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Original Research

Associations Between Financial Fraud Victimization and Depressive Symptoms, Loneliness, and Suicidality Among Young Adults in Taiwan: Moderating Effects of Working Memory and Inhibitory Control Deficits

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Abstract

Background: Most studies on financial fraud have focused on older adults. The experiences of financial fraud victimization and their associations with mental health problems among young adults warrant further investigation. The present study examined the associations between financial fraud victimization and depressive symptoms, loneliness, and suicidality, as well as the moderating effects of working memory and inhibitory control deficits on these associations in young adults. **Methods**: A total of 1764 young adults (839 financial fraud victims and 925 nonvictims) participated in this web-based survey. 11 types of financial fraud victimization, depressive symptoms, loneliness, suicidality, and deficits in working memory and inhibitory control, were assessed. Associations between financial fraud victimization and depressive symptoms, loneliness, and suicidality, as along with the moderating effects of working memory and inhibitory control deficits on these associations, were examined using multiple linear and logistic regression. **Results**: Financial fraud victimization was positively and significantly associated with the severities of depressive symptoms, loneliness, and the risk of suicidality. The associations between financial fraud victimization with depressive symptoms and loneliness were stronger at higher levels of inhibitory control deficits, whereas the association with depressive symptoms was weaker at higher levels of working memory deficits. **Conclusions**: Financial fraud victimization was significantly correlated with depressive symptoms, loneliness, and suicidality among young adults. Working memory and inhibitory control deficits moderated the associations between financial fraud victimization and depressive symptoms and loneliness.

Keywords: financial fraud; depression; loneliness; suicidality; working memory; inhibitory control

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1. Introduction

Financial fraud is increasing globally, as evidenced by reports from the United States (US; Burnes et al., 2017), several Asian countries (Fan and Yu, 2021; Li et al., 2022; Ueno et al., 2022), and developing countries (Bar Lev et al., 2022). According to the Federal Trade Commission (2024), US consumers reported losses exceeding US$10 billion due to financial fraud in 2023, representing a 14% increase from 2022. In Asia, consumers collectively lost nearly US$700 billion to digital scams in 2024 (Driver, 2025). In addition to financial losses, fraud victimization is associated with an increased risk of mental health problems, such as psychological distress (Button et al., 2014; Hamby, 2021), decreased well-being (Hamby, 2021), and poorer health-related quality of life (Hamby, 2021). Victims of financial fraud may also be at increased risk of suicidality (Rodríguez-Rodríguez et al., 2020). Given the rising prevalence of financial fraud worldwide, its mental health effects warrant careful examination and targeted intervention.

Most studies on financial fraud have focused on older adults (Burnes et al., 2017; Fan and Yu, 2021; Li et al., 2022; Ueno et al., 2022). Older individuals often experience cognitive decline (Han et al., 2015a) and may have outdated financial knowledge (Han et al., 2015b), which increases their vulnerability to financial fraud (Boyle et al., 2012). However, financial fraud victimization is not limited to older populations; younger groups, including young adults, are also at high risk (DeLiema et al., 2024). Although young adults may have better cognitive abilities to recognize fraud, they are more likely than older adults to engage in online transactions, which is a major channel for financial fraud (Ueno et al., 2021). In addition, many young adults are newly responsible for managing their finances and may not yet have developed effective risk management skills. Therefore, examining mental health risks and related factors among young adult victims of financial fraud is crucial for developing effective prevention strategies.

Not all victims of financial fraud experience mental health problems, suggesting the presence of moderating factors. Cognitive function is one such factor that warrants examination. Cognitive decline plays a critical role in vulnerability to financial fraud among older adults (DeLiema., 2018; Judges et al., 2017). Studies have determined that older fraud victims exhibit lower cognitive performance across several domains, including language, memory, attention and concentration, processing speed, visuospatial ability, and executive functioning, compared with nonvictims (DeLiema., 2018; Ebner et al., 2020; Judges et al., 2017; Han et al., 2016). Working memory and inhibitory control are two core components of executive function that enable individuals to plan, organize, and manage tasks effectively (Diamond, 2013). Working memory refers to the cognitive system responsible for the temporary storage and manipulation of information required for complex cognitive tasks, such as language comprehension, learning, and reasoning (Baddeley, 1992). Inhibitory control refers to the ability to regulate attention, behavior, thoughts, and emotions to override strong internal impulses or external temptations and act appropriately (Diamond, 2013). Studies have demonstrated that working memory and inhibitory control are strongly associated with the ability to detect deception in older adults (Calso et al., 2020; Judges et al., 2017). By contrast, cyberfraud victims often display greater disinhibition, characterized by urgency and sensation seeking (Whitty, 2019). Moreover, deficits in executive function are strongly correlated with depressive symptoms (Rock et al., 2014), loneliness (Sin et al., 2021), and suicidality (Bredemeier and Miller, 2015). Examining whether deficits in working memory and inhibitory control moderate the associations between financial fraud victimization and mental health problems among young adults may inform the development of targeted intervention programs.

The present study examined the associations between financial fraud victimization and depressive symptoms, loneliness, and the risk of suicidality, as well as the moderating effects of working memory and inhibitory control deficits on these associations among young adults in Taiwan. We hypothesized that victims of financial fraud would exhibit higher levels of depressive symptoms, loneliness, and suicidality than nonvictims. In addition, we hypothesized that deficits in working memory and inhibitory control would moderate the associations between financial fraud victimization and depressive symptoms, loneliness, and suicidality.

2. Materials and Methods

2.1 Study Participants and Procedure

We recruited Taiwanese young adults aged 18–25 years through online advertisements posted on Dcard, the most widely used social media platform among young adults in Taiwan, with more than 10 million users. Participants were enrolled between August and October 2025. The advertisement provided detailed information on the study objectives, instructions for completing the online questionnaire, and assurances of data confidentiality and participant privacy. Individuals who agreed to participate accessed the questionnaire by clicking an “Agree to Participate” button and then submitted their responses. Those who did not wish to participate could opt out by selecting a “Not Willing to Participate” button or by ignoring the advertisement. A total of 1792 young adults consented to participate and completed the online questionnaires. The research questionnaire was designed to require completion of all items to prevent missing data. However, 28 participants provided identical responses across the questionnaire and were excluded. In total, data from 1764 young adults were included in the study.

2.2 Measures

2.2.1 Exposure: Financial Fraud Experience

This study surveyed participants' experiences with 11 types of financial fraud over the past 5 years. These types, identified as common in Taiwan, included "It's Me" fraud, kidnapping fraud, refund fraud, bank or mobile phone account fraud, billing fraud, shopping fraud, financial investment fraud, lottery fraud, job-hunting fraud, romance fraud, and fortune-telling fraud. Participants were asked to indicate for each item whether they had experienced the specified type of fraud by selecting "no" or "yes". Participants who selected "yes" were then asked a follow-up question on whether they had lost money, with response options of "no" or "yes". Participants who reported exposure to fraud and monetary loss were classified as financial fraud victims.

2.2.2 Outcomes: Depressive Symptoms

Depressive symptoms over the preceding month were evaluated using the 10-item version of the Center for Epidemiological Studies Depression Scale (CES-D-10) (Björgvinsson et al., 2013; Radloff, 1977). Each item is rated on a 4-point scale with endpoints ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*), with higher total scores indicating greater severity of depressive symptoms. In the present study, the CES-D-10 demonstrated good internal consistency, with a Cronbach's α of 0.82.

2.2.3 Outcomes: Loneliness

Participants' loneliness over the preceding month was examined using the 3-item version of the University of California, Los Angeles (UCLA) Loneliness Scale, Version 3 (UCLA-LSV3) (Lin et al., 2022a,b; Russell, 1996). Each item is rated on a 4-point scale ranging from 1 (*never*) to 4 (*always*), with higher total scores indicating greater loneliness. The 3-item version of the UCLA-LSV3 has been validated and shown to be reliable in the Taiwanese population (Lin et al., 2022a,b). In the present study, the Cronbach's α for the 3-item version of the UCLA-LSV3 was 0.86.

2.2.4 Outcomes: Suicidality

Participants' suicidality during the preceding month was evaluated using the question, "In the last month, have you had any suicidal thoughts, plans, or attempts?" Responses were recorded as either "yes" or "no".

2.2.5 Moderators: Working Memory and Inhibitory Control Deficits

This study used the Adult Executive Functioning Inventory (ADEXI) to assess working memory deficit (nine items; e.g., "I have difficulty remembering lengthy instructions") and inhibitory control deficit (five items; e.g., "I have a tendency to do things without first thinking about what could happen") (Holst and Thorell, 2018). Each item is rated on a 5-point scale ranging from 1 (*definitely not true*) to 5 (*definitely true*), with higher scores indicating greater deficits in working memory and inhibitory control. The ADEXI has demonstrated acceptable reliability and validity (Holst and Thorell, 2018). In the present study, Cronbach's α was 0.91 for working memory deficits and 0.71 for inhibitory control deficits.

2.2.6 Sociodemographic Characteristics

Data were collected on participants' sex (men, women, and nonbinary), age, and education level (high school or less vs. college or higher).

2.3 Statistical Analysis

Sociodemographic characteristics, executive function, and mental health indicators were compared between financial fraud victims and nonvictims using chi-square and *t* tests. Associations between financial fraud victimization and depressive symptoms, loneliness, and suicidality, as well as the moderating effects of working memory and inhibitory control deficits on these associations, were examined using multiple linear and logistic regression analyses. The confounding effects of sex, age, and educational level were controlled for. All statistical analyses were conducted using SPSS version 24.0 (SPSS Inc., Chicago, IL, USA). A *p*-value of <0.05 was considered statistically significant. When significant moderating effects were identified, the Johnson–Neyman method was applied to determine the values of the moderator variable at which the effect of the predictor on the outcome reached statistical significance.

3. Results

Table 1 presents comparisons of sociodemographic characteristics, executive function, and mental health indicators between financial fraud victims and nonvictims. No significant differences in sex or age were observed between the two groups. However, individuals with a college education or higher were more likely to be financial fraud victims. Compared with nonvictims, financial fraud victims had greater deficits in working memory and inhibitory control, higher levels of depressive symptoms and loneliness, and a higher risk of suicidality.

Table 2 presents the results of the analysis examining the association between financial fraud victimization and depressive symptoms. After adjustment for demographic characteristics, financial fraud victimization and working memory deficits were positively and significantly associated with the severity of depressive symptoms (Model I). The interaction between financial fraud victimization and working memory deficits was negatively and significantly associated with the severity of depressive symptoms, indicating that the strength of this association decreased as the level of working memory deficits increased (Model II). In contrast, the interaction between financial fraud victimization and inhibitory control deficits was positively and significantly associated with the severity of depressive symp-

Table 1. Comparisons of sociodemographic characteristics, executive function, and mental health indicators between financial fraud victims and nonvictims.

	Financial fraud victim		χ^2 or t
	No (n = 925)	Yes (n = 839)	
Sex, n (%)			
Women	522 (56.4)	464 (55.3)	0.227
Men	403 (43.6)	375 (44.7)	
Nonbinary	0	0	
Age (years), mean (SD)	22.3 (1.8)	22.3 (1.7)	–1.000
Education level, n (%)			
High school or below	143 (15.5)	93 (11.1)	7.266**
College or above	782 (84.5)	746 (88.9)	
Working memory deficits, mean (SD)[a]	21.3 (6.1)	24.8 (6.4)	–11.778***
Inhibitory control deficits, mean (SD)[a]	13.0 (3.3)	14.5 (3.3)	–9.709***
Depressive symptoms, mean (SD)[b]	7.4 (5.0)	9.8 (5.3)	–9.797***
Loneliness, mean (SD)[c]	5.9 (2.2)	6.8 (2.0)	–8.759***
Suicidality, n (%)			
No	905 (97.8)	788 (93.9)	17.470***
Yes	20 (2.2)	51 (6.1)	

[a]: Measured by the Adult Executive Functioning Inventory; [b]: Measured by the CES-D-10; [c]: Measured by the UCLA Loneliness Scale, Version 3.

**: $p < 0.01$; ***: $p < 0.001$.

CES-D-10, Center for Epidemiological Studies Depression Scale; SD, standard deviation; UCLA, University of California, Los Angeles.

Table 2. Associations of financial fraud victimization, demographic characteristics, and working memory and inhibitory control deficits with depressive symptoms (N = 1764).

	Model I	Model II
	B (SE)	B (SE)
Financial fraud victim	1.026 (0.228)***	0.843 (0.951)
Sex[a]	–0.258 (0.220)	–0.266 (0.220)
Age	0.087 (0.063)	0.081 (0.063)
Education level[b]	1.335 (0.325)***	1.304 (0.324)***
Working memory deficits	0.348 (0.026)***	0.416 (0.036)***
Inhibitory control deficit	0.051 (0.049)	–0.067 (0.066)
Financial fraud victim × Working memory deficits		–0.141 (0.052)**
Financial fraud victim × Inhibitory control deficits		0.250 (0.097)*

[a]: Women as the reference; [b]: High school or below as the reference.

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$.

SE, standard error.

toms, indicating that the strength of this association increased as the level of inhibitory control deficits increased (Model II). The Johnson–Neyman analysis revealed that the conditional effect of financial fraud victimization on depression symptoms was significant when ADEXI working memory deficit scores exceeded 27. In contrast, the effect remained statistically significant across the entire range of ADEXI inhibitory control deficit scores (Fig. 1).

Table 3 presents the results of the analysis examining the association between financial fraud victimization and loneliness. After adjustment for demographic characteristics, financial fraud victimization, working memory deficits, and inhibitory control deficits were positively and significantly associated with the severity of loneliness (Model I). The interaction between financial fraud victimization and inhibitory control deficits was also positively and significantly associated with the severity of loneliness, indicating that the strength of this association increased as the level of inhibitory control deficits increased (Model II). The Johnson–Neyman analysis indicated that the conditional effect of being a financial fraud victim on loneliness was significant when the ADEXI inhibitory control deficit score exceeded 7 (Fig. 1).

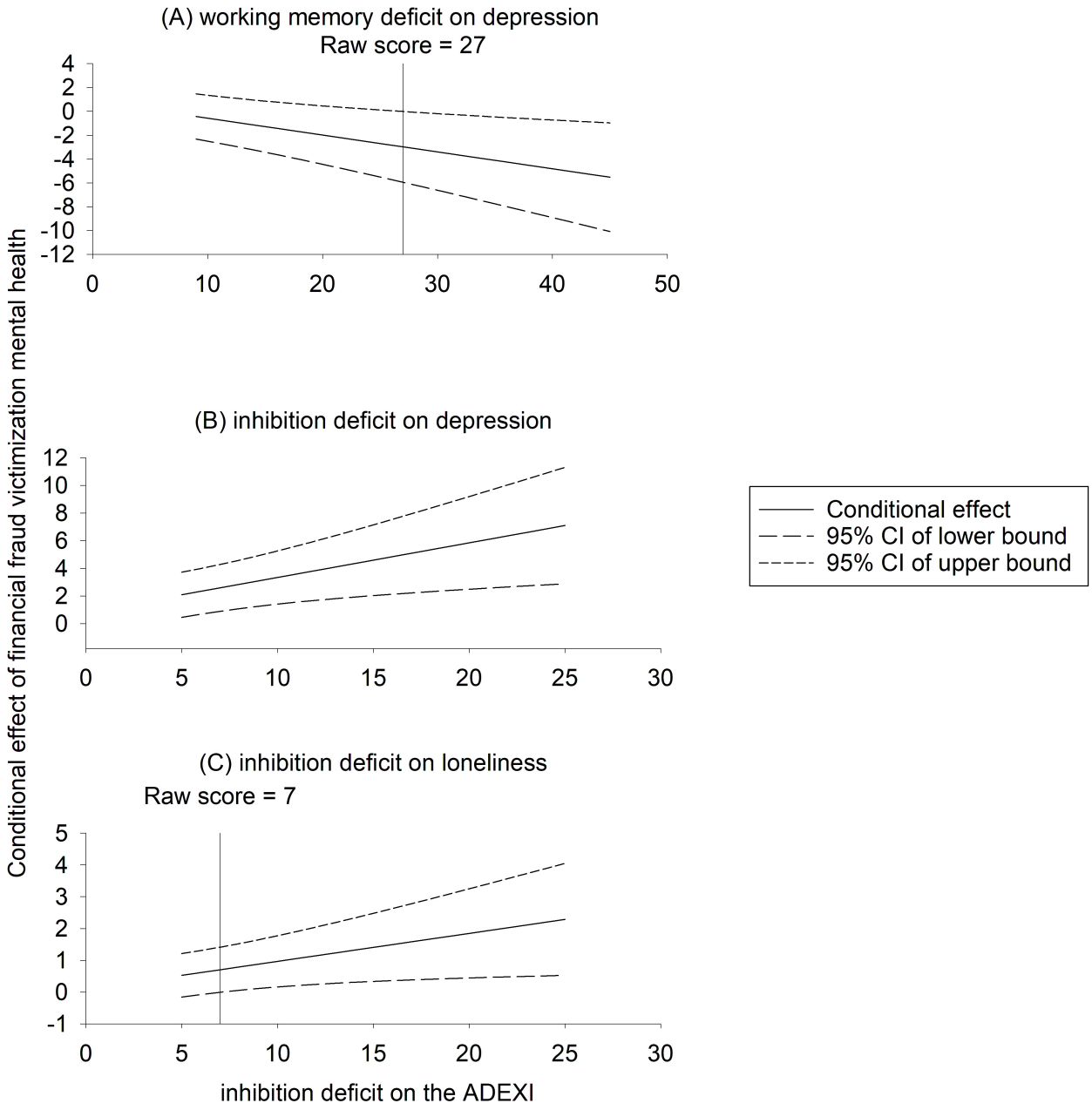

Fig. 1. Moderating effects of working memory and inhibitory control deficits on the associations between financial fraud victimization and depressive symptoms and loneliness. ADEXI, Adult Executive Functioning Inventory; CI, confidence interval.

Table 4 presents the results of the analysis examining the association between financial fraud victimization and suicidality. After adjustment for demographic characteristics, being a financial fraud victim and working memory deficits were positively and significantly associated with the risk of suicidality (Model I). The interactions between financial fraud victimization and working memory deficits, as well as inhibitory control deficits, were not significantly associated with suicidality (Model II).

4. Discussion

The present study determined that financial fraud victimization was positively and significantly associated with the severity of depressive symptoms, loneliness, and suicidality among young adults. The results also indicated that the associations between financial fraud victimization and depressive symptoms and loneliness strengthened as inhibitory control deficits increased, whereas the association between financial fraud victimization and depressive symptoms weakened as working memory deficits increased. To the best of our knowledge, this is the first study to examine

Table 3. Associations of financial fraud victimization, demographic characteristics, and working memory and inhibitory control deficits with loneliness (N = 1764).

	Model I	Model II
	B (SE)	B (SE)
Financial fraud victim	0.385 (0.095)***	0.088 (0.398)
Sex[a]	–0.368 (0.092)***	–0.373 (0.092)***
Age	–0.001 (0.026)	–0.002 (0.026)
Education level[b]	0.288 (0.136)*	0.278 (0.136)*
Working memory deficits	0.114 (0.011)***	0.133 (0.015)***
Inhibitory control deficits	0.052 (0.020)*	0.011 (0.028)
Financial fraud victim × Working memory deficits		–0.040 (0.022)
Financial fraud victim × Inhibitory control deficits		0.088 (0.041)*

[a]: Women as the reference; [b]: High school or below as the reference.

*: $p < 0.05$; ***: $p < 0.001$.

Table 4. Associations of financial fraud victimization, demographic characteristics, and working memory and inhibitory control deficits with suicidality (N = 1764).

	Model I	Model II
	OR (95% CI)	OR (95% CI)
Financial fraud victim	2.094 (1.212, 3.618)**	0.726 (0.059, 8.923)
Sex[a]	0.907 (0.556, 1.478)	0.906 (0.555, 1.478)
Age	1.042 (0.906, 1.198)	1.045 (0.908, 1.202)
Education level[b]	0.674 (0.355, 1.280)	0.679 (0.357, 1.291)
Working memory deficits	1.064 (1.006, 1.126)*	1.030 (0.930, 1.142)
Inhibitory deficits	1.101 (0.987, 1.229)	1.109 (0.915, 1.344)
Financial fraud victim × Working memory deficits		1.046 (0.926, 1.182)
Financial fraud victim × Inhibitory control deficits		0.993 (0.787, 1.254)

[a]: Women as the reference; [b]: High school or below as the reference.

CI, confidence interval; OR, odds ratio.

*: $p < 0.05$; **: $p < 0.01$.

the moderating effects of working memory and inhibitory control deficits on the associations between financial fraud victimization and mental health outcomes in young adults. These findings provide a basis for the development of targeted intervention strategies for this population.

The association between financial fraud victimization and mental health problems may be bidirectional. Many young adults have an unstable economic base, and financial fraud victimization can lead to financial hardship that considerably compromises their livelihood. For example, a study conducted in England and Wales reported that one in ten victims lost more than one year of household income to fraud (Button et al., 2014). Victims may experience psychological distress and develop mental health problems when confronted with the threat of financial insecurity. Fraud can also strain relationships between partners and within families, in addition to negatively affecting victims' physical health (Button et al., 2014). Some victims may also face threats of violence or intimidation from perpetrators (Button et al., 2014). Feelings of self-blame, shame, and embarrassment are also common (Button et al., 2014; Cross, 2015). Victims of online fraud are often portrayed as greedy and gullible, and an overwhelming sense of blame and responsibility is frequently attributed to them for the actions that led to their loss (Cross, 2015). These direct and indirect consequences of financial fraud victimization can be highly detrimental to mental health.

Mental health problems may increase the risk of financial fraud victimization. For example, individuals with higher levels of loneliness may have limited social interaction and lack supportive networks from which to seek advice when uncertain about the legitimacy of a message. In addition, depressive symptoms may impair judgment and increase vulnerability to fraud. However, the cross-sectional design of the present study precludes inference of temporal relationships between financial fraud exposure and mental health problems. Longitudinal studies are needed to clarify these associations.

The present study demonstrated that deficits in working memory and inhibitory control moderated the associations between financial fraud victimization and specific dimensions of mental health problems in young adults; however, the directions of these moderating effects differed. The strength of the associations between being a finan-

cial fraud victim and both depressive symptoms and loneliness increased as the level of inhibitory control deficits increased. Inhibitory control enables individuals to regulate impulses and avoid making poor decisions in the context of potential fraud (Baddeley, 1992; Diamond, 2013). Individuals with greater inhibitory control deficits may therefore experience stronger negative emotional responses after experiencing financial fraud. Inhibitory control deficits may also hinder effective management of post-fraud challenges, such as lawsuits, thereby increasing the psychological burden on victims. By contrast, the strength of the association between financial fraud victimization and depressive symptoms decreased as working memory deficits increased. Working memory supports the temporary storage and processing of information required for reasoning, decision-making, and learning (Baddeley, 1992; Diamond, 2013). Working memory deficits may make it more difficult for victims to manage disputes arising from financial fraud and may thereby exacerbate depressive symptoms. However, the opposite pattern was observed in the present study. Further research is required to clarify how working memory deficits moderate this relationship. Furthermore, although the ADEXI is a well-validated and widely used self-report instrument for assessing executive dysfunction, its ecological and inferential validity is more limited than that of performance-based neuropsychological assessments, such as the Digit Span task (Tulsky et al., 1997) and n-back paradigms (Sweet, 2011) for assessing working memory, and the Stop-Signal Task for assessing inhibitory control (Verbruggen and Logan, 2008). Future research should use these standardized tools to assess working memory and inhibitory control and examine their associations with financial fraud victimization.

4.1 Implications

The mental health of young adult victims of financial fraud warrants careful attention. Regular assessment of mental health in this group may facilitate early identification of problems and timely intervention. In addition, among young adults with mental health problems, efforts to raise awareness of financial fraud and improve their coping skills should be strengthened to reduce their risk of financial fraud victimization. Young adults who are victims of financial fraud and have poor impulse control may be especially vulnerable to severe depression symptoms and loneliness, underscoring the need for targeted mental health support. Further research is required to clarify how working memory deficits moderate the association between financial fraud victimization and depressive symptoms in young adults.

4.2 Strengths and Limitations

This study is the first to examine the moderating effects of executive function deficits on the association between being a financial fraud victim and mental health problems in young adults. However, several limitations should be noted. First, participants were recruited through online advertisements on Dcard, a platform widely used by young adults in Taiwan. Although Dcard has a broad reach, its users may not be fully representative of the overall young adult population, which may limit the generalizability of the findings. Second, all data were self-reported, introducing the potential for single-rater or recall bias that may have affected the accuracy and reliability of responses. Third, the cross-sectional design of this study precluded inference of temporal relationships between financial fraud victimization and depression, loneliness, and suicidality. Longitudinal studies are therefore needed to establish temporal precedence and causality. Fourth, potential confounding factors, including prior psychiatric history, baseline depressive symptoms, neurological and organic brain disorders that may affect cognitive functioning, income or family economic status, social support, and a history of substance use, were not controlled for and may have influenced both fraud exposure and psychological outcomes.

5. Conclusions

Young adult victims of financial fraud exhibit greater depressive symptoms, loneliness, and suicidality than non-victims. Inhibitory control deficits strengthen the associations between financial fraud victimization and both depressive symptoms and loneliness, whereas working memory deficits attenuate the association between financial fraud victimization and depressive symptoms. These findings highlight the importance of assessing mental health among young adult victims of financial fraud, particularly those with inhibitory control deficits. Further research is warranted to clarify the moderating role of working memory deficits in the associations between financial fraud victimization and mental health outcomes.

Availability of Data and Materials

Data are available via https://www.dropbox.com/scl/fi/svzs00k68jiv3f4vwq284/shared_data.sav?rlkey=cl6r04yp8u23cgsnwc95dftrs&st=js2s2im6&dl=0.

Author Contributions

PCL: writing the manuscript, conceptualization and project administration; CFH: project administration and writing the manuscript; YPC: project administration and revising the manuscript; YLC: statistical analysis and drafting the manuscript; CFY: writing the manuscript, conceptualization, data curation and methodology. All authors give final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

The study protocol was approved by the Institutional Review Board of Kaohsiung Medical University Hospital (KMUHIRB-E(I)-20240422). This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and the guidelines for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. All participants provided online informed consent before they proceeded with their response to the questionnaire.

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Conflicts of Interest

The authors declare no conflicts of interest.

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