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RESEARCH ARTICLE

The Mediating Role of Cognitive Flexibility in the Relationship between Intolerance of Uncertainty and Subjective Well-Being in High School Students during the COVID 19 Pandemic

Arzu BUYRUK GENÇ[a]

[a]Bahçeşehir University, Istanbul, Turkey

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ABSTRACT

The COVID-19 pandemic brought some uncertain and new changes in life patterns. These changes have had psychological effects on high school students as well as in all age groups. This study aimed to examine the mediating role of cognitive flexibility between intolerance of uncertainty and subjective well-being in high school students during the COVID-19 pandemic. Participants of the study consisted of 437 high school students (234 females and 203 males) in Turkey. They completed measures of intolerance of uncertainty, cognitive flexibility, and adolescent subjective well-being. The hypothetical model developed in order to determine whether cognitive flexibility mediates in the relationship between intolerance of uncertainty and subjective well-being was tested through Structural Equation Modeling. The results of the study revealed that intolerance of uncertainty had a significant direct effect on subjective well-being. Cognitive flexibility partially mediated the association between intolerance of uncertainty and subjective well-being for the high school students during the COVID-19 pandemic. Practitioners can create psychoeducational programs to decrease intolerance of uncertainty and increase the cognitive flexibility levels of the students. The practitioners can apply these programs to high school students.

In the days when the world was preparing to meet the year 2020, it encountered the Coronavirus (COVID-19) pandemic that emerged in China. The pandemic affected many countries in a short time. From March 11, 2020, when the epidemic was declared as a global epidemic by the World Health Organization (WHO, 2023), 767 million people were infected and approximately seven million people died. In parallel with many countries, the spread of the pandemic could not be stopped in Turkey, and the virus was transmitted to approximately 17 million people and 101 thousand deaths occurred until May, 2023 (Republic of Turkey Ministry of Health. 2023; WHO 2023).

Many measures were taken both in other countries and in Turkey to reduce the risk of transmission of this virus. Some of these measures can be listed as the transition to distance education at all levels of education, the prohibition of citizens over 65 and under 20 from going out, street restrictions on weekends and official holidays, night curfews, closure of socialization areas such as movie theaters and restaurants. The measures

CORRESPONDING AUTHOR Arzu BUYRUK GENÇ, arzu.buyrukgenc@bau.edu.tr, ORCID: 0000-0002-4765-3274, Bahçeşehir University, Istanbul, Turkey.

taken to prevent the transmission of the virus caused changes in the lifestyles of individuals, reduced their daily interactions and social relationships, and increased the feeling of loneliness (Zandifar & Badrfam, 2020). On the other hand, the fear, anxiety and stress levels of individuals also increased (Rajkumar et al., 2020). Some factors including the uncertainty of the disease, the lack of knowledge about the disease, the fear of people losing their loved ones, and feeling that they are not in control triggered the state of anxiety and fear about the epidemic (Brooks et al., 2020). In short, COVID-19 is not only a fatal disease, but also poses a serious risk to the mental health of the community (Duan & Zhu, 2020; Huang & Zhao, 2020).

High school students in adolescent period were also affected by these COVID-19 related negativities (Camacho-Zuniga et al., 2021). COVID-19 pandemic threatened the mental health of high school students (Williams et al., 2021). In epidemic situations, especially adolescents are at higher risk for poor mental health (Kar & Bastia, 2006). The COVID-19 pandemic and quarantine have affected adolescents' lives in different ways. As adolescents spend less time with family members, they improve a tendency to construct cliques and they start to spend time with their peers in these cliques. During this period, self-esteem further differentiates and, for most adolescents, increases. Academic performance, peer acceptance, and the larger social environment all influence self-esteem (Berk, 2018).

It is thought that long-term curfew, difficulties in adapting to distance education, not being able to meet face-to-face with friends, and conflicts with parents because of having to stay home for a long time may negatively affect the mental health of high school students. Throuhout the COVID 19 pandemic, many issues such as when the pandemic will end, whether a drug will be found, the nature of the mutated virus, and whether there will be possible new mutations have caused uncertainty. It has been predicted that the uncertainty brought about by the pandemic may be an important stress factor for all people and especially high school students.

Intolerance of Uncertainty

Uncertainty, which is defined as the uncertainty of the future and expectations about the future, creates negative psychological effects (Sarıcam et al., 2014). The predisposition to react emotionally, cognitively and behaviorally from a negative perspective to uncertain events and situations manifests itself as intolerance (Buhr & Dugas, 2002). Intolerance of uncertainty is defined as the dispositional fear that underlies emotional difficulties and causes anxiety when uncertainty is perceived intensely (Fergus, 2013). Individuals who have a high level of intolerance of uncertainty tend to perceive uncertainty as negative and threatening (Dugas et al., 2005). They tend to exaggerate the possibility of unexpected negative events when interpreting uncertain information (Yook et al., 2010).

It has been demonstrated that intolerance of uncertainty is the main component of common anxiety disorders (Dugas et al., 2005; Moris et al., 2016). In addition, intolerance of uncertainty is positively associated with depression (Butzer & Kuiper, 2008; Yok et al., 2010). It may play a greater role in the etiology of worry in adolescents (Lugas et al., 2012). Laugesen et al. (2003) examined the relation between worry and intolerance of uncertainty, negative problem orientation, positive beliefs about worry and cognitive avoidance among adolescents. They demonstrated that intolerance of uncertainty had the strongest association with worry scores, and intolerance of uncertainty was the most important variable in discriminating between moderate and high worriers. The characteristics of worry tend to change with age, going from more concrete concerns in childhood to abstract concerns in adolescence (Benctein et al., 1996). Furthermore, during adolescence, the individual tries to make plans and decisions for the future. Therefore, individuals may encounter uncertainties during adolescence. Bakioğlu et al. (2021) found the relationship between intolerance of uncertainty and some other negative effects, such as depression, anxiety, and stress during the COVID-19 pandemic. Intolerance to uncertainty during the COVID-19 pandemic negatively affects the subjective well-being of individuals (Satici et al., 2020).

Subjective Well-Being

Well-being represents positive emotions and positive social interactions as well as the absence of a disease or illness (Schueller, 2009). Subjective well-being refers to an individuals' evaluation of their life positively or negatively. Subjective well-being consists of positive affection, negative affection and life satisfaction (Diener, 2000). Subjective well-being occurs in the presence of life satisfaction, positive emotions and absence of negative emotions (Diener, 2006). It was demonstrated that there are four important factors affecting

adolescent subjective well-being: having supportive parents, being able to handle difficult tasks, experiencing positive life events, and being highly satisfied with relationships with important individuals (Park, 2004). COVID-19 pandemic is a negative life event and has caused a decline in individuals' subjective well-being (Zacher & Rudolph, 2020).

Cognitive Flexibility

Adolescents need to cope with biological changes related to maturing, developing a successful identity across many fields, get familiar with new environments, meet new people and achieve academic success. On the other hand, high school students have had to dealt with for a more livable life during the difficult pandemic period. It is thought that high school students in adolescence period may need cognitive flexibility to meet these demands successfully.

Cognitive flexibility, defined as the potential to switch from one thought to another, to adapt to different situations, or to look at different problems with multi-faceted strategies (Martin & Rubin, 1995), could be a skill that can contribute to the subjective well-being of the high school students. Cognitive flexibility emphasizes that the individual is flexible in the face of new situations, aware of alternative solution options and ways, and feels competent in these situations (Martin & Anderson, 1998; Martin & Rubin, 1995). Dennis and Vander Wal (2010) emphasized that cognitive flexibility is the ability of an individual to change their cognitions according to changing environmental conditions. They explained cognitive flexibility as the ability to perceive that there may be alternatives to situations that arise in life and human behavior, the tendency to control difficult situations and the ability to produce many solutions in order to solve difficult situations.

As can be understood from the definitions, cognitive flexibility is an important skill that enables an individual to be flexible in adapting to new situations. Cognitive flexibility is associated with goal-oriented behaviors including creativity, problem solving, and decision-making (Gabrys et al., 2018) and enables an individual to cope with crisis situations (Yildiz-Akyol & Boyaci, 2020). Because of these features, it is thought that cognitive flexibility may be a variable that affects well-being of high school adolescent students during the COVID-19 pandemic. Therefore, cognitive flexibility may play an important mediating role in the relationship between intolerance to uncertainty and subjective well-being.

The Current Study

High school students are one of the groups most affected by the measures taken to be protected against the COVID-19 pandemic. It is known that intolerance of uncertainty has the consequences of generalized anxiety (Dugas et al., 2005; Carleton et al., 2012), and depression (Carleton et al., 2012). Intolerance to uncertainty negatively affects individuals' level of happiness (Yildiz & Eldeleklioglu, 2021), and their well-being (Satici et al., 2020). It was found to be positively correlated with the level of cognitive flexibility (Yildiz & Eldeleklioglu, 2021).

In this context, the research has been deemed important in terms of aiming to provide information to interventions that will increase students' subjective well-being by evaluating the relationship between the level of intolerance of uncertainty and their well-being and whether cognitive flexibility has a mediating role in this relationship. In other words, this research has been deemed important in terms of providing evidence for preventive interventions that can be applied to prevent the possible unwanted psychological consequences of the COVID-19 outbreak. In addition, the study was thought to be important, as it was the first study to reveal the mediating role of cognitive flexibility between intolerance to uncertainty and well-being. For this purpose, an answer was sought to the following question: Does cognitive flexibility mediate the relationship between high school students' intolerance to uncertainty and their subjective well-being in the COVID-19 pandemic?

Method

Participants and Procedure

The study comprised of 437 high school students in Turkey. The participants were determined by using random sampling method. 234 (%53.55), of the participants are female 203 (56.45) are male and 184 (42.1%) of the participants are 9th grade, 80 (18.3%) 10th grade, 121 (27.7%) 11th grade, 52 (11%) 12th grade students. Prior

to the administration of data collection tools, the Informed Consent Form prepared by the researcher was sent to guardians of the participants. Guardians of the participants have read and approved this form. The data collection tools used in the study were sent to the participants via a link prepared by using Google Forms, and all the data were collected online. The study was approved by Local Ethics Committee.

Data Collection Tools

Intolerance of Uncertainty Scale. The Short Version of the Intolerance of Uncertainty Scale (IUS; Carleton et al., 2007) was used. IUS was adapted to Turkish by Sarıcam et al. (2014). This scale has 12 items and a 5-point Likert type. The total scores alter between 12 and 60, and an increase in scors indicates an increase in intolerance of uncertainty. The scale has two subscales named as prospective anxiety and inhibitory anxiety. Researchers have reported that the Turkish version is both acceptable and reliable (Sarıcam et al., 2014). In this study, IUS's Cronbach's alpha reliability coefficient has been found as 88.

Cognitive Flexibility Inventory. In order to measure the cognitive flexibility of participants, Cognitive Flexibility Inventory (CFI) was used. The scale was developed by Dennis and Vander Wal (2010) and was adapted to Turkish by Sapmaz and Dogan (2013). The CFI has 20-item 5-point Likert-type. The total points vary between 20 and 100 and the increase in scores indicates an increase in cognitive flexibility. Researchers showed that the Turkish version is both reliable and acceptable (Sapmaz & Dogan, 2013). In this study, Cronbach's alpha reliability coefficient of the scale has been found as 0.91.

Adolescent Subjective Well-being Scale. In order to measure the subjective well-being of participants, Adolescent Subjective Well-Being Scale (ASWBS) was used. The scale was developed by Eryilmaz (2009). It consists of 15 items and a 4-point Likert scale. The total scores alter between 15 and 60 and the increase in scores shows a stronger sense of subjective well-being. The scale has four subscales named as satisfaction from family relationships, positive emotions, satisfaction from relationships with important others, and life satisfaction. Researcher has reported that ASWBS is both acceptable and reliable (Eryilmaz, 2009). In this study, Cronbach's alpha reliability coefficient of the scale has been found as 0.87.

Data Analysis

The PROCESS macro for the SPSS (Model 4, Hayes, 2018) was conducted to analyses the model used to test mediating effect of cognitive flexibility in the relationship between intolerance of uncertainty and subjective well-being in high school students during the COVID 19 Pandemic. In the analysis 5000 bootstrap samples were conducted with confidence intervals of 95%. Since the confidence intervals do not comprise of zero, they may be concluded that they have statistical value (Hayes, 2018).

Results

Preliminary Analyses

Before proceeding with the analysis, the necessary assumptions were examined. It was observed that the skewness of the variables varied between -30 and 0.17, and kurtosis of the variables varied between -41 and -21. This analysis showed that normality criteria were met. In addition, the Durbin Watson value was found to be 1.96, the variance inflation factor values were found to be between 1.22 and 1.61, and the tolerance value was found to be between 0.62 and 0.82. As a result of these analyses, it was determined that there were no multicollinearity or residual problems and the assumptions were met.

The study analyzed the correlations and descriptive statistics of the variables. Correlations and descriptive statistics of the variables are given in Table 1. Intolerance of uncertainty and subjective well-being have a negative correlation (r=-.312) and cognitive flexibility (r=.167) is a negative one. On the other hand, the relation between cognitive flexibility and subjective well-being however is positive in nature (r=315).

Under this heading assumptions were also evaluated. The presence of multivariate normality in a data set can be ascertained by examining the normality, linearity, homoscedasticity for each one of the variables. Skewness and kurtosis values are studied in order to identify whether the variables in the data set have normal distribution. These values are expected to range between -1.5 and +1.5 (Tabachnik & Fidell, 2012). Furthermore, the absence of multiple linear relationship is one of the assumptions of structural equation

analysis. An intervariable relationship value of .90 and above is the sign of a multiple relationship issue (Tabachnick & Fidell, 2012).

Table 1. Correlation and descriptive statistics for the variables

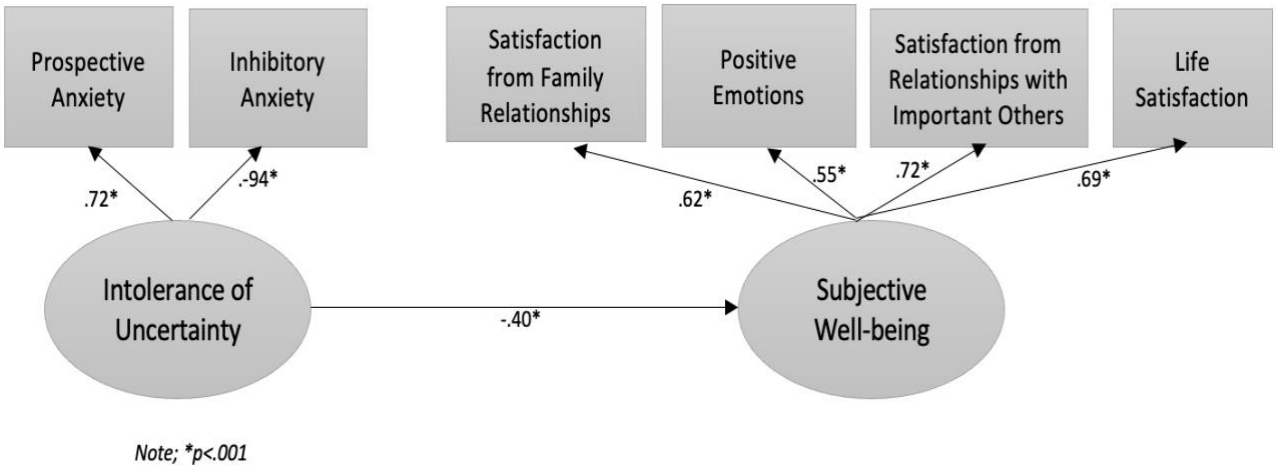
Variables	**1**	**2**	**3**
1. Intolerance of Uncertainty	-		
2. Cognitive Flexibility	-.167**	-	
3. Subjective Well-Being	-.312**	.315**	-
Mean ($\bar{x}$)	39.20	73.46	46.84
Standard Deviation (SD)	10.47	13.36	8.39
Skewness	-.319	-.111	-.595
Kurtosis	-.554	-.415	-.063

As you show in Table 1, all the variables analyzed in this study were found to have skewness values of -2 and +2. In addition, the correlation between the variables of the study were found as -.167, -.312 and 315 (p <.01). Consequently, no multiple relationship problem exists among the variables.

Hypothetical Model Analysis

First of all, it was examined whether the independent variable had a significant effect on the dependent variable. The analysis performed for this purpose is shown in Figure 1.

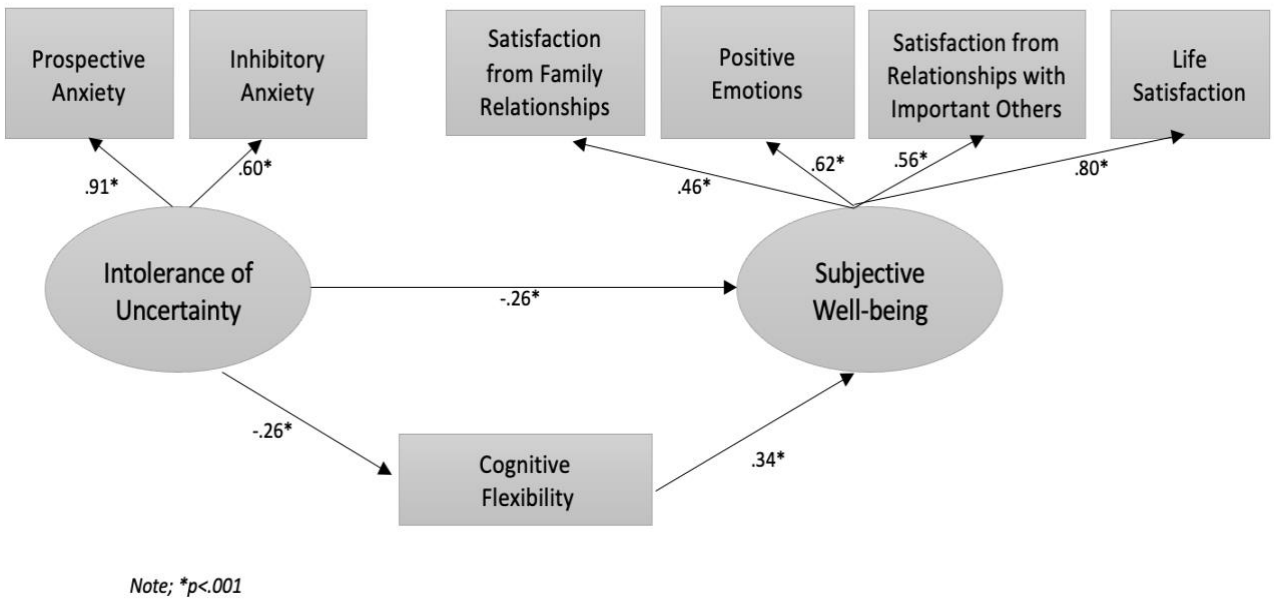
Figure 1. Regression analysis result regarding how intolerance of uncertainty predicts subjective well-being



As it can be seen in Figure 1, the analysis revealed that subjective well-being is significantly predicted by intolerance of uncertainty (β=-.40. p<.001). Thus, it can be submitted that the first assumption stated by Baron and Kenny (1986) before testing mediation.

For mediation effect, the independent variable must have a significant effect on the mediator variable. In addition, when the mediator variable is included in the regression analysis with the independent variable, the effect of the independent variable on the dependent variable decreases or becomes meaningless, while the mediator variable must have a significant effect on the dependent variable (Baron & Kenny, 1986). In line with these suggestions, the mediating effect was tested and the hypothetical model regarding the mediating role is presented in Figure 2. As seen in the model in Figure 2, when cognitive flexibility, which is the mediator variable, is included in the hypothetical model, this effect decreases but still remains significant (β = -. 26, p <.001). Hence, cognitive flexibility showed a partial mediation between intolerance to uncertainty and subjective well-being.

Figure 2. Hypothetical model



As seen in the direct effects in Figure 2, intolerance of uncertainty predicted cognitive flexibility negatively (β = -. 26, p <.001). Cognitive flexibility predicted subjective well-being positively (β = .34, p<.001). The direct effect of intolerance of uncertainty on subjective well-being was -.40. When cognitive flexibility, which is the mediator variable, is included in the hypothetical model, this effect decreases but still remains significant (β = .- 26, p <.001). Therefore, cognitive flexibility showed a partial mediation between intolerance to uncertainty and subjective well-being.

When the fit indexes of the structural model are examined, it is seen that the result is 3.68 when Chi Square value is divided by degree of freedom. In addition, the goodness of fit indexes of the model were calculated as follows: GFI: .98, CFI: .96, AGFI: .94, NFI: .95 and RMSEA: .08. The values are within the range of good fitness values.

Table 2 below displays the bootstrapping coefficient, which was calculated by using 10.000 resampling method and shows whether the indirect effects of the partial mediation determined in the model are significant. The table also displays lower and upper bounds of 95% confidence intervals.

Table 2. Bootstrapping results

			%95 Confidince interval		
Indirect effects	**Coefficient**	**SE**	**Lower limit**	**Upper limit**	**p**
Intolerance of uncertainty → Cognitive flexibility →Subjective well-being	-.088	. 133	-.131	-.059	.000*

*Not: *p <.01*

Table 2 Bootstrapping results regarding the mediation of cognitive flexibility between intolerance of uncertainty and subjective well-being. In order to evaluate whether the indirect effect resulting from bootstrapping is significant, it is determined according to whether the mediator variable contains zero within the lower and upper limits of the 95% confidence interval of the point estimation. If the confidence intervals do not include zero, it is concluded that the indirect effect is significant (Shrout & Bolger, 2002). It can be seen Table 2 bootstrap analysis shows that partial mediation model is significant. Bootstrap confidence intervals do not include the upper and lower limits of zero. Therefore, the significance of the mediating effect of cognitive flexibility between intolerance of uncertainty and the subjective well-being was supported.

Discussion

The Covid 19 pandemic or other possible pandemics may continue to affect many people lives. It was thought that high school students were also affected by this pandemic mentally, and it was considered important to investigate the variables that affect the well-being levels of high school students. Therefore, this study aimed to investigate the relationship between the level of intolerance to uncertainty and well-being of high school students during the COVID-19 pandemic and whether cognitive flexibility has a mediating role in this relationship.

The results of the study revealed that high school students' intolerance of uncertainty negatively and significantly predicted cognitive flexibility. As high school students' intolerance to uncertainty levels increased, their cognitive flexibility levels decreased.

This finding of the study supported the findings of other studies (Demirtas & Yildiz, 2019; Yildiz & Eldeleklioğlu, 2020) that had revealed the negative relationship between intolerance of uncertainty and cognitive flexibility. To be cognitively flexible, one needs to focus his attention regularly on changing conditions. In addition, in order to adapt his behaviors to new conditions, the person needs to reconstruct his knowledge to interpret the new situation and new needs effectively (Canas et al., 2006). The COVID-19 outbreak has caused many changes in the lives of high school students. Many new situations such as applying the measures announced by official authorities to prevent the transmission of the virus, adapting to distance education, restricting contact with friends, having to spend longer time at home have entered the lives of high school students. These changes in the life styles of high school students required the restructuring of knowledge and behavior. This requirement, which occurs in uncertainty situations, emphasizes the cognitive flexibility feature.

Cognitive flexibility is the ability of an individual to adapt cognitive processing strategies to face new and unexpected conditions in the environment (Canas et al., 2003). Individuals with a high level of intolerance of uncertainty tend to exaggerate the possibility of unforeseen negative events when interpreting uncertain information (Yook et al., 2010). Therefore, it can be said that students who focus more on the negativities tend to exaggerate while interpreting these negativities. In other words, students with high levels of intolerance of uncertainty have low cognitive flexibility levels.

The results of the study revealed that high school students' cognitive flexibility positively and significantly predicts subjective well-being. As high school students' cognitive flexibility levels increase, their subjective well-being levels increase. In the literature cognitive flexibility is positively associated with happiness (Yildiz & Eldeleklioglu, 2021), psychological well-being (Cardom, 2016), well-being (Asici & İkiz, 2015; Fu & Chow, 2016, Koesten, et al., 2009); subjective well-being (Metzl, 2009). It is stated that individuals with high cognitive flexibility are better equipped to solve personal problems and cope with stress, and this increases mental and cognitive health (Koesten et al., 2009). Keith et al. (2015) stated that cognitive flexibility decreases the level of post-traumatic stress symptoms and that there are positive relationships between high level of cognitive flexibility and post-traumatic growth and optimistic expectations for the future. It is known that individuals with high level of cognitive flexibility look for more alternatives and feel themselves more competent while solving their problems (Dennis & Vander Wal, 2010). In this study, students with high levels of cognitive flexibility, who faced new situations during the COVID-19 outbreak, showed high levels of well-being.

According to the result of the study, cognitive flexibility has been mediated partially between intolerance of uncertainty and subjective well-being. In the literature, there is no study focusing on the mediation of cognitive flexibility between intolerance to uncertainty and subjective well-being levels. However, cognitive flexibility mediates the relationship between exposure to trauma and life satisfaction (Fu & Chow, 2016) and the relationship between hopelessness and perceived stress (Demirtas & Yildiz, 2019).

The COVID-19 pandemic is a stressful situation in life. It has also brought many uncertainties. Individuals with a high level of intolerance of uncertainty tend to consider situations involving uncertainty as sad and stressful situations and avoid uncertainty (Buhr & Dugas, 2002). Therefore, in this study, high school students

with a high level of intolerance to uncertainty may evaluate the COVID-19 pandemic as a sad and stressful situation and so they could not use appropriate coping strategies, in other words, they could not display cognitive flexibility. Because it is known that individuals who can evaluate stressful situations more effectively and use appropriate strategies show cognitive flexibility (Dennis & Vander Wall, 2010). Because it is known that individuals who can evaluate stressful situations more effectively and use appropriate strategies show cognitive flexibility (Dennis & Vander Wall, 2010). Individuals with cognitive flexibility consider the difficult situations they encounter as more manageable and can discover new ways. They can change the thoughts that force them to more harmonious ones (Gulum & Dag, 2012). Individuals with flexible cognitions may be easier to adapt to difficult life events (Keith et al., 2015). It is an expected result that individuals who adapt to difficult life events and have high cognitive flexibility have high levels of well-being. As a matter of fact, Koesten et al. (2009) founded that adolescents who are cognitively flexible are more competent in managing their personal problems and stressful experiences, and these characteristics increase their subjective well-being. Metzl (2009) also revealed that the effect of cognitive flexibility in predicting subjective well-being, which emerged as life satisfaction after Hurricane Katrina, and stated that subjective well-being of cognitive flexibility after an adverse event made an important contribution.

Limitations

This research has some limitations. First, the research data were collected through self-report scales. Using more than one method in data collection may be effective in reducing bias in answering questions. Secondly, the data were obtained only from high school students in Istanbul province. Therefore, the research may need to be repeated both in other provinces of Turkey and in other countries.

Suggestions

The result of the study revealed that cognitive flexibility mediated partially in the relationship between intolerance of uncertainty and subjective well-being in high school students. As the intolerance of uncertainty decreases, cognitive flexibility increases and as cognitive flexibility increases, subjective well-being increases. For this reason, some suggestions are included for practitioners, families, and researchers.

Practitioners should create psychoeducational programs that can decrease intolerance of uncertainty and increase the cognitive flexibility levels of students, and apply these programs to high school students. In this way, support and contribution would be made in terms of reducing intolerance of uncertainty and increasing cognitive flexibility. Thus, subjective well-being of high school students would increase.

Families may play a role in the development of cognitive flexibility. Therefore, organizing seminars where families are provided with theoretical information about cognitive flexibility and practical information about how to increase cognitive flexibility in adolescents can make an augmentation in adolescents' cognitive flexibility.

In the future, researchers should investigate what cognitive flexibility means in high school students and the factors that increase cognitive flexibility using qualitative research methods. For these purposes, researchers should use the Online Photovoice (OPV) method, which is among the qualitative research methods. Researchers also should use Online Photovoice method to understand what contributes to the students' subjective wellbeing and what cause intolerance to uncertainty and improve functional implications at individual, group, school and community levels.

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Data Availability: The data sets are available from the author upon reasonable request.

Ethics Approval and Consent to Participate: The ethics committee approval of the study was obtained from Maltepe University Ethics Committee on 30/04/2021 (Karar no: 2021/12-02)

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