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THE MEDIATING ROLE OF SOLUTION-FOCUSED THINKING IN THE RELATIONSHIP BETWEEN PSYCHOLOGICAL RESILIENCE AND MATHEMATICAL RESILIENCE IN MIDDLE SCHOOL STUDENTS

O PAPEL MEDIADOR DO PENSAMENTO FOCADO NA SOLUÇÃO NA RELAÇÃO ENTRE RESILIÊNCIA PSICOLÓGICA E RESILIÊNCIA MATEMÁTICA EM ALUNOS DO ENSINO FUNDAMENTAL

EL PAPEL MEDIADOR DEL PENSAMIENTO CENTRADO EN LA SOLUCIÓN EN LA RELACIÓN ENTRE LA RESILIENCIA PSICOLÓGICA Y LA RESILIENCIA MATEMÁTICA EN ESTUDIANTES DE EDUCACIÓN BÁSICA

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ABSTRACT: The purpose of this study is to examine the mediating role of solution-focused thinking in the relationship between psychological resilience and mathematical resilience in middle school students. The sample of the study consisted of a total of 1,020 students who attended different middle schools in western Turkey and voluntarily participated in the study. The research was conducted within the framework of a correlational survey model. During the data collection process, the 'Brief Resilience Scale', 'Academic Resilience in Mathematics Scale', and 'Solution-Focused Thinking Scale' were used. The validity and reliability of the scales have been confirmed in previous studies and have not been retested in this research. The quantitative data obtained were analysed using SPSS 29.0 and PROCESS macro v4.1 software. The findings revealed that psychological resilience showed significant positive relationships with both solution-focused thinking and mathematical resilience. Additionally, solution-focused thinking was found to have a partial mediating effect on the relationship between psychological resilience and mathematical resilience. The results emphasise the importance of developing solution--focused educational programmes by guidance counsellors and subject teachers to strengthen students' psychological resilience and academic resilience in cognitively challenging subjects such as mathematics.

KEYWORDS: Psychological resilience. Solution-focused thinking. Mathematical resilience. Mediation model. Middle school students.

RESUMO: *O objetivo deste estudo é examinar o papel mediador do pensamento focado em soluções na relação entre resiliência psicológica e resiliência matemática em alunos do ensino fundamental. A amostra do estudo consistiu em um total de 1.020 alunos que frequentavam diferentes escolas do ensino fundamental na região oeste da Turquia e participaram voluntariamente do estudo. A pesquisa foi conduzida dentro da estrutura de um modelo de pesquisa correlacional. Durante o processo de coleta de dados, foram utilizadas a "Escala Breve de Resiliência", a "Escala de Resiliência Acadêmica em Matemática" e a "Escala de Pensamento Focado em Soluções". A validade e a confiabilidade das escalas foram confirmadas em estudos anteriores e não foram testadas novamente nesta pesquisa. Os dados quantitativos obtidos foram analisados utilizando o software SPSS 29.0 e o PROCESS macro v4.1. Os resultados revelaram que a resiliência psicológica apresentou relações positivas significativas tanto com o pensamento focado em soluções quanto com a resiliência matemática. Além disso, verificou-se que o pensamento focado em soluções tem um efeito mediador parcial na relação entre resiliência psicológica e resiliência matemática. Os resultados enfatizam a importância do desenvolvimento de programas educacionais focados em soluções por orientadores e professores da disciplina para fortalecer a resiliência psicológica e a resiliência acadêmica dos alunos em disciplinas cognitivamente desafiadoras, como a matemática.*

PALAVRAS-CHAVE: *Resiliência psicológica. Pensamento focado em soluções. Resiliência matemática. Modelo de mediação. Alunos do ensino fundamental II.*

RESUMEN: *El objetivo de este estudio es examinar el papel mediador del pensamiento centrado en soluciones en la relación entre la resiliencia psicológica y la resiliencia matemática en estudiantes de secundaria. La muestra del estudio estuvo compuesta por un total de 1020 estudiantes que asistían a diferentes escuelas secundarias en el oeste de Turquía y que participaron voluntariamente en el estudio. La investigación se llevó a cabo en el marco de un modelo de encuesta correlacional. Durante el proceso de recopilación de datos, se utilizaron la «Escala breve de resiliencia», la «Escala de resiliencia académica en matemáticas» y la «Escala de pensamiento centrado en soluciones». La validez y fiabilidad de las escalas han sido confirmadas en estudios anteriores y no se han vuelto a comprobar en esta investigación. Los datos cuantitativos obtenidos se analizaron utilizando el software SPSS 29.0 y PROCESS macro v4.1. Los resultados revelaron que la resiliencia psicológica mostraba relaciones positivas significativas tanto con el pensamiento centrado en soluciones como con la resiliencia matemática. Además, se descubrió que el pensamiento centrado en soluciones tenía un efecto mediador parcial en la relación entre la resiliencia psicológica y la resiliencia matemática. Los resultados enfatizan la importancia de desarrollar programas educativos centrados en soluciones por parte de los orientadores y profesores de las asignaturas para fortalecer la resiliencia psicológica y la resiliencia académica de los estudiantes en materias cognitivamente desafiantes como las matemáticas.*

PALABRAS CLAVE: *Resiliencia psicológica. Pensamiento centrado en soluciones. Resiliencia matemática. Modelo de mediación. Estudiantes de secundaria.*

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INTRODUCTION

Psychological resilience, one of the key constructs of positive psychology, is defined as the ability to remain flexible, adapt to environmental conditions, and function effectively despite adverse experiences (Luthar et al., 2000). This structure is influenced by both internal and environmental factors and can be developed over time. From an academic standpoint, psychological resilience supports success by helping individuals manage academic stress, fear of failure, and performance anxiety. In this context, resilience is particularly significant in mathematics, a field requiring abstract thinking, analytical reasoning, and sustained cognitive effort.

Mathematical resilience refers to individuals' capacity to overcome mathematical difficulties, persist through challenges, and learn from mistakes. High-achieving students demonstrate both cognitive and emotional resilience (Cassidy, 2015; Pajares & Graham, 1999). Solution-focused thinking serves as a cognitive bridge between psychological and mathematical resilience, encouraging individuals to draw on their strengths and focus on solutions rather than problems (Grant et al., 2012; Oliver & Charles, 2015). Research indicates that this strategy enhances psychological resilience and supports persistence in academic contexts (Şanal-Karahan, 2016). Accordingly, this study examines the mediating role of solution-focused thinking in the relationship between psychological resilience and mathematical resilience.

Psychological resilience is defined as an individual's capacity to adapt and achieve positive outcomes despite serious difficulties encountered in life, and it is closely related to broader constructs of resilience (Masten, 2001; Stewart et al., 1997). It enables individuals to maintain psychological balance by effectively utilizing protective factors when faced with traumatic or stressful experiences (Durak, 2021; Rutter, 2006). Overall, psychological resilience is considered a multidimensional construct shaped by the interaction of individual characteristics, environmental resources, and coping skills (Gürgan, 2006; Luthar et al., 2000). Empirical studies indicate that individuals with high levels of psychological resilience demonstrate more functional coping strategies, higher cognitive and academic performance, and stronger social and adaptive skills (Block & Block, 1980; Mandleco, 2001; Padesky, 2009).

While various risk factors—including poverty, migration, parental psychopathology, and child neglect—may undermine resilience (Garmezy, 1993; Karaırmak, 2006; Lansford et al., 2006), protective factors such as intelligence, self-esteem, humour, effective problem-solving, and social support have been shown to strengthen it (Gizir, 2004; Masten, 1994; Werner, 2000). In a similar vein, mathematical resilience, defined by Johnston-Wilder and Lee (2021), represents individuals' positive affective attitudes toward mathematics and their persistent approach to overcoming challenges in this field. Students with high mathematical resilience

tend to exhibit patience, collaboration, and a growth mindset, emphasizing that learning improves through sustained effort (Lee & Johnston-Wilder, 2014).

This construct not only promotes mathematical success but also supports broader academic development, as resilient learners experience less stress, use more effective learning strategies, and transform difficulties into opportunities for growth (Cassidy, 2015; Martin & Marsh, 2006). Recent studies have underscored the role of social-emotional variables—such as perception, belief, empathy, and well-being—in fostering mathematical resilience (Baker et al., 2019; Faradillah & Wulandari, 2021; Joy & Obiagaeri, 2019; Kahveci & Bulut-Serin, 2017; Layco, 2020; Mota et al., 2016).

Solution-focused thinking, relying on past-oriented causality, emphasizes a solution-oriented perspective that promotes structured problem-solving (Grant et al., 2012; Oliver & Charles, 2015). Through this process, individuals develop the ability to recognize and use both internal and external resources, thereby reinforcing components of psychological resilience such as flexibility, hope, and self-regulation (Kim & Park, 2022). The model underlying this approach consists of three components (De Jong & Berg, 2013): recognizing that problem-solving is possible and applying functional techniques; increasing self-awareness through positive experiences; and fostering hope and courage for the future.

This triadic structure enables individuals to distance themselves from problems, focus on solutions, and develop effective, goal-oriented strategies (Oliver & Charles, 2015). Studies in positive psychology show that individuals adopting this approach demonstrate high empathy (Şanal-Karahan et al., 2017), strong social skills (Siyez & Tan-Tuna, 2014), higher self-efficacy and life satisfaction (Sarı et al., 2019), better psychological well-being (Arslan & Asıcı, 2021), and greater hope (Şanal-Karahan, 2016). They also exhibit more positive emotional states and subjective well-being (Grant & Spence, 2010; Kashdan & Rottenberg, 2010; Kim & Franklin, 2015; Theeboom et al., 2015). Developing a solution-focused mindset enhances well-being and strengthens one's capacity to set goals, create action plans, and initiate positive change (Kondrat & Teater, 2010; Jackson & McKergow, 2007).

This approach enables individuals to consider multiple alternatives in problem-solving without relying on the cause-and-effect cycle. It promotes optimism (Murdock, 2016) and a positive future orientation (Corey, 2008). This study was conducted within the framework of Positive Psychology (Seligman & Csikszentmihalyi, 2000) and the Cognitive Behavioural Approach (Beck, 2011). In this regard, the main objective of this study is to examine the mediating role of solution-focused thinking in the relationship between middle school students' psychological resilience levels and mathematical resilience. Within this scope, the following hypotheses have been formulated.

- H1: Psychological resilience positively affects mathematical resilience.

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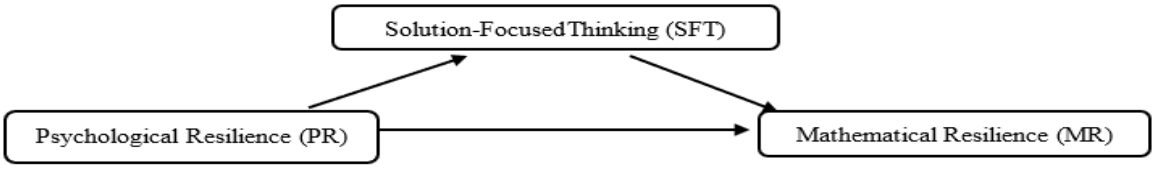
- H2: Psychological resilience positively affects solution-focused thinking.
- H3: Solution-focused thinking positively affects mathematical resilience.
- H4: Solution-focused thinking plays a mediating role in the relationship between psychological resilience and mathematical resilience.

Figure 1
The Research Model



Note. Prepared by the authors.

METHODOLOGY

In this study, a quantitative design based on a correlational survey model was used. The correlational survey model is a quantitative research design used to determine the level of relationship between two or more variables. Researchers frequently prefer in educational sciences to reveal the natural relationships between structures (Fraenkel et al. 2012). The independent variable in this study is psychological resilience, the dependent variable is mathematical resilience, and solution-focused thinking is determined as the mediating variable. The research group consisted of 1,020 middle school students who were selected using purposive sampling, a non-random method in grades 5 to 8 studying in Bursa during the spring semester of the 2024–2025 academic year. Three different measurement tools were used to collect data for the study: the Brief Psychological Resilience Scale (BPRS) developed by Smith et al. (2008) and adapted into Turkish by Doğan (2015), the Academic Resilience in Mathematics Scale developed by Ricketts et al. (2017) and adapted to Turkish by Pekdemir et al. (2019), and the Solution-Focused Thinking Scale developed by Smock et al. (2010) and adapted into Turkish by Arslan et al. (2021).

RESULTS

Descriptive Statistics for Research Variables

To determine whether the variables are normally distributed, skewness and kurtosis values were calculated along with mean and standard deviation values (Table 1).

Table 1
Descriptive statistics of scores obtained from scales

Variable	N	Cronbach	Min	Max	X	Ss	Skewness Value	Sd	Kurtosis Value	S.d
Solution-Focused Thinking	1020	0,838	1,58	5,00	3,80	,588	-,560	,108	,688	, 216
Psychological Resilience	1020	0,713	1,00	5,00	3,14	,749	,147	,108	-,102	,216
Mathematical Resilience	1020	0,789	1,00	5,00	3,58	,863	-,497	,108	-,326	,216

Note. Prepared by the authors (2025).

When Table 1 is examined, it can be seen that the skewness values of the variables range from 0.147 to -0.560, while the kurtosis values range from -0.326 to 0.688. According to George and Mallery (2010), for a variable to have a normal distribution, its skewness and kurtosis values must fall within the range of ±2. In this regard, it was determined that the calculated values were within the specified range and that the normal distribution assumption was met. The Cronbach's alpha reliability coefficients of the scales used in the study were found to be 0.789 for the Mathematical Resilience Scale, 0.713 for the Psychological Resilience Scale, and 0.838 for the Solution-Focused Thinking Scale. These results indicate that the scales used in the study are highly reliable.

Correlation Analysis

Table 2
Correlation results between psychological resilience, solution-focused

	1	2	3
1.Solution-Focused Thinking	-		
2.Psychological Resilience	0,277**		
3.Mathematical Resilience	0,327**	0,530**	-

Note. Prepared by the authors (2025). **p< 0,01.

According to the results in Table 2, there are positive and moderate correlations between middle school students' solution-focused thinking levels and their psychological resilience (r = 0.277**) and mathematical resilience, (r = 0.530**) levels. Additionally, a positive, moderate, and statistically significant relationship was found between students' psychological resilience and mathematical resilience levels (r = 0.327**).

Analyses related to hypotheses

To determine the mediating role of solution-focused thinking in the relationship between psychological resilience levels and mathematical resilience the results obtained using the Bootstrap method within the scope of the mediation analysis conducted with the PROCESS Macro are presented in Table 3. To test the possible mediating role of solution-focused thinking, regression-based mediation analyses were conducted using the procedures provided by Hayes (2018).

Table 3
Analysis of mediating effects of Solution Focus Thinking

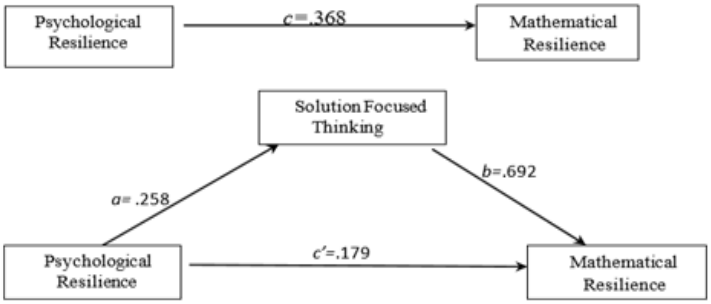
Path		t	p	Bootstrap95%CI	
Coefficient(SE)				Lower Level	Upper Level
Model (Figure 1)				-	
PR →SFT	.258(.033)	7,833	*0,000	.193	.323
SFT →MR	.692(.058)	11,91	*0,000	.578	0,806
RP →SR.	.368(.048)	6,694	*0,000	.231	.421
PR →SFT →SR.	.179(.028)	3,892	*0,013	.126	.237

Note. Prepared by the authors (2025). *p<.01,PR= Psychological Resilience, MR= Mathematical Resilience, SFT= Solution FocusThinking.

According to the results presented in Table 3, psychological resilience has a significant and positive effect on solution-focused thinking (B = 0.258, p < 0.001; 95% CI [.193, .323]). Solution-focused thinking, on the other hand, has a strong and significant effect on mathematical resilience (B = 0.692, p < 0.001; 95% CI [.578, .806]). The direct effect of psychological resilience on mathematical resilience was also found to be significant (B = 0.368, p < 0.001; 95% CI [.231, .421]).

Bootstrap confidence intervals were examined to determine whether psychological resilience had an indirect effect on mathematical resilience. The findings indicate that this indirect effect emerges through solution-focused thinking (B = 0.179, p < 0.001; 95% CI [.126, .237]). The inclusion of solution-focused thinking in the model reduced the direct effect of psychological resilience on mathematical resilience from 0.368 to 0.179, indicating a partial mediating effect. The results are presented in Figure 2.

Figure 2
The mediating role of solution-focused thinking between psychological resilience and mathematical resilience



Note. Prepared by the authors (2025).

When examining Figure 2, it can be seen that psychological resilience predicts solution-focused thinking skills, and similarly, solution-focused thinking skills directly predict mathematical resilience positively. In addition, psychological resilience directly predicts mathematical resilience, and the total effect is significant. However, when solution-focused thinking, the mediating variable, is included in the model, the effect of psychological resilience on mathematical resilience decreases (c'=.179) but remains significant. Since the coefficient resulting from the inclusion of mediating variables in the model remains significant, partial mediation is present. This indicates that individuals with high psychological resilience tend to exhibit higher mathematical resilience, and this relationship is partially explained by solution-focused thinking.

DISCUSSION

The findings indicate that students' psychological resilience levels positively and significantly affect their mathematical resilience. This finding is consistent with the results obtained in Demir's (2023) study. Although there are a limited number of studies on these two variables in the literature, the current findings indicate the existence of a positive relationship between psychological resilience and mathematical resilience.

The research findings reveal a positive and moderately significant relationship between psychological resilience and solution-focused thinking. This result is consistent with existing research showing that solution-focused approaches affect individuals' psychological resilience and coping skills (Momenipoor et al., 2025; Sağar, 2022). Solution-focused thinking supports individuals in focusing on the future, not on dwelling on the past, effectively using their current resources, and developing flexible solutions to the problems they encounter (Booth & Neill, 2017; Kim & Franklin, 2009).

Overall, the findings are largely consistent with the existing literature. Psychological resilience and solution-focused thinking make important contributions to individuals' development of flexibility in the face of challenges and support their self-efficacy and academic courage (Grant, 2011; Martin & Marsh, 2006). Indeed, a study by Li et al. (2022) found that individuals with high psychological resilience, when combined with a history of childhood trauma, may turn to malicious creativity through aggression. The results also showed that solution-focused thinking significantly and positively affected students' levels of mathematical resilience. Accordingly, developing flexible and future-oriented cognitive strategies that focus on generating solutions when faced with mathematical difficulties, supports individuals' resilience. Indeed, previous studies have also shown that solution-focused thinking is closely related to self-efficacy, hope, and problem-solving skills; and that these psychological resources increase an individual's level of resilience in the face of academic challenges (Cassidy, 2015; Grant & Spence, 2010; Şanal-Karahan, 2016).

These findings reveal that solution-focused thinking should be evaluated as a supportive element in mathematics education, not only in terms of cognitive goals but also emotional ones. According to the results, general self-efficacy plays a mediating role in the effect of students' psychological resilience on life satisfaction,' was examined. The result indicates the importance of students' general self-efficacy as a variable in the relationship between psychological resilience and life satisfaction, a relationship supported by literature and this study. Moreover, according to the results obtained from the study, solution-focused thinking plays a mediating role in the relationship between psychological resilience and mathematical resilience. It was determined that as psychological resilience levels increase, solution-focused thinking skills also increase, significantly affecting mathematical resilience. The result is consistent with previous studies showing that a solution-focused approach both increases psychological resilience, and supports academic resilience behaviours (Grant, 2011; Kim & Franklin, 2009).

CONCLUSION

In conclusion, this study has made a meaningful contribution to literature by revealing the positive relationship between psychological resilience and mathematical resilience in middle school students. The findings indicate that solution-focused thinking plays a partial mediating role in this relationship, and that individuals' levels of psychological resilience significantly influence their levels of mathematical resilience through solution-focused cognitive strategies.

Individuals with high levels of psychological resilience exhibit a more flexible, solution-focused, and determined attitude when faced with mathematical difficulties, and this

attitude strengthens their resilience capacity. So, in this context, it has been concluded that holistic approaches aimed at supporting students both cognitively and emotionally can contribute to the development of resilience in mathematics learning processes.

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