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Childhood Threats and Cognitive Difficulties in Mid and Later Life: A Gendered Perspective on the Mediating Role of Family Functioning

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ABSTRACT

This study examined the associations between childhood threats (parental abuse and bullying victimization) and cognitive difficulties in mid and later life. Data were extracted from the 2022 Panel Study on Active Ageing and Society in Hong Kong ($N = 5,007$). Mediation analyses were performed using the PROCESS macro, both for the entire sample and gender-stratified models. Findings revealed that frequent parental abuse and bullying victimization during childhood were associated with increased cognitive difficulties in mid and later life. Contemporary family functioning mediated these relationships. Gender differences were observed in the mediating role of family functioning, with its significance limited to older women.

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Bullying victimization; parental abuse; childhood threats; cognitive impairment; family functioning; gender differences

Background

Cognitive impairments, characterized by memory deterioration, learning difficulties, and reduced attention, is a significant global issue among the aging population (Eshkoor et al., 2015). It is estimated that approximately 19% of community-dwelling older adults worldwide suffer from cognitive impairments (Pais et al., 2020). The impact of cognitive decline goes beyond individual well-being, leading to a lower quality of life, mental distress, and increased mortality in older adults (Duan et al., 2020; Stites et al., 2018). Furthermore, cognitive deficits place a substantial burden on families and society, resulting in significant economic costs and an increased demand for long-term care services (Tahami Monfared et al., 2022).

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Given the profound personal and societal consequences of cognitive impairments, it is crucial to thoroughly understand the factors that influence cognitive functions. Existing research has identified various contemporary risk factors associated with cognitive impairments, including inactive lifestyle (Zaninotto et al., 2018), depressive symptoms (Mukku et al., 2021), chronic diseases (Lor et al., 2023), social support and participation (Cai et al., 2024; Ma et al., 2024), and neighborhood environment (Guo et al., 2019). Beyond these contemporary factors, the life course perspective suggests that early-life events can have a lasting impact on cognitive functions due to the cumulative effects of risk exposures throughout one's life (Chey & Kwak, 2023). Consistent with this perspective, emerging empirical evidence indicates that exposure to parental abuse during childhood significantly affects multiple aspects of cognitive health in older adults (Dannehl et al., 2017; Nilaweera et al., 2022). However, most cognitive research on childhood threats, referring to harmful experiences or traumatic events during childhood, has focused on abuse or violence within the family or those perpetrated by caregivers. Studies examining the effects of childhood bullying by peers have mainly focused on psychological distress or biological outcomes, such as obesity and inflammation, in middle adulthood (Takizawa et al., 2014, 2015).

The pathway model within the life course perspective further emphasizes that life is a sequence of interconnected stages, where earlier childhood threats can trigger a chain of risks and set individuals on a particular trajectories or "pathways." These pathways further affect individuals' future behavior, social and health outcomes (Cai et al., 2024; Kuh et al., 2003). Existing studies linking childhood threats to cognition in later life have predominantly focused on individual pathways, such as socialization, psychological factors like depressive symptoms, and biological process including inflammation (Ding & He, 2021; Lowry et al., 2022). However, interpersonal and social factors, especially family functioning, have not been thoroughly examined, despite its potential significant role in linking early-life experiences to cognitive development in later life.

The family has long been recognized as a crucial agent for social integration and a primary source of social support (Wallace & Sterns, 2022). Positive childhood experiences may contribute to healthy family functioning in adulthood, fostering positive interactions and nurturing close family relationships. This effective family functioning, in turn, may serve as a protective factor for cognitive enrichment in later life (Wang et al., 2022; Yang & Jia, 2022). Therefore, it is reasonable to examine whether childhood adversity may directly and indirectly affect cognitive functioning in later life through family functioning. Moreover, given the existence of gendered health inequality and the differential effects of family life on men and women (Bai et al., 2024; Yeom & Lee, 2020), it is necessary to adopt

a gendered perspective when exploring the mediating role of family functioning.

Using data from the 2022 Panel Study on Active Ageing and Society (PAAS), a representative survey with 5,007 adults (aged 50 years and older) in Hong Kong led by the first author, this study aimed to examine the extent to which the two types of childhood threats, namely parental abuse and bullying victimization, affect the cognitive difficulties of aging Chinese adults. The study also explored the mediating role of family functioning in these associations, both in the overall sample and stratified by gender. Overall, this study sought to provide a more nuanced understanding of how childhood threats from different perpetrators (i.e., caregivers and peers) may have long-term influences on cognitive function in mid and later life. Additionally, it presented a comprehensive picture by elucidating the underlying mechanism of family functioning as a mediator between childhood threats and cognitive difficulties, while also taking potential gender differences into account.

Childhood abuse, bullying victimization, and cognitive function in mid and later life

Childhood threats encompass experiences of harm and trauma that may directly jeopardize a child's physical or psychological well-being (McLaughlin et al., 2014). Additionally, research indicates that childhood threats have both immediate and enduring impacts on healthy aging and are associated with externalizing psychopathology (McLaughlin & Sheridan, 2016). Hence, prioritizing threat-related adversities is crucial for designing effective interventions to prevent abuse and violence. Among the various forms of childhood threats, parental abuse is the most common. Recent studies in China and France have shown that early-life experiences of parental abuse are negatively associated with the cognitive functions in older adults, as indicated by lower scores in mental intactness, episodic memory, and psychomotor speed (Ding & He, 2021; Nilaweera et al., 2022). Conversely, other studies have reported conflicting findings, suggesting a positive relationship between childhood abuse and enhanced visual-verbal memory, executive function, and processing speed among older adults in Ireland and the Netherlands (Feeney et al., 2013; Tjoelker et al., 2022). One possible explanation for these findings is that childhood trauma may trigger elevated levels of arousal and vigilance, potentially enhancing cognitive performance (Feeney et al., 2013). However, these inconsistent results underscore the need for more empirical evidence from diverse socio-cultural contexts to examine the relationship between childhood abuse and cognitive functioning in older adults.

Bullying victimization is another common form of childhood threat, characterized by intentional and repeated harm inflicted by peers, and an imbalance of power between the victim and perpetrator within the school context

(Liu & Graves, 2011; Wolke & Lereya, 2015). Schools are often the first environment where children spend significant time socializing with their peers, making bullying victimization a potent stressor during childhood. This experience can have lasting effects on physical and mental well-being into middle adulthood and later life (Takizawa et al., 2015; Zhou & Zhou, 2024). While bullying is increasingly recognized as a significant public concern, research on its long-term impact on cognitive functions in later life is limited. Only two studies suggested that childhood bullying leads to poorer cognitive functioning in young children (Menken et al., 2022) and middle adulthood (Takizawa et al., 2014). However, it remains unclear whether these adverse effects persist into mid and later life, resulting in cognitive impairments.

The mediating role of family functioning

Family functioning refers to the social and structural attributes within family systems (Lewandowski et al., 2010), primarily manifested as the interaction patterns and relationship quality among family members (Olson et al., 2019). The cognitive enrichment hypothesis (Hertzog et al., 2008) suggests that successful cognitive aging can be fostered through engagement in intellectually, socially, and physically stimulating activities. Healthy family functioning, characterized by effective communication, strong emotional bonds, and supportive relationships among family members (Miller et al., 2000), cultivates an environment conducive to cognitive enrichment. In such a context, older adults are more likely to engage in activities that stimulate mental and cognitive processes, thereby promoting the activation and maintenance of cognitive functions. This perspective is corroborated by Windsor et al. (2014), who found that negative interaction patterns with spouses are associated with poor memory performance in young-old adults. Similarly, A. W. T. Fung et al. (2019) found that non-confiding relationships with family members could increase the risk of cognitive impairments in older adults. Conversely, positive intergenerational relationships and sufficient family support may alleviate feelings of loneliness and social isolation in later life, potentially slowing the process of cognitive decline in older adults (Wang et al., 2022; Yang & Jia, 2022).

Early-life experiences significantly shape family functioning in later life. Attachment theory posits that childhood relationships are crucial for developing a sense of security, which lays foundation for forming and maintaining future relational patterns (Bowlby, 1980). Children who experience abuse or bullying may develop insecure attachment styles, characterized by anxiety or avoidance in relationships (Doyle & Cicchetti, 2017; Widom et al., 2018). These insecure attachment styles can manifest in adulthood as difficulties in communication, emotional intimacy, and conflict resolution within family settings

(Savla et al., 2013). For example, research indicates that experiences of childhood abuse or bullying are associated with reduced support, increased strain, less frequent contact, and lower levels of emotional closeness with families in mid and later life (Kong et al., 2019; Zhou & Zhou, 2024). Moreover, childhood experiences can be intergenerationally transformed and extended into parenting practices (Campbell & Gilmore, 2007). Adults who were victims of abuse may replicate dysfunctional patterns learned during their formative years, resulting in less supportive and more conflictual family environments (Greene et al., 2020). Although previous studies have examined the paired relationships between childhood threats, family functioning, and cognitive function, few studies have simultaneously investigated these three components, particularly emphasizing the mediating role of family functioning.

Gender differences in the mediating effect of family functioning

A gendered perspective is crucial when examining the mediating role of family functioning. In feminist sociology, gender is regarded as a social system that assigns different roles, power, and resources to men and women (Ridgeway & Correll, 2004), with persistent inequality within the families (Adams, 2018). Cultural gender norms often expect women to engage more in family activities (Bronstein, 2006), providing caregiving and emotional support (Ofstedal et al., 2004; Sharma et al., 2016). Furthermore, adopting a life course perspective on the ecology of gender, Moen (1996), p. 171) suggests that “the intersection of age and gender yields distinctive life patterns for men and women at all stages of the life course.” Considering these disparities, it is plausible that the effect of childhood threats on family functioning, or the relationship between family functioning and cognitive difficulties, may differ between by gender. For example, evidence suggests that the impact of severe childhood abuse on perceived low levels of social support from family members is more pronounced among women (Gayer-Anderson et al., 2015). Additionally, Kim and Chon (2018) found that association between frequent contact with adult children and cognitive decline was stronger in women than in men. Therefore, it is necessary to examine whether family functioning’s mediating effect, linking childhood threats to cognitive difficulties in mid and later life, differs by gender.

The present study and research hypotheses

This study aimed to comprehensively explore the family pathway linking childhood threats to cognitive difficulties among aging adults. The research questions are as follows: (1) To what extent that childhood parental abuse and bullying victimization influence cognitive difficulties in later life? (2) How does family functioning mediate the relationships between childhood

threats (parental abuse and bullying victimization) and cognitive difficulties in older adults? (3) Are there gender differences in the mediating effect of family functioning on the associations between childhood threats and cognitive difficulties? Based on these research questions, the corresponding hypotheses are: (1) Frequent experiences of parental abuse and bullying victimization during childhood are significantly associated with higher levels of cognitive difficulties in later life; (2) The associations between two types of childhood threat and cognitive difficulties were significantly mediated by family functioning in later life; (3) The mediating effect of family functioning in the associations between childhood threats and cognitive difficulties is significant only for women, or is stronger among women than men.

Method

Participants and data collection

This study used data from the first wave of the PAAS, a representative dataset among Chinese-speaking adults aged 50 years and older in Hong Kong (Bai et al., 2024). A two-stage stratified random sampling method was employed. Twenty-thousand landline and mobile phone numbers were randomly generated and dialed according to the numbering plan of the Office of the Communications Authority, Hong Kong SAR Government. After excluding invalid and non-responsive numbers, 7,648 eligible households were identified. From each household, one respondent was selected using the “next birthday” rule, which means the person selected for participation is the one whose birthday is closest to the date of data collection. Respondents were equally stratified into two age groups (50–64 and 65 and over) based on the 2021 population by-census, ensuring adequate representation within each stratum.

Data collection was conducted by telephone surveys from June 2022 to November 2022. Eligible respondents were interviewed by trained interviewers under on-site supervision using a Web-based Computer Assisted personal communication (Web-CATI). All study procedures and protocols were approved by the first author’s affiliated institution. The survey commenced by obtaining oral consent from respondents, ensuring they were fully informed about the research objectives and their rights in the study. Among the initial 8,303 eligible older adults, a total of 5,007 older adults were successfully interviewed, resulting in a response rate of 60.3%. To ensure data quality, a rigorous quality control approach was implemented to review the completed interviews and verify adherence to fieldwork procedures by interviewers.

Measures

Cognitive difficulties were assessed using a two-item cognitive difficulty scale, which was previously used in the World Health Organization Study on Global Ageing and Adult Health (SAGE) (Kowal et al., 2012). The respondents were asked to rate the extent to which they experienced difficulties in (a) concentrating or remembering things, and (b) learning a new task (e.g., acquiring directions to a new location, grasping a new game, understanding a new recipe). Ratings were provided on a five-point scale, ranging from 1 (*none*) to 5 (*extreme/cannot do*). The score was obtained by summing the unweighted responses of the two items, resulting in a potential range of 2 to 10. A higher score indicated greater levels of cognitive difficulties. The inter-item correlation and item-total correlation were between 0.69 to 0.93, indicating satisfactory internal reliability of the measurement.

Childhood experiences of parental abuse and bullying victimization were assessed based on their frequency before the age of 14 years. Parental abuse was measured by asking respondents to indicate the extent of physical or emotional abuse from their mother or father on a four-point Likert scale from 1 (*never*) to 4 (*always*). Similarly, bullying victimization was assessed by asking respondents how often they were bullied by peers at school, also using a scale from 1 to 4. Higher scores in both parental abuse and bullying victimization indicated a more frequent occurrence of childhood threats.

Family functioning was assessed using a 3-item Brief Assessment of Family Functioning Scale (BAFFS) (Mansfield et al., 2019). Respondents were asked to rate the three statements regarding the interactions with their family members: “We can express feelings to each other,” “We don’t get along well together,” and “We confide in each other,” on a scale from 1 (*strongly disagree*) to 4 (*strongly agree*). The score for the second statement was reversely coded. The scale was calculated by taking the sum of the three items, resulting in a potential range of 3 to 12, with a higher score indicating stronger family functioning. The Cronbach’s Alpha for BAFFS in the present sample was 0.69.

Covariates. With reference to previous research (Lowry et al., 2022; Nilaweera et al., 2022), this study controlled for several variables: respondents’ age, marital status (0 = never married, separated, divorced or widowed, 1 = married or cohabiting), education level (0 = below secondary, 1 = secondary or above), socio-economic class (0 = lower, lower-middle and middle class, 1 = upper or upper-middle class), self-rated health in later life (1 = very poor, 5 = very good), and poor health status in childhood (0 = no, 1 = yes). To improve the precision of estimation, we also controlled for additional variables of health behaviors and health conditions, including drinking (0 = no, 1 = yes), smoking (0 = no, 1 = yes), and the number of diagnosed chronic diseases (e.g., diabetes, hypertension, heart disease, stroke).

Data analyses

Data analyses were conducted using SPSS Version 26 (IBM Corp, 2019). Initially, both unweighted and weighted statistics were reported. The data was weighted according to the 2021 Population Census information on age, sex, and population proportions of each district. Bivariate tests were performed to examine gender differences in the key variables. Mediation analyses were conducted using Model 4 of the PROCESS macro (Hayes, 2018) to investigate the role of family functioning as a mediator in the relationship between two types of childhood threats (parental abuse and being bullied) and cognitive difficulties in the whole sample. In the mediation model, covariates were controlled for in the regression analyses on both the mediator and the outcome variable. In addition, the mediation models were further stratified by gender to detect whether the mediating effect differs between men and women. Bootstrapped samples with 5,000 iterations were employed to calculate the total effect, direct effect, and bootstrap-based confidence intervals (CIs) of the indirect effect. Mediating effects were considered significant if the 95% CIs did not include zero in component paths (Yzerbyt et al., 2018).

Results

Table 1 presents the descriptive statistics of each variable. The average score of cognitive difficulties was 3.27 ($SD = 1.41$) for the entire sample. Female aging adults exhibited higher levels of cognitive difficulties than male participants ($t = -3.30$, $p < .01$). The average frequency of childhood parental abuse and bullying victimization was 1.59 ($SD = 0.54$) and 1.39 ($SD = 0.65$) respectively. Men reported higher rates of parental abuse ($t = 5.03$, $p < .001$) and bullying victimization ($t = 3.31$, $p < .001$) during childhood compared to women. The mean value of family functioning was 9.33 ($SD = 1.74$) out of 12. The average age of respondents was 64.22 years ($SD = 8.35$). Among the participants, 71.6% ($n = 3,587$) were married, and 46.3% ($n = 2,318$) had completed high school education or above. Only 5.6% ($n = 281$) identified themselves as belonging to the upper or upper-middle socio-economic class. 7.2% of participants ($n = 360$) reported poor health status in childhood. The average score of self-rated health was 3.26 ($SD = 0.81$). 12.88% and 22.93% of respondents had the habits of smoking and drinking, respectively. The average number of chronic diseases was 0.97 ($SD = 1.06$).

As depicted in Figure 1, frequent experiences of parental abuse were significantly associated with higher levels of cognitive difficulties in later life ($B = 0.182$, 95% CI [0.116, 0.248]). Family functioning mediated 12.64% of the total effect, with a significant indirect effect observed ($B_{\text{indirect}} = 0.023$, 95% CI [0.007 to 0.038]). Frequent experiences of bullying during childhood were also associated with greater cognitive difficulties ($B = 0.120$, 95% CI [0.066, 0.175]).

Table 1. Descriptive analysis ($N = 5,007$).

	Full sample (unweighted)	Full sample (weighted)	Female ($n = 2679$)	Male ($n = 2328$)	Difference by gender
	Mean (SD)/N (%)	Mean (SD)/N (%)	Mean (SD)/N (%)	Mean (SD)/N (%)	
Cognitive difficulties (2–10)	3.27 (1.41)	3.30 (1.44)	3.33 (1.42)	3.20 (1.40)	$t = -3.30^{**}$
Childhood parental abuse (1–4)	1.59 (0.54)	1.59 (0.54)	1.55 (0.53)	1.63 (0.54)	$t = 5.03^{***}$
Childhood bullying victimization (1–4)	1.39 (0.65)	1.40 (0.65)	1.36 (0.63)	1.42 (0.67)	$t = 3.31^{***}$
Family functioning (3–12)	9.33 (1.74)	9.34 (1.73)	9.31 (1.73)	9.35 (1.75)	$t = 0.97$
Age (50–95)	64.22 (8.35)	64.10 (9.30)	63.8 (8.23)	64.61 (8.5)	$t = 3.12^{**}$
Marital status					
Not married	1420 (28.4%)	1496 (29.9%)	884 (33%)	536 (23%)	$\chi^2 = 60.98^{***}$
Married	3587 (71.6%)	3511 (70.1%)	1795 (67%)	1792 (77%)	
Education					
Below high school	2689 (53.7%)	2621 (52.3%)	1518 (56.7%)	1171 (50.3%)	$\chi^2 = 20.28^{***}$
High school or above	2318 (46.3%)	2386 (47.7%)	1161 (43.3%)	1157 (49.7%)	
Socio-economic class					
Middle or below	4726 (94.4%)	4714 (94.1%)	2558 (95.5%)	2168 (93.1%)	$\chi^2 = 13.05^{***}$
Upper or upper-middle	281 (5.6%)	293 (5.9%)	121 (4.5%)	160 (6.9%)	
Poor health status in childhood	360 (7.2%)	364 (7.3%)	223 (8.3%)	137 (5.9%)	$\chi^2 = 11.10^{**}$
Self-rated health (1–5)	3.26 (0.81)	3.25 (0.83)	3.23 (0.80)	3.30 (0.81)	$t = 3.35^{***}$
Smoking (yes)	645 (12.88%)	637 (12.72%)	88 (3.28%)	557 (23.93%)	$\chi^2 = 472.89^{***}$
Drinking (yes)	1148 (22.93%)	1120 (22.37%)	301 (11.23%)	847 (36.38%)	$\chi^2 = 445.77^{***}$
Chronic diseases (0–8)	0.97 (1.06)	0.97 (1.08)	0.92 (1.04)	1.03 (1.08)	$t = 3.40^{**}$

(a) SD = standard deviation. (b) *** indicates $p < .001$ and ** indicates $p < .01$ at two tailed-tests. (c) The weighting was based on the age, sex, and population proportions of each district derived from the Population Census data in 2021.

Family functioning partially mediated the association between bullying victimization and cognitive difficulties ($B_{\text{indirect}} = 0.019$, 95% CI [0.007, 0.031]), accounting for 15.83% of the total effect.

Tables S1 and S2 (see supplementary material) present the influences of covariates on cognitive difficulties and family functioning. Specifically, advanced age, female gender, poor childhood health, and a greater number of chronic diseases were positively associated with cognitive difficulties. In contrast, being married, having a high school diploma or higher, and better self-rated health were negatively associated with cognitive difficulties. Protective factors for healthy family functioning included advanced age, being married, educational attainment of high school or above, upper-class status, better self-rated health, and alcohol consumption. Conversely, poor childhood health was negatively linked to family functioning.

Figure 2 presents the results of the mediation analyses for the relationship between parental abuse and cognitive difficulties, stratified by

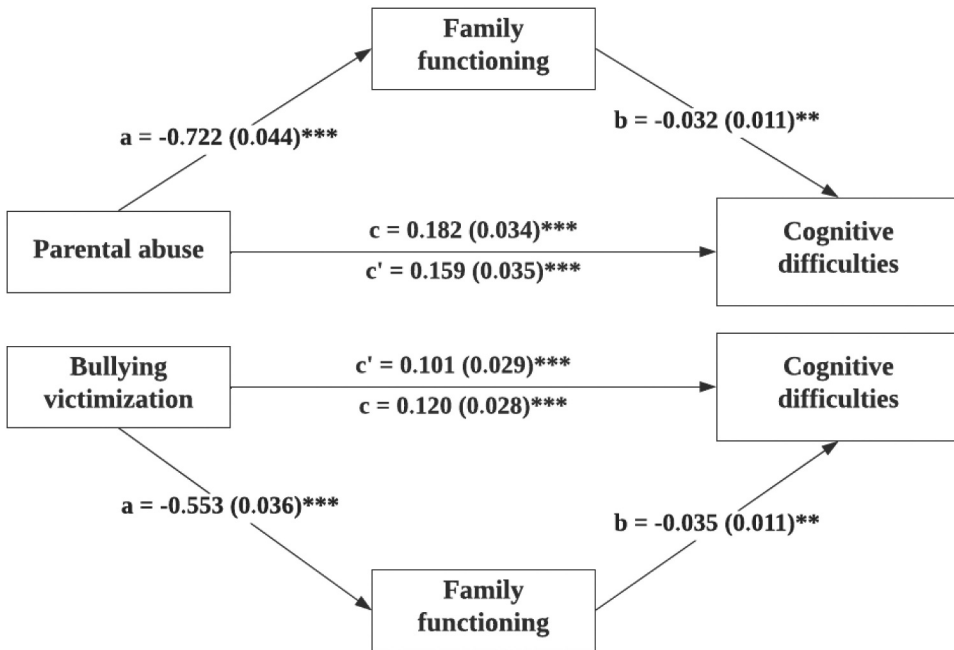


Figure 1. Mediation of family functioning on the associations of childhood parental abuse and bullying victimization with cognitive difficulties ($N = 5,007$). *Note:* (a) For the association between parental abuse and cognitive difficulties, total effect was 0.182 (95% CI [0.116, 0.248]); indirect effect was 0.023 (95% CI [0.007 to 0.038]); direct effect was 0.159 (95% CI [0.091 to 0.227]). (b) For the association between bullying victimization and cognitive difficulties, total effect was 0.120 (95% CI [0.066, 0.175]); indirect effect was 0.019 (95% CI [0.007, 0.031]); direct effect was 0.101 (95% CI [0.045 to 0.157]). (c) *** indicates $p < .001$ and ** indicates $p < .01$ at two tailed-tests. (d) The R-squared values for the two models, with parental abuse and bullying victimization as independent variables, were 0.208 and 0.207 respectively.

gender. Among women, a significant indirect effect ($B = 0.046$, 95% CI [0.023, 0.070]) of parental abuse on cognitive difficulties was detected, with family functioning mediating 24.2% of the total effect. However, family functioning was not significantly associated with cognitive difficulties in later life ($B = 0.007$, 95% CI [-0.027, 0.035]) for men, indicating that the mediating effect of family functioning was not significant among older men.

Figure 3 presents the results of the mediation analyses for the relationship between bullying victimization and cognitive difficulties, stratified by gender. For female aging adults, there was a significant indirect effect ($B = 0.041$, 95% CI [0.021, 0.061]) of childhood bullying on the cognitive difficulties in later life, with family functioning mediating 33.1% of the total effect. However, among male aging adults, the association between family functioning and cognitive difficulties was not significant ($B = 0.001$, 95% CI [-0.030, 0.032]), indicating that family functioning did not mediate

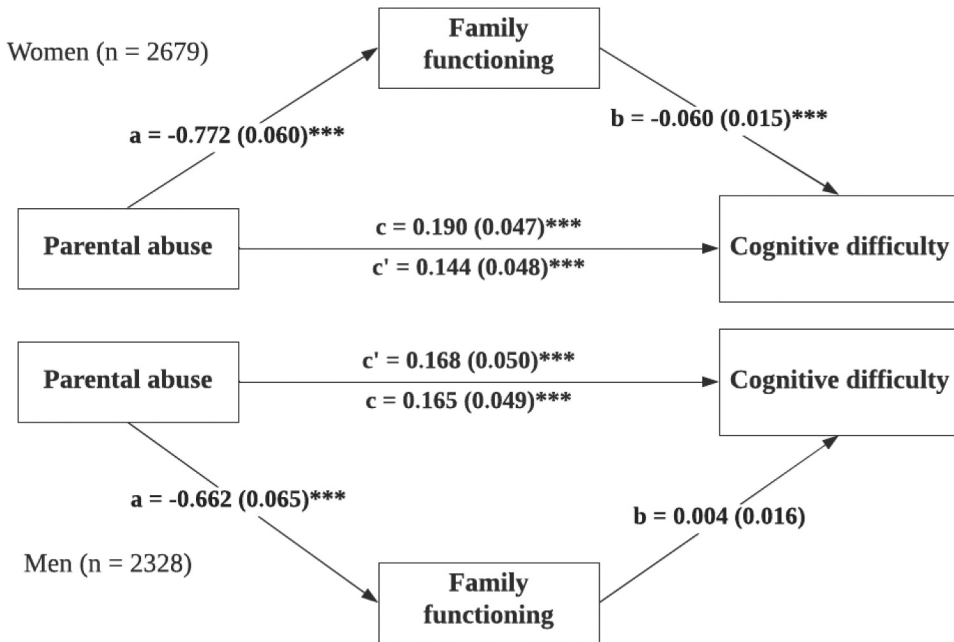


Figure 2. Mediation of family functioning on the association between childhood parental abuse and cognitive difficulties in women and men. *Note:* (a) Among female participants, total effect was 0.190 (95% CI [0.099, 0.282]); indirect effect was 0.046 (95% CI [0.023 to 0.070]). (b) For male participants, total effect was 0.165 (95% CI [0.069, 0.261]); indirect effect was -0.003 (95% CI [-0.023, 0.017]). (c) The R-squared values of the two models were 0.207 and 0.212 for women and men, respectively. (d) *** indicates $p < .001$ at two-tailed test.

the influence of bullying victimization on cognitive difficulties in older man.

Discussion

Using the representative data among aging adults in Hong Kong, this study represents one of first efforts to investigate the mechanism of the associations between childhood threats (parental abuse and bullying victimization) and cognitive functions in mid and later life from a family contextual perspective. It reveals childhood parental abuse and peer bullying are associated with higher levels of cognitive difficulties in mid and later life. Our study also uncovers the underlying mechanism of family functioning as a mediator in the relationships between childhood threats and cognitive difficulties. These findings contribute to the existing literature by identifying the mediating role of family functioning in shaping the influence of early-life experiences on health outcomes in later life. Furthermore, this study examined gender differences in the mediation role, revealing that the mediating effect of family functioning is significant only among women.

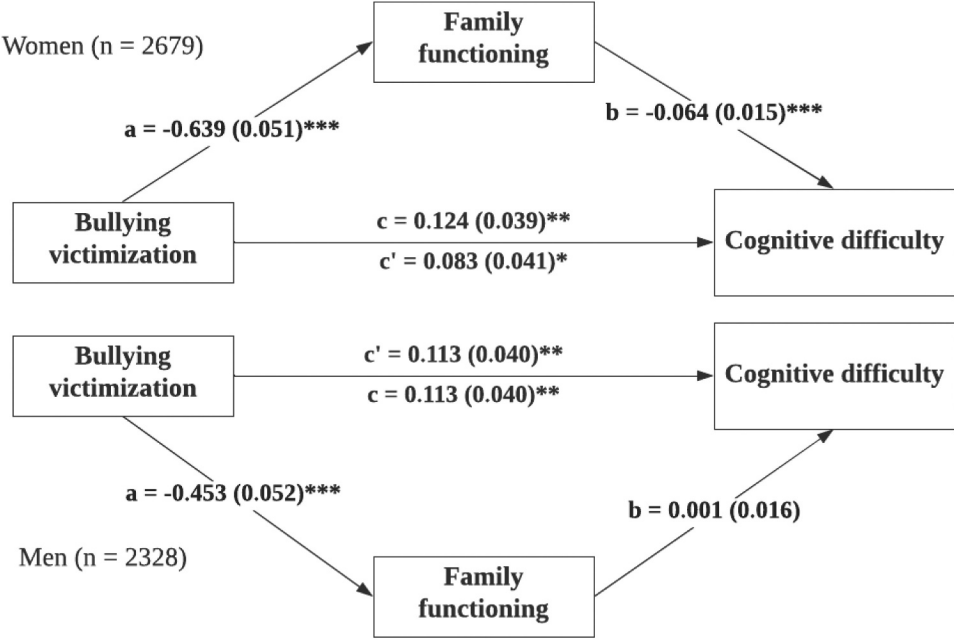


Figure 3. Mediation of family functioning on the relationship between childhood bullying victimization and cognitive difficulties in women and men. *Note:* (a) Among female participants, total effect was 0.124 (95% CI [0.047, 0.201]); indirect effect was 0.041 (95% CI [0.021 to 0.061]). (b) For male participants, total effect was 0.113 (95% CI [0.035, 0.190]); indirect effect was -0.000 (95% CI [-0.014, 0.013]). (c) The R-squared values of the two models were 0.206 and 0.211 for women and men, respectively. (d) *** indicates $p < .00$, ** indicates $p < .01$ and * indicates $p < .05$ at two-tailed tests.

This finding underscores the importance of gender-specific interventions aimed at mitigating the negative family outcomes associated with childhood threats, with the ultimate goal of promoting cognitive health in mid and later life.

Results of this study confirm the hypothesized inverse relationship between the frequency of childhood parental abuse and cognitive difficulties in older adulthood. This finding is consistent with the majority of existing research, reinforcing the detrimental effect of childhood abuse on cognitive functions in later life (Ding & He, 2021; Nilaweera et al., 2022; Su et al., 2019). Neurologists have posited that when the brain detects threats, such as negative parent-child interactions, it triggers a series of physiological responses involving activations in the neuroendocrine, metabolic, and immune systems (Lupien et al., 2009). Parental abuse, viewed as a form of chronic stress, is known to induce long-term alterations in both functional and structural brain maturation over the lifespan (De Bellis et al., 2013; Lupien et al., 2009).

This study also validates the association between frequent bullying victimization in childhood and greater cognitive difficulties in mid and later life, thereby affirming the first research hypothesis. While bullying victimization

has long been recognized as a public health concern, existing literature has not addressed whether childhood bullying experiences have a lasting impact on cognitive functions in later adulthood. By building on previous research on the cognitive consequences of bullying in childhood (Menken et al., 2022) and middle adulthood (Takizawa et al., 2014), our study extends the current literature by demonstrating the enduring effect of bullying victimization on cognitive impairments in later life. Moreover, our study holds particular significance in Hong Kong, where the rate of school bullying remains the highest among 72 countries and regions (A. L. C. Fung, 2019). Given the long-term cognitive consequences associated with bullying victimization, it emphasizes the urgent need to implement antibullying education programs and interventions aimed at preventing school bullying incidents in Hong Kong.

To gain a comprehensive understanding of the underlying mechanism linking childhood threats to cognitive functions, this study further examined the mediating role of family functioning. Our findings indicate that both frequent parental abuse and bullying victimization are significantly associated with lower family functioning, ultimately leading to poorer cognitive functions in mid and later life. Thus, the second research hypothesis has been substantiated. This may be explained by the fact that exposure to childhood threats triggers insecure attachment, undermines emotional regulation, and impairs social functioning throughout lifespan development, thereby jeopardizing interaction patterns and the quality of relationships with family members in adulthood (Poole et al., 2018; Riggs, 2010). In turn, weakened family functioning, characterized by ineffective communication, conflicted relationships, or avoidance of addressing problems, hinders older adults from engaging in positive, stimulating activities that enrich their cognitive status (Hertzog et al., 2008; Miller et al., 2000). Unlike previous research mainly focusing on individual pathways such as sedentary lifestyles and chronic diseases (Lor et al., 2023; Zaninotto et al., 2018), our research highlights the mediating role of family functioning in the associations of childhood threats and late-life cognition. Thus, it expands the current research focus from solely individual pathways to cover contextual situations, suggesting that experiences of childhood threats may exert a broad influence on interaction patterns with others, particularly family members, subsequently affecting cognition performance in mid and later life.

Our study further reveals that the mediating effect of family functioning is significant only among women, providing support for the third research hypothesis. Specifically, while childhood threats are associated with weakened family functioning for both men and women, the association between family functioning and cognitive difficulties is pronounced solely among women. This finding resonates with a recent study indicating that the effect of family functioning on mental stress is absent in men in Korea (Yeom & Lee, 2020). Similar to the gender norms in East Asia, the daily experiences of older women

in Hong Kong are influenced by the culture where women are expected to engage more in family life (Chen et al., 2022). The gender-specific pattern observed in our study might be attributed to the societal gender role expectations that emphasize women's roles in caregiving and housework responsibilities (Bronstein, 2006; Sharma et al., 2016). Engaging in positive family activities and interactions, which effectively stimulate cognition of older adults, can be viewed as a means of constructing and demonstrating gender (Courtenay, 2000). Additionally, as individuals age, older women tend to rely more on their families for financial support compared to their male counterparts (Ofstedal et al., 2004). This family-oriented perspective may enhance the significance of familial effects on cognition for older women, as health is often constructed in relation to femininity and institutional structures (Courtenay, 2000). Given the persistent gender disparity in family roles, the mediating effect of family functioning linking childhood threats to cognitive difficulties differs by gender, with women experiencing prominent influence of family functioning on their cognitive health in old age. This finding indicates that the influences of early-life experiences on health inequalities in mid and later life are stratified by gender due to the differential engagement in family life between men and women throughout the life course.

Implications

This study provides practical implications for promoting the cognitive health of older adults from a life course perspective. First, it underscores the necessity of reducing childhood abuse and school bullying through preventive strategies. For instance, implementing educational campaigns and early childhood home visitation programs can enhance positive parenting practices and create a nurturing family environment in early life stages (David-Ferdon et al., 2016). Addressing school bullying could involve the use of social-emotional learning approaches in school, focusing on developing children's interpersonal skills, emotional regulation, and empathy to prevent violence and foster healthy behaviors (Farrington et al., 2012). Second, this study provides evidence supporting the enhancement of family functioning as a means to protect cognitive function of older adults. Family members should aim to provide adequate emotional, financial, and instrumental support to older adults, especially older women. Moreover, considering women's stronger ties with family, it is advisable to offer comprehensive counseling sessions, supportive phone calls, and respite services specifically tailored to older women in need to alleviate their stress when engaging in family activities (Reinhard et al., 2008).

This study provides insights into two significant research directions. First, it highlights the importance of expanding research attention beyond childhood threats within family settings. Future research could explore the influences of multiple sources of bullying (e.g., school peers,

siblings, and neighbors) on a diverse range of health outcomes, as well as the trajectories of these influences over time. Second, this study underscores the necessity to expand the examination of individual-level pathways to incorporate family contextual pathways when elucidating the mechanisms linking early-life events to health status in mid and later life. In addition to examining the family context, it would be beneficial to explore whether multi-level contextual systems, such as interpersonal relationships, perceived social support, and social engagement, could potentially mediate the influence of childhood threats on late-life cognition.

Limitations

This study has several limitations that should be acknowledged. First, it uses a cross-sectional design, so causal interpretations should be made with caution. Second, cognitive difficulties are assessed in only two domains – memory/concentration and learning – which may not fully capture cognitive functioning. Moreover, childhood threat information is based on retrospective self-reported data, which depend on the memory recall and may be subject to bias. However, previous research suggests that recollections of early-life adverse experiences are generally stable and reliable (Havari & Mazzonna, 2015), indicating minimal impact on measurement validity. Lastly, this study examines family functioning as a whole, without distinguishing between relationships with specific family members. Future research could explore these distinctions to better understand how specific family relationships are affected by childhood threats and impact cognitive functions in mid and later life.

Conclusion

Drawing upon the life course perspective, this study examined the lasting influences of childhood parental abuse and bullying victimization on cognitive difficulties in mid and later life. By expanding the scope of previous research on childhood threats beyond the family environment, this study enhances our understanding of how childhood bullying victimization can impact cognitive health into later life. It identifies a potential mediating role of family functioning in linking childhood threats to cognitive difficulties and highlights gender differences in this mediation. These findings suggest the need for gender-specific interventions to promote cognitive health in mid and later life by addressing the adverse effects of childhood threats on family dynamics.

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Data availability Statement

Data that support the study are available from the corresponding author upon reasonable request.

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