Aging and Decision-Making Competence

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May 2016

PRC WP2016
Pension Research Council Working Paper
Pension Research Council
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Abstract

Around the world, average life expectancy is increasing. Adults of all ages face important decisions that affect their life outcomes and overall well-being. This paper reviews recent developments in research on age differences in decision-making competence. The measurement of age differences in decision-making competence is grounded in normative theories of decision making, which posit how people should be making decisions, as well as descriptive research, which aims to examine how people actually make decisions. Studies on age differences in decision making have shown mixed patterns of results, perhaps because of having included a wide range of decision-making competence tasks. Each decision task may rely on a different combination of skills, with some showing age-related declines and others showing no change or improvements with age. Here, I discuss the potential skills that may contribute to making good decisions, including cognitive deliberation, experience, emotions, and motivation. Although fluid cognitive abilities that underlie cognitive deliberation are known to decline with age, the others show different developments with age. I also discuss potential interventions that aim to target cognitive deliberation, experience, emotions, and motivation, so as to promote better decisions and associated life outcomes across the life span.

Keywords: Aging, decision making, interventions

Acknowledgment: Funding was received from the European Union Seventh Framework Programme (FP7-People-2013-CIG-618522; PI: Bruine de Bruin). My research on aging and decision-making competence has benefited greatly from collaborations with Baruch Fischhoff, Fabio Del Missier, Andrew M. Parker, JoNell Strough, and others.

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Aging and Competence in Decision Making

People are living longer, implying that they must make important life decisions affecting their finances, health, and overall well-being. As policymakers in different countries give people increasing responsibility for their health care and retirement, older adults are confronted with more complicated decisions about these topics. As a result, older persons' decision-making competence is of rising importance.

Unfortunately, relatively little is known about aging and decision-making competence. Researchers on judgment and decision making traditionally recruited college students who participated in studies for course credit. Because these studies aimed to identify when people experience problems in making their decisions, the assumption was that findings would generalize to the general population. For instance, if college students experienced difficulties in making decisions then it was thought that individuals with lower educational attainment or other disadvantages would also face those problems.

Recent improvements in sampling and recruitment have spurred new research with age-diverse participants. Initial studies of adult age differences in decision-making competence have reported mixed findings. For example, Figure 2.1 shows age differences in six tasks that have been studied in the judgment and decision-making literature.

Insert Figure 2.1 here

The six tasks divided comprise the Adult Decision-Making Competence battery which measures individual differences in decision-making competence. The tasks are reliable, in terms of correlations across items and test-retest performance (Bruine de Bruin et al. 2007). The tasks also have demonstrated validity, in terms of correlations with self-reported decision outcomes such as bankruptcy and type 2 diabetes (Bruine de Bruin et al. 2007; Parker et al. 2015). As Figure 2.1

suggests, some decision tasks reveal age-related declines in performance, while others indicate no change or even improvements with age.

This chapter suggests that age differences in decision-making competence depend on the demands of the tasks presented. It highlights four main skills relevant to decision-making competence and shows differential changes with age (Figure 2.2). These include cognitive deliberation, experience, emotion regulation, and focused motivation, all of which are discussed below. Then we discuss potential interventions for improving decision-making competence across the life span, and a final section focuses on limitations and next steps. This review expands on previous ones with various colleagues (Bruine de Bruin, forthcoming; Bruine de Bruin et al. 2014a; Peters and Bruine de Bruin 2012; Strough et al. 2015).

Insert Figure 2.2 here

Cognitive Deliberation and Decision Making

Making decisions involves deliberation about the features of the available options and selecting the one that is most likely to produce desired outcomes. Such deliberation requires fluid cognitive abilities such as processing speed, working memory, executive functions, and numeracy. For example, Table 2.1 shows one item from a decision task referred to as 'Applying Decision Rules.' The presented item asks participants to apply the 'averaging rule' so as to choose between five DVD players. Specifically, the goal is to choose the DVD player that has the highest rating across the dimensions of picture quality, programming options, and reliability of brand. Computing, remembering, and comparing the average ratings for all DVD players create considerable cognitive demands. People with better fluid cognitive abilities tend to perform better on such cognitively-demanding decision tasks (Bruine de Bruin et al., 2007).

Insert table 2.1 here

Age differences in cognitive deliberation. Age-related declines in fluid cognitive abilities are well-documented and emerge after people reach their 20s (Salthouse 2004). Indeed, older adults' relatively lower fluid cognitive abilities explain why they tend to perform less well than younger adults on cognitively-demanding decision tasks (Bruine de Bruin et al. 2012, 2015; Del Missier et al. 2013; Finucane et al. 2005; Peters and Bruine de Bruin 2012). Older adults make more mistakes when they are asked to apply decision rules to choose between products (Bruine de Bruin et al. 2012; Del Missier et al. 2013). As the number of options increases and decisions become more difficult, older adults are especially less likely to select the optimal option (Besedeš et al. 2012).

Nevertheless, it should be noted that cognitive deliberation may not be relevant to all decisions; that is, performance on some decision tasks relies relatively little on decision makers' cognitive deliberation. It has even been argued that too much cognitive deliberation may be harmful when making some decisions (Wilson and Schooler 1991). For example, students who are explicitly asked to deliberate while choosing dorm room posters are less satisfied with their choices two weeks later, compared to controls receiving no such instructions (Wilson et al. 1993). While such decisions have not been studied with age-diverse samples, it is possible that they require other skills such as those learned with age-related life experience.

Experience and Decision Making

After years of working in a specific domain, people may develop experience-based knowledge or crystallized cognitive ability. Experience-based knowledge can be gained through deliberate practice and training, and, if so, people with experience-based knowledge may make better decisions.

For example, consider the decision task outlined in Table 2.2. It involves 'sunk costs' or a prior investment that is no longer recoverable. Because sunk costs are lost independent of how the decision maker proceeds, the economic sunk cost rule posits that these should not be taken into account. The normatively correct decision is to discontinue prior investments if they no longer represent the best available course of action. Correlational evidence suggests that students who have taken economics classes are more likely to accurately follow economic rules when making decisions (Larrick et al. 1993). By contrast, individuals without training in economics often find it difficult to decide to discontinue because they feel bad about having 'wasted' their prior investments (Arkes and Blumer, 1985).

Insert Table 2.2 here.

Experienced decision makers may not have to think very hard about their decisions, because they already know what to do. When deciding if a hypothetical couple should open an Individual Retirement Account (IRA), financial experts need less time to make a decision, compared to non-experts (Hershey et al. 1990). When making decisions, therefore, experience-based knowledge therefore is thought to decrease reliance on fluid cognitive ability.

Age differences in experience. Experience-based knowledge or crystallized cognitive ability accumulates with age. For instance, adults have more vocabulary knowledge than younger adults (Salthouse 2004), presumably because they have had more experience using their language. It has similarly been argued that older adults' accumulated life experience may explain why they perform better when making judgments and decisions in social contexts, as opposed to abstract contexts (Hess 2005).

Older adults' experience-based financial knowledge can also help them to make better decisions about personal finances. For example, age-related improvements in crystallized

cognitive abilities explain why older adults perform better in hypothetical financial decisions (Li et al. 2013, 2015).

Table 2.3 presents one example of a hypothetical decision in which participants are asked to pay off credit cards. Older adults are more likely than younger ones to pay off high-interest credit cards, as financial experts would recommend. Older adults also perform better in actual credit card decisions (Agarwal et al. 2009) and have better credit scores (Li et al. 2015). Across these studies, older adults' experience-based knowledge counteracted age-related declines in fluid cognitive abilities. As a result, it has been argued that peak performance for financial decisions occurs when people are in their 50s (Agarwal et al. 2009).

Insert Table 2.3 here

Older adults are also better able than younger adults to discontinue commitments that are no longer beneficial, even in the face of larger sunk costs (Bruine de Bruin et al. 2014b; Strough et al. 2008). As noted above, Table 2.2 shows an example of a decision that involved sunk cost. In part, older adults' ability to make better decisions about sunk costs is due to age-related changes in semantic memory, which may store knowledge about economic rules (Del Missier et al. 2013). In other words, older adults may have learned about the sunk cost rule from their prior experience.

Of course, what older adults take away from their experiences may not always be beneficial to their decision making. Learning from experience requires repeated judgments with immediate feedback, something that occurs in weather forecasting, but is rare in most other domains (for a review, see Keren 1991). Repeated exposure to misinformation can actually increase misguided confidence in its accuracy, especially among older adults (Skurnik et al. 2005). Thus the usefulness of previous experiences depends on the accuracy of the acquired knowledge.

Emotion Regulation and Decision Making

People's judgments and decisions are also influenced by their emotions, and these often emerge before cognitive deliberation has started (Zajonc 1980). Some emotions are integral to the decision at hand, such as when the perceived risks associated with a new technology are higher if people feel more negative about it (for a review, see Slovic et al. 2002). Incidental emotions can also influence decisions despite being unrelated to the task at hand, such as when investors' positive emotional responses to the weather leads to more optimistic trading decisions (Hirshleifer and Shumway 2003). Although emotions have originally been seen as distracting people from cognitive deliberation and threatening the quality of their decisions, it has been posited that emotions can also improve the quality of decisions, by focusing attention and improving information processing (for a review, see Peters 2006).

Age differences in emotion regulation. As people age, they develop a deeper understanding of emotional states (Labouvie-Vief et al. 1989). Older adults also have better emotion regulation in the face of adversity, focusing on the positive, while younger adults keep dwelling on the negative (Sütterlin et al. 2012; Torges et al. 2008). Perhaps as a result, emotional well-being tends to increase with age through the 60s, and older people generally report experiencing more positive than negative emotions (Carstensen, et al. 2000; Charles et al. 2001). This finding may be explained by older adults' increased realization that they should make the best of the limited time they have left to live (Carstensen 1995).

Older adults' focus on the positive may also affect their decision making. Older adults ruminate less about past losses, which contributes to their better ability to apply the sunk cost rule (Bruine de Bruin et al. 2014b). They also spend more time looking at positive-emotional

information than at negative-emotional information (Mather and Carstensen 2005). Perhaps as a result, older adults are just as likely as younger adults to remember positive information, but they remember negative information less well (Mikels et al. 2005). Older adults' better memory for positive information also increases their feelings of post-choice satisfaction (Kim et al. 2008). Of course, a selective focus on positive information may not be beneficial for every decision task.

Selective Motivation and Decision Making

Performance on difficult tasks is thought to be partly influenced by motivation. For example, Table 2.4 shows an example of an item from a test of 'numeracy' or number ability, which experimental participants often find frustrating. Individuals who self-report higher motivation to think hard about complex problems do tend to perform better on such numeracy items (Bruine de Bruin et al. 2015).

Insert Table 2.4 here

Motivation is also relevant to decision making. Some decision makers may be motivated to 'maximize' and systematically compare all available options to identify the very best. Others may prefer 'satisficing' by selecting an option that is 'good enough' on key attributes. Although maximizing should typically lead to better decision outcomes, satisficing may lead to choices that are just as good, especially when time is limited or options are too difficult to distinguish (Payne et al. 1993). Moreover, maximizers' tendency to engage in counterfactual comparisons with alternatives they could have selected instead puts them at risk for regret, dissatisfaction, and clinical depression (Bruine de Bruin et al., forthcoming; Iyengar et al. 2006; Schwartz et al. 2002). Hence, motivated decision makers do not necessarily experience better outcomes.

Age differences in selective motivation. As people get older, they become more selective about how to spend their cognitive effort. For instance, they may no longer be as motivated to work hard on cognitively demanding tasks such as the numeracy item presented in Table 2.4. Older adults also perform less well on numeracy items, which has been statistically explained by their lower self-reported motivation to think hard about complex problems (Bruine de Bruin et al., 2015). They also report being less motivated to use effortful choice strategies such as 'maximizing' (Bruine de Bruin et al. 2016). In studies of actual choice behavior, older adults reduce their cognitive effort by considering less information and comparing fewer options (Chen and Sun 2003; Johnson 1990).

Older adults do invest more effort in decisions when they perceive the context as personally relevant (Hess et al. 2013) or when they are explicitly asked to try harder (Kim et al. 2005). Cognitive effort can be measured via relative increases in systolic blood pressure as compared to a state of rest (Hess and Ennis 2012). The correlation between self-reported motivation and this objective measure of cognitive effort is higher in older adults than in younger adults (Ennis et al., 2013). This finding suggests that older adults think relatively harder when they are more motivated.

Suggestions for Interventions

If people experience difficulties in making their decisions, interventions may be needed. Ideally, such interventions should build on decision makers' strengths while addressing their weaknesses. It might therefore be useful to take into account age-related changes in cognitive deliberation, experience-based knowledge, emotions, and motivation. Below, I offer a few

suggestions for potential useful interventions which of course would still need to be tested for their effectiveness.

Interventions targeting cognitive deliberation. According to the 'use it or lose it' hypothesis, deliberate exercise is needed to prevent the decline of cognitive deliberative skills (for a review, see Park et al. 2007). Cognitive skills training for older adults tends to focus on teaching strategies for counteracting age-related declines in memory, reasoning, and speed of processing (Ball et al. 2002). Due to brain plasticity persisting even in older age, stroke patients of all ages can show dramatic improvement after extensive training and practice (Hallett 2001).

Yet it is also possible that older adults are averse to deliberate cognitive training. Perhaps due to concerns about age-related cognitive declines, older adults often do not feel confident about their performance on cognitively-demanding decision tasks (Bruine de Bruin et al. 2012). They also feel less motivated to think hard about complex problems (Bruine de Bruin et al. 2015). Interventions that encourage older adults to use their cognitive deliberative skills in enjoyable leisure activities have been proposed as potentially being more effective (Park et al. 2007).

In addition to training, external aids may be developed to support cognitive deliberation. The provision of organizational charts and medication organizers has been useful for helping older adults with medication adherence (Park et al. 1992). Visual icon arrays make risk information easier to understand for adults of all ages (Galesic et al. 2009). Icon arrays show icons for individuals with negative outcomes as part of a larger set of icons representing the overall at-risk population. Yet research shows that, visual displays should focus on a simple take-home message and avoid complex animations (Zikmund-Fischer et al. 2012). Indeed, 'less is more' when presenting information to aid decisions, especially for individuals who have limited ability to deliberate about numbers (Peters et al. 2007).

Another strategy for addressing problems with cognitive deliberation is to reduce the complexity of decisions, through, for example, reducing the number of options. Adults of all ages benefit from smaller choice sets, which have been associated with better decisions and higher post-choice satisfaction (Besedeš et al. 2012; Botti and Iyengar 2006; Hanoch et al. 2011; Tanius et al. 2009). A 'tournament' strategy for introducing sub-sets of options may also improve older adults' decisions (Besedeš et al. 2015). Thus various intervention strategies may be useful for confronting low motivation among decision makers.

Interventions targeting experience-based knowledge. A review of the literature suggests that deliberate practice from an early age is needed to build expertise (Ericsson et al. 2007). For instance, decision-making competence has successfully been included in the high-school curriculum. High-school students who are randomly assigned to history classes that discuss the potential decision errors of historical figures improve their decision-making competence, as compared to controls taking standard history classes (Jacobson et al. 2012). Youth development accounts, practical financial interventions, and financial education bring promise for promoting better financial decisions (Lusardi and Mitchell 2014, Shobe and Sturm 2007). Teaching simple rules may be more effective than teaching complex rules which can create cognitive overload and choice avoidance. Indeed, people who apply simple rules to retirement planning tend to save as much as those who engage in complex planning, and more than those who have no plan (Binswanger and Carman 2012). Teaching financial rules-of-thumb is even more effective than standard accounting training for teaching small entrepreneurs (Drexler et al. 2014).

It has been proposed that older adults may benefit from interventions that help them to rely on their experience-based knowledge (Park et al. 2007). Correlational evidence does indeed

suggest that, by relying on knowledge acquired with age, older adults may be able to counteract age-related declines in their ability to deliberate (Agarwal et al. 2009, Li et al. 2013, 2015).

Interventions targeting emotions. There is also evidence that individuals who receive short-term boosts to their mood use more efficient decision strategies (Isen and Means 1983). Positive mood inductions may increase the flexibility and effort with which decision makers complete interesting tasks (for a review, see Carpenter et al., 2013). Although negative mood inductions increase efforts devoted to less interesting tasks (Forgas 2013), invoking rumination about negative mood may actually undermine people's ability to execute academic tasks (Lyubomirsky et al. 2003). Age differences in responses to mood inductions have not yet been studied, but positive-mood inductions have been found to lead older adults age 63-85 to increase cognitive deliberation and performance on choices between risky prospects (Carpenter et al. 2013).

Longer-term emotion-focused interventions may also be possible. Cognitive behavioral therapy, physical exercise, and social activities may distract depressed individuals from disruptive rumination, and thus they could improve their performance on cognitive tasks (for a review, see Nolen-Hoeksema et al. 2008). Although few studies have examined effects of emotion-focused interventions on decision making in non-clinical populations, there is initial evidence with student samples that the encouragement of positive action-focused coping skills can help to overcome dysfunctional decision avoidance (van Putten et al. 2009). As noted above, correlational evidence has suggested that better emotion regulation in terms of coping with irrecoverable losses helps decision makers overcome the sunk-cost bias (Bruine de Bruin et al. 2014b). Thus, promoting positive mood among older adults may potentially improve their decision-making competence.

Interventions targeting selective motivation. Interventions may be ineffective if people lack the motivation to put in the effort. Providing financial incentives for better performance improves

intelligence test performance among young people (Duckworth et al. 2011). Yet a meta-analysis conducted across multiple studies has suggested that financial incentives can also undermine intrinsic motivation to engage with the task (Deci et al. 1999). To date, there have been no studies of age differences in responsiveness to financial incentives, in the context of improving decisions.

To motivate older adults to put effort into their decisions, information should be made more personally relevant. As noted, older adults will work harder on task they perceive as personally relevant (Hess et al. 2013) Adding the personal narratives of others may compel people of all ages to engage with presented information, though it may distract from decision-relevant statistical facts (for reviews, see Bekker et al. 2013; Winterbottom et al. 2008). Especially low-numerate individuals pay more attention to concrete narratives than to abstract statistics (Dieckmann et al. 2009).

The instructions provided as part of a decision aid can also influence people's motivation to complete specific goals. Younger adults are more likely to implement an action if they have been asked to imagine when and how they would perform it (Gollwitzer and Sheeran 2006). Older adults also benefit from such goal-focused instructions, for example for remembering glucose monitoring (Liu and Park 2004). Older adults may further be motivated by instructions that encourage emotional rather than cognitive processing when making their decisions, perhaps because it motivates them to focus on their strengths rather than their weaknesses (Mikels et al. 2010). Older adults may also perform better when they are instructed to give reasons for their choices (Kim et al. 2005).

If motivation is especially low, this could provide a rationale to delegate decisions to others. Although older adults value their autonomy as decision makers (Delaney et al. 2015), they are more likely than younger adults to seek financial advisors (Milner and Rosenstreich 2013).

Advice may also be sought from friends and family members (Loibl and Hira 2006), which may especially be favored by older adults as they increasingly value select close relationships (Fung et al. 1999). Additionally, people of all ages who feel unmotivated to make a specific decision may welcome 'nudge' interventions that promote a recommended default (Johnson and Goldstein 2003). A well-known example of default setting pertains to auto-enrolment retirement savings plans (Thaler and Bernartzi 2004). Yet not everyone will welcome the liberal paternalism of 'nudge' interventions.

Limitations and Next Steps

A main limitation of emerging research on age differences in decision-making competence is that studies to date have mainly been conducted on cross-sectional rather than on longitudinal samples. This leaves the possibility open that differences between age groups reflect generational effects and not aging (e.g., Schaie 1965). Indeed, it is possible that current generations will prefer more autonomy and choice than previous generations as they age. Fortunately, measures of decision-making competence are increasingly being added to longitudinal studies and national life span samples (for example, see Del Missier et al. 2013). Such studies are also needed to better understand how age-related developments in fluid and crystallized cognitive abilities, motivation, and emotions interact to support the quality of people's decisions across the life-span.

Another limitation is that decision-making competence has mostly been measured with hypothetical decision tasks. And while performance on hypothetical decision-making tasks has slowly been linked with better real-world decision outcomes (Bruine de Bruin et al. 2007), it is important to expand measurement to include real-world decisions. Additionally, a better understanding is needed of the skills that support decision-making competence in older age, as

well as their interactions. Age-related cognitive declines are well-documented, through a battery of validated measures of fluid cognitive ability, working memory, and executive functioning. By comparison, understanding and measurement are less developed for the skills that may potentially improve with age to benefit older adults' decisions. The measures currently used to assess decision-relevant experience, emotions, and motivation are mostly based on self-reports rather than actual performance (for a review, see Appelt et al. 2011). Because self-perceptions change with age, self-reported performance may show age differences that do not translate into actual performance (Bruine de Bruin et al. 2012).

A key next step is to develop and test interventions for improving decisions across the life span. High priority foci would address age-related changes in cognitive deliberation, experience, emotions, and motivation. Interventions should focus on the needs of specific audiences, and they must also be tested for effectiveness before they are disseminated (for a review, see Bruine de Bruin and Bostrom 2013). Ultimately, research on age differences in decision-making competence will help people of all ages make better decisions, thus producing better life outcomes and overall well-being.

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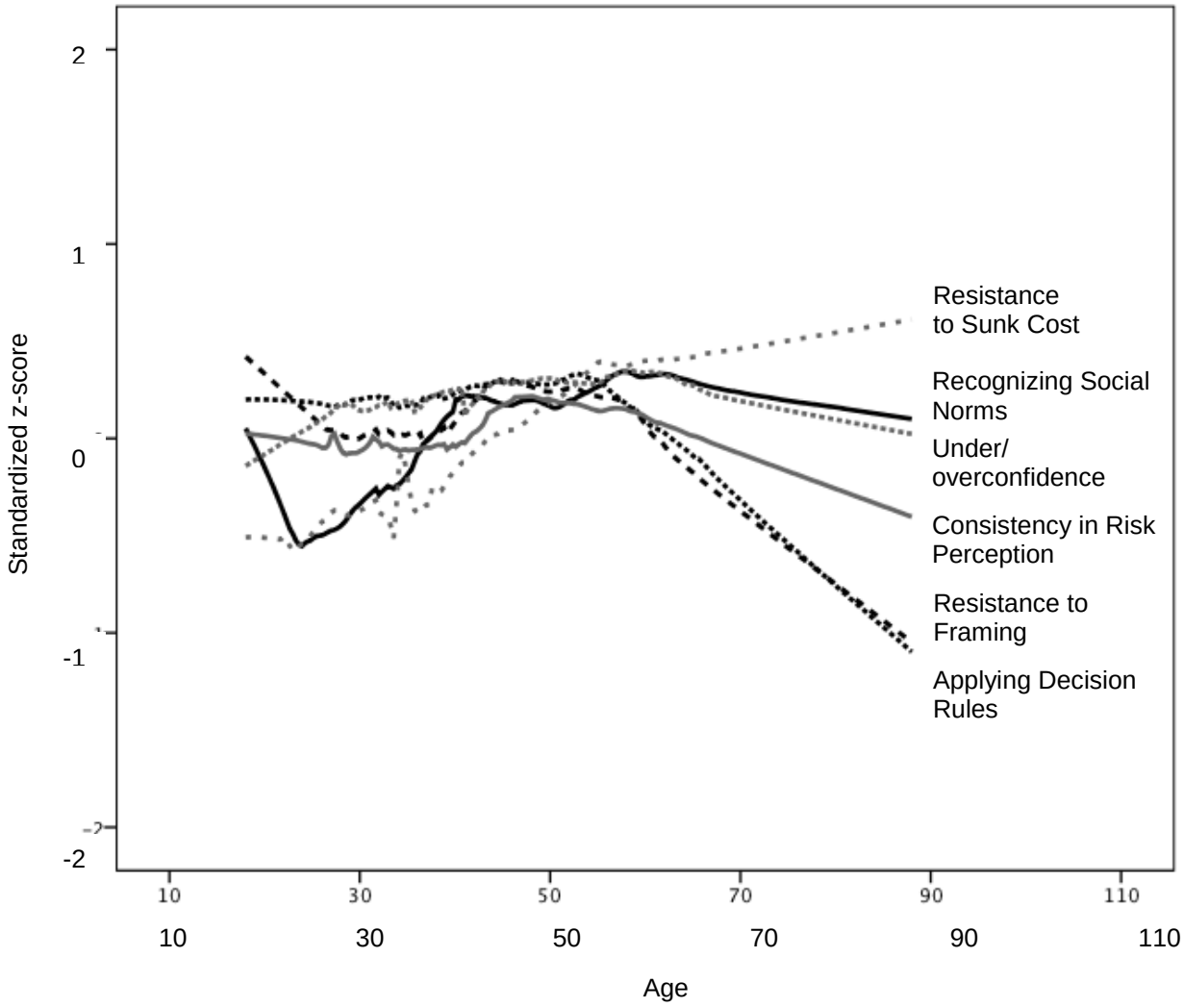

Figure 2.1. Age differences in judgment and decision tasks

Note: Age-spectrum trends in performance on judgment and decision tasks, LOESS fit-line estimation. Resistance to Sunk Costs refers to willingness to discontinue failing commitments with irrecoverable losses; Recognizing Social Norms refers to accurately judging the percent of peers approving socially undesirable behaviors (e.g., stealing) as compared to actual peer endorsements; Under/Overconfidence refers to expressing confidence in true/false statements of general knowledge that correspond to knowledge scores across statements; Consistency in Risk Perception refers to judging probabilities for specific events (e.g., surviving or dying in terrorist attack) while adhering to the rules of probability theory; Resistance to Framing refers to making consistent choices between options independent of whether they are negatively or positively described; Applying Decision Rules refers to accurately applying decision rules to choose between presented products (e.g., choose option with highest average product rating across features)

Source: Strough et al. (2015).

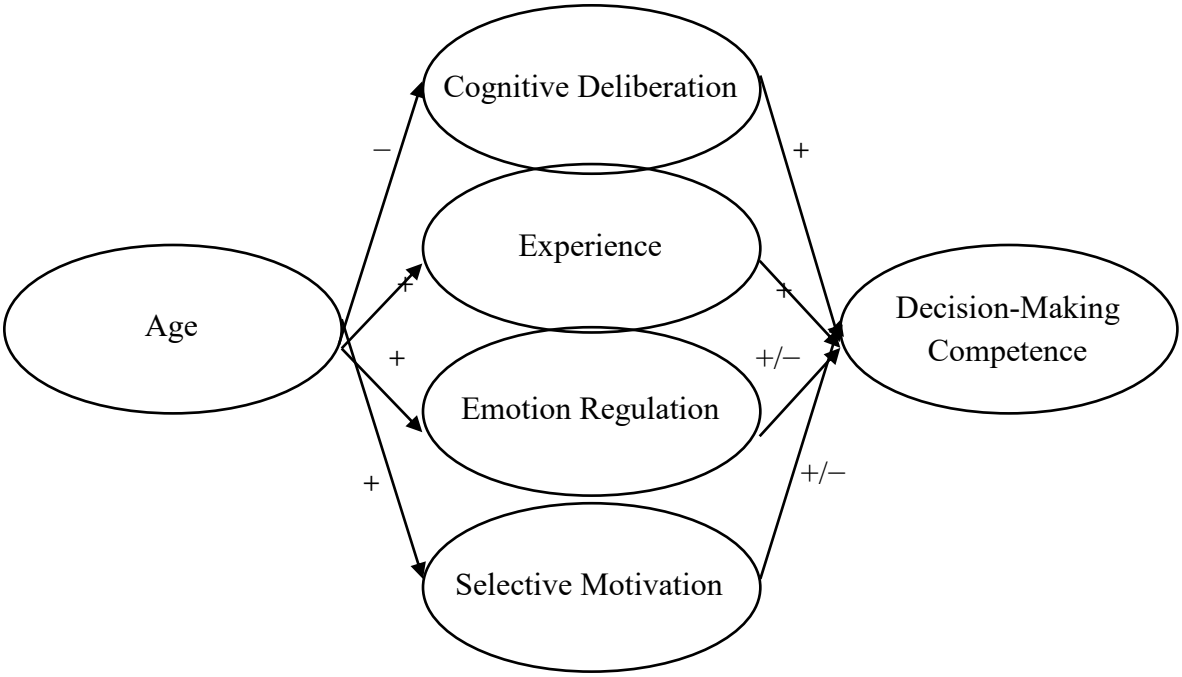

Figure 2.2. Overview of skills relevant to understanding age differences in decision-making competence

Note: + reflects positive relationship; − reflects negative relationship; +/− reflects mixed findings.

Source: Author's elaboration.

Table 2.1. Applying decision rules: An experimental presentation.

		Features of the DUD				
		Picture Quality	Sound Quality	Programming Options	Reliability of Brand	Price
DVD	A	3	1	5	2	$369
	B	1	2	1	2	$369
	C	5	4	3	1	$369
	D	4	2	3	3	$369
	E	4	4	2	4	$369

Lisa wants the DVD player with the highest average rating across features. Which **one** of the presented DVD players would Lisa prefer? _____

Source: Bruine de Bruin et al. (2007).

Table 2.2. Resistance to sunk costs: An experimental presentation.

You are buying a gold ring on layaway for someone special. It costs $200 and you have already paid $100 on it, so you owe another $100. One day, you see in the paper that a new jewelry store is selling the same ring for only $90 as a special sale, and you can pay for it using layaway. The new store is across the street from the old one. If you decide to get the ring from the new store, you will not be able to get your money back from the old store, but you would save $10 overall.

Would you be more likely to continue paying at the old store or buy from the new store?

1 2 3 4 5 6

Most likely to continue paying at the old store Most likely to buy from the new store

Source: Bruine de Bruin et al. (2007).

Table 2.3. Credit card repayment decision: An experimental presentation.

Imagine you have two credit card accounts: a MasterCard account with a £100 balance and a 10% annual percentage rate (APR) and a Visa account with a £1,000 balance and a 15% APR. You just received a $1,000 government stimulus rebate and you decided to use the entire rebate to repay debt.

Please indicate how much you would repay:

___ on the Mastercard account

___ on the Visa account

Source: Li et al. (2013).

Table 2.4. Numeracy: An experimental presentation.

In the BIG BUCKS LOTTERY, the chances of winning a £10.00 prize are 1%. What is your best guess about how many people would win a £10.00 prize if 1000 people each buy a single ticket from BIG BUCKS? _____

Source: Schwartz et al. (1997).