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ORIGINAL RESEARCH

Adverse Childhood Experiences to Mental Well-Being: A Serial Mediation Through Social Connectedness, Psychological Capital and Dark Future

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Abstract
Individuals with adverse childhood experiences (ACEs) may continue to suffer the negative consequences of these experiences into adulthood. While prior research has identified separate relationships between ACEs, social connectedness, psychological capital, dark future, and mental well-being, the serial links among these variables remain underexplored. This study investigates the serial mediation of social connectedness, psychological capital, and dark future in the relationship between ACEs and mental well-being in a Turkish sample. The sample consisted of 357 participants (206 women [71.7%] and 101 men [28.3%]), aged 18 to 63 years (M = 30.62, SD = 9.14). Structural equation modeling results indicated that social connectedness, psychological capital, and dark future fully mediated the effect of ACEs on mental well-being. ACEs were negatively associated with social connectedness, which in turn predicted lower psychological capital. Reduced psychological capital was associated with increased future anxiety. This serial pathway suggests that ACEs may impact individuals' mental well-being through disruptions in social and psychological resources.

Keywords Adverse childhood experiences · Social connectedness · Psychological capital · Dark future · Mental well-being

Introduction

Adverse childhood experiences (ACEs) refer to early-life negative events, typically originating from family or the social environment, that hinder children's physical and psychological development (Kalmakis & Chandler, 2014). These traumatic experiences not only reduce children's well-being and increase maladaptive behaviors, but also lead to long-term developmental consequences (Boullier & Blair, 2018; Schoonover & Perryman, 2023). Prior research has linked ACEs to chronic health problems, risky behaviors, emotional dysregulation, mood disorders, impaired social functioning, and post-traumatic stress disorder (Bradley et al., 2011; Danese et al., 2009; McLaughlin & Lambert, 2017; Schafer, 2023; Selous et al., 2020). Moreover, adverse experiences in childhood can undermine a child's confidence, disrupt self-regulation, and contribute to persistent stress and mental health challenges later in life (Narayan et al., 2020).

The long-term consequences of adverse childhood experiences can significantly impair individuals' mental health. Well-being, however, goes beyond the mere absence of illness; it reflects a comprehensive state of physical, emotional, and psychological functioning (Vik & Carlquist, 2018). Numerous studies have investigated the association between ACEs and mental well-being, revealing consistent negative outcomes (Bartolomé-Valenzuela et al., 2024; Chen et al., 2021; Nurius et al., 2015). Despite this, limited research has explored the underlying mechanisms linking ACEs to well-being. Although prior work has demonstrated individual associations between ACEs and constructs such as social connectedness, psychological capital, and future anxiety (dark future), the combined, serial nature of these relationships remains unclear. Therefore, the current study investigates the serial mediation effects of social connectedness, psychological capital, and dark future in the relationship between ACEs and mental well-being.

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Social Connectedness, Psychological Capital, and Dark Future as Mediators

Humans are inherently social beings, and connecting with others is among their most fundamental needs. In this context, the concept of social connectedness reflects an individual's perception of being part of a broader whole (Karcher, 2001), as well as experiencing a sense of closeness and belonging within their environment (Lee & Robbins, 1998). Social connectedness also contributes to one's sense of personal identity and placement within society (Miller, 1992). Early childhood is often considered a foundational period for the development of relationships, behaviors, and social health (CDC, 2019). According to Gültekin and Arıcıoğlu (2017), social attachment begins to form through early relationships and attachment styles. Accordingly, adverse childhood experiences may play a critical role in shaping, or disrupting, this process. Attachment theory (Bowlby, 1969) suggests that interpersonal relationships formed in early childhood influence how individuals cope with stress and maintain psychological health later in life. Individuals exposed to ACEs are more likely to struggle with forming healthy relationships, often due to impaired trust, emotional dysregulation, and maladaptive coping mechanisms (Poole et al., 2018).

Adverse experiences during childhood can contribute to feelings of insecurity, hostility, and difficulties in self-regulation throughout later developmental stages, leading to behavioral maladjustments (Grady et al., 2017). Chen (2017) noted that securely attached individuals tend to hold stable views of relationships and possess a strong sense of self-worth. Conversely, individuals who do not develop secure attachment are more likely to experience problems in their social interactions. For instance, Ray et al. (2020) found that negative childhood experiences impair social and emotional competencies, which in turn hinder social development. On a biological level, chronic stress in childhood can disrupt hormonal functioning and inhibit neuronal growth and connectivity, resulting in emotional dysregulation and impairments in social bonding and commitment during adulthood (Anda et al., 2010). Additional studies have shown that ACEs increase the likelihood of developing insecure attachment styles (Murphy et al., 2014; Ye et al., 2024), elevate stress in adulthood, and are associated with interpersonal difficulties and poor mental health outcomes (Jones et al., 2018). There is also substantial evidence that social connectedness positively influences well-being (Arslan, 2017; Brown et al., 2012; Ergün & Satıcı, 2023; Jose et al., 2012), in part because strong social ties are protective against psychopathology (Yelpaze et al., 2021). Thus, since ACEs can disrupt adult social relationships, lower social connectedness may reduce well-being. Moreover, because social connectedness is essential for psychological well-being, it may also play a critical role in shaping psychological capital, a key construct in positive psychology.

Psychological capital is a core construct in positive psychology that significantly contributes to well-being and comprises four components: self-efficacy, optimism, hope, and resilience (Luthans et al., 2015). Self-efficacy refers to one's belief in their ability to fulfill necessary responsibilities; optimism involves positive expectations for success in both the present and future; hope reflects goal-directed determination and the ability to generate alternative pathways; and resilience denotes the capacity to recover from challenges and adversity. Empirical studies have demonstrated that psychological capital is positively associated with well-being (Luthans et al., 2013; Rabenu et al., 2017). Notably, optimism, being future-oriented, suggests that psychological capital may shape how individuals perceive and approach the future. A decline in psychological capital, therefore, can contribute to a more negative outlook on what lies ahead. In this context, the concept of dark future, also known as future anxiety, may emerge as a psychological consequence.

The concept of dark future refers to a future-oriented attitude in which negative emotions dominate cognitive and emotional processes, and fear outweighs hope (Zaleski, 1996). This perspective can influence individuals' cognitive patterns and behaviors (Tucholska et al., 2022) and is often shaped by prior negative experiences. Research shows that individuals exposed to ACEs are more likely to experience heightened anxiety about the future (Lee et al., 2020). Such negative expectations can significantly undermine mental health (Holman & Silver, 2005). Among the components of psychological capital, resilience in particular plays a vital role in regulating future anxiety and protecting overall well-being (Paredes et al., 2021). Thus, psychological capital appears to be a key resource for mitigating the effects of dark future. Empirical evidence further supports that dark future is negatively associated with well-being (Lanz et al., 2025; Paredes et al., 2021).

Taken together, these findings suggest that ACEs negatively influence social connectedness, which in turn may reduce psychological capital. Given that optimism, a key component of psychological capital, is inherently future-oriented, a decline in psychological capital may lead to heightened perceptions of a dark future. This increase in future anxiety is likely to result in diminished levels of mental well-being.

The Present Study

Building on the theoretical framework outlined above, the present study examined whether social connectedness, psychological capital, and dark future serially mediate the

relationship between ACEs and mental well-being. Investigating these mechanisms can offer valuable insights into how early-life adversity continues to affect individuals into adulthood and identify protective psychological and social factors that may buffer these effects. The findings have practical implications as well: counselors may design interventions that target improvements in social connectedness and psychological capital to foster better psychological outcomes. Such support programs may be particularly beneficial for individuals with a history of childhood trauma by helping them build internal resources and healthier social ties.

The following hypotheses were formulated by the authors in line with the purpose of the study:

H_1: Social connectedness mediates the relationship between adverse childhood experiences and mental well-being.
H_2: Psychological capital mediates the relationship between adverse childhood experiences and mental well-being.
H_3: Dark future mediates the relationship between adverse childhood experiences and mental well-being.
H_4: Social connectedness, psychological capital, and dark future serially mediate the relationship between adverse childhood experiences and well-being.

Method

Procedure and Participants

The sample size required for the structural equation modeling tested in the study was calculated using Monte Carlo Power Analysis (Muthen & Muthen, 2002). This analysis is a method that estimates the variance by simulating the sampling distribution of mediation effects (Mackinnon et al., 2004). In the light of the results of other studies in the literature on the relationships between the variables in this study, estimates were made for the correlation coefficients and standard deviation values for the relationships between the variables. As a result of the analyses based on similar studies, it was seen that a minimum sample of 309 people was needed for the structural equation modeling tested in the study with a 95% confidence interval and 80% power (Tofighi & Mackinnon, 2015). As a result, a total of 357 Turkish participants, 206 women (71.7%) and 101 men (28.3%), constituted the sample group of this study. Everyone participated in the study, regardless of whether they had been exposed to ACEs before or not, and whether they had received therapy or not. Participants were aged between 18 and 63 years (M = 30.62 years, SD = 9.14). Other details about the participants are given in Table 1.

Table 1 Participants' characteristics

Variable	Frequency	%
Gender		
Female	256	71.7
Male	101	28.3
Perceived Socio-Economic Status		
Poor	52	14.6
Moderate	234	65.5
Good	71	19.9
Relationship Status		
Dating	67	18.7
Engaged	13	3.6
Married	148	41.5
No Relationship	129	36.1
Number of Siblings		
1	86	24.1
2	142	39.8
3	58	16.2
4	62	17.4
No Sibling	9	2.5
Birth Order		
1	135	37.8
2	123	34.5
3	56	15.7
4	43	12.0
Have received psychological support (until today)		
Yes	115	32.2
No	242	67.8

Measures

Adverse Childhood Experiences The Adverse Childhood Experiences Scale (ACE) developed by Kaiser Permanente and adapted into Turkish by Gündüz et al. (2018) was used to measure adverse childhood experiences and traumas. In the adaptation study, the validity and reliability results of the scale were similar to the original scale. The scale consists of 10 items. The total ACE trauma score is calculated by giving 1 point for each "yes" answer to the scale items. The scores that the participants can get from the scale vary between 0 and 10, and a high score indicates a high level of negative experiences in childhood. Analyses conducted in the adaptation study of the scale to the Turkish sample show that the scale has a good internal consistency reliability (α = .74). In this study, the internal consistency coefficient of the scale was also good (α = .75 and ω = .75).

Social Connectednes The Social Connectedness Scale developed by Lee and Robbins (1995) and adapted to Turkish culture by Duru (2007) was used to measure of the

participants' sense of belonging. The scale consists of 8 items (e.g., "Even when I am with familiar people, I do not feel that I belong to them"). In each item of the scale, a situation indicating feelings and thoughts about social relationships is presented and individuals are asked to answer how often they experience this situation on a 6-point Likert scale (1 = Strongly Agree, 6 = Strongly Disagree). The scores that the participants can get from the scale vary between 8 and 48, and a high score on the scale indicates the high sense of belonging. Analyses conducted in the adaptation study of the scale to the Turkish sample show that the scale has a strong internal consistency reliability (α = .91). In this study, the internal consistency coefficient of the scale was good (α = .94 and ω = .94).

Psychological Capital The Psychological Capital Scale (PCS) developed by Lorenz et al. (2016) and adapted to Turkish culture by Çağış and Yıldırım (2023) was used to measure the psychological capital level of the participants. The scale consists of 12 items. (e.g., "I can stay calm when faced with difficulties. Because I am confident in my coping skills"). The scale consists of 4 sub-dimensions: self-efficacy, optimism, resilience, and hope. In addition, the scale is answered on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The scores that the participants can get from the scale vary between 12 and 60, and a high score on the scale indicates high psychological capital. Analyses conducted in the adaptation study of the scale to the Turkish sample show that the scale has a strong internal consistency reliability (α = .90). In this study, the internal consistency coefficient of the scale was good (α = .94 and ω = .94).

Dark Future The Dark Future Scale (DFS) developed by Zaleski et al. (2019) was used to measure participants' worries and anxieties about the future. The scale, which was adapted into Turkish by Yıldırım et al. (2023), consists of 5 items (e.g., "Sometimes the thought of facing life's crises or difficulties scares me a lot"). The scale is answered on a 6-point Likert scale (1 = absolutely false, 6 = absolutely true). Participants can score between 5 and 30 on the scale and, a high score on the scale indicates high dark future. Analyses conducted in the adaptation study of the scale to the Turkish sample show that the scale has a good internal consistency reliability (α = .79). In this study, the internal consistency coefficient of the scale was also good (α = .84 and ω = .84).

Mental Well-Being The Warwick-Edinburgh Mental Well-Being Scale was developed by Tennant et al. (2007) and the short form of the scale was adapted to Turkish culture by Demirtaş and Baytemir. The short form of the scale, consisting of 7 items, aims to measure the mental well-being of individuals (e.g., "I cope well with problems"). The scale is answered on a 5-point Likert scale (1 = never, 5 = always). Participants can score between 7 and 35 on the scale and a high score on the scale indicates high mental well-being. Analyses conducted in the adaptation study of the scale to the Turkish sample show that the scale has a good internal consistency reliability (α = .86). In this study, the internal consistency coefficient of the scale was also good (α = .90 and ω = .90).

Ethics

For the measurement tools used in this study, permission to use the scale was obtained from the researchers who adapted or developed the relevant measures. In addition, this study was approved by the [blinded] University Social Sciences and Humanities Ethics Committee. All stages of the study were conducted following the Declaration of Helsinki, which aims to protect human rights and ethical rules. The confidentiality and privacy of the participants were meticulously protected and informed consent was obtained in all data collection processes.

Data Analysis

While analyzing the data, firstly, descriptive statistics, internal reliability values, and relationships between variables were analyzed for adverse childhood experiences, social connectedness, psychological capital, dark future, and mental well-being variables. Skewness and kurtosis scores of the variables <|1| indicate that there is a normality assumption (Hair et al., 2013). Subsequently, the model tested in the study was analyzed according to the two-stage method widely preferred in the literature (Anderson & Gerbing, 1988).

In the first stage, the measurement model was tested for adequate goodness of fit and then the hypothesized structural model was tested. In the structural model, indirect relationships from adverse childhood experiences to mental well-being through social connectedness, psychological capital, and dark future were tested. However, since the observed variables of adverse childhood experiences, social connectedness, dark future, and mental well-being were unidimensional, a parcellation technique was used to minimize measurement errors and improve the results obtained (Little et al., 2002). As a result, adverse childhood experiences were divided into AP1 and AP2, social connectedness into SCP1 and SCP2, dark future into DFP1 and DFP2, and mental well-being into MP1 and MP2.

The fit statistics suggested by Hu and Bentler (1999) and Klem (2000) were used to evaluate the fit of the data set to the model. Accordingly, RMSEA and SRMR fit indices less than.08 and CFI, GFI, TLI, NFI, IFI fit indices greater

Table 2 Descriptive statistics and correlation results

Variables	Mean	Descriptive Statistics and Reliabilities					Correlations			
		SD	Confidence interval	Variance	α	ω	1	2	3	4
1.ACE	2.31	2.16	2.09–2.54	4.64	.75	.75	-			
2.Social connectedness	33.34	8.77	32.42–34.25	76.92	.94	.94	−0.336**	-		
3.PsyCap	42.24	9.05	41.29–43.18	81.96	.94	.94	−0.336**	0.590**	-	
4.Dark future	20.39	5.91	19.77–21.01	34.98	.89	.89	0.364**	−0.454**	−0.585**	
4.Mental well-being	24.51	5.38	23.95–25.07	28.91	.90	.90	−0.332**	0.668**	0.780**	−0.616**

Note. ** $p < .01$, *ACE;* adverse childhood experiences, *PsyCap;* psychological capital

than.90 indicate acceptable fit to the observed data. SPSS 26.0 and AMOS programs were used in the analyses.

Results

Preliminary Analyses

Descriptive statistics, reliabilities of the variables, and correlations between variables are reported in Table 2. Mental well-being was negatively correlated both with adverse childhood experiences ($r = -.332$, $p < .01$) and dark future ($r = -.616$, $p < .01$). In addition, it positively correlated both with social connectedness ($r = .668$, $p < .01$) and psychological capital ($r = .780$, $p < .01$). Moreover, adverse childhood experiences were negatively correlated both with social connectedness ($r = -.336$, $p < .01$) and psychological capital ($r = -.336$, $p < .01$). It also positively correlated with dark future ($r = .364$, $p < .01$).

Structural Equation Modeling

Measurement Model While testing the measurement model, a model consisting of five latent variables (adverse childhood experiences, social connectedness, psychological capital, dark future, and mental well-being) and 12 observed variables was tested. The model fit indices obtained from confirmatory factor analysis (CFA) show that the measurement model exhibits a good fit. The fit indices obtained for the model were $\chi 2_{(80,\ N=357)} = 203.935$; CFI = 0.97; GFI = 0.93; TLI = 0.96; NFI = 0.95; IFI = 0.97; SRMR = 0.03; RMSEA = 0.06. These values indicate that the measurement model is statistically significant and provides a good fit. In addition, the results also showed that the factor loading ranged from.79 to.91 and all factor loadings were found to be significant. Therefore, the findings obtained that the latent constructs were strongly represented by the observed variables included in the study. Following the analyses of the measurement model, the second stage, structural equation modeling tested whether social connectedness, psychological capital, and dark future have serial mediation effects on the relationship between adverse childhood experiences and mental well-being. Structural modeling allows us to investigate how early negative experiences may affect mental well-being through social connectedness, psychological capital and future anxiety variables.

Structural Model At this stage, gender and socio-economic status demographic information were added to the model as control variables. In the structural equation modeling analysis, the fully mediated model, which includes indirect pathways but not the direct pathway from adverse childhood experiences to mental well-being, was tested first. The results of the analysis show that the fully mediated model has a good fit ($\chi^2_{(108,\ N=357)} = 325.482$; CFI = 0.95; GFI = 0.90; TLI = 0.94; NFI = 0.93; IFI = 0.95; SRMR = 0.03; RMSEA = 0.06; AIC = 415.482; ECVI = 1.167). Then, a partially mediated model with mediator variables and a direct path from adverse childhood experiences to mental well-being was tested. The results of the analysis show that the partially mediated model has a good fit ($\chi^2_{(107,\ N=357)} = 325.327$; CFI = 0.95; GFI = 0.90; TLI = 0.94; NFI = 0.93; IFI = 0.95; SRMR = 0.03; RMSEA = 0.07; AIC = 417.327; ECVI = 1.172).

The results show that the fit indices of both partially and fully mediated models are at acceptable levels. The final model was decided by evaluating the fit indices obtained from these two models. In model comparisons, it is stated that the model with the lowest AIC (Akaike's Information Criterion) and ECVI (Expected Cross Validation Index) values is more acceptable (Burnham & Anderson, 2004). For this purpose, AIC and ECVI values were compared and the full mediation model with lower AIC and ECVI values was preferred. When the above values are examined, it is seen that the full mediation model is a statistically supported explanation of the research model. The standardized path coefficients of the preferred model are presented in Fig. 1.

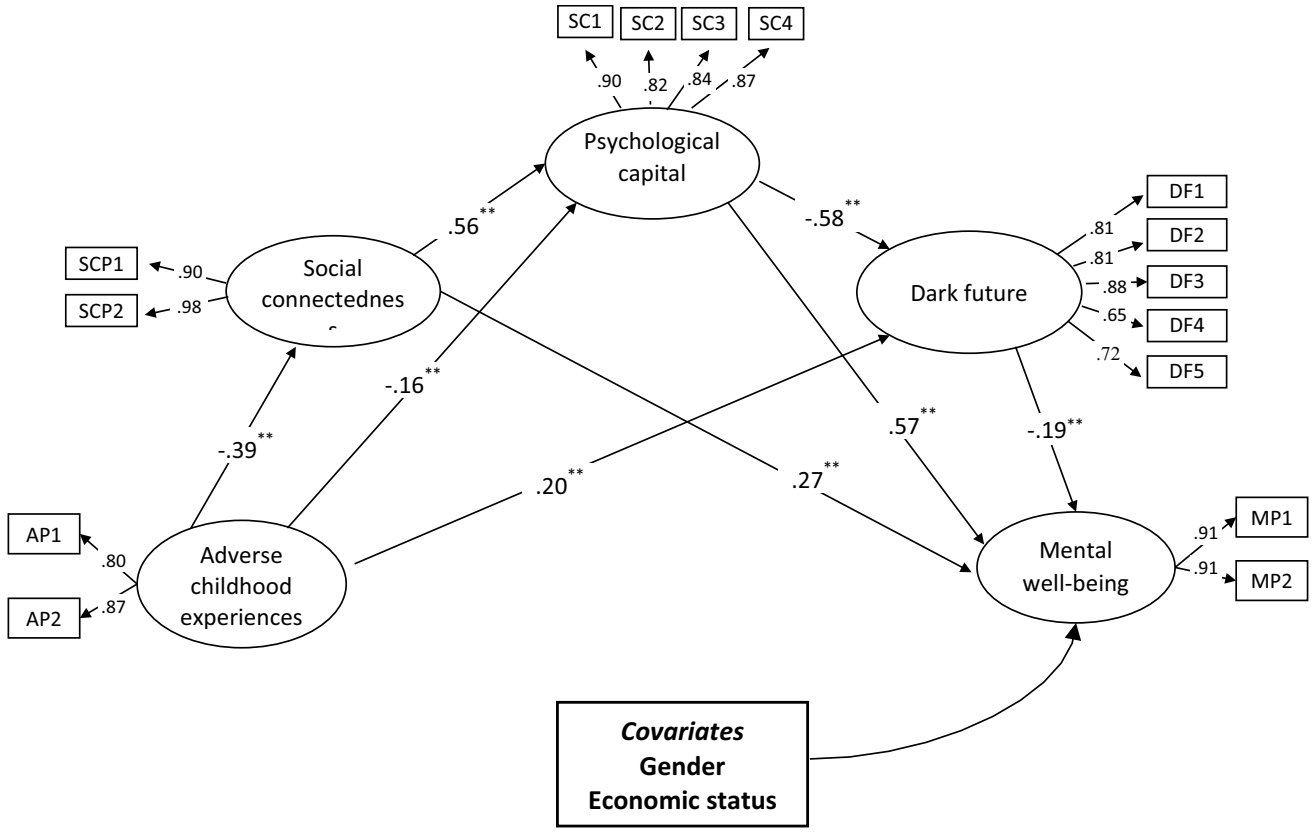

Fig. 1 Structural equation modeling for the chain mediation model. Note. * $p < .05$, ** $p < .01$, *AP:* parcel of adverse childhood experiences, *SCP*: parcel of social connectedness, *SC*: sub-dimension of psychological capital; DF: items of dark future, *MP:* parcel of mental well-being

Discussion

A comprehensive understanding of well-being is extremely important for mental health. Individuals may face many positive or negative situations in their lives. In this sense, it can be said that many factors affect well-being. The aim of this study is to investigate the serial mediation of social connectedness, psychological capital, and dark future in the relationship between ACEs and well-being. The results revealed that ACEs predicted mental well-being through social commitment, psychological capital, and dark future. Particularly, elevated ACE levels can be associated with diminished social connectedness, consequently linked to reduced psychological capital levels. Lower psychological capital may be related with higher dark future. High dark future can then impact on low well-being.

ACEs, as defined by Brown et al. (2009), refer to early-life stressors or traumas that can lead to long-term psychological and physical consequences. These experiences have been linked to conditions such as depression, anxiety, and even premature mortality in adulthood (Boullier & Blair, 2018; Daníelsdóttir et al., 2024; Desch et al., 2023; Merrick et al., 2017). Thus, ACEs are considered a significant risk factor for reduced well-being later in life. However, prior to this study, no research had comprehensively examined the serial mediating roles of social connectedness, psychological capital, and dark future in the relationship between ACEs and mental well-being. By addressing this gap, the current study offers a more integrated understanding of how adverse childhood experiences can shape adult mental health through interconnected psychosocial mechanisms.

Research findings show that social connectedness, psychological capital, and dark future fully mediate the pathway from ACE to mental well-being. In other words, having negative experiences in childhood may decrease social connectedness and this may lead to a reduction in psychological capital. A decrease in psychological capital may increase dark future, consequently contributing to a reduction in mental well-being.

In the first finding of the study supporting hypothesis H_1, indicates that higher ACE levels predict lower social connectedness, which in turn is associated with diminished mental well-being. Since ACEs are fundamentally social in nature, they often disrupt the development of healthy interpersonal relationships (Trinidad, 2021). Research by Jones et al. (2018) supports this connection, showing that

childhood adversity can result in emotional difficulties and impair social functioning in adulthood, which in turn undermines mental health. From an attachment theory perspective, early traumatic experiences may erode trust in others and interfere with the formation of secure bonds. Individuals exposed to ACEs may thus find it more difficult to establish close, meaningful relationships, resulting in increased social isolation. Munoz et al. (2022) also highlight that ACEs can leave lasting imprints on emotional development, further compromising social connectedness and psychological well-being.

Furthermore, ACEs may contribute to individuals feeling excluded or alienated from their social environment, thereby reducing their ability to access social support. Felitti et al. (1998) highlighted that adverse childhood experiences can weaken one's support systems across the lifespan, with detrimental consequences for mental health. Individuals exposed to ACEs may struggle to form secure interpersonal bonds, resulting in chronic isolation and disconnection from others. These difficulties often stem from challenges in trust, attachment, and emotional regulation—key elements necessary for healthy social functioning. As a result, the lack of accessible support networks may compound the negative impact of ACEs on social connectedness and further erode overall well-being.

In the second finding of the study supporting hypothesis H_2, confirming that psychological capital mediates the relationship between ACEs and mental well-being. Individuals with lower levels of psychological capital tend to report lower levels of well-being, particularly if they have experienced adversity in childhood. Psychological capital, comprising hope, self-efficacy, resilience, and optimism, is a developmental asset that plays a protective role against psychological distress (Luthans et al., 2015; Ravikumar, 2023). Positive social relationships, often disrupted by ACEs, are crucial for fostering psychological capital (Barrant & Duran, 2021). For instance, research by Kuiper et al. (2016) showed that individuals with stronger social ties tend to be more resilient, one of the essential components of psychological capital. When psychological capital is low, individuals may struggle to manage stress, which can negatively impact both social relationships and mental health (Masten, 2021). This suggests that ACE-related damage to social functioning may further undermine psychological capital, compounding the risk of poor well-being outcomes (Dorri et al., 2023).

Supporting H_3, the findings revealed that dark future mediates the relationship between ACEs and mental well-being. In other words, individuals with higher levels of ACEs are more likely to experience increased future anxiety, which in turn reduces their psychological well-being. The concept of dark future refers to the sense of fear, uncertainty, and pessimism individuals feel when thinking about what lies ahead (Zaleski et al., 2019). This future-oriented anxiety is a strong indicator of psychological distress. Prior research has shown that self-efficacy, a core element of psychological capital, is negatively associated with dark future (Rabei et al., 2020), suggesting that individuals who lack confidence in their ability to cope with challenges are more vulnerable to future anxiety. Since dark future reflects a breakdown in positive future orientation, its presence can significantly compromise well-being.

Finally, the results confirmed H_4, demonstrating a significant serial mediation pathway from ACEs to mental well-being. Specifically, ACEs were found to negatively predict social connectedness; lower social connectedness, in turn, predicted lower psychological capital; reduced psychological capital was associated with increased dark future; and dark future ultimately predicted decreased mental well-being. This sequential pathway highlights how early adverse experiences may erode key psychological and social resources, which progressively increase vulnerability to negative future expectations and poor mental health outcomes. The full mediation pattern observed suggests that interventions aiming to strengthen any one of these mediators may help mitigate the long-term mental health effects of childhood adversity.

Limitations

This study has several limitations that should be considered when interpreting the findings and designing future research. First, data were collected using self-report measures, which may be subject to biases such as social desirability or recall inaccuracy. To obtain a more comprehensive understanding of ACEs and their consequences, future studies are encouraged to adopt mixed-methods approaches, incorporating both qualitative and quantitative data. Such designs could provide deeper insights into the development of social connectedness, psychological capital, and dark future. Second, the cross-sectional nature of this study limits the ability to infer causal relationships among variables. Longitudinal research is needed to clarify the temporal ordering and directionality of these associations. Third, the study sample was limited to individuals residing in Turkey, which may restrict the generalizability of the findings. Cross-cultural studies could help explore how cultural context influences the impact of ACEs and their psychological mediators. Finally, although the ACE scale used in this study is valid and reliable, it may not capture culturally specific or less overt forms of trauma, suggesting a need for culturally sensitive assessment tools in future research.

Implications

Despite its limitations, the current study offers valuable insights into the mechanisms linking ACEs to mental

well-being. The findings underscore that childhood adversity not only affects individual psychological health but also undermines key protective resources, such as social connectedness and psychological capital, while increasing vulnerability to future-oriented anxiety. These interconnected pathways highlight the urgent need for early interventions and preventive strategies targeting individuals with a history of ACEs. Mental health practitioners can benefit from developing programs that enhance social relationships and build psychological capital, particularly focusing on optimism, resilience, and self-efficacy. Additionally, interventions that help individuals manage future anxiety may reduce the long-term psychological burden of early trauma. These results can inform public health policy, guiding the design of multi-level interventions aimed at strengthening adult mental well-being by addressing the lasting impact of childhood adversity.

Conclusion

The results of this study show that ACEs predict mental well-being. ACEs may damage an individual's social relationships with others and thus social connectedness. Damage to social connectedness may also negatively affect individuals' psychological capital levels. Negative effects on psychological capital, which include important concepts of positive psychology, may cause a dark future for individuals.

Author Contributions All authors contributed to the study's conception and design. Conceptualization and formal analysis were performed by HYK and ST. Investigation and methodology were performed by HYK, SAS, MED. Data curation, resources, software, supervision and validation were performed by HYK, ST, SAS. The first draft of the manuscript was written by ST and MED. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability Data will be available on request.

Declarations

Pre-Registration Statement This study was not pre-registered.

Ethical Approval The study protocol has been approved by Yildiz Technical University Scientific Research and Ethical Review Board (ID: 20231002337). The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its following updates.

Consent to Participate Informed consent was obtained from all the individual participants that were included in the study.

Conflict of interest No conflict of interest exists for this manuscript for any of the authors.

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