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Adverse Childhood Experiences and Problematic Gambling Among Young Adults: A Moderated Serial Mediation Analysis

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Abstract

Problem gambling is a serious public health issue among young adults today and the literature suggests that adverse childhood experiences may be associated with it. Additionally, difficulties in emotion regulation and self-control may contribute to the association between problem gambling and adverse childhood experiences. Sensation seeking and a family history of gambling may also influence these relationships. Hence, we examined the relationship between adverse childhood experiences and problem gambling among young adults. We analyzed the collected data from 579 young adults (18-29 years old, 67.5% male) via an online survey using a cross-sectional research design. More specifically, we tested the serial mediating roles of difficulties in emotion regulation and self-control, as well as the moderating roles of sensation seeking and a family history of gambling. We found a significant positive association between adverse childhood experiences and problem gambling. Both difficulties in emotion regulation and self-control had significant mediating effects. Sensation seeking and family history of gambling moderated the mediating effects, strengthening the pathways leading to problem gambling at higher levels of sensation seeking and in the presence of family gambling history. These findings indicate that emotion regulation and self-control are important psychological processes in

explaining the relationship between adverse childhood experiences and problem gambling. They also suggest that high sensation seeking and a family history of gambling may strengthen the relationships.

Keywords: Problem gambling, emotion regulation, childhood experiences, self-control

Introduction

Gambling is an act of staking a valuable asset on an event with an uncertain outcome in the expectation of a reward (Lopes & Tavares, 2025). Whereas gambling may be engaged in by some individuals for entertainment, socializing, or excitement, in others, it can develop into a problem pattern characterized by loss of control, repetitive participation, and continued engagement despite negative consequences (Neophytou et al., 2023). Gambling disorder is classified under the category of substance-related and addictive disorders in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). Current meta-analytic findings indicate that approximately 1.3-1.4% of adults worldwide meet the criteria for gambling disorder, and a broader group is at risk for problem gambling (Tran et al., 2024). Therefore, problem gambling is considered a serious mental health issue due to its consequences to the individual and society.

Problem gambling is behaviors associated with multifaceted negative consequences, including financial losses, debt, family conflicts, reduced occupational functioning, and impaired social relationships (Koomson et al., 2022; Ngetich et al., 2023; Tulloch et al., 2022). It has been reported that psychological difficulties such as depression, anxiety, stress, reduced life satisfaction, and substance use may co-occur with problem gambling (Howard et al., 2023; Richard et al., 2020; Sagoe et al., 2021). Male gender, younger in age, low socioeconomic status, a family history of gambling, impulsivity, risk-taking tendencies, and comorbid psychiatric disorders are cited as significant risk factors associated with problem gambling (Arpaci & Kocadag Unver, 2020; Moreira et al., 2023). Such research indicates that problem gambling is a complex phenomenon linked with multi-level risk processes.

One of the most frequently cited theoretical frameworks for explaining the development and maintenance of problem gambling is the Pathways Model of Problem and Pathological Gambling (Blaszczynski & Nower, 2002). According to the model, problem gambling does not stem from a single cause; rather, it arises from the interplay of developmental risk factors, psychological vulnerabilities, and behavioral processes. The model also argues that problem gambling can emerge through multiple developmental pathways resulting in three core gambler profiles: Behaviorally conditioned gamblers, shaped by behavioral conditioning processes; emotionally sensitive gamblers, characterized by emotional

vulnerabilities and maladaptive coping patterns; and antisocial-impulsive gamblers, predominated by impulsivity and antisocial traits (Blaszczynski & Nower, 2002). This framework suggests that problem gambling may develop through mechanisms such as difficulties in emotion regulation and deficits in self-control. Additionally, it has been reported that problem gambling can be sustained through both positive reinforcement processes (e.g., expectation of reward, sense of winning, experience of pleasure) and negative reinforcement processes (e.g., avoidance, stress reduction, and escape from negative emotions; Mestre-Bach et al., 2025).

Interest in the impact of early-life experiences on problem gambling has increased in recent years. Early traumatic life events involving but not limited to abuse, neglect, violence, or domestic dysfunction, such as parental substance abuse, mental illness history, or divorce to which a child is exposed to before the age of 18 are labeled as adverse childhood experiences (ACEs) and have negative effects on the individual's development during early childhood as well as in their lifespan later (Hustedde, 2021; Ye et al., 2024). It has been reported that such experiences can impact not only childhood adjustment but also emotional, cognitive, and behavioral functioning in later life (e.g., Dagnino et al., 2025; Feiler et al., 2023). Research indicates that ACEs are associated with higher risks of addiction, impulsivity, psychological symptoms, and patterns of risky behavior (Bristow et al., 2022). Tucker et al. (2021) reported that early-life traumatic experiences can predict gambling symptoms through

various psychological mechanisms. Therefore, problem gambling may be associated not only with behavioral preferences but also with adverse experiences beginning in early childhood and appears important to consider early childhood experiences when understanding the etiology of problem gambling.

ACEs and Problem Gambling

Recent studies strongly support that ACEs are closely associated with problem gambling (e.g., Bahri et al., 2024; Bristow et al., 2022; Goodrich et al., 2023; Horak et al., 2021). Traumatic and negative events during childhood are known to play crucial roles in tendencies toward risky and addictive behaviors eventually (e.g., Royer et al., 2022; Sakulsriprasert et al., 2023). Such experiences undermine the security, attachment, and emotion-regulation systems during childhood and leave lasting impacts (Tokumitsu et al., 2025). Early exposure to trauma tends to lead struggles to cope with stress and negative emotions in adulthood and to engage in behaviors that provide short-term relief but lead to addiction in the long term (Levin et al., 2021).

ACEs not only increase the risk of gambling but also impact the severity and likelihood of continued problem gambling. Bristow et al. (2022) reported that many types of ACEs, significantly increased the likelihood of gambling addiction. Their study showed that emotional and physical abuse, in particular, were among the strongest predictors of problem gambling in

adulthood. Similarly, Marchica et al. (2022) found that ACEs were significant predictors of problem gambling among adolescents. Tucker et al. (2021) reported that early childhood traumas were effective in the development of gambling addiction through mediating psychological factors. More specifically, difficulties in emotion regulation and impulsivity play a decisive role in this relationship. Moreover, Goodrich et al. (2023) associated ACEs not only with problem gambling but also with substance addiction, Internet gaming addiction, and other behavioral addictions.

The Serial Mediating Role of Difficulties in Emotion Regulation and Self-Control

ACEs are not only environmental challenges encountered during childhood but also impactful developmental risk factors that influence an individual's later emotional, cognitive, and behavioral adjustment processes (Ye et al., 2024). In particular, experiences such as neglect, abuse, family conflict, and caregiver inadequacy can weaken an individual's capacity to recognize, manage, and regulate emotions and, in turn, complicates psychological adjustment in later life stages (Dagnino et al., 2025; Feiler et al., 2023). Given that emotion regulation skills develop through early attachment relationships and parent-child interactions, ACEs may disrupt this developmental process, leading to greater emotion regulation difficulties (Brodbeck et al., 2022; Ye et al., 2024). Emotional regulation and self-control are considered interrelated yet functionally distinct core components of self-regulation (Brodbeck et al., 2022; Chapple et al., 2021).

Whereas emotion regulation refers to capacity to recognize, interpret, and manage emotional experiences, self-control encompasses the ability to regulate impulses, resist immediate gratification, and direct behavior towards long-term goals (Aydın & Süslü, 2023; Chapple et al., 2021).

Therefore, emotion regulation processes form a fundamental psychological basis for the development of self-control (Brodbeck et al., 2022; Thurm et al., 2023). Indeed, Individuals who struggle to regulate intense negative emotions have greater difficulty controlling impulsive responses, planning behaviors, and resisting short-term rewards (e.g., Jebraeili et al., 2023; Thurm et al., 2023).

From a developmental perspective, negative childhood experiences primarily affect an individual's emotional functioning (Dagnino et al., 2025; Ye et al., 2024). ACEs can hinder a child's ability to develop secure attachments and learn to regulate emotions (Feiler et al., 2023; Ye et al., 2024). Such experiences increase emotional reactivity, diminish emotional awareness, and increase vulnerability to negative emotions (Brodbeck et al., 2022; Dagnino et al., 2025). This disruption in emotional processes may, over time, also weaken self-control capacity (Jebraeili et al., 2023; Thurm et al., 2023). It has been reported that individuals experiencing difficulties with emotion regulation exhibit higher levels of impulsivity, risk-taking, and a pursuit of short-term rewards; conversely (Jebraeili et al., 2023; Thurm et al., 2023). Similarly, Individuals who have experienced childhood trauma exhibit lower levels of self-control and have an increased likelihood of

engaging in risky behaviors (Jones et al., 2023; Namusoke et al., 2024). Such findings suggest that negative childhood experiences may be associated first with difficulties in emotion regulation and subsequently with difficulties in self-control.

In the context of behavioral addictions, emotion regulation and self-control processes are closely linked to problem gambling (e.g., Flores-Pajot et al., 2021; Mestre-Bach et al., 2021). It may be sustained not only by the pursuit of rewards but also by the avoidance of negative emotions, the reduction of stress, and the provision of short-term relief (Mestre-Bach et al., 2025; Neophytou et al., 2023). Therefore, individuals experiencing difficulties with emotion regulation are more likely to engage in behaviors that provide short-term relief, such as gambling, to reduce negative emotional states (Estévez et al., 2023; Mestre-Bach et al., 2021). Furthermore, lower self-control makes it difficult for individuals to resist the short-term rewards offered by gambling and contributes to the continuation of the behavior (Flores-Pajot et al., 2021; Thurm et al., 2023). In this context, we hypothesized that the relationship between ACEs and problem gambling in young adults could be explained through difficulties in emotion regulation and self-control. In other words, we believe that ACEs weaken an individual's emotional regulation capacity, that weakens emotional regulation skills, lowers self-control, and that lower self-control increases the risk of problem gambling. Therefore, we considered that it would be theoretically and empirically meaningful to examine the relationship

between ACEs and problem gambling within the framework of a serial mediation model involving difficulties in emotion regulation and self-control.

The Moderator Role of Sensation Seeking

ACEs might impact developmental balance and leave lasting marks at both the neurological and psychosocial levels (Bahri et al., 2024). Such experiences can heighten the sensitivity of the stress-response system, thereby increasing reward seeking, impulsivity, and risk-taking (Babakr & Fatahi, 2023). In this context, ACEs may have a decisive influence on sensation seeking (Janković et al., 2023), a personality trait characterized by a tendency to seek pleasure from new, intense, and risky experiences (Zuckerman, 1994). Individuals with ACEs have been found to engage in risky and stimulating behaviors to suppress their negative emotions and experience intense arousal (Babakr & Fatahi, 2023). In such cases, gambling manifests as an emotional escape and a search for excitement and stimulation (Mancone et al., 2025).

There is a positive correlation between sensation seeking and problem gambling (Celik et al., 2022). Similarly, individuals with higher levels of sensation seeking show an increased risk of problem gambling and exhibit lower insight skills (Mancone et al., 2025). Teenagers with higher sensation-seeking tendencies view gambling as a means of “pleasure and stimulation” and have more flexible attitudes toward gambling and a higher propensity for risk-taking (Farhat et al., 2021). Thus, sensation seeking can be

considered a moderating factor shaping the relationship between ACEs and problem gambling. In other words, the likelihood of problem gambling among individuals exposed to ACEs may vary depending on the individual's level of sensation seeking. Whereas individuals with lower sensation-seeking tendencies are likely to avoid or suppress negative emotions, those with higher tendencies compensate for this emotional tension by engaging in risky and stimulating behaviors (Babakr & Fatahi, 2023).

The Moderator Role of Family Gambling History

Family is the primary environmental context where an individual's risk perception, reward expectations, and coping styles are shaped (Suomi et al., 2024). A family history of gambling is a considerable environmental factor that shapes both attitudes toward gambling and norms regarding risky behaviors (Forrest & McHale, 2021). Witnessing problem gambling can lead the child to perceive it as a "normalized" or "socially acceptable" activity (Dowling et al., 2021). Thus, a family history of gambling increases problem gambling. For example, Mancone et al. (2025) found that young adults with a parental history of gambling showed a significant increase in gambling frequency and addiction risk. The relationship was powerful when combined with high-risk tendencies and impulsive personality traits. Delfabbro et al. (2021) showed that exposure to parental gambling caused individuals to internalize gambling as a "reward-providing" activity. Individuals raised in families with a history of gambling often internalize risky behaviors more easily through both behavioral modeling and cognitive

learning. Furthermore, for these individuals, gambling may take on meaning not only as a “game of chance” but also as a form of emotional relief or establishing familial bonds. Therefore, the presence of a family history of gambling acts as an environmental moderator that amplifies the influences of ACEs by increasing cognitive distortions regarding problem gambling and lowering risk perception.

Theoretical Background and Hypotheses

We aimed to examine the mediating role of both emotion regulation and self-control in the relationship between ACEs and problem gambling among young adults, as well as the moderating relationship of sensation seeking and family history of gambling on these relationships. Literature covered above shows that ACEs negatively affect lifelong stress-coping skills, impulse control, and self-regulation and increases the tendency toward risky behaviors (e.g., Bahri et al., 2024; Brodbeck et al., 2022). Therefore, we expected that the impacts of ACEs on problem gambling would manifest *indirectly* through emotion regulation and low self-control. We also considered both individual tendencies and environmental factors that shape the relationship. In this context, sensation seeking was considered an important moderating variable in the emergence of problem gambling. Thus, we hypothesized that sensation seeking would act as a moderator, amplifying the influence of ACEs on problem gambling.

Family history of gambling is also an environmental factor that shapes an individual's attitudes and beliefs toward problem gambling. Therefore, we predicted that the impacts of ACEs on problem gambling would be more substantial with a family history of gambling. Our study makes an original contribution by synthesizing variables that have been typically treated unidirectionally. By addressing both emotional and behavioral mechanisms as well as personality-based tendencies and familial factors in explaining the impacts of ACEs on problem gambling, the study adopts a multilevel explanatory framework. We expect to contribute to the understanding of the long-term impacts of early-life experiences and to the development of preventive intervention programs. We sought to answer the following hypotheses based on the theoretical model shown in Figure 1.

Hypothesis 1 (H1): ACEs are positively associated with problem gambling.

Hypothesis 2 (H2): Difficulties in emotion regulation mediate the relationship between ACEs and problem gambling.

Hypothesis 3 (H3): Self-control mediates the relationship between ACEs and problem gambling.

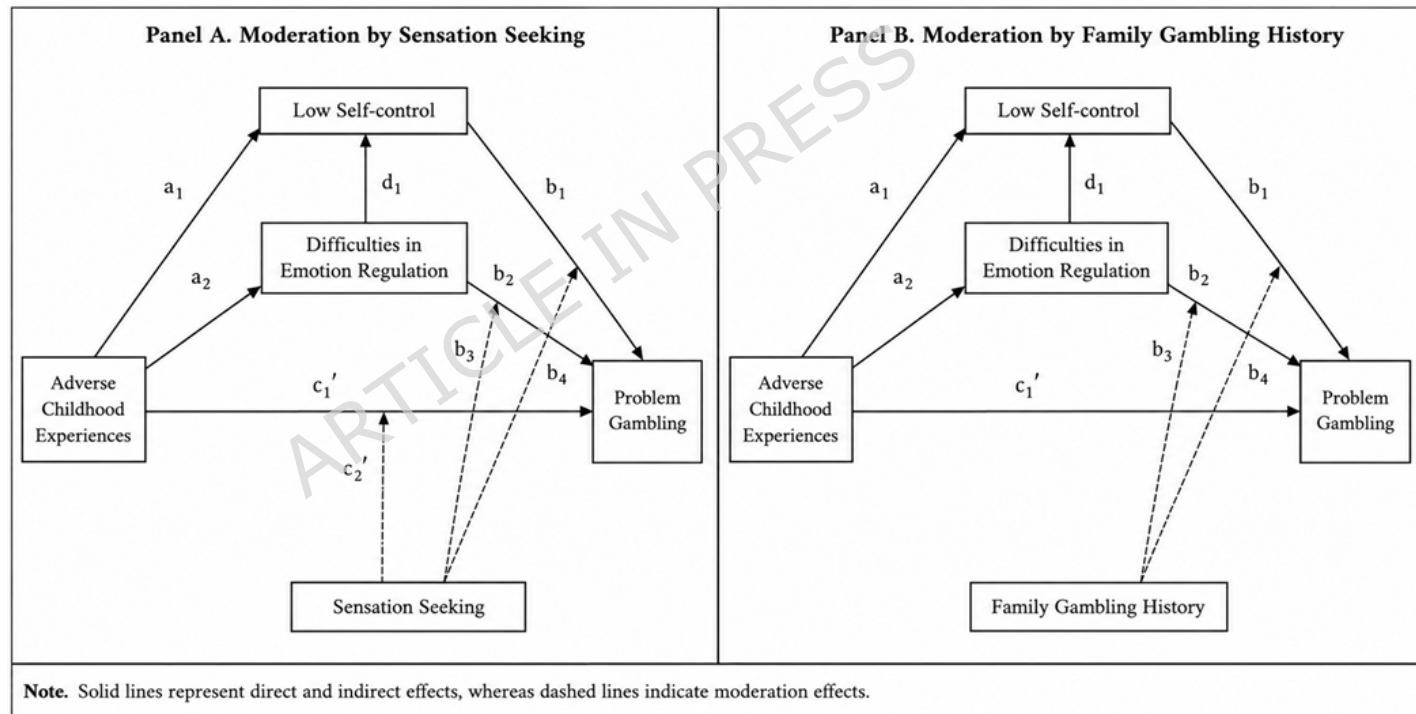
Hypothesis 4 (H4): Difficulties in emotion regulation and self-control sequentially mediate the relationship between ACEs and problem gambling.

Hypothesis 5 (H5): Sensation seeking moderates the associations between problem gambling and ACEs, difficulties in emotion regulation, and self-control.

Hypothesis 6 (H6): Family gambling history moderates the associations between problem gambling and difficulties in emotion regulation, ACEs, and self-control.

Figure 1

The Hypothetical Problem Gambling Model



Method

Participants

The study group included 579 young adults, all of whom were college students at a public university in Türkiye. Of the sample, 67.5% were male and 32.5% were female. Participants' ages ranged from 18 to 29 years, with an average age of 21.08 years ($SD = 1.93$ years). Majority were enrolled in undergraduate programs (91.2%). Parents of the participants were mostly married (93.3%). The remaining 6.7% comprised divorced/separated/widowed/other. In terms of family gambling history, 72% replied negatively and 28% replied affirmatively. According to the Problem Gambling Severity Index classification, 35.6% fall into the non-problem gambling category, 12.6% into the low-risk gambling category, 24.9% into the moderate-risk gambling category, and 26.9% into the problem gambling category. A post-hoc power analysis with G*Power (version 3.1) indicated that statistical power is quite high ($1-\beta > .99$) for a moderate effect size ($f^2 = .15$), a .05 significance level, a sample size of 579, and five predictor variables. This result indicates that the current sample size is sufficient for the analyses conducted. The primary reason for focusing on young adults in this study is that this developmental stage is marked by more pronounced risk-taking behaviors and gambling tendencies (Estévez et al., 2023). Additionally, because self-control and emotion-regulation processes are still developing in this age group, individuals may be more sensitive to environmental and familial factors (Ye et al., 2024).

Instruments

The Problem Gambling Severity Index

The Turkish version of the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) was used to assess individuals' problem gambling severity. The scale assesses individuals' problem gambling over the past 12 months. The scale is unidimensional, comprising 9 items (e.g., "gambling with more money than one can afford", "gambling again to recoup losses", "borrowing money", "health problems", "feelings of guilt"). Each item is rated on a four-point Likert-type scale ranging from "Never" (0) to "Almost always" (3). Total scale score is calculated by summing item scores, with total scores ranging from 0 to 27. Higher scores indicate greater problem gambling. The Turkish version confirms the scale's unifactorial structure ($\chi^2/df = 3.32$, CFI = .99, NNFI/TLI = .98, SRMR = .01, RMSEA = .07; Arcan, 2020). Additionally, the scale's internal consistency coefficient was high in the present study (Cronbach's $\alpha = .94$).

The Self-Control Scale

We used the Brief Self-Control Scale's (Tangney et al., 2004) Turkish version (Nebioğlu et al., 2012) to assess self-control levels. The scale comprises 13 items, rated on a 5-point Likert scale and under two subscales: Self-discipline and Impulsivity. Higher scores on the self-discipline subscale suggest greater self-control, whereas higher scores on

the impulsivity subscale indicate lower self-control. The Turkish version of the scale confirmed its two-factor structure ($\chi^2/df = 1.98$, CFI = .98, GFI = .99, RMSEA = .04) and internal consistency (Cronbach's $\alpha = .83$ for the overall scale, $\alpha = .81$ for Self-discipline, and $\alpha = .87$ for Impulsivity).

The Difficulties in Emotion Regulation Scale-8 (DERS-8)

We assessed emotion regulation challenges among young adults using the DERS-8. The scale's original and Turkish versions include 8 items across 4 subscales: Purpose, Impulse, Rejection, and Strategy. The scale's items are rated on a five-point Likert scale (Original: Penner et al., 2023; Turkish: Ekşi & Erik, 2023), with higher scores indicating greater difficulty in the subscales. The Turkish version of the scale confirmed its four-subscale structure ($\chi^2/df = 3.05$, GFI = .97, NFI = .96, TLI = .95, CFI = .98, and RMSEA = .07) and internal consistency (Cronbach's α coefficients ranging from .87 for the overall scale to between .68 and .77 for the subscales, respectively; Ekşi & Erik, 2023).

The Brief Sensation Seeking Scale (BSSS)

The BSSS was used to assess sensation-seeking levels in young adults using 8 five-point Likert-scale items within a single dimension (Stephenson et al., 2003). Higher scores reflect higher sensation seeking. The Turkish version of the scale confirmed its unidimensionality ($\chi^2/df = 1.32$; GFI = .99;

AGFI = .98; TLI = .99; SRMR = .01; CFI = .99; RMSEA = .02) and internal consistency (Cronbach's $\alpha = 0.82$; Çelik & Turan, 2016).

The Childhood Adverse Experiences Scale (CAES)

We used the Turkish version of the CAES to assess participants' levels of childhood adversity. The ACEs questionnaire was developed by the CDC-Kaiser Permanente (Felitti et al., 1998) and adapted to Turkish by Gündüz et al. (2018). The scale comprises 10 yes/no items assessing neglect, abuse, and family dysfunction before the age of 18. The total scale score ranges from 0 to 10, with higher scores indicating more adverse experiences. The adaptation study confirmed the scale's unidimensional structure. Because it consists of dichotomous items, internal consistency was calculated using the Kuder-Richardson 20 (KR-20), yielding an acceptable reliability coefficient (KR-20 = .74).

Procedure

First, we obtained approval from Ethics Committee of the Faculty of Social and Human Sciences at Bayburt University (Date: November 19, 2025; Decision No: 509/15). The study was conducted with university students enrolled at various state universities in Türkiye. The research target group consisted of young adults aged 18-29. We recruited voluntary participants online and used non-probability sampling (i.e., convenience sampling). We collected the data via Google Forms. No financial or academic incentives were provided to participants. Because an online,

volunteer-based sampling method was used, a precise response rate could not be calculated. Responses from participants who provided informed consent were recorded. Data from 17 individuals who either did not complete the form or were older than the target age range were excluded before analysis.

Data Analysis

We conducted data analyses using the SPSS 31.0 package and Hayes' PROCESS macro (v4.2; Hayes, 2022). First, we screened the data for analysis and computed descriptive statistics, including Pearson product-moment correlation coefficients, to explore relationships among variables. To examine the sequential mediating roles of difficulties in emotion regulation and self-control in the process leading from ACEs to problem gambling, Model 6 (the sequential mediation model) in Hayes's PROCESS macro was used. To assess the statistical significance of the mediational relationships, 95% confidence intervals were calculated using the bias-corrected bootstrap method with 5,000 resampling runs. Finally, Model 89 (which tests the conditional effects of moderator variables on mediation paths) was used to examine whether this serial mediation path was moderated by sensation seeking and family history of gambling. Since the PROCESS macro does not support including two moderator variables in a single model, the conditional process analyses were conducted as two

separate models: in the first, sensation seeking was the moderator; in the second, family history of gambling was the moderator.

Results

Preliminary Analyses

Table 1 shows that skewness values range from -0.41 to 1.38 and kurtosis values range from -0.74 to 0.55; all values satisfy the assumption of normality. Furthermore, no multicollinearity was observed among the variables. Results show that the variance inflation factor (VIF) ranged from 1.18 to 1.71, tolerance from .58 to .85, and the condition index from 3.23 to 25.12. These values meet the criteria of $VIF < 10$, condition index < 30 , and tolerance $> .10$ (Tabachnick & Fidell, 2013). Table 1 also shows that problem gambling is correlated highest with sensation seeking (positive) and lowest with ACEs (positive). On the other hand, ACEs is most strongly associated variable with self-control (negative).

Table 1

Descriptive Statistics and Bivariate Relationships Among the Study Variables (N = 579)

Variable	PG	ACEs	DER	SC	SS
Problem gambling (PG)	1				
ACEs	.39**	1			
Difficulties in emotion regulation (DER)	.50**	.28**	1		
Self-control (SC)	-.51**	-.37**	-.49**	1	

Sensation seeking (SS)	.53**	.22**	.35**	-.52**	1
Mean	6.16	2.61	21.70	42.03	24.22
Standard deviation	8.21	2.53	7.15	9.05	7.12
Ranges	0-27	0-10	8-40	16-64	8-40
Condition Index	1	3.23	6.50	8.79	25.12
Variance Inflation Factor	-	1.18	1.45	1.71	1.39
Tolerance	-	.85	.74	.58	.72
Skewness	1.38	.70	.37	-.41	.17
Kurtosis	.55	-.47	-.67	.01	-.74

** $p < 0.001$.

The Serial Indirect Relationships of ACEs and Problem Gambling

We examined the sequential mediating relationships of difficulties in emotion regulation and self-control on the relationship between ACEs and problem gambling using Model 6 of the PROCESS (Hayes, 2022). Findings are reported in Table 2.

Table 2

Serial Mediation Relationship of ACEs on Problem Gambling (N = 579)

Predictor	Model 1 (DER)		Model 2 (SC)		Model 3 (PG)	
	β	t	β	t	β	t
ACEs	.28	7.06***	-.26	-7.07***	.19	5.37***
Difficulties in emotion regulation (DER)			-.42	-	.31	8.11***
Self-control (C)				11.40***	-.28	-
						7.14***

$R^2 = .08$	$R^2 =$	$R^2 =$	
	.30	.37	
$F_{(1,577)} = 49.78^{***}$	$F_{(2,576)}$	$= F_{(3,575)}$	$=$
	122.38 ^{***}	113.32 ^{***}	

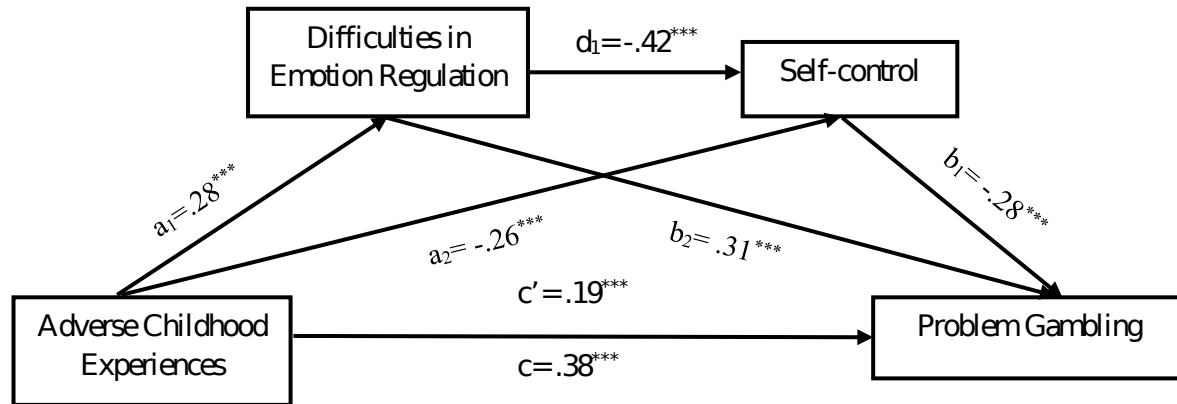
PG: Problem gambling; * $p < 0.05$ ** $p < 0.01$; *** $p < 0.001$.

Based on the findings shown in Table 2 and Figure 2, H1 is supported. Specifically, ACEs are significantly and positively associated with problem gambling. In examining mediating relationships, ACEs are positively associated with difficulties in emotion regulation. Conversely, difficulties in emotion regulation show a positive and significant relationship with problem gambling. This pattern indicates that difficulties in emotion regulation mediate the relationship between ACEs and problem gambling; thus, H2 is also supported.

Similarly, when assessed with the self-control variable, ACEs are moderately negatively associated with self-control ($\beta = -.26$, $p < 0.001$), and self-control, in turn, is moderately negatively associated with problem gambling ($\beta = -.28$, $p < 0.001$). These results show that self-control serves as a mediator in the relationship between ACEs and problem gambling, thereby supporting H3.

Figure 2

The Serial Mediation Model



According to Table 3, the direct influence of ACEs on problem gambling is significant (unstandardized effect = .63, 95% CI [.40, .86]). Furthermore, the indirect influence is also significant (unstandardized effect = .63, 95% CI [.46, .81]). When examining the indirect pathways separately, the confidence intervals for the ACEs→emotion regulation difficulties→problem gambling, ACEs→self-control→problem gambling, and ACEs→emotion regulation difficulties→self-control→problem gambling pathways do not include zero. These findings indicate that the influence of ACEs on problem gambling occurs both directly and through (single and serial) mediating pathways, and Hypothesis H4 has been confirmed; details are shown in Table 3.

Table 3

Bootstrap of the Serial Mediation Model in the Relationship Between Adverse Childhood Experiences and Problem Gambling

Path	β	B	Boot t SE	Boot CIL	Boot CIU
Direct influence	.19	.63	.12	.40	.86

Indirect influence	.19	.63	.09	.46	.81
ACEs→ DER→PG	.09	.28	.06	.18	.40
ACEs→SC→PG	.07	.24	.05	.14	.35
ACEs→DER→SC→PG	.03	.11	.03	.06	.17
Total effect	.38	1.25	.13	1.01	1.50

ACEs: Adverse Childhood Experiences; DER: Difficulties in Emotion Regulation; SC: Self-Control; PG: Problem Gambling. CIL: Confidence Interval Lower; CIU: Confidence Interval Upper; B: Unstandardized Coefficients; β : Standardized Coefficients.

Alternative Models

In addition to the proposed sequential mediation model, alternative models were tested to assess their robustness. In this context, a model in which the order of the mediators was reversed (self-control → difficulties in emotion regulation) (Supplementary Figure S1) and a model in which the mediating relationships were treated in parallel (Supplementary Figure S2) were examined. Analysis results indicated that the indirect influences of adverse childhood experiences on problem gambling were significant in both alternative models. However, the magnitudes of the direct, indirect, and total effects obtained in the alternative models were similar to those in the proposed model, and the models' explanatory power (as measured by R^2 values) largely overlapped. These findings suggest that difficulties in emotion regulation and self-control may play roles in the relationship with problem gambling, both independently and sequentially, and that these relationships can be examined within the framework of multiple potential mechanisms.

-Insert Supplementary Figure S1 here-

-Insert Supplementary Figure S2 here-

The Moderated Mediation Influence of Sensation Seeking

The moderated serial mediation model, based on Hayes PROCESS Model 89, was assessed with sensation seeking as the moderator. In the regression analysis, the interaction terms were significant. The interactions between sensation seeking and ACEs ($\beta = .54$, 95% CI = [.13, .95]) and between sensation seeking and difficulties in emotion regulation ($\beta = .43$, 95% CI = [.27, .58]) were highly positive. In contrast, the interaction between sensation seeking and self-control ($\beta = -.29$, 95% CI = [-.43, -.16]) was moderately negative. The overall regression model was statistically significant and explained 51% of the variance in problem gambling ($F_{(7,571)} = 84.83$, $p < .001$). Results are shown in Table 4.

Table 4

The Moderated Mediation Influence of Sensation Seeking ACEs on Problem Gambling

Variables	β	SE	t	Bootstrap 95% CI	
				Lower	Upper
Sensation seeking (SS)	5.64	3.99	1.42	-2.19	13.47
ACEs	-.32	.33	-.98	-.97	.32
ACEs $\times$ SS	.54	.21	2.61**	.13	.95
Difficulties in emotion regulation (DER)	-.32	.12	-2.63**	-.56	-.08
DER $\times$ SS	.43	.08	5.39***	.27	.58

Self-control (SC)	.30	.11	2.83**	.09	.51
SC $\times$ SS	-.29	.07	-4.32***	-.43	-.16
$R^2 = .51$					
$F_{(7,571)} = 84.83^{***}$					
PG: Problem gambling. * $p < .05$; ** $p < .01$; *** $p < .001$.					

A simple slope analysis was performed to clarify the previously discussed interaction. Sensation seeking was examined at levels below and above its mean. The results showed that the relationship between difficulties in emotion regulation and problem gambling was significant at lower levels of sensation seeking ($\beta = .11$, 95% CI = [.01, .21]). In contrast, at higher levels, the relationship was also significant and stronger ($\beta = .54$, 95% CI = [.42, .66]). Supplementary Figure S3 illustrates that the relationship between difficulties in emotion regulation and problem gambling becomes more pronounced as sensation seeking increases. This finding suggests that difficulties in emotion regulation are more strongly associated with problem gambling in individuals with high sensation seeking.

-Insert Supplementary Figure S3 here-

The results showed that the relationship between self-control and problem gambling was non-significant at lower levels of sensation seeking behavior ($\beta = .01$, 95% CI = [-.09, .10]). In contrast, at higher levels, the relationship became significant and stronger ($\beta = -.29$, 95% CI = [-.38, -.19]). Supplementary Figure S4 illustrates that the connection between self-

control and problem gambling becomes more pronounced as sensation seeking increases. This finding suggests that self-control plays a more significant role in problem gambling among individuals with high sensation seeking.

-Insert Supplementary Figure S4 here-

The serial mediating relationship between ACEs and problem gambling varies depending on sensation seeking levels: it is insignificant and low at lower levels ($\beta = .22$, 95% CI = [-.07, .51]) and non-significant. However, at higher levels ($\beta = .76$, 95% CI = [.47, 1.06]), it becomes statistically significant. Supplementary Figure S5 illustrates that the link between ACEs and problem gambling grows stronger as sensation seeking increases. This finding suggests that negative ACEs may be more strongly associated with problem gambling in individuals with a high level of sensation seeking.

-Insert Supplementary Figure S5 here-

In sum, Table 5 shows that the influence across the three paths increases as sensation-seeking tendency rises. This finding confirms H5.

Table 5

Moderation Relationships of Sensation Seeking in the Serial Mediation Model

Path	Moderating variable		β	Boot SE	Boot CIL	Boot CIU
ACEs→ DER →PG	Lower seeking	sensation	.11	.05	.01	.21
	Higher seeking	sensation	.54	.06	.42	.66
ACEs→SC→PG	Lower seeking	sensation	.01	.05	-.09	.10
	Higher seeking	sensation	-.29	.05	-.38	-.19
ACEs→ DER →SC→PG	Lower seeking	sensation	.22	.15	-.03	.51
	Higher seeking	sensation	.76	.15	.47	1.06

ACEs: Adverse Childhood Experiences; DER: Difficulties in Emotion Regulation; SC: Self-Control; PG: Problem Gambling; CIL: Confidence Interval Lower; CIU: Confidence Interval Upper.

When examining conditional indirect effects and moderated mediation indices, sensation seeking appears to play a significant moderating role across both single- and serial-mediation paths (see Table 6).

Table 6

Conditional Indirect Effects and Indices of Moderated Mediation for Sensation Seeking

Indirect path	Sensation Seeking	Effect	BootSE	BootLL CI	BootUL CI	Index of Moderated Mediation	BootLL CI	BootUL CI
ACEs→ DER →PG	Low	.09	.04	.03	.17	.34	.17	.54
	High	.43	.10	.26	.63			

ACEs→SC→	Low	-.01	.03	-.07	.06	.27	.12	.45
PG	High	.26	.08	.13	.43			
ACEs→ DER	Low	-.01	.02	-.04	.03	.12	.05	.22
→SC→PG	High	.12	.04	.05	.21			

ACEs: Adverse Childhood Experiences; DER: Difficulties in Emotion Regulation; SC: Self-Control; PG: Problem Gambling

The Result of the Moderated Mediation Influence of Family Gambling History

Within the Hayes PROCESS Model 89 framework, the tested moderated serial mediation model included family gambling history as a moderator; the findings are presented in Table 7. Regression analysis results indicated that several interaction terms were statistically significant. Specifically, while the interaction between ACEs and family gambling history was not significant ($\beta = -.08$, 95% CI = [-.52, .37]), the interaction between difficulties in emotion regulation and family gambling history was highly positive and significant ($\beta = .45$, 95% CI = [.28, .62]). Furthermore, the interaction between self-control and family gambling history was lowly negative and significant ($\beta = -.18$, 95% CI = [-.31, -.05]). The overall regression model was significant and explained 55% of the variance in problem gambling ($R^2 = .55$; $F_{(7,571)} = 98.78$, $p < .001$).

Table 7

Moderated Mediation Influence of Family Gambling History

Variable	β	SE	t	Bootstrap 95% CI	
				Lower	Upper
FGH	3.97	4.22	.94	-4.31	12.25
ACEs	.42	.12	3.52***	.18	.65
Int1: ACEs $\times$ FGH	-.08	.23	-.34	-.52	.37
DER	.19	.04	4.44***	.11	.28
Int2: DER $\times$ FGH	.45	.09	5.15***	.28	.62
SC	-.09	.04	-2.23*	-.16	-.01
Int3: SC $\times$ FGH	-.18	.07	-2.71**	-.31	-.05

$R^2 = .55$

$F_{(7,571)} = 98.78^{***}$

FGH: Family Gambling History; ACEs: Adverse Childhood Experiences;

DER: Difficulties in Emotion Regulation; SC: Self-Control. * $p < .05$; ** $p < .01$; *** $p < .001$.

A simple regression analysis was conducted to clarify the previously discussed interaction. In this analysis, the moderating role of family gambling history was examined separately for those with and without a family gambling history (presence-absence). The findings revealed a significant relationship between difficulties in emotion regulation and problem gambling in the absence of a family history of gambling ($\beta = .19$, 95% CI = [.11, .28]), and this relationship was even stronger in the presence of a family history of gambling ($\beta = .64$, 95% CI = [.49, .79]). Supplementary Figure S6 illustrates that the association between difficulties in emotion regulation and problem gambling intensifies in the presence of a family history of gambling. This finding suggests that a family

history of gambling strengthens the link between difficulties in emotion regulation and problem gambling.

-Insert Supplementary Figure S6 here-

Results show that the association between self-control and problem gambling is significant when there is no family history of gambling ($\beta = -.09$, 95% CI = $[-.16, -.01]$). However, in the presence of a family history of gambling, this relationship became significant and stronger ($\beta = -.27$, 95% CI = $[-.37, -.16]$). Supplementary Figure S7 shows that the relationship between self-control and problem gambling intensified in the presence of a family history of gambling. This finding suggests that self-control plays a more significant role in problem gambling among individuals with a family history of gambling.

-Insert Supplementary Figure S7 here-

In summary, Table 8 indicates that family gambling history strengthens the DER $\rightarrow$ PG and SC $\rightarrow$ PG pathways but does not significantly moderate the direct ACEs $\rightarrow$ PG association ($\beta = -.08$, $p = .73$). H6 is therefore partially supported: the moderating effect holds for the difficulties in emotion regulation and self-control pathways but not for the direct path from ACEs to problem gambling.

Table 8

Moderated Relationships of Family Gambling History in the Serial Mediation Model

Path	Moderating variable	β	Boot SE	Boot CIL	Boot CIU
ACE→ DER →PG	FGH (-)	.19	.04	.11	.28
	FGH (+)	.64	.08	.49	.79
ACE→SC→PG	FGH (-)	-.09	.04	-.16	-.01
	FGH (+)	-.27	.05	-.37	-.16

ACE: Adverse Childhood Experiences; DER: Difficulties in emotion regulation; SC: Self-Control; PG: Problem Gambling; FGH: Family Gambling History; CIL: Confidence Interval Lower; CIU: Confidence Interval Upper.

When examining conditional indirect effects and moderated mediation indices, family gambling history appears to play a significant moderating role across both single- and serial-mediation paths (see Table 9).

Table 9

Conditional Indirect Effects and Indices of Moderated Mediation for Family Gambling History

Indirect path	FGH	Effect	BootSE	BootLL CI	BootUL CI	Index of Moderated Mediation	BootLL CI	BootUL CI
ACEs→ DER →PG	Absence	.15	.04	.08	.25	.36	.15	.62
	Presence	.51	.13	.28	.79			
ACEs→SC→PG	Absence	.08	.04	.01	.16	.17	.02	.33
	Presence	.25	.08	.11	.40			

ce											
ACEs→ DER	Absenc	.04	.02	.01	.08						
→SC→PG	e					.08	.01	.16			
	Presen	.11	.04	.05	.20						
ce											
ACEs: Adverse Childhood Experiences; DER: Difficulties in Emotion Regulation; SC: Self-Control; PG: Problem Gambling; FGH: Family Gambling History											

Discussion

We found that adverse childhood experiences (ACEs) were significantly and positively associated with problem gambling and that difficulties in emotion regulation and self-control serially mediated this relationship, with sensation seeking and family gambling history moderating the mediation. Findings indicate that ACEs are associated with problem gambling both directly and indirectly through difficulties in emotion regulation and self-control. These findings are consistent with recent literature (e.g., Bahri et al., 2024; Bristow et al., 2022; Goodrich et al., 2023). ACEs show positive correlations with many different types of addictions (Leza et al., 2021) and negative correlations with the quality of life (Howard et al., 2023). Consequently, ACEs may push an individual towards risky behaviors that lead to addiction problems, such as problem gambling, which is economically, physiologically, and psychologically risky but difficult to prevent.

We hypothesized that difficulties in emotion regulation would mediate the relationship between adverse childhood experiences and problem gambling. The findings supported our hypothesis as also recently reported by Ye et al. (2024) and Feiler et al. (2023). Individuals who experience difficulty in emotion regulation are at increased risk for gambling addiction (Mestre-Bach et al., 2021). Problem gambling among young adults is also related to traumatic events and emotion regulation, and these findings yield similar results to studies. When correlational and predictive studies are evaluated, ACEs can be partially described as traumatic. Genetic and environmental factors may partly explain this relationship between gambling and ACEs; furthermore, socio-economic status may also play a role (Tucker et al., 2021). The observed indirect pathway through emotion regulation is consistent with prior work emphasizing the role of affective processes in linking early adversity to addictive behaviors (e.g., Mestre-Bach et al., 2021; Ye et al., 2024). Considering the importance of emotion regulation in human life, a mediating correlation may have emerged.

We hypothesized that self-control would mediate the relationship between ACEs and problem gambling. We were unable to locate prior research that modeled this relationship. However, it has been reported that skills and impulses gained during childhood negatively affect self-control (e.g., Chapple et al., 2021; Jones et al., 2023; Namusoke et al., 2024). Furthermore, given the positive correlation between self-control and problem gambling (e.g., Flores-Pajot et al., 2021), we expected this

mediation. The decline in self-control skills resulting from ACEs may have led to risky behaviors, and from these risky behaviors, to problem gambling, which is a relatively accessible risky behavior. Furthermore, when the young-adult period is included in this process, the search for risk is likely further driven by the pursuit of financial gain, which may have contributed to the outcome.

We found that difficulties in emotion regulation and self-control mediated the relationship between ACEs and problem gambling. This finding is consistent with previous studies (e.g., Chapple et al., 2021; Feiler et al., 2023; Flores-Pajot et al., 2021; Jones et al., 2023; Mestre-Bach et al., 2021; Namusoke et al., 2024; Ye et al., 2024). The inclusion of both difficulties in emotion regulation and self-control in the model was associated with significant regression coefficients and indirect effects. This finding suggests that difficulties in emotion regulation may be related to self-control. In this context, the model obtained aligns with similar approaches in the literature. While the findings of this study support the proposed sequential mediation model, the fact that alternative models also reveal similar patterns suggests that the relationships among these variables may not be limited to a single linear or causal mechanism. In this context, rather than asserting that the current findings definitively establish a specific mechanism, it can be argued that they suggest the relationships among the variables can be evaluated within multiple possible theoretical frameworks.

We further included both sensation seeking and family gambling history as moderating variables in the model. The relationship between self-control and problem gambling was not significant at lower levels of sensation-seeking behavior. However, at higher levels, this relationship became stronger and more significant. The moderating role of sensation seeking has frequently been examined in studies of young adults, particularly in statistical mediation and moderation models (e.g., Babakr & Fatahi, 2023; Celik et al., 2022; Janković et al., 2023; Zuckerman, 1994). Mancone et al. (2025) state that there are increases in sensation seeking and problem gambling, especially among young adults, and that increased sensation seeking goes hand in hand with these increases. Multiple factors may have influenced this outcome. First, expectations of quick gains, escape from stress, and intense emotional experiences are likely contributors to the findings reported in the present research. Therefore, while lower levels of sensation seeking may have a minimal role in problem gambling, higher levels are expected to increase the risk. Another factor may be the regulatory role of family gambling history, which is the study's final hypothesis. Family context plays a major role in gambling disorder (Forrest & McHale, 2021). Supporting this view, Delfabbro et al. (2021) state that problem gambling is higher among those exposed to parental problem gambling. Therefore, the tendency to model salient family behaviors may significantly moderate the relationship.

Conclusion

Theoretical and Clinical Implications

This study makes significant contributions to the literature by examining multiple sequential mediators and moderators within a comprehensive model that explains problem gambling. The model was developed using independent variables such as difficulties with emotion regulation and self-control, ACEs, sensation seeking, and a family history of gambling. The findings underscore the decisive role of family factors and ACEs in understanding and preventing problem gambling. Given that gambling is legal for individuals aged 18 and older in many countries and is becoming increasingly complex due to online gambling platforms, a comprehensive approach to this issue is essential. Therefore, integrating the model and the related variables identified in the study into prevention and intervention programs is of great importance.

The study also has significant implications for clinical practice. In particular, assessing early adverse childhood experiences emerges as a critical element in the prevention and intervention of problem gambling. In this context, the study emphasizes that individuals exhibiting problem gambling should be assessed not only for their behavioral characteristics but also for their underlying traumatic experiences. Consequently, the research demonstrates that incorporating ACEs experiences into clinical

processes could contribute to developing more effective assessment and intervention strategies.

Limitations

The study has some limitations to be mentioned at this point. First, mediation analysis based on cross-sectional data has been debated in the literature. According to some researchers, longitudinal designs are appropriate for causal and mediation studies (Li et al., 2023). For this reason, although this study employed a cross-sectional design, its non-longitudinal nature is a limitation. In this regard, although the current findings reveal relationships among the variables, they do not permit causal inferences. Furthermore, mediation and moderation analyses demonstrate statistical relationships but do not establish a definitive causal mechanism among the variables. Therefore, the findings must be evaluated within a correlational rather than a causal framework. It is recommended that future studies employ longitudinal and experimental designs to more accurately identify the direction of these relationships and the underlying processes.

Additionally, we collected data using self-report instruments, which may influence participants' responses. The main focus of the study, problem gambling, may have introduced possible distortion. This is because gambling is illegal in the country where the data were collected (Duvarci et al., 1997), and the sample consists of young adults, which may have contributed to the limitations. Furthermore, the absence of qualitative data,

given the study's quantitative design, is also a limitation. Finally, the present study did not separately assess online or cyber gambling, which represents a rapidly growing segment of gambling activity (Gezgin et al., 2025). Future research should examine whether the proposed model operates similarly for online and offline problem gambling. However, the data were collected using convenience sampling, and the sample included a higher proportion of men than women. Thus, the study's findings may not be generalizable, particularly due to an imbalance in the gender distribution. Furthermore, the proportion of participants classified as problem gamblers (26.9%) substantially exceeds population-level estimates (Tran et al., 2024), likely reflecting self-selection associated with the online recruitment design and the topical interest of those who chose to participate. Generalizability to the broader young adult population should therefore be made with caution.

Based on the findings, we make several recommendations. Future studies may benefit from focusing on interventions for high school populations, drawing on field-specific experts, a societal perspective, and a prevention focus. Furthermore, the increased pursuit of excitement among teenagers may have contributed to the rise in problem gambling rates. This point needs further investigation. Therefore, including qualitative studies on the problem may yield deeper insights.

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Declarations

Informed consent: “All procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.”

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