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# The Relationship Between Stress and Adolescent Academic Perception Ability Based on Gender and Body Mass Index

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**KEYWORDS**

adolescents, stress, academic perception ability, BMI, mental health

**ABSTRACT**

Stress in adolescents has the potential to impact various aspects of physical and mental health, including perceived academic ability. Differences in gender and nutritional status, such as body mass index (BMI), can affect stress levels and academic perception abilities in adolescents. This study aims to assess the relationship between stress and academic perception abilities based on gender and BMI in high school-aged adolescents. An observational analytical method with a cross-sectional approach was conducted on 53 students aged ≤18 years at SMAN 2 Parepare. Data were collected through an online questionnaire using the Indonesian version of the *PSS-10* instrument and the *TASES* scale. BMI was calculated from weight and height. Data were analyzed using the t-test, ANOVA, and Pearson correlation. Results show there were no significant differences in stress scores or academic perception abilities based on gender and BMI category ($p > 0.05$). There was no significant relationship between stress and academic perception abilities ($r = –0.02$; $p = 0.901$). Thus, gender and BMI status do not significantly influence stress and academic perception abilities. Other factors, such as coping strategies and social support, need further investigation.

## INTRODUCTION

Adolescence is a complex and dynamic developmental stage, marking the transition from childhood to adulthood (Backes & Bonnie, 2019). Biologically, this period is characterized by significant physiological changes, including puberty, endocrine system maturation, and rapid growth that affects body structure and central nervous system function, particularly in the prefrontal cortex, which plays a role in decision-making and emotional regulation. Beyond biological aspects, adolescence is also marked by psychological changes, including the formation of self-identity, strengthening *self-esteem*, and the search for meaning in social roles within the family and community. During this phase, individuals begin to develop reflective abilities and emotional autonomy but remain vulnerable to emotional fluctuations, peer group influences, and the dynamics of external pressures. Therefore, adolescents often experience ambivalence in balancing the need for social acceptance and personal achievement.

Stress is a natural reaction of an organism when faced with a stressful situation. This reaction can be adaptive or detrimental, depending on the intensity. In the educational context, academic stress is the pressure arising from learning demands and is associated with a variety

of symptoms, including sleep disturbances, anxiety, cognitive decline, and academic problems. One indicator of the impact of stress is the perception of learning ability, or *perceived academic ability*.

Academic self-perception, often referred to in the literature as *academic self-perception*, is an important aspect of educational psychology that reflects a student's internal assessment of their own academic competence. This concept refers to the extent to which an individual believes they are capable of understanding course material, completing school assignments, participating in learning, and achieving desired educational goals. In other words, academic self-perception encompasses not only cognitive evaluations of learning ability but also reflects the accompanying affective and motivational dimensions (Marsh & Martin, 2011).

Academic self-perception is formed through a complex interaction between previous learning experiences, feedback from teachers and parents, and the social environment, such as peer support and classroom atmosphere. Students with positive academic self-perceptions tend to demonstrate high levels of self-confidence in learning, are more willing to face challenges, and are more persistent in completing difficult tasks. Conversely, students with negative perceptions of their academic abilities often give up easily, avoid challenging tasks, and are more likely to experience academic anxiety.

Academic self-perceptions also play a crucial role in emotional regulation, particularly in the face of learning pressure or academic failure. Students with positive self-perceptions generally have more adaptive coping skills, are able to manage frustration, and are less easily affected by academic stress. In the long term, this contributes to academic resilience, the ability to persist, thrive, and achieve despite environmental obstacles or pressures.

In the context of adolescents, *academic perception ability* does not exist in isolation but is influenced by various personal and environmental factors, including gender and nutritional status. One indicator commonly used to assess nutritional status is the *Body Mass Index* (BMI), which is the ratio of body weight (in kilograms) to the square of height (in meters). BMI is a simple screening tool used by the WHO to categorize nutritional status into underweight, normal weight, overweight, and obesity, based on specific standards for children and adolescents aged 5–19 years.

Nutritional status reflects a person's health, which is influenced by nutrient intake, nutrient utilization by the body, and metabolic status. In adolescents, nutritional status is particularly important because they are in a phase of rapid growth and development, both physically and cognitively. A BMI that is too low (*underweight*) can indicate chronic malnutrition, which impacts energy, concentration, and learning stamina. Conversely, a BMI that is too high (*overweight* or *obesity*) can affect body image and self-esteem, and increase the risk of social stigma and isolation, which in turn can negatively impact academic self-confidence.

Gender is one factor that influences stress and academic performance. Various studies have shown that adolescent girls tend to experience higher levels of stress than adolescent boys, likely influenced by hormonal fluctuations, social expectations, and the dual roles they play in daily life. Meanwhile, extreme BMIs, whether too low or too high, can potentially impact self-image and self-confidence, which are important components in shaping academic

perceptions. Therefore, gender and nutritional status are two variables that potentially contribute to adolescents' psychological health and academic success.

Early detection of psychosocial factors affecting adolescent health is crucial; therefore, studies are needed that examine the relationship between stress and academic perceptions based on biological factors such as gender and BMI. The purpose is to analyze the relationship between stress and academic perception abilities in adolescents and to identify differences based on gender and BMI category.

Several researchers have examined the interplay between BMI, gender, and adolescent psychological outcomes, yet gaps remain in understanding their combined effect on academic self-perception under stress. Nam and Park (2021) investigated how obesity—measured via BMI and self-perceived weight—affects adolescent stress and well-being in Korean youth, revealing that perceived obesity, not actual BMI, significantly influences stress, moderated by gender. While their findings highlight perception's importance, they did not examine academic self-assessment or how stress intersects with learning in educational contexts. Similarly, Nanu et al. (2015) longitudinally found that higher BMI during adolescence predicts long-term body dissatisfaction, negatively impacting self-esteem. However, this study focused on general well-being rather than academic domains and did not consider gender differences or stress effects on perceived learning ability.

The objective is to identify the differential impact of stress on academic self-perception among adolescents, moderated by gender and BMI category. The benefits include evidence-based recommendations for educators and school counselors to tailor interventions—e.g., stress management programs and body-positive education—that enhance academic confidence and resilience among diverse student groups.

## RESEARCH METHOD

This research was an observational analytical study with a cross-sectional design. It aimed to evaluate the relationship between stress levels, perceived academic ability, gender, and nutritional status in adolescents. This approach was chosen because it was appropriate for evaluating the relationship between variables at a single observation point, without direct intervention on the research subjects.

The target population in this study was students at SMA Negeri 2 Parepare. Inclusion criteria included students aged ≤18 years, willingness to participate, and completion of a complete questionnaire. Of the total participants, 53 respondents who met the criteria were included in the analysis. The sample selection process was conducted using a non-probabilistic total sampling technique, considering limited access and the focus on a specific school-aged adolescent population.

Data collection was conducted using an online questionnaire via Google Forms, consisting of three main sections: demographic data, a stress scale using the validated Indonesian version of the *Perceived Stress Scale-10* (PSS-10), with a score range of 0–40, where higher scores indicated greater levels of perceived stress. Academic self-perception was then assessed using the Indonesian version of the *Tanjung Academic Self-Efficacy Scale* (TASES), with a score range of 25–125, where higher scores reflected higher academic self-confidence.

Nutritional status was measured using the *Body Mass Index* (BMI), calculated by dividing weight (kg) by the square of height ($m^2$). BMI categories were determined based on the 2007 WHO standards for children and adolescents aged 5–19 years, which categorize BMI into underweight, normal, overweight, and obese based on z-scores.

Statistical analysis was performed using SPSS version 26 software. To determine differences in stress and academic self-efficacy based on gender and BMI category, an independent t-test and one-way ANOVA were used. Pearson's correlation test was applied to evaluate the relationship between stress levels and academic self-perception. Significance was determined at $p < 0.05$.

Before the main analysis was carried out, the data were checked to ensure completeness and appropriateness, and the assumptions of normality and homogeneity of variance were examined to ensure the validity of the parametric tests.

## RESULT AND DISCUSSION

The data analysis showed that the mean stress score reported by respondents was 8.1 with a standard deviation (SD) of 1.75, indicating a low level of perceptual stress according to the PSS 10 scale classification. Meanwhile, the mean academic perception ability score was 95.4 (SD = 10.3), indicating a relatively high level of academic efficacy in the student population studied.

An independent t-test showed no statistically significant differences between genders in stress scores ($p = 0.728$) or academic perception ability ($p = 0.108$). These results indicate that both males and females have similar levels of stress and academic self-efficacy, and that gender is not a significant variable influencing these constructs in this population.

Furthermore, a one-way ANOVA analysis showed that Body Mass Index (BMI) category did not significantly impact stress scores ($p = 0.617$) or academic perception ability scores ($p = 0.148$). This indicates that differences in nutritional status—whether thin, normal, overweight, or obese—were not significantly related to perceived stress levels or individual assessments of their academic capacity.

Furthermore, the Pearson correlation test results showed no significant relationship between stress scores and perceived academic ability ($r = –0.02$; $p = 0.901$). This very small and negative correlation coefficient indicates that the relationship between the two variables is very weak and statistically insignificant. In other words, students' perceived stress levels were not correlated with their perceptions of academic ability.

Overall, these results indicate that in the high school student population studied, gender and nutritional status did not significantly influence stress and academic perceptions, and no meaningful association was found between stress and academic perceptions themselves. These findings should be interpreted with caution, given the limited sample size and the possibility of other unmeasured confounding variables, such as the quality of social support, prior academic experience, or learning style.

This study makes an important contribution to broadening our understanding of adolescent mental health in formal educational settings. Although the primary results did not show a statistically significant relationship between stress and perceived academic ability, the

direction of the correlation still indicated a negative trend. This aligns with previous findings indicating that increased stress tends to be accompanied by decreased academic self-confidence, although the intensity can vary depending on the social and individual context. Zhang et al. (2024) stated that stress management skills play a crucial mediator in improving students' mental well-being, especially when combined with self-efficacy and adaptive coping training.

Adolescence is a transitional developmental stage from childhood to adulthood, characterized by dynamic and simultaneous biological, psychological, and social changes. According to the World Health Organization (WHO) definition, adolescents are individuals aged 10 to 19 years, and this period is divided into three phases: early adolescence (10–13 years), middle adolescence (14–16 years), and late adolescence (17–19 years).

Physiologically, adolescents experience significant accelerated physical growth, including sexual maturation (puberty), hormonal changes, and central nervous system development, particularly in the prefrontal cortex, which regulates executive functions such as planning, impulse control, and decision-making. These changes often impact emotional stability and increase sensitivity to external pressures.

Psychologically, adolescents begin to form their self-identity, explore personal values, and develop emotional independence. They also begin to more actively reflect on life experiences and learn to manage their emotions. However, their still-developing capacity for emotional regulation makes them more reactive to stress and social pressures.

Socially, adolescents face shifting relationship dynamics—from dependence on family to increased interaction and affiliation with peers. Social expectations, pressure from the school environment, academic achievement, and social media use are external factors that have the potential to cause identity conflict and psychosocial stress.

During this period, academic pressure and social demands are two major factors that can trigger significant stress. Schoolwork, academic competition, parental expectations, and social role demands (including gender roles and physical appearance) can affect adolescents' emotional balance. If not managed adaptively, stress can develop into psychological disorders such as anxiety, depression, or even psychosomatic disorders.

Furthermore, numerous studies show that adolescence is a crucial period in establishing the foundation for long-term mental health. Psychological disorders that emerge during adolescence are at risk of persisting into adulthood if not addressed early. Therefore, understanding the factors influencing stress in adolescents is crucial for designing school- and community-based promotive and preventive interventions.

Academic stress is one of the most common forms of stress experienced by adolescents, especially those in secondary education. Academic stress in adolescents has long been known to have significant implications for physical and mental health. In the short term, adolescents experiencing severe stress can exhibit symptoms such as anxiety, sleep disturbances, impaired concentration, and decreased social interaction skills. In the long term, chronic stress impacts the activation of the hypothalamic-pituitary-adrenal axis (HPA axis), which, if left untreated, can impair executive brain functions such as attention, working memory, and decision-making (Baron et al., 2020; Reer et al., 2022). Persistent activation of the sympathetic nervous system also contributes to long-term physiological disorders, including early-onset hypertension and an increased risk of metabolic disorders (McDaid et al., 2021). Therefore, promotive interventions that target stress early on are crucial, particularly in the school environment.

However, academic stress is not always negative. To a certain extent, stress can be adaptive and motivate students to achieve better performance (eustress). Therefore, a student's ability to manage stress determines whether stress becomes a burden or a positive stimulus.

The finding that there were no significant differences based on gender in stress levels and academic self-perception is quite interesting, considering that some previous literature suggests that adolescent girls are more vulnerable to social pressures that affect their academic self-perceptions, while adolescents with extreme BMIs are more likely to experience body image disturbances that lower academic self-confidence (Mekonen et al., 2021; Misra & McKean, 2000). In the Indonesian context, these results can be interpreted as indicating that equitable education systems and access to psychosocial support have begun to reduce gender-based gaps in academic perceptions and burdens. In general, boys tend to have higher academic self-perceptions in exact science subjects, while girls have higher academic self-perceptions in verbal or language subjects (Mekonen et al., 2021; Marsh et al., 2018). However, these differences are not biological in nature, but rather influenced by social stereotypes, teacher expectations, and early learning experiences.

Similarly, the lack of significant differences between Body Mass Index (BMI) categories in stress and self-perception suggests that nutritional status may not be a major factor in determining adolescents' psychological well-being in the school environment. These results align with a study by Bibiloni et al. (2021), which emphasized that body perception is more influenced by cultural values and the social environment than objective measures such as BMI. This demonstrates the importance of a biopsychosocial approach in assessing adolescent mental health.

The relationship between nutritional status and self-perception is a multidimensional issue that cannot be simplified. A study by Meland et al. (2021) showed that adolescents with a high BMI tend to experience body dissatisfaction, which impacts self-esteem. However, this is strongly influenced by gender and local cultural constructs. In the Indonesian context, where beauty and body image standards are rooted in unique social and cultural norms, perceptions of BMI may not always be associated with negative stigma. Similar studies from Colombia and Italy confirm that increased BMI is often associated with decreased self-esteem and emotional well-being, particularly in women (Pérez et al., 2016; Toselli et al., 2022).

Nutritional status is a key indicator of health and growth, influenced by nutrient intake, metabolism, and body requirements. Nutritional status, generally assessed through Body Mass Index (BMI), is an important indicator not only for assessing a person's physical condition but also closely related to psychosocial dimensions, particularly in adolescents. A BMI outside the normal range—whether underweight or overweight (obesity)—often impacts how individuals view and evaluate their bodies, a phenomenon known as body image.

During adolescence, body image plays a central role in the formation of self-identity and self-esteem. A discrepancy between actual body shape and social or cultural standards of the ideal body can lead to body dissatisfaction, which in many cases results in decreased self-esteem. Low self-esteem, particularly in educational contexts, is known to correlate with reduced confidence in one's ability to handle academic tasks and can impact learning motivation, engagement in the educational process, and overall academic performance.

Previous research, such as that presented by Toselli et al. (2022) and Meland et al. (2021), suggests that adolescents with extreme nutritional status are more vulnerable to experiencing psychosocial barriers, including decreased academic self-efficacy. This is mediated by various factors, including experiences of appearance-based discrimination, social pressure, and

negative interactions with peers and educational institutions. Feelings of being unaccepted or physically different can lead to decreased self-confidence, including in the academic domain.

Beyond psychological aspects, nutritional status also influences physiological and cognitive functions that support learning readiness. Overweight adolescents are at higher risk of experiencing sleep disorders, such as sleep apnea, which can lead to chronic fatigue, impaired concentration, and memory decline. Conversely, adolescents who are malnourished tend to experience energy deficits and deficiencies in important micronutrients like iron, which can impair neurocognitive functions, including memory, attention, and information processing speed.

It is important to understand that the relationship between BMI and academic perception ability is not a simple linear relationship. Factors such as social support, the quality of relationships within the family and school, and cultural norms regarding physical appearance can act as mediators, strengthening or weakening the influence of nutritional status on adolescents' learning psychology. Therefore, approaches to supporting adolescents' academic achievement should encompass a holistic strategy—not only focusing on strengthening cognitive abilities, but also including interventions that support the development of positive body image, fostering healthy self-esteem, and creating an inclusive learning environment.

Several studies have shown that adolescents with extreme nutritional status, whether underweight or overweight/obese, tend to experience a decline in social participation and academic activities. This decline is not always directly related to actual cognitive or academic abilities, but rather is caused by negative self-perceptions and the social environment's response to their physical condition.

Specifically, adolescents who feel their bodies do not conform to social standards or ideal body image often experience decreased self-confidence and doubts about their personal competence, including in learning and academic achievement. Although they may have intellectual potential comparable to their peers, dissatisfaction with body image can create internal psychological barriers that impact motivation, class engagement, discussion participation, and self-expression.

This phenomenon suggests that the relationship between nutritional status and academic performance is not direct but is mediated by various psychosocial factors. Several important factors that act as mediators in this process include peer support: Adolescents who feel accepted by their social environment, especially by close friends, tend to have more positive self-perceptions and greater confidence in academic contexts. Conversely, adolescents with extreme BMIs who experience teasing or social exclusion are more likely to withdraw from school activities.

Teacher encouragement, such as positive feedback, motivation, and recognition of student effort, can provide psychological protection for students experiencing stress due to body image. This support is crucial for breaking the cycle between body dissatisfaction and decreased academic self-efficacy.

Body-related social feedback, one of the key factors in an environment that values body shape diversity and does not associate physical appearance with individual worth, will better support the development of adolescents' self-esteem. Conversely, schools or communities that tend to negatively label certain body shapes can worsen adolescents' psychosocial well-being and hinder their potential achievement.

In addition to biological and gender factors, ethnic and cultural identity also moderate the impact of BMI on self-perception. A study by Frayon et al. (2021) in the Pacific region found that ethnic identity, namely feelings of attachment and pride in one's ethnic group, can

act as a protective factor against the negative impact of BMI on self-esteem. In other words, adolescents with a strong ethnic identity tend to have more stable self-esteem, even if they have a high BMI (obesity) or low BMI (thinness), because their self-perceptions are more influenced by collective social values than by generally accepted physical or aesthetic standards.

This suggests that social and cultural norms within a given community can moderate or even neutralize the psychological distress that typically arises from body shape mismatches with dominant societal ideals. In more collectivistic or inclusive cultures, individuals may feel more accepted and less judged solely on their physical appearance, thus reducing the influence of BMI on self-image.

Academic self-perception, in this context, remains a key element in building resilience against academic stress. As stated by Bandura, self-perception influences how a person thinks, feels, and acts when faced with challenges. A study by Lee and Mao (2016) confirmed that self-perception is a key predictor of academic success because it enhances students' motivation, persistence, and responses to learning obstacles. In the digital age, self-perception is becoming increasingly important. A study by Yi et al. (2024) showed that in online learning environments, self-perception helps students manage their cognitive, emotional, and behavioral engagement.

Self-perception skills have also been shown to play a mediating role in personal academic conflict and to be an element that enhances the positive impact of a supportive learning environment (Wang et al., 2020). In the context of technology-based learning, Ibrahim and Aldawsari (2023) showed that students with high digital efficacy tend to perform better academically. Furthermore, in technical learning such as distributed programming, confidence in one's abilities can increase the perceived value of learning tools and overall student engagement (Daradoumis et al., 2022).

The lack of a significant difference in the relationship between stress and academic self-perception in this study ($r = –0.02$; $p = 0.901$) does not necessarily indicate a lack of association. Rather, it emphasizes the importance of considering other potential moderating and mediating variables, such as social support, emotion regulation skills, and prior learning experiences. Zare et al. (2020) emphasized that self-perception can remain high if supported by an inclusive learning environment and adaptive coping strategies.

The findings of this study confirm that although gender and nutritional status did not demonstrate a statistically significant relationship to academic stress or perceptions in adolescents, psychosocial burden among students remains a significant public health issue that requires special attention. Therefore, in the context of community medicine, these results have strong implications for the formulation and strengthening of school-based adolescent mental health promotion policies.

The WHO (2020) explicitly recommends a comprehensive promotive and preventive approach to addressing mental health issues in adolescents, including social skills training to improve interaction competence and emotional regulation, stress management education to strengthen adaptive abilities to academic pressures, and the provision of easily accessible and integrated psychosocial counseling services within the school environment.

The role of schools and families is crucial in helping adolescents recognize, express, and manage academic stress in a healthy manner. One of the school's roles, the School Health Unit (UKS), is particularly strategic. The UKS's function is not limited to physical health promotion (such as dental checkups, iron supplementation, or nutrition education), but should also be expanded to serve as a key pillar in promoting and protecting students' mental health. The

Community Health Center (UKS) can be developed as a center for early psychosocial screening, empowering teachers in the early detection of emotional problems, and facilitating referrals to professional services such as school psychologists or community health centers.

Regular psychosocial screening based on standardized instruments, such as the PSS-10 or the academic self-efficacy scale, can be integrated into the school's routine agenda to identify high-risk youth groups, including those experiencing high stress or low academic self-confidence. The program also designs contextual psychosocial interventions, such as peer support, coping skills development, or academic mentoring. It also improves cross-sector coordination between schools, community health centers, and education offices in developing evidence-based adolescent mental health policies.

The community health approach focuses not only on curative or educational efforts but also on strengthening support systems at the grassroots level to ensure that every adolescent has access to a psychologically healthy learning environment. Sustainable implementation of these interventions in schools is a concrete step in developing a healthy, resilient generation of young people who are ready to face the challenges of education and social life in a balanced manner.

This research emphasizes that efforts to improve adolescent mental well-being cannot solely focus on biological factors such as gender and BMI. Instead, a comprehensive and contextual approach that encompasses psychological, social, cultural, and structural aspects needs to be prioritized so that education not only produces high-achieving students, but also individuals who are mentally healthy and socially resilient.

## CONCLUSION

This study found no significant differences in stress levels or perceived academic abilities among adolescents based on gender or nutritional status measured by Body Mass Index (BMI), nor a significant relationship between stress and academic perceptions, suggesting these factors are largely independent in this population. These findings imply that biological factors such as gender and BMI may not be primary determinants of adolescent stress and academic confidence within the school environment. Instead, psychosocial elements—such as social support, learning climate, and emotional coping skills—appear more influential, underscoring the need for promotive and preventive interventions that address psychological and social dimensions. School-based mental health programs should therefore integrate stress management education, self-efficacy training, and regular counseling, alongside routine screening for psychosocial risk factors. Future research is recommended to explore these psychosocial determinants in greater depth and to examine how targeted interventions can enhance both mental health and academic outcomes in diverse adolescent populations.

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