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RESEARCH ARTICLE

Loneliness could lead to risk of fraud victimization for middle-aged and older adults

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ABSTRACT

Older adults have a strong desire for emotional connectivity and those who lack such social connectedness would be easily taken advantage of and experience fraud. We aimed to examine the association between loneliness and fraud victimization and further investigate the causal relationship through experimental manipulation. Fifty younger adults (aged 18–29, $M_{age} = 26.62$), 43 middle-aged adults (aged 32–53, $M_{age} = 40.84$) and 54 older adults (aged 60–88, $M_{age} = 68.31$) were randomly assigned to induced loneliness or control conditions by a complete randomized design and then were asked to rate the credibility and purchase intention for nine misleading advertisements. Middle-aged and older adults, but not younger adults, showed higher susceptibility to fraud after loneliness manipulation. The present experiment confirmed that loneliness could lead to higher fraud victimization for middle-aged and older adults, suggesting future interventions should target those lonely middle-aged and older adults to prevent potential fraud.

KEYWORDS

Fraud victimization; loneliness; older adults; social isolation; social relationship

Whether or not older adults are at a higher risk of fraud victimization is still under debate (e.g., Kirchheimer, 2011; Ross et al., 2014), but it is clear that older adults are more vulnerable to fraud in terms of the consequences caused. It may be particularly damaging for an older person to be a victim as they tend to have fixed incomes to rely on (Nerenberg, 2000; Ross et al., 2014). There is also the risk of losing their independence if their family members notice these older adults are not making safe financial decisions (Ross et al., 2014).

Many studies have examined the various risk factors that may make individuals vulnerable to fraud. Some of these factors include demographics (Anderson, 2013), personality (Ashton & Lee, 2008), and cognitions (Agarwal & Mazumder, 2013; Gamble et al., 2014; Wilson et al., 2016). Despite these efforts, other factors that might be associated with fraud victimization remain unstudied. In the present study, we ought to investigate one potential factor, i.e., loneliness, which might contribute to risks of fraud victimization for older adults.

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Fraud victimization in older age and related risk factors

Financial or consumer fraud victimization in older adults is an increasingly widespread phenomenon worldwide. For example, in the United States, fraud victimization perpetrated by loved ones, elder fraud, and scams tripled from 2013 to 2019 (U.S. Financial Crimes Enforcement Network, 2019). Similarly, in China in 2022, it was estimated that more than ¥30 billion was lost due to fraud among older adults (The Ministry of Public Security of the People's Republic of China, 2023). The consequences of fraud victimization are significant and devastating to the physical and mental well-being of older adults, many of whom are retired and may struggle to recover from them financially and psychologically (Nerenberg, 2000).

Previous studies have identified several factors associated with increased risk of fraud victimization, including older age, lower household income, impairments in activities of daily living, physical frailty, worse overall cognition, and depressive symptoms (Acierno et al., 2009, 2010, 2019; Axelrod et al., 2020; Beach et al., 2010; Lichtenberg et al., 2013, 2016; Peterson et al., 2014). Cognitive impairment, ranging from mild cognitive impairment to Alzheimer's Disease, is particularly linked to a higher risk of fraud victimization (Boyle et al., 2019; Han et al., 2016; James et al., 2014; Jones et al., 2019). Social functioning is also a critical factor in the context of fraud victimization. Older adults who experience higher levels of loneliness are more likely to be targeted by telemarketing fraud (Alves & Wilson, 2008). This highlights the importance of considering social factors in the development of interventions aimed at preventing fraud victimization. Furthermore, individuals with lower cognitive abilities and higher levels of loneliness have been found to have compromised financial decision-making skills (Stewart et al., 2020). Conversely, older adults who perceive greater social support and feel less lonely are more resilient against fraud victimization (Beach et al., 2018).

Social isolation and loneliness as risk factors

According to Pinsker et al. (2010) theoretical framework, social skill is one of the most important factors that is related to older adults' vulnerability to financial fraud victimization. Social isolation, a structural aspect of social connections, refers to the lack of a broader group of contacts and objective relationships with others (de Jong Gierveld et al., 2006; Weiss, 1973). Loneliness is defined as a subjective feeling induced by social isolation (Victor et al., 2002). Liu et al. (2017) demonstrated through survey data that negative interactions within older adults' social networks that led to higher loneliness were associated with higher risk of fraud victimization. It is suggested that socioemotional vulnerability, a relatively neglected factor in previous studies, deserves attention in fraud-related research, because social

support could potentially be an essential strength in decreasing the risk of fraud victimization in older adults. Conversely, the presence of socioemotional vulnerabilities could be detrimental and escalate older adults' risk of fraud victimization. For example, loneliness was identified in the past as a potential risk factor for fraud victimization, and theorists included this concept as an important component in most fraud victimization models (e.g., Pinsker et al., 2010; Wilber & Reynold, 1996).

A handful of empirical studies directly investigated relationships between the risk of fraud victimization and loneliness, and the empirical studies on the impact of loneliness on the risk of fraud victimization generated mixed findings. Some studies have found no significant link. For example, Lichtenberg et al. (2013) reported that lack of social support and loneliness did not predict fraud victimization. Similarly, Amstadter and colleagues (2011) found that perceived lower social support, which could lead to increased loneliness, was not a significant factor once other risk factors such as ethnic minority status, the need for daily living assistance, and poor health were considered. Garre-Olmo et al. (2009) further demonstrated that while the absence of a trusted person, which can heighten feelings of loneliness, was associated with psychological abuse and neglect, it did not increase the risk of fraud victimization. These findings suggest that the relationship between loneliness and fraud victimization might be more complex than initially thought.

However, other studies have reported otherwise. Beach et al. (2016) found that older adults with smaller social networks but higher perceived social support and lower levels of loneliness were the most resistant to fraud victimization. Judges et al. (2018) showed that loneliness was a significant predictor of fraud victim status in older adults, even when controlling for cognition and interpersonal trust. This suggests that loneliness itself, rather than other factors, might be a key determinant of fraud vulnerability. Consistent with the findings of previous two studies, Wen et al. (2022) also found that loneliness increased older adults' susceptibility to various types of fraud. This body of research underscores the potential role of loneliness as a risk factor for fraud victimization, particularly among older adults.

Age-related differences in the meaning of social relationships and response to loneliness

When taking age-related differences into consideration, socioemotional selectivity theory (Carstensen, 2006) suggests that, as people grow older, their social network size decreases, as a result of motivational change in goals. Such that when getting closer to the end of life, an individual's future time perspective becomes more limited, shifting older adults' goals from future-oriented to emotionally meaningful-related, such as spending time with loved ones rather than making new friends (e.g., Lang & Carstensen, 1994). Considering older

adults' preference for spending time with close network members, it would be reasonable to predict that loneliness which means lack of quality relationship with others should make older adults more vulnerable to fraud.

Indeed, several studies suggested that older adults who suffer from severe loneliness may be more likely to become fraud victims. For example, loneliness could drive them to seek social interaction, a behavior supported by the evolutionary theory of loneliness (Cacioppo et al., 2015). This need for interaction might lead them to engage with strangers, including potential fraudsters who exploit their emotional needs. The situation is further complicated by the fact that many lonely older adults live alone, either due to the loss of a spouse or because their children have moved away, leaving them without the protective oversight of family members (Shao et al., 2019). Unavailable family support, combined with the experience of loneliness, could leave older adults vulnerable to various types of fraud, including "emotional care" fraud (Xing et al., 2020). Taken together, among older adults with a strong desire for emotional closeness as suggested by Socioemotional Selectivity Theory (Carstensen, 2006), the experience of loneliness could easily leave them taken advantage of, and vulnerable to fraud.

The present study

The present study aimed to extend previous research on the relationship between loneliness and fraud victimization in two ways. First, while previous research has extensively explored the link between loneliness and the risk of fraud victimization, these studies have primarily relied on questionnaires, resulting in correlational findings that do not allow for causal inferences. It is important to consider that the observed correlation could be influenced by other factors or may even be bidirectional. For example, studies have found that higher loneliness and risk of fraud victimization are both associated with low self-control (Reisig & Holtfreter, 2013; Stavrova et al., 2022) and low conscientiousness (Buecker et al., 2020; Judges et al., 2017), suggesting that the positive correlation between loneliness and fraud victimization may be partly due to shared personality traits (e.g., low self-control and conscientiousness). Moreover, there might also be reversed causality, such that the fraud experience, perhaps also some monetary loss, might lead to conflict with partners, especially with spouse or adult children, which may cause older adults to experience a mismatch between their relationship needs and the reality of their relationships, bringing about more loneliness. In the present study, we aim at an in-depth investigation of the causal relationship between loneliness to fraud victimization by employing experimental manipulations to induce feelings of loneliness. This approach will provide us with a more comprehensive understanding of the association between loneliness and the risk of fraud victimization.

Secondly, while there has been a substantial body of research focusing on older adults (e.g., Shao et al., 2019; Xing et al., 2020), the inclusion of younger and middle-aged adults in studies examining the effects of loneliness on susceptibility to fraud was limited. Buil-Gil and Zeng (2022) have found that heightened loneliness during COVID-19 correlated with an increased vulnerability to romance fraud among younger adults. However, the study did not observe a significant increase in loneliness among older adults during COVID-19, which limited the possibility of comparing how loneliness affects the risk of fraud across different age groups. Additionally, Kadoya et al. (2021), using data from a broad age range (aged 20–92, M_{age} = 47.58, SD_{age} = 14.36), identified both age and loneliness as significant predictors of financial fraud. However, they have neither investigated the relationship between loneliness and fraud victimization especially in younger or middle-aged adults nor investigated the age by loneliness interaction. In the present study, in addition to older adults, we also included younger and middle-aged adults to further investigate whether older adults are more susceptible to loneliness-induced manipulations compared to younger and middle-aged adults in the context of fraud vulnerability.

By incorporating both experimental manipulations and different age groups, our study adopted a 2 (condition: the loneliness vs. control condition) × 3 (age: younger, middle-aged vs. older adults) complete randomized design, and sought to examine the following hypotheses. Firstly, we expected a main effect of age group, showing that older adults would be more susceptible to fraud victimization when compared to younger adults, with middle-aged adults in between (H1). Second, we hypothesized a main effect of loneliness condition, where the induced state of loneliness would increase the risk of fraud victimization across all age groups (H2). Lastly, and most importantly, an interaction between the loneliness condition and age group was also expected, suggesting that the impact of loneliness on fraud victimization might be particularly pronounced among older adults instead of younger and middle-aged adults (H3).

Method

Participants

A priori Power analysis performed by G*Power 3.1 (Faul et al., 2009) of a 3 (age: younger, middle-aged vs. older adults) × 2 (condition: the loneliness vs. control condition) between-subject ANOVA showed that 138 participants should be sufficient to reach 80% power with a medium effect size (f =.25) and significant main effects and interactions at $\alpha = 0.05$. A total of 147 participants from local communities or university were recruited. The final sample consisted of 50 younger adults (aged 18–29, M_{age} = 26.62, SD_{age} = 3.11,

36 females), 43 middle-aged adults (aged 32–53, $M_{age} = 40.84$, $SD_{age} = 5.45$, 25 females) and 54 older adults (aged 60–88, $M_{age} = 68.31$, $SD_{age} = 7.69$, 34 females).

The study was approved by the Institutional Review Board of School of Psychological and Cognitive Sciences, Peking University. Older adults were screened for potential neurological deficits by the Mini-Mental State Examination (Folstein et al., 1975; Zhong et al., 2017). All the older adult participants passed the MMSE with a score higher than 26 ($M = 28.67$, $SD = 1.20$).

Materials and Measurements

Autobiographical loneliness event recall paradigm (loneliness condition)

The autobiographical recall paradigm is a method used to induce loneliness by guiding participants to recall, and thus reexperience their past personal experience of exclusion and loneliness (Bernstein et al., 2008; Gardner et al., 2000). Considering some older adults have trouble writing, we adapted the task from writing to speaking. In the context of the loneliness condition of our study, participants were instructed to verbally recall an event in which they were socially excluded by their relatives and friends and felt lonely about it. The experimenter repeated the events to participants and asked them to confirm after participants have finished recalling.

Cyberball mixed with autobiographical event recall paradigm (control condition)

To provide a comparable experience to the loneliness condition, participants in the control group engaged in a ball-tossing game conducted on computers known as the Cyberball Task (Williams et al., 2000; Williams & Jarvis, 2006). They were instructed to tell names of two real-life friends and to imagine that they were playing the ball-tossing game with the two friends. In fact, the other players were simulated by computers to control the tosses participants received. Participants received multiple tosses equaled to the other two players to mimic the feeling of social inclusion. After the Cyberball game, participants were instructed to verbally recall the experience of ball-tossing similar to the loneliness event recall task, and the experimenter repeated the described experience to participants for confirmation.

Emotion scales

Emotion was measured by a 7-point Likert scale assessing both valence (from 1 = extremely negative to 7 = extremely positive) and arousal (from 1 = the lowest level of arousal to 7 = the highest level of arousal; Kircanski et al., 2018).

UCLA loneliness scale

We used two items (i.e., "I feel isolated from others." and "I feel left out.") of a short-form UCLA loneliness scale, ULS-4 (Hays & DiMatteo, 1987; Russell, 1996) to measure loneliness of participants. This scale is a 7-point Likert scale, and higher score indicates that participants had higher levels of loneliness.

Misleading advertisements task

In this task, participants were asked to rate the credibility of misleading advertisements and indicate their purchase intention on a 7-point Likert scale. To develop a pool of advertisements for this task, we reviewed a list of misleading advertisements published by the Industrial and Commercial Administration of China from 2015 to 2018. From this list, we selected 12 misleading advertisements that were representative. In a pilot study, 20 participants rated the credibility and their purchase intentions for products in these advertisements. Based on their ratings, we eliminated the advertisements with low homogeneity levels and retained nine advertisements as our experiment material (Asp et al., 2012). One of these advertisements was used as practice trials to get participants familiar with the rating process, while the remaining eight were utilized to measure participants' susceptibility to fraud. The chosen advertisements included a variety of products, some familiar to older adults like health supplements, gout medications, food, and daily essentials, and others less familiar such as financial management services, investment opportunities, educational programs, and cognitive enhancement products. Each advertisement was presented in a simple format, focusing on the products' design and slogan while excluding extraneous details like brand names and packaging to minimize distractions. Participants were asked to evaluate each advertisement on two dimensions: the perceived credibility of the advertisement, rated from 1 (very untrustworthy) to 7 (very trustworthy), and their intention to purchase the product in the advertisement, rated from 1 (completely unwilling) to 7 (very willing). For a detailed view of the misleading advertisements used in our study, please refer to the Appendix.

Cognition task

In addition to the primary focus on loneliness and fraud victimization, our study included a range of cognitive variables, including digit span test (forward and backward), digit symbol substitution test (WAIS-III; Wechsler, 1997), and category naming task (Spreen & Benton, 1977), to measure different domains of cognition.

Digit Span Test (forward and backward test) measures working memory (WAIS-III; Wechsler, 1997). Participants were asked to recall sequences of numbers, both in the forward and reverse order, as read by the examiner. The forward test ranged from 3 to 9 digits, while the backward test varied from 2 to 8 digits. Scoring is based on the maximum sequence length that participants

could accurately repeat, with higher scores reflecting better working memory ability.

Digit Symbol Substitution Test, a paper-and-pencil test measures processing speed (WAIS-III; Wechsler, 1997). Participants were required to match symbols to corresponding numbers according to a provided key of symbol – digit pairs on the top of the page and then replicate these symbols under a series of numbers within a 60-s limit. The score is determined by the total number of correct matches, with a higher count indicating a quicker processing speed.

Category Naming Task measures verbal fluency (Spreen & Benton, 1977). Participants are instructed to write about different species of animals (e.g., dogs). The score is the total count of unique animal species provided, with a greater number signifying enhanced verbal fluency.

These variables were well-established measures used in previous studies to capture cognitive changes associated with aging (e.g., Chen et al., 2022). By controlling these cognitive variables as covariates in our analysis, we sought to gain a more robust causal association between loneliness and risk of fraud victimization.

Procedures

The experiment was conducted in a quiet room at the university or community center, with each participant completing the tasks individually. Upon arrival, participants provided their written informed consent. Utilizing a completely randomized design, participants were assigned to either the loneliness or control condition.

In the control condition, participants engaged in a combination of Cyberball and autobiographical event recall, a task designed to evoke a neutral emotional state. Conversely, those in the loneliness condition were tasked with recalling autobiographical loneliness events that induced feelings of loneliness. This manipulation aimed to create a controlled environment to assess the effects of induced loneliness. Once the initial tasks were completed, participants were asked to complete an emotion scale of valence and arousal and an adapted version of the short-form UCLA Loneliness Scale. These measures served as a manipulation check to confirm the effectiveness of the loneliness induction. Next, all participants needed to finish misleading advertisement task to rate credibility of the advertisement and indicate their purchase intention. After an optional resting period, participants complete cognition tasks designed to measure various cognitive abilities that might influence their performance in fraud-related tasks. Following the cognition measures, participants provided demographic information, including age, sex, education level (ranging from 1, indicating primary school and below, to 4, indicating a bachelor's degree and above), self-reported health status (ranging

from 1 = very poor, to 5 = very good), and self-rated socioeconomic status (SES, ranging from 1 = the lowest in the country, to 10 = the highest in the country). Finally, participants get paid for their participation and are fully debriefed.

Data analysis

A 3 (age: younger, middle-aged vs. older adults) × 2 (condition: the loneliness vs. control condition) × 2 (rating type: credibility rating/purchase intention rating, within-subject factor) mixed-model ANOVA would be conducted on ratings of advertisements. If rating type did not interact with age or condition, the two scores would be merged as a new index of susceptibility to fraud. In order to investigate the effect of age, loneliness condition and their interaction, we would further perform a 3 (age: younger, middle-aged vs. older adults) × 2 (condition: the loneliness vs. control condition) between-subject ANOVA on susceptibility to fraud.

Results

Descriptive statistics

Table 1 displays the demographic information and cognitions of different age groups, and chi-square test and one-way ANOVAs were conducted to examine age differences among the three age groups. The results indicate that the different age groups had similar gender composition, $\chi^2(2) = 2.07$, p =.36, Cramer's V= .12, but differed in age, F (2, 144) = 816.54, $p < .001$, $\eta^2_{\text{partial}} = .92$. Moreover, the results of ANOVAs revealed significant age differences for education level, self-reported health and cognitions, while no significant age differences were found for self-rated socioeconomic status. For Education, F (2, 144) = 43.19, $p < .001$, $\eta^2_{\text{partial}} = .38$, and post hoc test showed that both younger ($M = 3.98$, $SE = 0.09$) and middle-aged ($M = 3.81$, $SE = 0.09$) adults have a higher level of education than older

Table 1. Descriptive statistical results (*M* (*SD*)).

	YA (*N* = 50)	MA (*N* = 43)	OA (*N* = 54)
Age***	22.62(3.10)[a]	40.84(5.46)[b]	68.31(7.69)[c]
Gender ratio(male/female)	14/36	18/25	20/34
Education level***	3.98 (0.14)[a]	3.81(0.50)[a]	2.96(0.87)[b]
Self-reported health***	3.62(0.86)[a]	3.09(1.07)[b]	2.81(0.93)[b]
Self-reported socioeconomic status	3.94(1.04)	4.12(0.97)	3.87(0.93)
Digit span-forward***	8.82(0.44)[a]	8.58(0.66)[a]	7.70(1.04)[b]
Digit span-backward***	6.86(1.26) [a]	5.91(1.48)[b]	4.33(1.20)[c]
Digit symbol substitution test***	50.02(6.06)[a]	42.42(7.57)[b]	22.89(6.11)[c]
Verbal fluency test**	21.02(8.30)[a]	25.30(8.35)[b]	20.41(5.18)[a]

YA: younger adults; MA: middle-aged adults; OA: older adults. *M* (*SD*) with different superscripts represents significant age-differences of this variable in post-hoc analysis at $p < .05$.

adults ($M = 2.96$, $SE = 0.08$) ($ps < .001$), but no age difference was found between younger and middle-aged adults ($p = .18$). For Self-reported Health, $F\ (2,\ 144) = 9.55$, $p < .001$, $\eta^2_{\text{partial}} = .12$, and post hoc test showed that younger adults ($M = 3.62$, $SE = 0.13$) self-reported being healthier than both middle-aged ($M = 3.09$, $SE = 0.15$) and older adults ($M = 2.82$, $SE = 0.13$) ($ps \leq .008$), whereas no significant age difference was found between middle-aged and older adults ($p = .15$). For Digital span – forward, $F\ (2,\ 144) = 22.36$, $p < .001$, $\eta^2_{\text{partial}} = .24$, post hoc test demonstrated that age differences emerged between older adults ($M = 7.70$, $SE = 0.11$) and other two age groups ($ps \leq .001$), and younger adults ($M = 8.82$, $SE = 0.11$) and middle-aged adults ($M = 8.58$, $SE = 0.12$) showed no age difference ($p = .14$). For Digital span – backward, $F\ (2,\ 144) = 30.36$, $p < .001$, $\eta^2_{\text{partial}} = .30$, and Digit symbol substitution, $F\ (2,\ 144) = 237.45$, $p < .001$, $\eta^2_{\text{partial}} = .77$. Post hoc test found the same age difference pattern for these two indicators, such that younger adults (Digital span – backward: $M = 6.86$, $SE = 0.19$; Digit symbol substitution: $M = 50.02$, $SE = 0.93$) outperformed the other two age groups ($ps \leq .001$), and middle-aged adults (Digital span – backward: $M = 5.91$, $SE = 0.20$; Digit symbol substitution: $M = 42.42$, $SE = 1.00$) also performed better than older adults (Digital span – backward: $M = 4.33$, $SE = 0.18$; Digit symbol substitution: $M = 22.89$, $SE = 0.89$) ($ps < .001$). And for Verbal fluency, $F\ (2,\ 144) = 6.10$, $p = .003$, $\eta^2_{\text{partial}} = .08$, as evidenced by post hoc test, only middle-aged adults ($M = 25.30$, $SE = 1.12$) performed better on the test than both younger ($M = 21.02$, $SE = 1.04$) and older adults ($M = 20.41$, $SE = 1.00$). In the subsequent data analysis, these variables showing significant age differences were controlled as covariates.

Manipulation check

To check the effectiveness of loneliness manipulation, we conducted a 3 (age: younger, middle-aged vs. older adults) × 2 (condition: the loneliness vs. control condition) between-subject ANOVA on emotional valence and arousal reported after the manipulation. The results showed that significant condition main effects were observed, Valence, $F\ (1,\ 135) = 240.30$, $p < .001$, $\eta^2_{\text{partial}} = .64$, and Arousal, $F\ (1,\ 135) = 15.64$, $p < .001$, $\eta^2_{\text{partial}} = .10$, respectively. The main effect was qualified by a significant age × condition interaction, Valence, $F\ (2,\ 135) = 8.65$, $p < .001$, $\eta^2_{\text{partial}} = .11$, and Arousal, $F\ (2,\ 135) = 3.72$, $p = .03$, $\eta^2_{\text{partial}} = .05$. Simple main effect indicated that participants from all three age groups although showed condition differences in diverse magnitudes, these differences were in the expected direction, such that participants in the loneliness condition reported valence to be more negative ($M = 2.50$, $SE = 0.12$), and arousal to be more intense ($M = 5.40$, $SE = 0.14$) compared with participants in the control condition (Valence: $M = 5.02$, $SE = 0.11$, and Arousal: $M = 4.64$, $SE = 0.13$).

A similar ANOVA was conducted for reported loneliness after the manipulation. A significant condition main effect was found, F (1, 135) = 7.63, $p = .045$, $\eta^2_{\text{partial}} = .03$. Participants in the loneliness condition reported to experience a higher level of loneliness ($M = 3.65$, $SE = 0.17$) than did participants in the control condition ($M = 3.18$, $SE = 0.16$). These results suggested a successful manipulation of loneliness, which brought a feeling of loneliness and more negative and intense emotions in the loneliness condition compared to the control condition.

The effect of loneliness on susceptibility to fraud

A 3 (age: younger, middle-aged vs. older adults) × 2 (condition: the loneliness vs. control condition) × 2 (rating type: credibility rating/purchase intention rating, within-subject factor) mixed ANOVA was conducted on ratings of advertisements. Since rating type did not interact with age or condition, Fs < 1.32, ps > .05, the two scores were merged as a new index of susceptibility to fraud, and a two-way ANOVA, with age and condition as the between-subject factors was conducted. As shown in Figure 1, no significant age was found, F (2, 135) = 0.42, $p = .66$, $\eta^2_{\text{partial}} = .01$, while the condition main effect was approaching significance, F (1, 135) = 3.85,

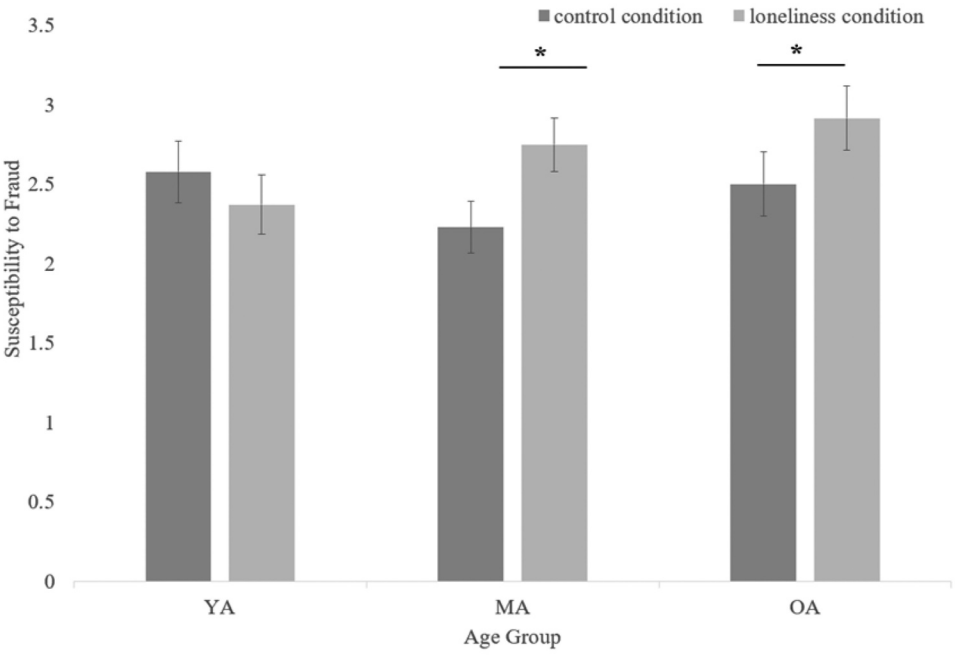

Figure 1. Susceptibility to fraud under loneliness condition or control condition among different age groups. Error Bars represent standard error of the means. * yields significant age-related differences ($p < 0.05$).

$p = .06$, $\eta^2_{\text{partial}} = .03$, such that induced loneliness could marginally make participants show increased risk of fraud victimization (loneliness condition: $M = 2.68$, $SE = 0.09$; control condition: $M = 2.44$, $SE = 0.09$). However, a significant interaction between age and condition was observed, F (2, 135) = 3.42, $p = .04$, $\eta^2_{\text{partial}} = .05$. Simple main effect analysis indicated that condition difference was found for both middle-aged adults (loneliness condition: $M = 2.75$, $SE = 0.17$; control condition: $M = 2.23$, $SE = 0.16$; F (1,135) = 5.35, p =.02, $\eta^2_{\text{partial}} = .04$) and older adults (loneliness condition: $M = 2.92$, $SE = 0.20$; control condition: $M = 2.50$, $SE = 0.20$; F (1,135) = 4.03, p =.04, $\eta^2_{\text{partial}} = .03$), but not for younger adults (loneliness condition: $M = 2.37$, $SE = 0.19$; control condition: $M = 2.58$, $SE = 0.19$, F (1,135) = 0.96, $p = .33$, $\eta^2_{\text{partial}} = .01$), suggesting that middle-aged and older adults are more likely to be influenced by induced loneliness and show increased risk of fraud victimization.

Discussion

Insignificant age effect on susceptibility to fraud in our study (H1) was not surprising, since results of previous research on the age-related difference in fraud susceptibility were mixed (e.g., Kirchheimer, 2011; Ross et al., 2014). Our results echoed some previous studies suggesting that there was no strong evidence to support the idea that older adults were more likely to be victims of fraud (e.g., Ross et al., 2014). This challenged the belief that age was a significant risk factor of fraud victimization, demonstrating that researchers should take other variables (e.g., loneliness) interplayed with age into consideration.

Furthermore, our study's findings indicated a marginally significant effect of loneliness induction (H2) on susceptibility to fraud. Such marginal significance showed the subtle tendency that individuals in all age groups might have become more susceptible when they experienced loneliness. On the other hand, such effect was indeed qualified by the significant age × loneliness condition interaction. In other words, there was a lack of significant differences in fraud susceptibility in the loneliness vs. control conditions among younger adults, while both middle-aged and older adults were more vulnerable to fraud when experiencing more severe loneliness after experimental manipulation. Extending prior work suggesting the correlation between loneliness and fraud victimization among older adults (Beach et al., 2016, Judges et al., 2018; Wen et al., 2022), the present experiment further showed the causal relationship between them and further suggested that middle-aged and older adults, rather than younger adults, might be more likely to be adversely impacted. Such that loneliness may be an imminent predictor of fraud victimization, over and above demographic, cognitive, and psychological covariates (Fenge & Lee, 2018). To the best of our knowledge, the present study is

among the first studies to establish such causal relationship with an experimental design and an inclusion of younger and middle-aged groups.

Fraud victimization in older adults

The relationship between loneliness and susceptibility to fraud among older adults can be explained through several potential mechanisms. First of all, and more directly, personal needs arising from factors such as social exclusion and loneliness could contribute to an older person complying with the demands of fraud individuals to gain companionship (X. Dong et al., 2007). Older adults may face significant life transitions, such as retirement or loss of a spouse, leading to increased social isolation and vulnerability to loneliness.

Other indirect paths include some social factors, for example, when the ability to interact with other people deteriorates, relatives and nonfamily members may avoid spending time with an older person who no longer conducts him or herself in a socially appropriate manner (Segrin & Givertz, 2003). Social isolation and loneliness create a context in which acts of fraud and exploitation are less likely to be detected by trusted others (Blunt, 1996). Indeed, a diminished social network (Fulmer, 1991; Wolf & Pillemer, 1989) and lack of social support (X. Q. Dong & Simon, 2008) have been shown to correlate with various forms of abuse among older adults.

Fraud victimization in middle-aged adults

It is not surprising that older adults are more vulnerable to loneliness, which eventually leads to a higher risk of fraud victimization. However, while most previous studies have extensively focused on fraud victimization among older adults, leaving the middle-aged to be neglected, a novel finding in the present study, is that middle-aged adults also showed a higher risk of fraud victimization after experiencing loneliness. Contrary to the common assumption that middle-aged adults, with their relatively intact cognitive functions, are less susceptible to fraud (Moore et al., 2014), our findings show that they are not immune to its effect.

In our study, middle-aged adults exhibited a lower baseline susceptibility to fraud, as indicated by their lower perceived credibility and purchase intentions in the control condition. However, after the induced loneliness manipulation, middle-aged adults demonstrated a significant increase in fraud vulnerability. Such findings could echo data from the American Association of Retired Persons (AARP), which found that individuals between the ages of 45 and 59 who reported feeling lonely or socially isolated were more prone to engaging in risky financial behaviors and falling for financial scams. In addition, scammers often target these individuals undergoing significant life transitions like divorce or the death of

a spouse, which can amplify feelings of loneliness and vulnerability. While more research may be necessary to fully understand the relationship between loneliness and fraud vulnerability, there is evidence supporting the notion that lonely middle-aged adults may be at a higher risk of becoming fraud victims (Luhmann & Hawkley, 2016; Wang et al., 2023).

The present study highlights the need for targeted interventions and support systems, particularly for middle-aged individuals experiencing loneliness in the transition stage (Nicolaisen & Thorsen, 2014). Such measures can help reduce their susceptibility to financial exploitation and protect them from the detrimental effects of fraud. It is crucial to recognize that loneliness can affect anyone in middle-aged and older adults, regardless of cognitive status, and proactive preventions are essential to safeguard against the risks associated with fraud.

Loneliness and fraud victimization

As individuals move through the various stages of adulthood, their motivations change from a desire for future-relatedness during their younger years to a focus on regulating emotions (to reach emotional meaningfulness) later in life as proposed by socioemotional selectivity theory (Carstensen, 2006). These changes in motivation can be far-reaching, influencing how people engage with their social world, particularly during periods in which they may need to make decisions related to fraudulent activity.

For older adults, as well as for those in middle age, having a supportive network is particularly important (Charles & Carstensen, 2010). When individuals in this age range become socially isolated, they frequently experience feelings of loneliness (Cornwell & Waite, 2009; Pinquart & Sorensen, 2001), which can make them more vulnerable to fraud (James et al., 2014). Previous studies have already demonstrated that lonely individuals who lack social support may seek out consumer interactions as a means of obtaining social contact (Kang & Ridgway, 1996), potentially increasing the risk of trusting unscrupulous individuals. Our research revealed that individuals who experienced higher loneliness are at an increased risk of fraudulent behaviors, as evidenced by a greater intention to judge unreliable products as credible and purchase them. One possibility might be that such purchases may serve to regulate negative emotions (Atalay & Meloy, 2011).

The implications of these findings are profound, particularly when considering the potential for interventions aimed at reducing the risk of fraud victimization. Future research should explore the role of social engagement and satisfaction as a means of intervention. For instance, studies have shown that fostering social connections within communities can help protect older adults from various forms of abuse, including those perpetrated by individuals within their own social networks

(Schafer & Koltai, 2015). These studies suggest that interventions that enhance social interconnectivity could serve as a protective measure against fraud.

Moreover, the long-term impact of fraud victimization on an individual's mental and physical health is well-documented (Nerenberg, 2000). Implementing interventions, including community programs that promote social interaction, support groups for those experiencing loneliness, and educational initiatives that raise awareness about the risks of fraud and the importance of maintaining a strong social network, which focus on improving interpersonal relationships among older adults could have a dual benefit: not only could they reduce the likelihood of falling prey to scams but they might also contribute to better overall health and well-being.

Limitations and future directions

Several limitations should also be acknowledged. First of all, in the present study, we only measured participants' perceived credibility and purchase intention of misleading advertisements, without assessing their actual purchasing behaviors of advertised products. Subsequent research could examine their actual purchasing behaviors. Second, experiencing loneliness was associated with a higher risk of fraud victimization, yet the precise mechanisms linking loneliness to fraudulent purchase intention remain to be elucidated. We could only suspect that regulation of negative emotions induced by loneliness could be one possibility (Kircanski et al., 2018). Future studies may investigate this and other potential causal pathways.

Conclusions

The present study suggested that loneliness could lead to higher fraud victimization for middle-aged and older adults instead of younger adults by experiment. By understanding the complex relationship between age, loneliness, and vulnerability to fraud, researchers and policymakers can develop more effective strategies to protect individuals, particularly those in middle-aged and older adults, from the detrimental effects of fraud. This could involve a combination of social, psychological, and educational interventions that not only address the immediate risk of fraud but also promote a more supportive and connected society to lower loneliness among middle-aged and older adults.

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The present study was not preregistered. The data could be made available upon reasonable request to the first author.

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