Risk-Taking Differences Across the Adult Life Span: A Question of Age and Domain

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Background. Older adults face important risky decisions about their health, their financial future, and their social environment. We examine age differences in risk-taking behaviors in multiple risk domains across the adult life span.

Methods. A cross-sectional study was conducted in which 528 participants from 18 to 93 years of age completed the Domain-Specific Risk-Taking (DOSPERT) scale, a survey measuring risk taking in 5 different domains.

Results. Our findings reveal that risk-taking tendencies in the financial domain reduce steeply in older age (at least for men). Risk taking in the social domain instead increases slightly from young to middle age, before reducing sharply in later life, whereas recreational risk taking reduces more steeply from young to middle age than in later life. Ethical and health risk taking reduce relatively smoothly with age. Our findings also reveal gender differences in risk taking with age. Financial risk taking reduced steeply in later life for men but not for women, and risk taking in the social domain reduced more sharply for women than for men.

Discussion. We discuss possible underlying causes of the domain-specific nature of risk taking and age.

Key Words: Aging—Domain-specific risk taking—DOSPERT—Gender differences—Older adults—Risk taking.

Just because you’re an old guy, you don’t have to sit around drooling in the corner. Get out and do something. Get out and enjoy life.

—George H.W. Bush (Thomas, 2009)

The former U.S. President George H. W. Bush commemorated his 85th birthday with a 10,500-foot skydive over Maine (Thomas, 2009). In this adventurous spirit, 85-year-old Anthony Smith and his elderly crew navigated their home-made raft, constructed of polyethylene pipes with a prefabricated pig shelter for a cabin, across 3,000 miles of the Atlantic Ocean to arrive at St. Martin in the Caribbean (Farnham, 2011). Reports of this kind are in contrast with studies in the psychological literature identifying older adults as risk avoidant (Rolison, Hanoch, & Wood, 2012; Turner & McClure, 2003; Vroom & Pahl, 1971). But the psychological literature has mainly focused on older adult risk taking in the financial domain (Bakshi & Chen, 1994; Deakin, Aitken, Robbins, & Shahakian, 2004; Mata, Josef, Samanez-Larkin, & Hertwig, 2011; Zamarian, Sinz, Bonatti, Gamboz, & Delazer, 2008), and may not reflect decisions that older adults make about their health (e.g., medical care) and social environment (e.g., whether to live independently or in a nursing home). We reveal that older adult risk taking, typically studied in financial domains does not relate to risk taking in other domains, and that to better capture older adults’ risk-taking tendencies, researchers need to evaluate risk behavior in a range of domains.

The dominant view in the psychological literature is that risk taking represents either a single personality trait or a small cluster of subtraits (e.g., impulsivity and sensation seeking; Hansen & Breivik, 2001). This view of risk-taking behavior, which brands individuals with either a risk-taking or risk-averse style, does not provide a reliable model for predicting behavior across domains and situations (Schoemaker, 1990). Managers’ attitudes toward financial risk for instance are reported to differ from their attitudes toward personal and recreational risks (MacCrimmon & Wehrung, 1990). Smokers are more likely than nonsmokers to take risks that concern their health, but are no more risk taking in other domains (Hanooh, Johnson, & Wilke, 2006), and women are more cautious than men in multiple domains except for situations that relate to their social environment (Weber, Blais, & Betz, 2002). There is also wide cultural variation in risk taking across domains (Weber, 2001).

Addressing the domain-specific nature of risk, Weber and colleagues have developed the Domain-Specific Risk-Taking Scale (DOSPERT; Blais & Weber, 2006; Weber et al., 2002), which captures individual behaviors across five risk domains, including the financial domain, combining elements of risky financial investment and gambling, the health domain, and social, recreational, and ethical domains. Within the DOSPERT scale, risk taking—a self-reported likelihood of engaging in a risky activity—is measured separately from two additional scales that measure perceived
risks and expected benefits of engaging in risky activities in each domain. Weber and colleagues (Blais & Weber, 2006; Weber et al., 2002) have provided a risk-return framework, in which risk-taking behavior varies as a function of the individual’s perceptions of risk and their associated benefits. In this study, we focused on the behavioral component of the DOSPERT and measured only participants’ likelihood of engaging in risky activities in each domain.

The original 40-item DOSPERT scale, measuring risk attitudes, and perceived risks and benefits, has been demonstrated to have satisfactory internal consistency reliability of its scale items (Weber et al., 2002), adequate test–retest reliability (Weber et al., 2002), and to capture the domain-specific nature of real-world risk taking. For example, Markiewicz and Weber (2013) found responses only to the gambling items of the DOSPERT to predict the trading volume of investors, a particularly risky variant of financial investment, and Brown and Braver (2007) reported that risk-averse responses on the gambling items of the DOSPERT relate to greater activity in the anterior cingulate cortex—neurological activity associated with cognitive control and anticipation of performance errors. The DOSPERT is also demonstrated to provide an effective clinical tool for measuring health-related risk attitudes in health settings, captured by responses to items in the health domain (Harrison, Young, Butow, Salkeld, & Solomon, 2005). Our present purposes are to identify age differences in attitudes toward risk in various content domains, and thus we focus on the risk-taking component of the DOSPERT. We apply the revised 30-item DOSPERT scale, developed by Blais and Weber (2006) specifically for measuring domain-specific risk taking among individuals of broad age ranges and education levels. In contrast with the original 40-item scale, developed for use with college undergraduates, items of the revised 30-item scale are applicable also to adult age ranges. For example, “Disagreeing with your father on a major issue,” an item that measures risk taking in the social domain, is replaced with “Disagreeing with an authority figure on a major issue” in the revised 30-item DOSPERT scale (see Supplementary Appendix A for the full list of scale items).

Separate from theoretical developments in domain-specific risk taking, researchers studying aging have focused on financial risk taking and gambling behavior (Deakin et al., 2004; Mata et al., 2011; Vroom & Pahl, 1971; Zamarian et al., 2008). Researchers using behavioral measures have found that age differences vary across risk-taking tasks, highlighting the importance of studying risk taking in multiple contexts and with various methodologies. For example, Henninger, Madden, and Huettel (2010) reported that older adults were more risk averse than their younger counterparts on the Balloon Analogue Risk Task (BART; see also Rolison et al., 2012), but more risk seeking on the Iowa Gambling Task (IGT; see also Deakin et al., 2004; Denburg, Tranel, Bechara, & Damasio, 2001). The authors discovered that the BART and IGT make different learning demands on processing speed and memory, which may interact with the cognitive declines that are associated with older age. The different cognitive context of these tasks results in different predictions for risk-taking behavior in older adults. When people are instead provided full information about the expected payoffs of risky choice options, rather than having to learn them from experience, age differences typically reduce (Mata et al., 2011; Samanez-Larkin, Wagner, & Knutson, 2010; Zamarian et al., 2008).

In contrast with findings from some behavioral studies, researchers using self-report measures and responses to risky dilemmas have typically found increased risk aversion among older adults (Botwinick, 1966; Turner & McClure, 2003; Wallach & Kogan, 1961; but see Chou, Lee, & Ho, 2007), perhaps due to the reduced learning component. For example, Rolison and colleagues (2012) found that younger adults were willing initially to take greater risks than older adults on the BART, but that experience on the task eroded age differences, suggesting that older adults may be more cautious when their risk taking is based on their initial risk perceptions. Importantly, many of the serious decisions that older adults face about their medical care and treatment, social environment (e.g., whether to move to an over 60 community), and financial future (e.g., when to begin to draw on one’s retirement savings) are one-off decisions that do not offer an opportunity for learning. Previous studies that have investigated people’s willingness to engage in risky activities, however, have failed to consider these types of contextual effects on risk taking. For example, the Choice Dilemma Scale, developed by Kogan and Wallach (1964), measures individuals’ willingness to accept hypothetical risks in various domains, but participants’ responses are summed across all scale items to calculate their risk score, which ignores risk-taking tendencies that are specific to risk domain. Using the DOSPERT scale, in this study we test for age differences in risk taking separately for several risk domains.

Cross-sectional studies comparing younger and older adults have revealed that age differences in financial risk taking typically emerge from around the age of retirement (~65+ years; Jianakoplos & Bernasek, 1998; Riley and Chow, 1992), suggesting that changes in risk attitude with age may be more abrupt in later life. The underlying causes of age differences are complex and multifaceted. In a review of the literature, Mather (2006) identified a number of potential causes of increased cautiousness in older age, including changes in life circumstances, motivational factors, and cognitive decline. We can expect that in the financial domain, the time horizon of older adults is also relevant to their risky decisions (Rolison, Girotto, Legrenzi, & Hanoch, 2013). Individuals with shorter time horizons (e.g., saving for the purchase of a new car) are discouraged from investing aggressively, as a loss to savings can take time to recover. This is particularly relevant to older adults who have a shorter time horizon than younger individuals for long-term investments in their financial future. Older adults are encouraged by financial advisors to invest more cautiously.
(Bernard, 2012), for a loss to retirement savings invested in risky assets could take many years to recover. Thus, we might expect age differences in financial risk taking to be steeper in older age secondary to life circumstances, and as such, may not reflect age differences in risk taking in other domains.

Age differences in decisions about financial investment may not be a good predictor of decisions in other domains. Some items in the social domain of the revised 30-item DOSPERT scale (e.g., “Admitting that your tastes are different from those of a friend,” “Disagreeing with an authority figure on a major issue”) relate to independent decision making in social contexts and may be more relevant to age changes in social risk taking during young adulthood. Gardner and Steinberg (2005) reported that younger adults (18–22 years) are more influenced by their peers than other age ranges (24 years and older) when making risky decisions. Moreover, D’Zurilla, Maydeu-Olivares, and Kant (1998) found that middle age adults (40–55 years) demonstrated better social problem-solving abilities than young adults (17–20 years) and exhibited less avoidant strategies in social contexts. Thus, we may expect that risk taking in the social domain will actually increase with age from young adulthood to middle age.

However, age differences in social risk taking during young adulthood may not relate to age differences in social risk taking in older age. Individuals are less socially active in later life and the frequency of their social interactions reduces (Field & Minkler, 1988). Older adults also demonstrate different social motivations than younger adults, emphasizing existing relationships, and are less willing than younger individuals to interact with unfamiliar people (Fredrickson & Carstensen, 1990). Older adults report more satisfaction with relationships and employ different strategies when faced with interpersonal conflict. For example, older adults are more likely to adopt avoidance strategies when required to solve interpersonal problems (Blanchard-Fields, Mienaltowski, & Sey, 2007). Using an ultimatum game, Roafl, Mitchell, Harbaugh, & Janowsky (2012; see also Bailey, Ruffman, & Rendell, 2013) found that older adults (65–85 years) accepted fewer offers from an unfamiliar individual (a computer; depicted by a name and photograph) than younger adults (21–45 years) when proposed fair or unfair divisions of a $10 bill. The older adults were particularly less willing to accept unfair divisions, and their overall acceptance rates were predicted by their scores on the revised 30-item DOSPERT, which suggests that attitudes toward trust and fairness may be linked to risk-taking preferences in social contexts. Indeed, D’Zurilla and colleagues (1998) observed reduced social problem-solving abilities among older adults (60–80 years) compared with middle age adults, which was exemplified by less positively oriented problem-solving strategies. Together, the earlier findings suggest that risk taking in social domains, related to independent decision making in social contexts may increase from young adulthood to middle age, but reduce in older age. This suggests an inverted U-shape trend with age in the social domain from young adulthood through to older age.

Individuals of middle age are more likely to attend voluntarily annual health checks and health education sessions than younger individuals (~50+ years. Deeks, Lombard, Michelmore, & Teede, 2009; ~45+ years, Waller et al., 1990), which may reflect both increased awareness and increased concern about health problems toward middle age. This provides some indication that middle age adults may be less willing than younger adults to engage in risky activities that concern their health, such as “Engaging in unprotected sex” and “Sunbathing without sunscreen,” items measured by the health component of the DOSPERT. Younger adults, who typically are not encouraged to attend regular medical screening and who are generally at less risk than older age ranges, miss out on important health-related advice (Herbert, Holdsworth, & Kubba, 2008). Some items in the health component of the DOSPERT scale relate to how individuals might respond to public health warnings, such as “Drinking heavily at a social function” and “Driving a car without wearing a seat belt,” and may reflect a general increase in sensitivity to health risks with age. Thus, we may expect risk taking in the health domain to reduce steadily with age as individuals become more aware and more exposed to health risks.

The recreational domain of the DOSPERT scale contains items such as “Going down a ski run that is beyond your ability,” “Going whitewater rafting at high water in the spring,” and “Bungee jumping off a tall bridge,” each of which relate to risk of physical harm. We may then expect age differences in recreational risk taking to be similar to age differences in risk taking in the health domain. Across a larger sample of participants (N = 2,151) ranging in age from 20 and 60 years, Nicholson, Soane, Fenton-O’Creevy, and Willman (2005) found that individuals reported to engage in fewer risky recreational activities (e.g., rock climbing, scuba diving) with age. Similarly, Diehm and Armatas (2004) found that younger adults were more likely than adults of other age ranges to engage in surfing than the less risky sport of golf and also that surfers overall scored higher on a sensation-seeking scale. Thus, we might expect that age differences in recreational risk taking, in common with risk taking in the health domain, would reduce toward middle age as a reflection adults’ changing attitudes toward risk of potential harm.

Some survey items in the ethical domain of the DOSPERT scale relate to one’s willingness to engage in ethically risky tax-related and financial activities (“Taking some questionable deductions on your income tax return” and “Not returning a wallet you found that contains $200”). In a large survey of tax payers, Song and Yarbroug (1978) found that participants’ ethical views toward tax returns increased gradually until 65 years of age, suggesting that risk taking in ethical contexts that concern tax or finance may reduce
with age. Other items in the ethical domain relate instead to a willingness to engage in personal dishonesty with no obvious financial gain (e.g., Having an affair with a married man/woman,” “Passing off somebody else’s work as your own”). In a study of 1,800 university students, although representing a fairly narrow age range, McCabe and Treviño (1997) found that situational factors (severity of punishment and peer disapproval) had a much greater affect on students’ likelihood of cheating on a test than personal characteristics (age and gender), suggesting that ethical risk taking may be highly contextual, and thus perhaps differ little with age.

Research on domain-specific risk taking has revealed gender differences that are specific to content domain. Using the 40-item DOSPERT scale, Weber and colleagues (2002) found that women were more cautious than men in various domains, including domains that involve recreational and financial risks, but that women were no less risk taking than men in the social domain. Dohmen and colleagues (2011) observed that women were less willing to take risks than men in a range of contexts, and that gender differences were largest with regard to attitudes toward driving behavior (see also Turner & McClure, 2003) and financial affairs. Other research examining specific domains indicate that women are more sensitive than men to potential health risks (women attend more health checks annually compared with men and seek more information regarding illness prevention; Deeks et al., 2009). Although studies of aging have often neglected gender differences in risk taking, Byrnes, Miller, and Schafer (1999) reported in a meta-analysis of 150 studies of men and women effects of gender on age differences in risk taking, and that these effects were content specific. Byrnes and colleagues (1999) found that although in most situations (e.g., drinking and drug use, driving, sexual activities), men took greater risks than women, in some situations (e.g., smoking, sexual activities), gender differences reduced with age. Thus, risk-taking differences with age are likely to contrast for men and women, and these may depend also on the risk domain.

In this article, we present a cross-sectional study of a large sample of participants spanning the adult age range and measure their risk taking in multiple domains. Our principal hypothesis was that age differences in risk taking would depend on risk domain. Specifically, we hypothesized that (a) financial risk taking would reduce with age more abruptly in later life, (b) social risk taking would increase from younger to middle age, but reduce in older age, and (c) health and recreational and ethical risk taking would reduce steadily with age.

Method

Participants

Participants (N = 528; 161 males, 367 females; age range = 18–93; mean [M] = 43.10; standard deviation [SD] = 21.07) were recruited from three sources. Advertisements online (N = 212; age range = 18–80; M = 35.64; SD = 16.88) and Mechanical Turk on Amazon (N = 210; age range = 18–79; M = 35.61; SD = 13.72) were used to recruit participants from younger age ranges. The former group volunteered to fill out the questionnaire with no compensation, and the latter group was paid a token amount of 0.25 U.S. dollars for completing the survey. The reliability of data provided by the Amazon Mechanical Turk participant pool has been demonstrated elsewhere by comparisons with other methods of data collection (Paolacci, Chandler, & Ipeirotis, 2010). Older adults (N = 107; age range = 52–93; M = 72.83; SD = 12.70) were recruited from a local senior center and were invited to Scripps College, CA to complete the survey. The older adults were compensated with 10 U.S. dollars to cover their travel expenses.

Regarding the sample demographics, there was a similar proportion of men and women in the younger and middle age ranges (age 18–39 years = 79 males, 195 females; age 40–59 years = 30 males, 83 females; χ²(1) = 0.21, p = .650) and in the middle and older age ranges (age 60+ years = 52 males, 89 females; χ²(1) = 3.06, p = .080). Participants indicated their highest educational attainment (as either “less than high school,” “completed high school,” “some college,” or “college or higher”). The majority of participants indicated some college (146; 28%) or higher (315 of 528; 60%), and few indicated high school (63; 12%) or less than high school (4; 1%) as their highest educational attainment. Participants recruited via advertisements online and Amazon’s Mechanical Turk did not differ in age, t(420) = 0.02, p = .986, or education level, Mann–Whitney test, p = .185. Across all three sources of participants, male and female participants were of similar age, t(526) = 1.73, p = .083, but age correlated positively with education, Spearman ρ (528) = 0.37, p < .001.

Materials and Procedure

Prior to data collection, ethical approval for the research protocol was granted by the appropriate internal review board. To ensure that the survey format and study procedure were identical for all participants, each participant completed the survey online.

Participants completed the 30-item risk-taking component of the revised DOSPERT (Blais & Weber, 2006) and were informed that the study examined their attitudes toward various life experiences. The DOSPERT contained six items each for the ethical, financial, health, recreational, and social domains. The financial domain combined elements of risky financial investment (e.g., investing in a moderate growth mutual fund) and gambling (e.g., betting on a sporting event), whereas the health domain combined items of health (e.g., engaging in unpredicted sex) and safety (e.g., driving a car without wearing a seatbelt), and were measured independently from risk attitudes in the social (e.g., admitting your tastes are different from those of a friend),
recreational (e.g., taking a skydiving class), and ethical (e.g., taking some questionable deductions on your income tax return) domains. For each item, participants were asked the likelihood that they would engage in the activity on a seven-point scale, ranging from extremely unlikely (with a numeric value of 1) to extremely likely (with a numeric value of 7). To calculate risk-taking attitudes, responses were summed across the six items for each risk domain, where higher values indicate greater risk-taking attitudes.

Statistical Analysis

The internal consistency reliability of the DOSPERT scale was determined by calculating the Cronbach α scores for the items of each domain. Intercorrelations for the DOSPERT scale were calculated using Pearson r correlations. To test for domain specificity in risk attitudes, we conducted a Friedman’s analysis of variance (ANOVA) for ordinal data on participants’ risk attitude ratings, with risk domain (ethical, financial, health, recreational, and social) as the repeated measures factor. Multiple regression analyses were conducted on participants’ risk attitude ratings in each domain to test for risk-taking differences with age. Age (as a continuous predictor) and gender were included as predictors in a first stage (Model A), and an interaction term between gender and age was included in addition to age and gender in a second stage (Model B). In a third stage (Model C), the interaction term was replaced with a quadratic term for age (in addition to age and gender), and the R^2 change was assessed in comparison with Model A. (We also tested a fourth stage of our regression analyses [Model D], which included age, gender, age^2, age by gender, and age^2 by gender as predictors. This analysis did not reveal any significant interactions between age^2 and gender on risk taking in any of the risk domains.) If the interaction term between age and gender was significant in Model B, then Model C was conducted separately for men and women, and the R^2 change was assessed in comparison with Model A separately for men and women. Following the advice of Aiken and West (1991), age was grand mean centered in all our regression analyses to reduce multicollinearity. We used an α level of .05 for all our analyses.

Results

The Cronbach α values provided in Table 1 indicate that the DOSPERT scale exhibited reasonable levels of internal consistency reliability for each of the five risk domains. Also provided in Table 1 are the intercorrelations for the DOSPERT scale. The intercorrelations were high among the five risk domains, except between the ethical and social domains, which is consistent with previous findings (Weller & Tikir, 2011).

The mean group risk attitudes, provided in Table 2, were highest overall in the social domain (M = 5.03), followed by the recreational (M = 2.72), financial (M = 2.44), health (M = 2.36), and ethical (M = 1.92) domains. Our Friedman’s ANOVA revealed a significant effect of domain, χ^2(4) = 1026.07, p < .001, which remained significant after removing ratings for the social domain, χ^2(3) = 177.01, p < .001, which were much higher than for other domains. Thus, our findings confirm earlier reports of risk-taking differences with domain (e.g., Blais & Weber, 2006). Further, post hoc analysis using the Wilcoxon signed-rank test revealed significant differences in risk attitudes between the social and recreational domains (z = -18.91, p < .001), the recreational and financial domains (z = -3.62, p < .001), the financial and health domains (z = -2.33, p = .020), and between the health and ethical domains (z = -10.72, p < .001).

Our current concern was risk-taking differences with age in each domain. Table 3 provides the results of our regression analyses, which revealed men to have significantly higher risk-taking attitudes than women in the ethical, financial, health, and recreational domains, but not in the social domain (Model A; Table 3: We tested for collinearity in all our regression analyses by examining the variance inflation factor (VIF) and tolerance levels of our regression models. We also explored the casewise diagnostics for outlying data. Inspection of the standardized residuals and further examination of the Cook’s distance measure, average leverage values, and Mahalanobis distance measure identified an extreme case in the ethical domain, which was subsequently removed from all our analyses of the ethical domain.) Table 2 provides the mean group risk attitudes for men and women, where gender differences are shown to be largest in the financial domain (men = 2.80, women = 2.28) and smallest in the social domain (men = 4.93, women = 5.07).

Table 1. Intercorrelations for the Domain-Specific Risk-Taking Scale (N = 528)

<table>
<thead>
<tr>
<th>Risk domain</th>
<th>Ethical</th>
<th>Financial</th>
<th>Health</th>
<th>Recreational</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethical</td>
<td>(0.72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>0.35*</td>
<td>(0.70)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>0.60*</td>
<td>0.42*</td>
<td>(0.66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational</td>
<td>0.29*</td>
<td>0.35*</td>
<td>0.48*</td>
<td>(0.83)</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>0.80</td>
<td>0.14*</td>
<td>0.23*</td>
<td>0.26*</td>
<td>(0.67)</td>
</tr>
</tbody>
</table>

Notes. Cronbach α values are shown in parenthesis.
*p ≤ .05.

Table 2. Mean Group Risk Attitude Ratings for the Domain-Specific Risk-Taking Scale in Each Domain for Men (N = 161) and Women (N = 367)

<table>
<thead>
<tr>
<th>Risk domain</th>
<th>Overall M (SD)</th>
<th>Men M (SD)</th>
<th>Women M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethical</td>
<td>1.92 (0.91)</td>
<td>2.11 (1.07)</td>
<td>1.84 (0.81)</td>
</tr>
<tr>
<td>Financial</td>
<td>2.44 (0.94)</td>
<td>2.80 (1.08)</td>
<td>2.28 (0.81)</td>
</tr>
<tr>
<td>Health</td>
<td>2.36 (1.06)</td>
<td>2.69 (1.26)</td>
<td>2.22 (0.92)</td>
</tr>
<tr>
<td>Recreational</td>
<td>2.72 (1.43)</td>
<td>3.02 (1.47)</td>
<td>2.58 (1.39)</td>
</tr>
<tr>
<td>Social</td>
<td>5.03 (1.03)</td>
<td>4.93 (0.98)</td>
<td>5.07 (1.05)</td>
</tr>
</tbody>
</table>
RISK-TAKING DIFFERENCES ACROSS THE ADULT LIFE SPAN

Table 3. Multiple Linear Regression Analyses on Risk Attitude Ratings by Age and Gender in Each Risk Domain

<table>
<thead>
<tr>
<th>Model</th>
<th>Parameter</th>
<th>Ethical domain</th>
<th>Financial domain</th>
<th>Health domain</th>
<th>Recreational domain</th>
<th>Social domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model A</td>
<td>Age</td>
<td>$-0.41^{**}$</td>
<td>$-0.27^{**}$</td>
<td>$-0.42^{**}$</td>
<td>$-0.40^{**}$</td>
<td>$-0.99^{**}$</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>$-0.16^{**}$</td>
<td>$-0.28^{**}$</td>
<td>$-0.24^{**}$</td>
<td>$-0.17^{**}$</td>
<td>$0.06^{**}$</td>
</tr>
<tr>
<td></td>
<td>$R^2$</td>
<td>$0.18^{**}$</td>
<td>$0.14^{**}$</td>
<td>$0.22^{**}$</td>
<td>$0.18^{**}$</td>
<td>$0.01^{**}$</td>
</tr>
<tr>
<td>Model B</td>
<td>Age</td>
<td>$-0.54^{**}$</td>
<td>$-0.42^{**}$</td>
<td>$-0.56^{**}$</td>
<td>$-0.41^{**}$</td>
<td>$-0.02^{**}$</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>$-0.16^{**}$</td>
<td>$-0.28^{**}$</td>
<td>$-0.25^{**}$</td>
<td>$-0.17^{**}$</td>
<td>$0.06^{**}$</td>
</tr>
<tr>
<td></td>
<td>Age by gender</td>
<td>$0.16^{*}$</td>
<td>$0.18^{*}$</td>
<td>$0.17^{*}$</td>
<td>$0.01^{**}$</td>
<td>$-0.08^{**}$</td>
</tr>
<tr>
<td></td>
<td>$R^2$ change</td>
<td>$0.008^{*}$</td>
<td>$0.010^{*}$</td>
<td>$0.009^{*}$</td>
<td>$0.000$</td>
<td>$0.002^{**}$</td>
</tr>
<tr>
<td>Model C</td>
<td>Age</td>
<td>$-0.50^{<strong>} (-0.43^{</strong>})$</td>
<td>$-0.25^{<strong>} (-0.21^{</strong>})$</td>
<td>$-0.50^{<strong>} (-0.43^{</strong>})$</td>
<td>$-0.45^{**}$</td>
<td>$0.03^{**}$</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>$0.17^{**}$</td>
<td>$0.09^{**}$</td>
<td>$0.009^{**}$</td>
<td>$0.000$</td>
<td>$0.002^{**}$</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>$0.05 (0.09)$</td>
<td>$-0.19^{*} (-0.05)$</td>
<td>$0.04 (0.05)$</td>
<td>$0.09^{*}$</td>
<td>$-0.22^{**}$</td>
</tr>
<tr>
<td></td>
<td>$R^2$ change</td>
<td>$0.001 (.007)$</td>
<td>$0.021 (.002)$</td>
<td>$0.001 (.002)$</td>
<td>$0.006^{*}$</td>
<td>$0.033^{**}$</td>
</tr>
</tbody>
</table>

Notes. The $R^2$ change for Models B and C are assessed in comparison with Model A. The value not in parenthesis = men and the value in parenthesis = women.

* $p < .05$, ** $p < .01$.

Significant interactions between age and gender existed in the ethical and health domains (Model B; Table 3). For this reason, Model C, which included a quadratic term for age, was conducted separately for men and women (values for women are provided in parenthesis; see Table 3). The $R^2$ change for Model C was not significant for men or women in either domain, which implies that risk-taking attitudes reduced linearly for men and women in both the ethical and health domains. Figure 1 provides the best fitting slopes for age on risk attitudes in each domain, where it is revealed that risk attitudes reduced more steeply with age for men than for women in the ethical (men, 18 years = 2.71; 91 years = 1.01; women, 18 years = 2.20; 91 years = 1.13) and health (men, 18 years = 3.46; 91 years = 1.44; women, 18 years = 2.65; 91 years = 1.35) domains.

In the financial domain, age interacted with gender (Model B). Risk attitudes followed a quadratic trend with age for men and a linear trend for women (Model C). Figure 1 reveals that this was because financial risk attitudes reduced more sharply for men than for women in later life. Men were more risk taking than women in their financial attitudes in young (18 years, men = 3.08; women = 2.49) and middle age (43 years, men = 3.02; women = 2.27), but gender differences reduced sharply in later life (91 years, men = 1.54; women = 1.86).

There were no significant interactions between age and gender in the recreational and social domains (Model B). Risk-taking attitudes across all participants had a quadratic trend with age in both domains (Model C), but differences in risk attitude with age contrasted between the two domains. Risk attitudes in the recreational domain reduced more sharply from young (18 years, men = 3.88; women = 3.37) to middle age (43 years, men = 3.00; women = 2.40) than in older age (91 years, men = 1.97; women = 1.75). Risk attitudes in the social domain instead increased slightly from young (18 years, men = 4.76; women = 4.95) to middle age (43 years, men = 5.08; women = 5.33), before reducing in older age (91 years, men = 4.57; women = 4.04), and this trend appeared steeper for women than for men (see Figure 1).

Confirming earlier reports, risk taking depends on the domain in which it is studied (Dohmen et al., 2011; Weber et al., 2002). Our present findings also demonstrate age differences in risk taking that are specific to domain. Our cross-section comparisons of age and risk taking revealed financial risk taking (at least among men) reduced more steeply in later life than in other domains. Social risk taking instead increased slightly from young to middle age, before reducing in older age. (We tested whether our findings of age and gender differences in risk attitudes remained after partiailling out potential effects of participant recruitment method. We conducted our regression analyses on risk-taking scores, this time controlling for whether participants were recruited from the local senior center or online via advertisements and Mechanical Turk as an additional binary variable. Model A of our regression analyses confirmed that risk-taking tendencies reduced with age in the ethical [$\beta = -0.52$, $p < .001$], financial [$\beta = -0.24$, $p < .001$], health [$\beta = -0.47$, $p < .001$], and recreational [$\beta = -0.41$, $p < .001$] domains, but not in the social domain [$\beta = -0.10$, $p = .122$], which is consistent with the results of our main analyses. Similarly, men were found to be more risk taking than women in the ethical [$\beta = -0.16$, $p < .001$], financial [$\beta = -0.28$, $p < .001$], health [$\beta = -0.24$, $p < .001$], and recreational [$\beta = -0.17$, $p < .001$] domains, but not in the social [$\beta = 0.04$, $p = .308$] domain. In Model B, we again found that age interacted with gender in the ethical [$\beta = 0.15$, $p = .035$], financial [$\beta = 0.17$, $p = 0.016$], and health [$\beta = 0.18$, $p = 0.008$] domains, but not in the recreational [$\beta = 0.02$, $p = .822$] or social [$\beta = -0.12$, $p = .125$] domains. Thus, it would seem unlikely that our methods of participant recruitment influenced our main findings.)

**DISCUSSION**

Research findings in the psychological literature identify older adults as risk avoidant (e.g., Deakin et al., 2004; Rolison et al., 2012; Turner & McClure, 2003; Wallach & Kogan, 1961). The focus on financial risk taking in the literature may present a restricted view of age and risk...
taking in different areas of life. To enrich our understanding of how age relates to risk-taking tendencies, we conducted a cross-sectional study to examine risk-taking behavior in multiple domains at various ages. Consistent with studies of financial risk taking (Jianakoplos & Bernasek, 1998; Riley & Chow, 1992), we observed that risk tendencies in the financial domain reduced more steeply in later life. But risk-taking differences with age were specific to the risk domain. Risk taking in the social domain increased from young to middle age, before reducing steeply in older age,
recreational risk taking reduced more steeply from young to middle age than in later life, and health and ethical risk taking reduced smoothly with age. Our data clearly illustrate the importance of examining risk taking in multiple domains, and these findings call into question assumptions of decreasing risk taking with age across domains. As such, the focus on financial risk taking and gambling behavior in the aging literature (see Mata et al., 2011) may present a limited view of risk taking with age across domains.

This study is cross-sectional in design. We did not track age changes in risk-taking tendencies through the ages, and this limits the claims that can be made about the developmental trajectory of domain-specific risk taking. It is likely that generational changes in people’s attitudes toward risky situations (e.g., to smoking and seat belt use) and historical events, such as economic booms and busts, also contributed to the age differences in risk taking we observed. Moreover, we can expect that there are domain-specific effects of generational changes and historical events on people’s risk-taking attitudes. For instance, Weber and Hsee (1998) found that German and Polish participants differed in their risk preferences when reasoning about risky financial investment options, and Blais and Weber (2006), using the revised 30-item DOSPERT scale, reported risk-taking differences between French and English participants that were specific to risk domain. Historical events and generational changes in time, as with cultural differences, likely impact on cross-sectional comparisons of age differences in risk taking.

Our findings stress the importance of considering middle age adults in developmental studies of risk taking. Although risk taking in the health and ethical domains reduced smoothly with age, risk taking exhibited an inverted-U shape trend with age in the social domain. Risk-taking attitudes increased from young to middle age adults, before reducing in older age. D’Zurrilla and colleagues (1998) reported that middle age adults have better social problem-solving skills than younger adults. Social interaction (Field & Minkler, 1988) however, and willingness to engage with unfamiliar people (Fredrickson & Carstensen, 1990), reduces in older age, and this may be linked to increased risk avoidance in the social domain among older adults (Roalf et al., 2012). This data on age differences in social risk taking resonate well with these findings and suggest an inverted-U shape trend with age in the social domain, which emphasizes a need to consider all age ranges in studies of risk taking.

Risk taking in the health domain reduced relatively smoothly with age, indicating increasing awareness and perhaps greater risk of health problems with age. Younger adults are not typically encouraged to attend regular medical screening and miss out on important health advice (Herbert et al., 2008). Individuals around middle age actively seek health education information and voluntarily attend annual health checks (Deeks et al., 2009). Middle age adults may also be more responsive than younger adults to public health warnings. Although age differences in health risk taking likely depend on a multitude of factors, including changes to life circumstances (e.g., having children), risk taking trends with age in the health domain are different to those in the financial, ethical, and social domains, and point to different underlying causes.

In a meta-analysis of 150 studies of risk taking differences between men and women, Byrnes and colleagues (1999) concluded that gender differences in risk taking with age were content specific. The authors reported that gender differences reduced with age for risk attitudes toward activities such as smoking and sexual activities, but were more consistent with age for some other activities. Their findings resonate well with our current findings from the DOSPERT scale, which was designed especially to capture domain-specific risk taking. In three of the five DOSPERT domains, including the ethical, financial, and health domains, effects of age on risk-taking attitudes interacted with gender (see Figure 1). Gender differences in risk-taking attitudes in the recreational and social domains were, in contrast, more consistent with age.

There is a heavy focus in the literature on the developmental trajectory of females and males during childhood, adolescence, and young adulthood (e.g., Irwin & Millstein, 1991; Wigfield & Eccles, 1992), which informs us about the risk-taking propensities of young adults. But there is a scarcity of research that might bear on the behavior and risk-taking attitudes of adults through the adult life span. In young adulthood at age of 18 years, we found that women were more risk averse than men in the health domain of the DOSPERT scale, and that gender differences reduced with age (see Figure 1). According to one study, women and people over 50 years of age are more likely to attend regular health checks and seek health-related advice in comparison to younger women and men (Deeks et al., 2009). One possibility then is that age shrinks gender differences in risk taking in some domains as a result of changing attitudes. In contrast with this, we found that age differences in financial risk taking were amplified for men compared with women (see Figure 1) and reduced far more abruptly in later life for men, which closed the gender gap in older age. This may reflect men’s changing attitudes toward financial risks in retirement (Riley & Chow, 1992). Among women, financial risk taking varied little with age. One possibility is that women from a young age are generally less willing than men to engage in risky financial affairs. Chen and Volpe (2002) surveyed 924 college students and found women to be less confident and less enthusiastic than men regarding their personal finance, and also to be less willing to engage in learning about personal finance.

In this study, we studied age differences in risk taking in various domains. However, risk taking can have many forms. Although some theorists link risk-taking tendencies to reduced self-control (Gottfredson & Hirschi, 1990), others introduce concepts of sensation seeking and impulsivity (Zuckerman, 2007). Risk-taking behavior is...
likely a multifaceted construct, even within risk domains. Emotional processing is a major determinant of risk taking in some situations (Figner, Mackinlay, Wilkening, & Weber, 2009), and emotional processing alters in later life. Older adults exhibit a bias toward positive information at the neglect of negative information in comparison to younger adults (Carstensen & Mikels, 2005; see also Kellough & Knight, 2012), and this may lead to age differences on some kinds of risk-taking tasks (Wood, Busemeyer, Koling, Cox, & Davis, 2005). Indeed, we can expect that there are numerous contributing causes to risk-taking behavior. As Fox and Tannenbaum (2011) note, a climber may attempt to climb a dangerous rock face in response to peer-pressure, despite their underlying risk preference. Younger adults are more influenced by their peers than adults of other age ranges when making risky decisions, which suggest different underlying causes of risk-taking behavior with age. More generally, there is a need to examine how risk taking interacts with task characteristics, situational factors (e.g., context, domain), and individual differences (e.g., age, gender; Appelt, Milch, Handgraaf, & Weber, 2011). Further research may serve to unpack risk-taking differences with age by examining risk-taking behaviors in multiple content domains using multiple risk-taking measures.

In this study, we focused on age differences in people’s willingness to engage in risky activities. We did not make use of the additional scales of the DOSPERT that measure perceived risks and expected benefits of risk taking in each domain. Thus, it remains unclear the extent to which age differences in risk taking reflect age changes in the perceived risk and expected benefits of engaging in risky activities. Weber and colleagues (Blais & Weber, 2006; Weber et al., 2002) have developed a risk-return framework that describes risk taking as a trade-off between risk perceptions and expected benefits. Individual differences in risk-taking attitudes are found to vary more as a function of people’s risk perceptions than their expected benefits (Blais & Weber, 2006; Weber et al., 2002), and similarly, changing perceptions of risk across the adult life span may also explain age differences in risk taking observed in this study. We hope that these findings inspire further research to examine how risk perceptions and anticipated benefits might also be involved in age differences in domain-specific risk taking.

This study has a number of limitations. First, we sampled participants from three different sources. The majority of older adults were recruited from the local community, whereas younger adults were recruited via advertisements online and Mechanical Turk on Amazon. Although all participants completed the study online, it is possible that our sampling method compromised the homogeneity of our sample. Participants recruited online volunteered without compensation, whereas those recruited via Mechanical Turk on Amazon were paid a token amount of $0.25 U.S. dollars, and those recruited from the local community were compensated with $10 U.S. dollars to cover their travel expenses. It is possible that unequal payment in our recruitment methods influenced our results. However, our findings were similar when we additionally controlled for recruitment method in our analysis of participants’ risk-taking attitudes. Moreover, in previous studies that have reported an effect of participant payment, effects appear to be limited to performance measures (e.g., Brase, Fiddick, & Harries, 2006), suggesting that payment may affect measures that benefit from additional effort rather than the kinds of attitude measures used in this survey. Second, we applied a single measure of risk taking to examine age differences in various domains. We did not, however, validate participants’ reported risk attitudes with their real-life risk-taking behavior (e.g., whether individuals use a seatbelt when traveling in a motor vehicle or engage in unprotected sex). Others have noted a disparity between some risk-taking measures and engagement in real-life risky behaviors (Reyna et al., 2011). Despite this, studies using domain-specific measures report a stronger correspondence between risk-taking attitudes and engagement in risky behaviors within domains (Hanoch et al., 2006; Harrison et al., 2005). For example, Dohmen and colleagues (2011) found that engagement in risky activities was predicted best by risk attitudes that corresponded to the content domain. The authors found that smoking was better predicted by health-related risk attitudes than general attitudes toward risk. Thus, the link between risk attitudes and behavior may be strongest within domains.

How then should aging and risk taking be studied? First, a model of aging developed for a single risk domain is not sufficient to predict risk taking in other domains. For example, we found that risk taking in a social context increased from young adulthood to middle age, but then reduced sharply among women in later life with respect to risk taking in other domains, which suggests that a single measure of risk taking would miss age differences across domains. Domain-specific measures could be used in real-world contexts to identify situations in which individuals are likely to engage in risky activities based on personal characteristics, such as age and gender. The psychological literature has focused on older adult risk taking in the financial domain (Bakshi & Chen, 1994; Deakin et al., 2004; Mata et al., 2011; Zamarian et al., 2008), which is unlikely to reflect decisions that older adults make about their health (e.g., medical care) and social environment (e.g., whether to live independently or in a nursing home). We suggest that older adult risk taking, typically studied in financial domains does not relate to risk taking in other domains, and that to better capture older adults’ risk-taking tendencies, researchers need to evaluate risk behavior in a range of domains. These findings call for a domain-specific framework for studying effects of aging on risk taking. Second, risk-taking differences with age are not linear in all domains and exhibited
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an inverted U-shape trend with age in a social context, emphasizing a need to include all age ranges in studies of risk taking. Taken together, as our understanding of risk-taking behavior increases, it becomes clear that focusing on a single risk domain may not capture the complexity and richness of risk-taking behavior across the ages and across domains.

SUPPLEMENTARY MATERIAL

Supplementary material can be found at: http://psychsocgerontology.oxfordjournals.org/

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