; Handa & McGivern, 2009), as well as neuroimaging evidence of greater limbic activation in females and prefrontal engagement in males (Bürger et al., 2023; Goldfarb et al., 2019). Such findings underscore the value of sex-sensitive stress interventions emphasizing emotional regulation, particularly for females.

No significant sex differences were observed in resilience, consistent with literature showing resilience is evenly distributed across sexes (Gök & Koğar, 2021; Bornscheuer et al., 2024; Yalcin-Siedentopf et al., 2020). Minor domain-specific differences—spiritual or psychological—appear in certain contexts (Barnová et al., 2024; Chen et al., 2024), but overall resilience remains comparable, reflecting shared genetic and psychological determinants (Boardman et al., 2008; Eissman et al., 2022).

Regression analyses showed total physical activity did not predict stress reactivity but significantly predicted several resilience dimensions—personal competence, trust in one's instincts, positive acceptance of change, control, and overall resilience—excluding spiritual influences. This supports evidence that activity influences resilience through psychological mechanisms such as self-efficacy (Li et al., 2024; Peng et al., 2025) rather than physiological stress markers (Mücke et al., 2018; Neumann et al., 2021; Smith et al., 2024; Van Der Mee et al., 2022). Self-perceived fitness was a stronger and more

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consistent predictor, significantly associated with all resilience domains and modestly linked to lower social conflict reactivity (Neumann et al., 2021; Plante et al., 2000).

Sex-specific analyses further clarified these trends: among females, total physical activity predicted most resilience domains but not stress reactivity, while self-perceived fitness predicted nearly all resilience outcomes and several stress reactivity subscales (Belcher et al., 2020; Cao et al., 2024; Filippou et al., 2024; Neumann et al., 2021; Plante et al., 2000; Qiu et al., 2025). Among males, total physical activity predicted trust in one's instincts, positive acceptance of change, control, and overall resilience, while self-perceived fitness predicted all resilience dimensions and lower reactivity to social conflict (Neumann et al., 2021; Plante et al., 2000; Qiu et al., 2025). These findings emphasize the psychological importance of fitness perceptions in enhancing resilience and regulating stress, particularly among females.

Contributions and Limitations. This study uniquely contributes to Filipino research by integrating behavioral and perceptual measures to explore how physical activity and perceived fitness relate to stress reactivity and resilience—an approach not yet applied locally. Prior Filipino studies (e.g., Largoza et al., 2021; Cayaban et al., 2023) examined general links between activity, well-being, and stress but lacked multidimensional tools like the PSRS and CD-RISC or a focus on perceived fitness as a psychological factor. By combining IPAQ-based activity data with self-perceived fitness, this study offers a culturally grounded understanding of how physical health relates to psychological resilience among Filipino university students. However, its reliance on self-report measures limits objectivity and generalizability due to potential response bias. Future studies should incorporate objective fitness tests and stress biomarkers, and employ qualitative or mixed-method designs to capture the contextual and experiential dimensions shaping fitness, stress, and resilience in Filipino youth.

Conclusions

This study revealed that males reported significantly higher self-perceived physical fitness—excluding the morphological dimension—and higher physical activity levels in terms of total activity days, moderate METs, and total METs, while females demonstrated significantly higher stress reactivity across all subscales. No significant sex differences were found in resilience, with both groups showing comparable levels across all dimensions. Although total physical activity did not predict stress reactivity, it was a significant predictor of several resilience dimensions, excluding spiritual influences. In contrast, self-perceived physical fitness emerged as a stronger and more consistent predictor, significantly associated with all resilience dimensions and modestly linked to lower social conflict reactivity. Among females, physical activity predicted most resilience domains but not stress reactivity, whereas self-perceived fitness predicted nearly all resilience outcomes and several stress reactivity subscales. For males, physical activity was linked to select resilience dimensions, while self-perceived fitness predicted all resilience outcomes and lower reactivity to social conflict. These findings underscore the psychological value of perceived fitness—particularly for females—in enhancing resilience and managing stress, reinforcing the need for sex-sensitive, confidence-focused physical activity interventions and inclusive, culturally responsive health promotion programs. Nonetheless, the study's reliance on self-report measures and cross-sectional design limits causal interpretation, highlighting the importance of future research using objective assessments and longitudinal or qualitative approaches to deepen and validate these insights.

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