

Research Article

Ratna Jatnika*, Fitri Ariyanti Abidin*, Fitriani Yustikasari Lubis*, Dwi Marisa Putri,
Ditha Fadhillah Putri Hamdanie

Lecturer Support, Basic Psychological Need Satisfaction, and Statistics Anxiety in Undergraduate Students

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Abstract: Statistics anxiety is a prevalent form of anxiety experienced by students during statistics lectures or when conducting statistical analysis. This anxiety negatively impacts their performance and enjoyment of the subject. The present study investigates the relationship between lecturer support and undergraduate students' statistics anxiety, and whether the satisfaction of basic psychological needs mediates the relationship. We conducted a cross-sectional online survey involving 382 students from 11 universities (105 male, 277 female) aged 17–27 years ($M = 19.48$, $SD = 1.37$). We used the Indonesian version of the statistics anxiety measure, Teacher Support as Social Context Short-Form, and Basic Psychological Need Satisfaction Scale. Our findings indicate that lecturer support is negatively associated with statistics anxiety among undergraduate students. Moreover, undergraduate students' satisfaction with basic psychological needs partially mediates this relationship. These results highlight statistics lecturers' crucial

role in exhibiting involvement, structure, and autonomy support to reduce students' statistics anxiety.

Keywords: statistics anxiety, lecturer support, basic psychological needs satisfaction, undergraduate students

1 Introduction

Mastering statistics is an essential requirement for undergraduate students in research-based fields. It enables them to draw reliable conclusions from data, synthesize information, present their findings effectively, and formulate sound conclusions. However, despite its significance, statistics courses often trigger high levels of anxiety among students (Malik, 2015). Statistics anxiety is a specific type of anxiety, different from other academic anxieties, such as mathematics and test anxiety, that emerges from discomfort when studying statistics or analyzing data using statistical tools at any level or form (Cruise, Cash, & Bolton, 1985; Macher, Papousek, Ruggeri, & Paechter, 2015). Negative attitudes toward statistics precede statistics anxiety and to some extent are related to, mathematics anxiety (Chew & Dillon, 2014; Paechter, Macher, Martskvishvili, Wimmer, & Papousek, 2017).

According to Earp (2007), statistics anxiety is a multifaceted construct encompassing six domains: anxiety, fearful behavior, attitude, expectation, history and self-concept, and performance. Anxiety refers to anxiety related to various aspects of statistics, including tests, math, the class, statistics content, numbers, and interpreting numerical data. Fearful behavior is characterized by excessive worry, intrusive thoughts, mental disorganization, tension, and fear related to instructors, seeking help, past behavior, current behavior, and future behavior. Attitude pertains to beliefs about the value of statistics and psychological arousal concerning the level of personal fulfillment gained from practicing statistics. Expectations include social and cognitive expectations from parents and peers.

* **Corresponding author: Ratna Jatnika**, Department of Psychology, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia; Center for Psychometrics Study, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia, e-mail: ratna@unpad.ac.id

* **Corresponding author: Fitri Ariyanti Abidin**, Department of Psychology, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia; Center for Relationship, Family Life and Parenting Study, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia, e-mail: fitri.ariyanti.abidin@unpad.ac.id

* **Corresponding author: Fitriani Yustikasari Lubis**, Department of Psychology, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia; Center for Psychological Innovation and Research, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia, e-mail: fitriani.y.lubis@unpad.ac.id

Dwi Marisa Putri, Ditha Fadhillah Putri Hamdanie: Department of Psychology, Faculty of Psychology, Universitas Padjadjaran, Sumedang, 45363, Jawa Barat, Indonesia

History and self-concept are connected to a range of factors such as past successes and failures in math, low math self-esteem, and self-concept. They also relate to prior educational experiences with math in elementary and high school, the perceived quality of previous math classes, motivation to learn, the difficulty of material in earlier math courses, and the quality of instruction received. Finally, performance refers to the perception of course performance, the ability to perform statistical operations, and the ability to learn statistical concepts. Statistics anxiety has been identified as a significant determinant of academic performance (Lalande, Cantinotti, Williot, Gagnon, & Cousineau, 2019; Macher *et al.*, 2015; Slootmaeckers, Kerremans, & Adriaensen, 2014), prompting numerous studies to investigate the factors influencing it. Several factors, such as positive attitudes toward statistics (Gopal, Salim, & Ayub, 2018) and interest in statistics (Macher, Paechter, Papousek, & Ruggeri, 2012; Macher *et al.*, 2013; Slootmaeckers *et al.*, 2014), have been linked to lower levels of statistics anxiety. Additionally, McIntee *et al.* (2022) found that a positive attitude toward statistics, fewer maladaptive emotion regulation strategies, and psychological needs satisfaction were associated with reduced statistics anxiety.

Previous research on this topic has largely focused on personal factors, such as numeracy skills, confidence, and self-esteem (Cui, Zhang, Guan, Zhao, & Si, 2019); leaving a gap in our understanding of the role of social context in this phenomenon. However, as Egheosase and Ugwu (2017) argue, social context is crucial to student achievement. Lecturer support, in particular, is positively associated with students' motivation, achievement, and psychological well-being (Hornstra, Stroet, van Eijden, Goudsblom, & Roskamp, 2018) and can also help students overcome their statistics anxiety (Suminta, 2016). Lecturer support can be broken down into three components: autonomy support, involvement, and structure, as defined by Skinner and Belmont (1993). Autonomy support refers to the degree of freedom lecturers give their students to make decisions. Involvement relates to the quality of the interpersonal relationship between lecturers and students, with lecturers taking time for, expressing affection, enjoying interactions with, and providing resources to their students. Structure refers to how lecturers effectively communicate expectations and provide information about achieving desired outcomes. These three types of lecturer support are crucial for fulfilling students' basic psychological needs, as outlined by self-determination theory (SDT) (Stroet, Opdenakker, & Minnaert, 2013). SDT posits that individuals have three fundamental psychological needs: autonomy, competence, and relatedness, and fulfilling these needs is essential for personal growth and well-being (Ryan & Deci, 2000). In the

context of education, the needs of the student's influenced by their lecturers' support (Skinner & Belmont, 1993; Stroet *et al.*, 2013). Autonomy support fosters students' need for autonomy, structure satisfies their need for competence, and involvement fulfills their need for relatedness.

SDT proposes that when lecturers offer autonomy support to their students, for example, by granting them the freedom to choose how to complete assignments, students' need for autonomy is fulfilled. This satisfaction enables them to perceive greater control over their academic success (Stroet *et al.*, 2013). Lecturer involvement can take several forms, such as demonstrating compassion and care, empathy, promoting pro-social behavior, accessibility to all students, and exhibiting commitment to student learning (Stroet, Opdenakker, & Minnaert, 2015; Yeager *et al.*, 2016). Such involvement meets the need for relatedness (Deci & Ryan, 2000). Finally, lecturer support in the form of structure involves communicating the expectations of assigned tasks or lecture rules, facilitating students' comprehension of what is required. This structured approach primarily supports students in satisfying their basic need for competence, enabling them to feel proficient in their academic performance. The gratification of fundamental psychological needs is associated positively with well-being and negatively with ill-being conditions, including anxiety (Nishimura & Suzuki, 2016; Ryff *et al.*, 2006). Consequently, fulfilling fundamental psychological needs positively correlates with students' well-being and negatively with statistics anxiety, a reflection of ill-being conditions.

This study aims to examine the relationship between lecturer support and undergraduate students' statistics anxiety. In accordance with the theoretical framework of SDT, our study aims to enhance the existing literature by exploring the mediating role of basic psychological need satisfaction in the relationship (Figure 1).

We propose the following hypotheses: Firstly, lecturer support is negatively associated with statistics anxiety. Secondly, lecturer support is positively associated with the satisfaction of basic psychological needs. Thirdly, satisfaction with basic psychological needs is negatively

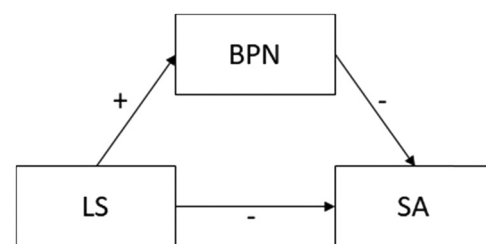


Figure 1: Conceptual framework of the current study.

associated with statistics anxiety. Finally, it is hypothesized that the satisfaction of basic psychological needs mediates the relationship between lecturer support and statistics anxiety.

2 Methods

Ethical approval for this study was obtained from the ethical committee of Universitas Padjadjaran. A cross-sectional quantitative approach was employed to investigate the effect of lecturer support on statistics anxiety in undergraduate students and the potential mediating effect of the satisfaction of basic psychological needs.

2.1 Participants

The study recruited participants from five universities who met the inclusion criteria of having completed at least one statistics course. In cases where participants had completed multiple statistics courses, they were instructed to select one specific teacher for one course. The recruitment of participants for this study was conducted through the researcher's network of lecturers, who were knowledgeable about potential participants that met the study's inclusion criteria. Voluntary participation was sought by inviting eligible participants to participate in the study and providing them with a consent form. Participants were asked to complete the consent form independently, without the lecturer's supervision, to ensure their voluntary participation.

Three hundred and eighty-two undergraduate students (277 female and 105 male) participated in this study. The age of participants ranged from 17 to 27, with a mean age of 19.48 years ($SD = 1.37$). Regarding academic majors, 24.9% of participants were from science, technology, engineering, and mathematics (STEM) disciplines, while 75.1% were from non-STEM fields.

2.2 Procedures

The survey instrument for this study was administered online using Google Forms, which allowed for convenient data collection and management. Participants were recruited through a network of lecturers from the five participating universities and were given access to the survey through this network. To ensure the confidentiality and privacy of participants, the

survey was completed without any supervision. On average, participants spent between 25 and 45 min completing the survey outside of their scheduled class time. This methodology allowed for efficient and flexible data collection while minimizing any potential influence from external factors.

2.3 Measurement

We used the Lecturer Support as Social Context Short-Form (Skinner & Belmont, 1993) to measure Lecturer Support. The students were instructed to complete the form concerning their statistics course. The instrument comprises 25 Likert scale questions with choices 1–4 (1 strongly disagree to 4 very agree). In alignment with the findings of Ahn, Patrick, Chiu, and Levesque-Bristol (2018) study, this instrument is identified as unidimensional. Notably, the Indonesian version of the instrument demonstrates robust internal consistency, with a Cronbach's Alpha coefficient of 0.922.

The satisfaction of basic psychological needs was measured using the basic psychological need satisfaction and frustration scale – General Measure (Chen et al., 2015). This instrument assesses satisfaction and frustration with basic psychological needs, but only the former was used in the present study. The 12 items of Basic Psychological need satisfaction measures relatedness, competence, and autonomy satisfaction. A Likert scale with five response options ranging from “Not at all true (scored 1)” to “Very true (scored 5)” is used. Consistent with prior research (Campbell et al., 2015), we employed a composite score to measure need satisfaction. The Indonesian version of the scale demonstrated satisfactory internal consistency with a Cronbach's alpha of 0.840.

The statistics anxiety measure (Earp, 2007) measured the students' anxiety. It consists of 43 items that measure six dimensions: Anxiety (12 items), Fearful Behavior (4 items), Attitude (9 items), Expectation (10 items), History and Self-Concept (8 items), and Performance (10 items). Each item is rated using a Likert scale of 1–4 (very poor to excellent). The Indonesian version showed satisfactory internal consistency, with estimates for Cronbach's Alpha of 0.882 for Anxiety, 0.825 for Fearful Behavior, 0.784 for Attitude, 0.723 for Expectation, 0.862 for History and Self-Concept, and 0.870 for Performance.

2.4 Data Analysis

We used aggregated scales for each variable to facilitate a latent analysis. By aggregating scales, we can more

effectively capture the true nature of the relationships between variables, leading to more reliable and insightful results. Descriptive statistics, including mean and standard deviation, were calculated for these variables. Pearson's correlation was used to measure the correlation between the variables. The direct and indirect relationships were tested using JASP 0.16.3.0 as the final step in the data analysis process.

3 Results

Table 1 provides descriptive statistics and correlation coefficients for the variables analyzed in the study. The results indicate a positive and statistically significant correlation between Lecturer Support and Basic Psychological Needs Satisfaction ($r = 0.23$, $p < 0.01$). Furthermore, the correlations between Statistics Anxiety and both Lecturer Support ($r = -0.44$, $p < 0.01$) and Basic Psychological Needs Satisfaction ($r = -0.29$, $p < 0.01$) were negative and statistically significant.

Table 1: Descriptive Statistics and correlation between variables and subscales

Variables	M (SD)	Range	Correlations		
			1	2	3
1. Lecturer support	2.68 (0.10)	1–4			
2. Basic psychological needs satisfaction	3.25 (0.16)	1–5	0.23**		
3. Statistics anxiety	2.32 (0.23)	1–4	–0.44**	–0.29**	

Note: ** $p < 0.01$.

3.1 Mediation Analysis

In the initial analysis, we calculated the direct path coefficients presented in Table 2. The results indicate a significant negative effect of lecturer support on statistics anxiety ($B = -0.398$, $SE = 0.046$, $p < 0.001$). We then tested the hypothesized mediation model, which included basic psychological needs satisfaction as a mediator in the relationship between lecturer support and statistics anxiety. Our findings indicate a significant negative indirect effect of lecturer support on statistics anxiety through basic psychological needs satisfaction (-0.046), as shown in Table 2. The 95% confidence interval excludes zero (-0.074 to -0.017), indicating that the indirect effect is significant. When we compared the total effect ($B = -0.444$; $SE = 0.046$, $p < 0.001$) to the indirect effect, we found that the association between lecturer support and statistics anxiety is partially mediated by basic psychological need satisfaction (Figure 2).

4 Discussion

This study aimed to contribute to the current understanding of the relationship between lecturer support, basic psychological need satisfaction, and statistics anxiety. The study yielded four main findings: (1) a negative association between lecturer support and statistics anxiety, (2) a positive association between lecturer support and the satisfaction of basic psychological needs, (3) a negative association between the satisfaction of basic psychological needs and statistics anxiety, and (4) partial mediation of the association between lecturer support and statistics anxiety by the satisfaction of basic psychological needs.

Consistent with our hypotheses, the results of this study showed that lecturer support is negatively associated with statistics anxiety. The significant role of teachers in reducing student anxiety has been widely reported in

Table 2: Path coefficients

	Standardized estimates	Std. Error	z	p	95% CI	
					Lower	Upper
Direct effects						
LS \square SA	–0.398	0.046	–8.631	<0.001	–0.488	–0.308
Indirect effects						
LS \square BPNS \square SA	–0.046	0.015	–3.142	0.002	–0.074	–0.017
Total Effects						
LS \square SA	–0.444	0.046	–9.676	<0.001	–0.534	–0.354

Note: LS, Lecturer's Support; SA, Statistic Anxiety; BPNS, Basic Psychological Needs Satisfaction.

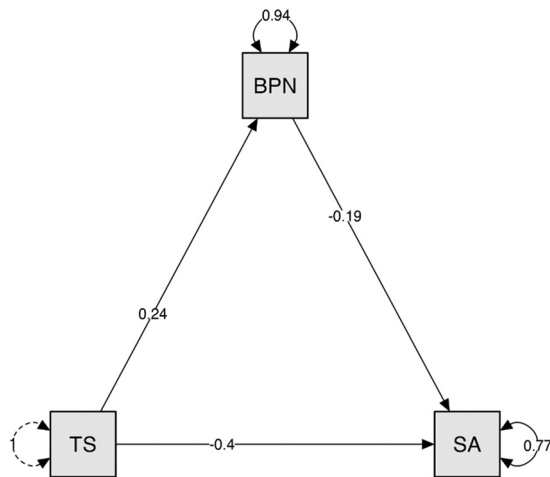


Figure 2: Empirical result.

previous research. Skinner, Furrer, Marchand, and Kindermann (2008), Van Ryzin, Gravely, and Roseth (2009), and Zimmermann, Tilga, Bachner, and Demetriou (2021) found that teacher support influences students' anxiety and other emotions. Furthermore, a meta-analysis conducted by Lei, Cui, and Chiu (2018) revealed a strong correlation between teacher support and students' academic emotions, particularly in Asia. These findings underscore the importance of providing adequate student support to alleviate anxiety and promote well-being.

As anticipated, the results of the current study reveal that lecturer support is positively associated with the satisfaction of basic psychological needs. Our results are in line with prior research conducted among middle school students (Conesa, Onandia-Hinchado, Dunabeitia, & Moreno, 2022; Cronin et al., 2019; Jin & Wang, 2019; Koçak, Tas, & Yerdelen, 2022; Leo, Mouratidis, Pulido, López-Gajardo, & Sánchez-Oliva, 2022). Our finding underscores the significant role played by lecturers as influential figures, even in the context of university students. The study conducted by Basson and Rothmann (2018) among pharmacy undergraduate students is consistent with our findings. However, in that study, compared to support from parents and peers, the support from teachers was observed to be the least pronounced. The positive association between lecturer support and the satisfaction of basic psychological needs has been elucidated by previous studies. Autonomy support, for instance, empowers students to determine their behavior (Skinner & Belmont, 1993), fostering reflection on their needs, resources, and values (Stroet et al., 2013) and expression of thoughts, feelings, and perspectives (Reeve, 2009). This cultivates a sense of autonomy, aligning with SDT, and subsequently promoting self-directed learning activities (Stroet et al., 2013). Involvement support from

lecturers enhances the satisfaction of relatedness, with students feeling a closer connection to their instructors, thus positively impacting the internalization of learning activities. The support structures fulfill students' need for competence in carrying out their learning activities, instilling a belief in their capacity to successfully complete them (Deci & Ryan, 2000; Skinner & Belmont, 1993; Stroet et al., 2013). The negative relationship between the satisfaction of basic psychological needs and statistics anxiety, as identified in our study, can be explained by the fact that individuals are more likely to experience positive well-being and less likely to experience negative states such as anxiety, as reported by Ryff et al. (2006) and Nishimura and Suzuki (2016). In addition, Leow, Leow, and Ean (2023) in a similar fashion studies in first year university students finds that basic psychological needs have positively affect well-being (of subjective vitality refers to the state of feeling alive and alert).

The study found that the satisfaction of basic psychological needs partially mediates the relationship between lecturer support and statistics anxiety. This suggests that two mechanisms may explain the decreased level of statistics anxiety. First, lecturer support may directly decrease statistics anxiety, which is consistent with the findings of Skordi and Fraser (2019). Understandably, the support provided by lecturers is an essential element of a positive learning environment, which in turn decreases negative feelings of the students, such as statistics anxiety (Nguyen, Newby, & Skordi, 2015). Pan and Tang (2004), also discovered that combining effective instructional methods with a lecturer's attentive attitude towards students can significantly reduce statistical anxiety. This similarity highlights the critical role of supportive teaching practices in mitigating students' anxiety about statistics. Second, lecturer support may decrease the level of statistics anxiety by fulfilling the three psychological needs outlined by the SDT (Deci & Ryan, 2000). In turn, fulfilling the three psychological needs decreases ill-being conditions such as statistics anxiety. This finding is consistent with the findings of Yu, Li, Wang, and Zhang (2016), who highlighted the mediating role of basic psychological needs satisfaction in the negative relationship between teacher support and students' anxiety in an adolescent sample.

The limitations of the present study should be acknowledged. The correlational design used in this study limits the ability to draw causal conclusions, as cause-and-effect relationships cannot be established. Additionally, correlational designs are not the strongest method for testing mediation models, as alternative explanations and omitted variables may account for the observed relationships. Future studies may employ experimental or longitudinal designs to

establish causal relationships and better test the proposed mediation model. Another limitation is the use of convenience sampling, which may limit the generalizability of the findings. Future research should employ probability sampling methods to obtain a more representative sample.

The present study highlights the importance of teacher support in promoting students' enjoyment of taking a statistics course. Other potential mediating variables may also play a role in this relationship, and further research should investigate these variables.

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Conflict of interest: The authors states no conflict of interest.

Data availability statement: The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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