



Research Paper: A Causal Model of Relationship between Basic Psychological Needs and Academic Resilience: The Mediating Role of Ambiguity Tolerance in Online Education



Parisa Tanhaei Dilmaghani^{1*}, Masoume Maleki Pirbazari², Milad SabzehAra Langaroudi²

¹ M. A. Student in General Psychology, Psychology Department, Rahman Institute of Higher Education

² Assistant Professor, Psychology Department, Rahman Institute of Higher Education

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Abstract

The present research was conducted to investigate the causal model of relationship between basic psychological needs and academic resilience in online education with the mediating role of ambiguity tolerance. The current research was applied in terms of purpose and correlational in terms of method. The population of the current research was Rahman Institute of Higher Education's student studying in the academic year 2021-2022. Two hundred and seven students out of the population were selected through convenience sampling method. The data collection tool in the present research included The Basic Needs Satisfaction in General Scale (BNSG-S), Academic Resilience Inventory (ARI), and ambiguity tolerance (AT). Then the data were analyzed through structural equation method using SPSS 22 and Smart PLS 3 software. The research results showed that basic psychological needs positively and directly affect academic resilience ($P < 0.05$). Moreover, the results revealed that ambiguity tolerance had a direct and positive effect on academic resilience ($P < 0.05$). On the other hand, the indirect effect of basic psychological needs on academic resilience was confirmed through ambiguity tolerance ($p < 0.05$); Therefore, it can be concluded that students whose basic psychological needs were satisfied more, had more tolerance for ambiguity; they were also more academically resilient; in the meantime, providing basic needs was especially important; Therefore, higher education administrators of the country should strive to develop these abilities in students.

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*** Corresponding author:**

Parisa Tanhaei Dilmaghani

Address: Rahman Institute of Higher Education, Ramsar, Iran

Tel: +98(912)4488547

E-mail: parisatanhaei93@gmail.com



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1. Introduction

One of the goals of educational institutions and organizations is to reduce the gap between students of schools or universities at risk of academic failure and successful learners. Academic resilience is one of the things that play a very important role in creating or reducing this gap. An educational context defines resilience as a high probability of success in school and other life situations despite hardships and difficulties (Paudel et al., 2021). Academic resilience is a process based on behavioral and cognitive-emotional reactions that express challenges, hardships, as well as difficulties in the educational field; it can also be responded to by students adaptively or non-adaptively (Cassidy, 2016).

Martin and Marsh (2006) state that academic resilience is influenced by theory of need for progress, motivation theory, intrinsic motivation, self-efficacy theory, motivational orientation theory, and self-determination theory. Based on these theories, it can be understood that to what extent students trust their ability to do work; their level of ability to face challenges, overcome obstacles, solve problems and develop resistance in dealing with challenges, difficulties, determine their academic resilience. in different situations. They introduce the process of fostering resilience in learners; according to them, the first component in this field is creating or increasing self-confidence and self-belief in learners. Creating learning opportunities and experiences for students increase their self-confidence and prepare them for planning more regarding success and learning experiences. They conclude that the way to progress is the efforts and strategies that are under the control at the discretion of the learners themselves.

Learners themselves can control their academic status. More efforts and perseverance lead to commitment and adherence to the task given, and they are less affected by the fear of failure; Thus resilience includes self-confidence, self-belief, and perseverance (Martin & Marsh, 2006). In research on academic resilience Cassidy (2016), finds that resilient students are stronger in terms of efficiency, perseverance, planning, and performance; additionally, they have less anxiety and uncertain control. Resilience depends on several factors; Some are environmental factors and some are individual ones. In this research, individual factors of resilience are investigated. Among the individual factors that affect academic resilience is the provision of basic psychological needs, i.e., perceived competence, autonomous academic motivation of learners, and the need for communication.

Competence is a psychological need that provides energy and motivation to pursue and master optimal challenges (Deci & Ryan, 1985). Competence is the need to be effective in interacting with the environment and communicating with others as well as dealing with challenges; therefore, a person can master the activity by using his or her talents and skills. On the one hand, skill acquisition reinforces the need for competence in learners, and learners who successfully tackle challenges achieve perceived competence; on the other hand, learners going to university due to personal choice or having enjoyable and satisfying experiences resulting from educational activities (intrinsic motivation) are always viewed as intrinsically and autonomously motivated individuals (Deci & Ryan, 1985). However, learners who are involved in university activities due to

external pressures (external regulation) with lack of motivation are people who do not have independent academic motivation. Hence, according to each component of the basic psychological needs mentioned above, it is possible to predict the effects of these needs on academic resilience. Moreover, another variable that can affect people's academic resilience is ambiguity tolerance.

Ambiguity tolerance is a personality trait based on which a person tends to understand, manage and control ambiguous stimuli. A person with low ambiguity relieves discomfort after facing a complex and difficult situation (Zenansi et al., 2008). Since people with a high level of ambiguity, find problems annoying, they try to find a suitable solution to get rid of these situations as quickly as possible; however, people who have a low level of ambiguity are unable to find a solution due to a defect in their cognitive cycle (Macdonald, 1970). People have a certain degree of ambiguity in their understanding; Consequently, ambiguity is necessary for personal and academic progress and human development (Bakalis & Jooiner, 2004). Tolerance of ambiguity is the acceptance of uncertainty as a part of life and the ability to survive with incomplete knowledge and the willingness to embark on a direct activity without knowing whether it will succeed (Antoncic, 2009). Ambiguity tolerance means how threatening and difficult it is to adjust to the work environment. When changes occur rapidly and unexpectedly, or when information is insufficient and ambiguous and people react differently, a person with a high degree of ambiguity usually has a complex understanding of events and has a high level of perception in his interpretation of what the outcome of

that particular event is. It can lead to a low tolerance for ambiguity. This leads to difficulties in dealing with stressful sources; Therefore, psychologists such as Budner (1962), aims to improve the tolerance of existing problems and stresses that people should be more adaptable. Studies show that people with a low tolerance for ambiguity perceive ambiguity as threatening from which they suffer; nevertheless, people who have a higher tolerance for ambiguity consider ambiguity to be an advantage and seek more questions (Brown, 2000). A person with low ambiguity tolerates discomfort after facing a complex or difficult situation; Zenansi et al. (2008) believe that tolerance of ambiguity supports creative behavior enabling people to deal with complex issues. People with low ambiguity are tolerant of avoiding ambiguous issues. In the following, the research background related to the subject is reviewed.

Shaterian Mohammadi et al. (2014) show that tolerance of ambiguity plays a role in metacognitive beliefs and academic engagement of students and tolerating ambiguity increases students' academic engagement. Radmehr and Karami's (2019) study reveals that there is a relationship between tolerance of ambiguity and academic conflict in students. In Yu et al.'s (2021) research, ambiguity tolerance is related to learners' participation in learning English. Doménech Betoret and Gómez Artiga (2011) investigate the relationship between students' psychological needs, their approach to learning, and academic achievement. They study 157 students, and the results indicate that satisfying the basic needs of an individual encourages him or her to use deep approaches in learning and

reduces the avoidance strategy. On the contrary, when essential needs are not met, it uses a superficial approach to learning; Therefore, it can be concluded that learning approaches (both superficial and deep) play an intermediary role in students' psychological needs and their progress. Chung (2022), conclude that the fulfillment of basic needs for intrinsic motivation and intrinsic motivation leads to satisfaction with education. These results indicate that when basic needs for competence and self-reliance are supported, learners are engaged in academic challenges, tasks, and projects.

With the start of the COVID-19 pandemic in 2019, online education found a special place in academic setting; therefore, studying the role of factors such as meeting basic psychological needs and tolerance of ambiguity on the academic resilience of learners in these special

conditions seems to be necessary and there is a research gap in this field. In some recent studies, factors affecting academic resilience have been discussed; However, in no domestic or foreign research, the effect of providing basic psychological needs and tolerance of ambiguity on students' academic resilience in online education conditions and the form of a causal model has not been investigated and the need for research in this field has been felt; thus it is of particular importance; Therefore, the purpose of this research is to determine the structural relationships of basic psychological needs, academic resilience and ambiguity tolerance; it also aims at determining the fit of the proposed research model.

Figure 1-1 shows the conceptual model of the present research.

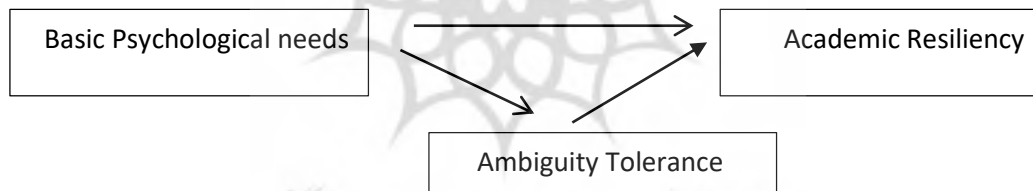


Figure 1 - Conceptual model of research

2. Method

2.1. Design

As far as the purpose and methodology of the present research were concerned, it was applied and correlational employing structural equation model. The population of the current study included all students of Rahman Institute of Higher Education who were studying online in 2021-2022 academic year. The minimum sample size in research with structural equation models and factor analysis was determined based

on the number of main constructs or hidden variables. Although there has been no general agreement about the sample size required for factor analysis and structural models, according to many researchers, the minimum required sample size calculated to be 200. In confirmatory factor analysis and structural model, the minimum sample size is determined based on latent variables, not observable variables. In the present study, 20 samples were required for each factor (latent variable). In general, at least

200 samples were recommended (Habibi & Adanvar, 2016). Hidden variables were the factors or dimensions of the model, and observable variables were the questions of the questionnaire; Thus, in the present research, 200 people were selected using the convenience sampling method.

2.2. Tools

The Basic Needs Satisfaction in General Scale (BNSG-S): The Basic Needs Satisfaction in General Scale was developed by LaGuardia et al. (2000 as cited in Ghorbani et al., 2008) to measure basic psychological needs. This questionnaire has 21 questions measuring these needs based on the Likert scale (7 points for absolutely correct and 1 point for not correct at all); however, the marking method for questions 3, 4, 7, 11, 15, 16, 18, 19, 20 was reversed. This questionnaire has three subscales of autonomy, competence, and relatedness. The reliability coefficients obtained from its implementation on the subjects' mother, father, romantic partner, and friends were 92%, 92%, 92%, and 92%, respectively. In Iran, this scale has been implemented in the samples of Iranian managers and students with good validity and reliability; therefore, Cronbach's alpha fluctuates between 74% and 79% (Salehi et al. 2013).

Academic Resilience Inventory (ARI): The academic resilience inventory was created by Samuels (2004) to measure academic resilience. This questionnaire has 29 questions and three subscales of communication skills, future orientation and positivity; based on a five-point Likert scale (strongly agree 5 points, agree 4 points, neither agree nor disagree 3 points, disagree 2 points and strongly disagree 1 point) academic resilience was measured in

students. Cronbach's alpha coefficient calculated by Soltaninejad et al. (2014) for this questionnaire was estimated to be 0.77; also, the content validity and criteria of this questionnaire was evaluated.

Tolerance for Ambiguity Scale: Tolerance for ambiguity scale (Badner, 1962) was developed to measure the level of ambiguity tolerance of people. It includes 16 questions and three subscales of novelty, insolubility, and complexity. In Iran, this questionnaire was translated into Farsi for the first time by Broomandnasab and Shokrkon (2009). The reliability coefficient of this questionnaire in the research of Broomandnasab and Shokrkon (2009) was obtained by Cronbach's alpha method as 0.67 and using Guttman's method as 0.36. In the research of Ahmadi and Sayyahi (2017), the correlation between the questions was 67%.

Pearson's correlation coefficient and structural equation method were used to analyze the data. Data were analyzed using SPSS22 and Smart PLS3 software.

3. Results

Based on the descriptive statistics, 73.91% of the sample were women and 26.09% were men. The age of most of the respondents (47.82%) was between 20 and 30 years old and the lowest frequency was related to the age group below 20 years (0.97%).

Table 1 shows the descriptive statistics related to the research variables and their subscales.

Table 1

Descriptive statistics of research variables and their subscales

variabels	Mean	Std. Deviation	Skewness	Kurtosis	Minimum	Maximum
Communication	34.79	5.293	0.553	0.887	21	55
Future orientation	35.00	3.875	0.073	0.080	23	45
Problem-oriented and positivity	21.59	3.210	-0.288	0.241	10	29
academic resilience	91.31	6.784	0.190	1.072	70	118
Novelty and innovation	14.10	2.145	-0.246	0.072	7	20
Intricacy	29.65	4.311	-0.046	3.028	9	44
Unsolvable problems	10.47	1.987	0.161	-0.154	5	15
ambiguity tolerance	54.22	6.385	-0.248	3.467	22	76
Autonomy	29.26	4.614	0.279	0.231	19	44
Competence	26.08	4.136	0.300	-0.240	17	36
Relation	37.15	5.120	-0.092	0.073	23	51
Basic psychological needs	92.42	10.844	0.110	0.373	65	124

The normality of the research data was checked by the Kolmogorov-Smirnov test. Additionally, the Z-statistic for ambiguity tolerance and resilience variables was obtained as 0.066 and 0.077, respectively and the significance level for both variables was less than 0.05 ($P < 0.05$); As a result, the indices of ambiguity tolerance and resilience had a non-normal distribution; On the other hand, the Z statistic for the basic psychological needs variable was 0.56 and its significance level was greater than 0.05; As a result, the basic psychological needs index had a normal distribution. After analyzing the data, the graphical output of the research model was obtained as follows.

To check the fit of the proposed research model, four criteria were R2, Q2, GOF, and SRMR (Standardized root mean square residual) index, the values of which presented below. The criterion R2 was related to the hidden endogenous (dependent) variables of the model. R2 was

a measure that illustrated the effect of an exogenous variable on an endogenous variable. The value of R2 in the present research for the variables of ambiguity tolerance and academic resilience was 0.261 and 0.278, respectively, which confirmed the appropriateness of the fit of the structural model. The Q2 criterion determined the predictive power of the model, which was obtained through the present research for the variables of uncertainty tolerance and academic resilience, 0.276 and 0.324, respectively. It showed the appropriate predictive power of the model regarding the endogenous structures of the research and confirmed the good fit of the structural model. Another indicator was the goodness of fit (GOF). The standard value of GOF was equal to 0.389 obtained, which was greater than the standard value of 0.3 and it highlighted the appropriate power of the model in predicting the endogenous current variable of the model. Currently, the most reliable index used to evaluate model fit in the PLS

method has been the SRMR (Standardized root mean square residual) index, which is used for overall model fit. Its value should be below 0.08; in this research, its value was found to be equal to (0.071). Therefore, the proposed research model had favorable conditions and has been a perfect fit.

Then, the structural model of the research was examined and the coefficients of the standard path of the conceptual model of the research are given in figure (2).

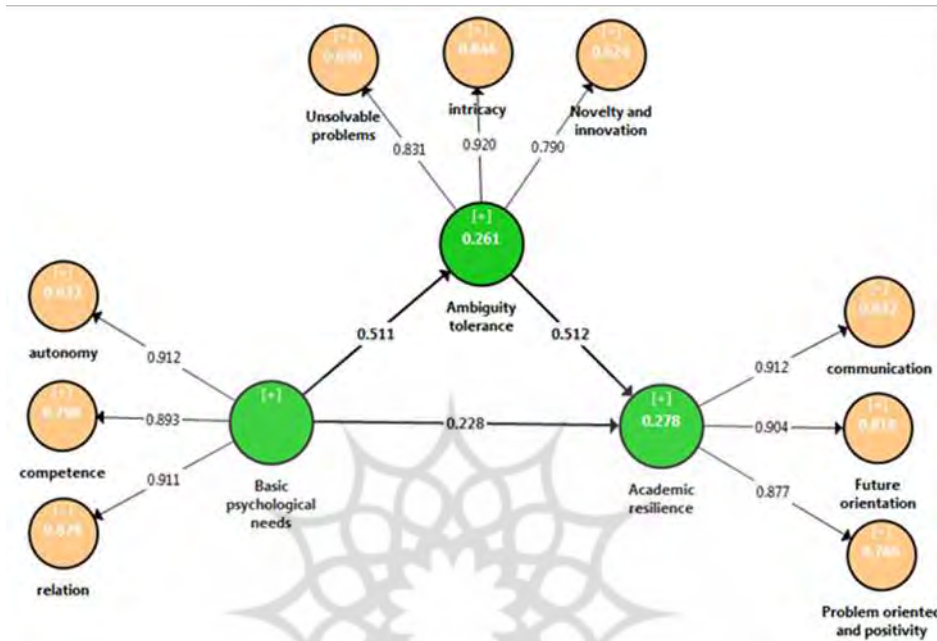


Figure 2- Standard path coefficients of the research conceptual model

The numbers written on the paths (Figure 2) represented the coefficients of the path.

To test the significance of the coefficients of the path using the Bootstrapping method, the values of the t-test were calculated; they are shown in Figure (3).

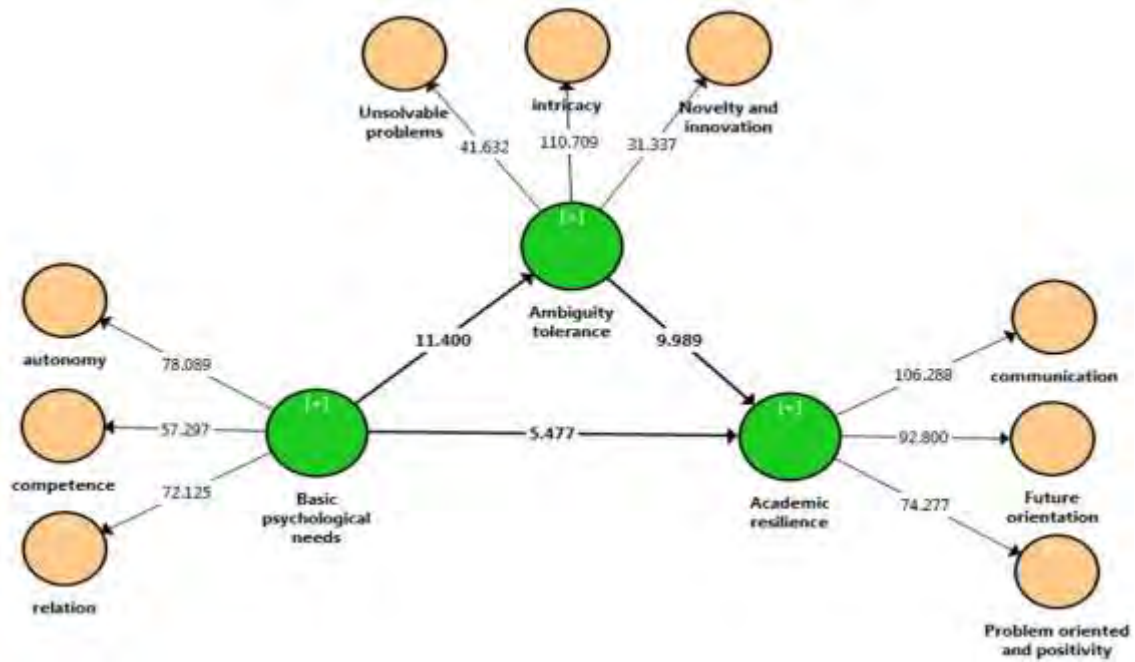


Figure 3-Results of t-Student's test to check the significance of path coefficients

If the value of the t-Student test was greater than 1.96, the path coefficient was significant at the 0.05 level. In the current research, all the significant path

coefficients of income, path coefficients, and the results related to their significance are given in Table (2).

Table 2

The results of the structural model evaluation for checking direct routes

Patch	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	sig
Ambiguity tolerance ---> Academic resilience	0.512	0.051	9.989	0.000
Basic psychological needs ---> Academic resilience	0.228	0.058	5.477	0.000
Basic psychological needs ---> Ambiguity tolerance	0.511	0.045	11.400	0.000

As can be seen in Table (2), the significant statistic between the variable of basic psychological needs and academic resilience was equal to (5.477), which was greater than (1.96); it indicated that the relationship between basic psychological needs and academic resilience was significant at the confidence level (95%). Correspondingly, the path coefficient

between these two variables was equal to (0.228) which showed the positive effect of basic psychological needs on academic resilience; In other words, one unit of change in basic psychological needs would increase 0.228 units in academic resilience. This means that the provision of basic psychological needs had a positive and direct effect on academic resilience.

Moreover, [Table \(2\)](#) illustrated that the significant statistic between the ambiguity tolerance variable and academic resilience was equal to (9.989), which was greater than (1.96) and it indicated that the relationship between ambiguity tolerance and academic resilience was significant at the confidence level (95%); additionally, the path coefficient between these two variables was equal to (0.512) which showed the positive effect of ambiguity tolerance on academic resilience; In other words, one unit of change in ambiguity tolerance would increase 0.512 units in academic resilience. This means that ambiguity tolerance had a positive and direct effect on academic resilience.

The bootstrapping method was used to investigate the indirect effect of basic psychological needs on academic resilience through ambiguity tolerance. In this method, if the value of the lower limit and the upper limit of the bootstrapping were both positive or both negative, with no zero placed between these two limits, then the indirect path would be meaningful. In addition, if the significance level was smaller than 0.05 ($P < 0.05$), the indirect effect was accepted.

Based on this index, the significance or non-significance of the indirect path is presented in [Table No. 3](#):

Table 3

The results of the bootstrapping method to check the significance of the indirect effect

Patch	Indirect effect	Confidence Intervals		T Statistics	Standard Deviation	P Values
		2.5%	97.5%			
Basic psychological needs -> Ambiguity tolerance -> Academic resilience	0.262	0.182	0.345	6.624	0.04	0.001

As [Table \(3\)](#) indicated, the significance level was equal to 0.001, smaller than 0.05 ($P < 0.05$), and the confidence interval did not include zero; Therefore, basic psychological needs had an indirect effect on academic resilience through ambiguity tolerance.

4. Discussion

The present research was conducted to investigate the causal relationship between self-determination and academic resilience in online education with the mediating role of ambiguity tolerance in students.

In this regard, the results demonstrated that the provision of basic psychological needs had a direct effect on academic resilience, which is in line with the results of [Mirzaei et al.'s](#) research (2016). According to the three components of psychological needs, i.e., the need for competence, the need for communication, and the need for autonomy, this result could be explained. To provide the need for competence, the student revealed better academic performance and perceived more competence. On the other hand, the need for communication was provided through interaction with other students and professors, and this received support would

be related to greater academic resilience. Moreover, by satisfying the need of autonomy, the student would do the assigned tasks with more stability, and as a result, he or she would gain more resilience. Providing basic psychological needs in virtual education has been also very important because in online education, communication does not take place in the real world. Therefore, students who could meet the need for communication in other ways, such as interacting with classmates and professors in virtual networks as well as online systems provide sense of competence and autonomy by displaying their successes in the virtual space, experiencing higher educational resilience.

In addition, the results of the present research showed that the tolerance of ambiguity had a direct effect on academic resilience, which is in a way consistent with the findings of [Yu et al. \(2021\)](#), [Shaterian Mohammadi et al. \(2014\)](#), as well as [Radmehr and Karami \(2019\)](#). Each of the factors of ambiguity tolerance, i.e., novelty and innovation as well as complexity and unsolvable problems, had a direct effect on the components of academic resilience, i.e., communication skills, future orientation, problem-oriented, and positivity. The reason that could be given in support of this hypothesis is that, for example, if a student succeeds in solving intractable problems and actually has a high level of ambiguity tolerance and performs better in difficult situations and being challenged, it will directly affect his resilience in education. Since this student is problem-oriented and positive, when facing a new subject that includes innovation and novelty he or she shows good performance; this behavior is because of the sense of self-esteem and inner self-confidence that student who

succeeded in previous stages or semesters, resulting in more academic resilience in this student experienced. For example, in facing new and unfamiliar topics such as language learning, and especially in the case of postgraduate students who studied another field in the previous stage, tolerance of ambiguity is very important. When facing new and sometimes ambiguous and questionable concepts and definitions, people who have a higher tolerance for ambiguity display more interest; they consider this situation as a challenge and are interested in solving novel and complex issues; consequently, they will have more academic resilience. This issue becomes more important in virtual education because students experience learning in a virtual system with which they are not familiar. Thus, this type of education seems to be a new, complex challenge as well as a problem, and a student who tolerates more ambiguity will display more academic resilience in virtual education.

Additionally, the results of the present research indicated that basic psychological needs had an indirect effect on academic resilience through ambiguity tolerance. Part of this result is consistent with the findings of [Mirzaei et al. \(2016\)](#), [Radmehr and Karami \(2019\)](#), and [Yu et al. \(2021\)](#). For explaining this hypothesis, it can be said that the components of communication skills are common in both variables of ambiguity tolerance and basic psychological needs and, the component of insoluble problems in tolerance of ambiguity is related to being problem-oriented and having positivity in students with academic resilience. Hence, it can be concluded that an autonomous student, for example, with a high level of ambiguity tolerance can solve intractable problems

well, which will strengthen the problem-oriented dimension and positivity in his or her academic resilience, explaining the indirect effect of self-determination through the mediating role of ambiguity tolerance on academic resilience in students; this issue will be especially important in virtual education.

One of the limitations of this research was due to the spread of COVID-19 at the time of data collection; therefore, the distribution of the questionnaire was done online employing the convenience the sampling method. Moreover, the research design was of the correlation type and it was not possible to draw definite conclusions about the cause-and-effect relationship between the variables. Therefore, the present results are limited to the students of Rahman Institute of Higher Education and the generalization of the results should be done with caution.

5. Conclusion

Therefore, it can be concluded that if the basic psychological needs of students, i.e., the need for competence, autonomy, and communication, are provided, they will show the ability to tolerate more ambiguity and as a result, they will experience more academic resilience. The results of the present study will be useful for higher education planners to devise some strategy to overcome the related problems.

Conflict of interest

The Authors declare that there is no conflict of interest with any organization. Also, this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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