Aging and Decision-Making Competence

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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

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Around the world, people are living longer (Kinsella and Phillips 2005). People of all ages face important decisions that affect their life outcomes and overall well-being. Older age and retirement may bring more complicated life decisions (Hershey et al. 2015), with fewer opportunities to recover from any bad decisions (Jin et al. 2011). Yet, young adults face many important life decisions for the first time, and may suffer the consequences of any bad decisions for the rest of their lives (Reyna and Farley 2006). Meanwhile, policies in health and financial domains are increasingly giving people of all ages more personal responsibility for their decisions, while increasing choice options and complexities (Schwartz 2004). Thus, good decision-making competence should be beneficial across the life span.

This paper expands on previous reviews of research on decision-making competence across the life span, which I have written with various colleagues (Bruine de Bruin, forthcoming; Bruine de Bruin et al. 2014a; Peters and Bruine de Bruin 2012; Strough et al. 2015). The first section discusses the measurement of decision-making competence, and its grounding in behavioral decision research. The second section reviews the skills that are relevant to decision-making competence, and how they change with age. The third section discusses potential interventions for improving decision-making competence across the life span.

**Measuring decision-making competence**

Measures of decision-making competence have been developed in the field of behavioral decision research, which combines insights from economics and psychology. Traditionally, the main focus of behavioral decision researchers had been to understand when and why people’s decisions violate assumptions of normative decision theories, which were grounded in expected utility theory (Edwards 1954; Keren and Bruine de Bruin 2003). To
this end, research participants were provided with hypothetical decision scenarios, which were carefully crafted to understand the limits of people’s decision-making competence.

Hypothetical decision tasks have been developed to measure people’s ability to follow the various normative rules for making good decisions. Normative rules pertain to the evaluation of options, the judgment of subjective probabilities, the application of decision rules, and the recognition of the limitations of one’s knowledge (Bruine de Bruin et al. 2007). For example, there are hypothetical decision tasks that consider how people evaluate options. According to normative theories of decision making, people should evaluate options solely on the basis of their expectations for future costs and benefits (Edwards 1954). However, studies of hypothetical decision tasks and of actual decisions have suggested that many people willingly remain committed to options with inferior future prospects, due to psychological concerns about previously incurred losses or ‘sunk costs’ (Arkes and Blumer 1985).

One potential drawback of assessing decision-making competence through hypothetical decision tasks is that the link to actual decisions can remain unclear. Yet, there is increasing evidence of performance on hypothetical decision tasks being correlated with underlying cognitive skills, such as working memory, executive functions, fluid cognition, cognitive reflection, working memory, executive functions, as well as numeracy or number ability (e.g., Bruine de Bruin et al. 2007; Finucane et al. 2002, 2005; Finucane and Gullion 2010; Del Missier et al. 2010, 2012, 2013, forthcoming; Peters et al. 2006; Stanovich and West 2008; Parker and Fischhoff 2005; Toplak et al. 2011).

Perhaps more importantly, two U.S.-based validation studies have suggested that performance on hypothetical decision tasks is associated with real-world decision outcomes, even after taking into account cognitive abilities. The first study showed that young people who performed better on hypothetical decision tasks were less likely to report behaviors
suggestive of poor decisions, such as juvenile delinquency and drug use (Parker and Fischhoff 2005). In a second study, adults’ performance on hypothetical tasks was associated with avoiding a range of negative life decision outcomes, such as bankruptcy or arrests for drunk driving (Bruine de Bruin et al. 2007; Parker et al. 2015). Because these relationships held after taking into account cognitive abilities, socio-economic status and other individual characteristics, it was concluded that hypothetical decision tasks likely do capture competencies that are relevant to real-world decision-making competence. Since then, our measure of decision-making competence has been used in countries beyond the U.S. to assess decision-making competence, including Sweden (Del Missier et al. 2013, forthcoming), Italy (Del Missier et al. 2010; 2012), and Slovakia (Bavolar 2013). In the next section, I review studies of age differences in these (and other) studies of decision-making competence.

**Age differences in decision-making competence**

Traditionally, hypothetical decision tasks were provided mostly to college students, thus preventing the opportunity to discover age differences in decision-making competence (Peters and Bruine de Bruin 2012). Because the main focus had been on understanding when and why people violate normative standards for decision making, individual differences had been largely ignored. However, recent developments towards validating individual-differences measures of decision-making competence (e.g., Bruine de Bruin et al. 2007; Finucane et al. 2005; Parker and Fischhoff 2005) have spurred research on aging.

Initial studies of adult age differences in decision-making competence reported mixed findings, perhaps because of their focus on different specific decision tasks (Bruine de Bruin, et al. 2012). Some decision tasks rely more on skills that improve with age, while others rely on skills that show age-related improvements or no change. Below, I review age-related changes in specific skill sets that have been deemed relevant to effective decision making, including cognitive deliberation, experience, emotions, and motivation.
Cognitive deliberation and decision making

Making decisions involves careful deliberation about the available options, and selecting the one that is most likely to produce desired outcomes (Keren and Bruine de Bruin 2003; Edwards 1954). Such deliberation requires fluid cognitive abilities, such as processing speed, working memory, executive functions (Salthouse 2004), and numeracy (Peters et al. 2006). People with better fluid cognitive abilities tend to perform better on cognitively demanding decision tasks, such as when applying decision rules to choose from a set of consumer products that vary along different attributes (Bruine de Bruin et al. 2007; Del Missier et al. 2012; Li et al. 2013; Stanovich and West 2008).

Age differences in cognitive deliberation

Age-related declines in fluid cognitive abilities are well-documented, and emerge after people reach their 20s (Park et al. 2002, 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; Li et al. 2013, Peters and Bruine de Bruin 2012). Older adults make more mistakes in the application of decision rules to consumer choices (Bruine de Bruin et al. 2012; Del Missier et al. 2013), especially when faced with a relatively large number of options (Besedeš et al. 2012). Older adults are also less likely to follow expected value calculations when choosing between risky prospects (Weller et al. 2011).

However, it should be noted that cognitive deliberation may not be relevant to all decisions. Performance on some decision tasks relies little on decision makers’ cognitive ability (Bruine de Bruin et al. 2012; Stanovich and West 2008). It has even been argued that cognitive deliberation may be harmful to some decisions (Wilson and Schooler, 1991). For example, students who are asked to deliberate while choosing dorm room posters are less
satisfied with their choices two weeks later, as compared to controls who were not asked to deliberate (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-based knowledge and decision making**

With increased experience and deliberate practice, people may develop expertise in a particular domain (Ericsson et al. 2007). Such domain-specific knowledge is also referred to as crystallized cognitive ability (Salthouse 2004). Experience and deliberate practice likely contributes to the quality of decisions. For example, correlational evidence shows that students who have taken economics classes are less likely to violate cost-benefit rules when making decisions (Larrick et al. 1993). Moreover, a high-school history curriculum augmented with a discussion of strategies for overcoming the potential decision problems of historical figures increased students’ performance on hypothetical decision tasks (Jacobson et al. 2012).

Once people have learned how to make specific decisions, they may need to rely less on cognitive deliberation when faced with those decisions. Experienced decision makers are described as making quick decisions on the basis of their acquired knowledge and intuitions (Strough et al. 2011, Reyna 2004). Indeed, financial experts spend less time and effort on their financial decisions, as compared to non-experts (Hershey et al. 1990).

**Age differences in experience-based knowledge**

Experience-based knowledge or crystallized cognitive ability accumulates increases with age (Park et al. 2002; Salthouse 2004). It has also been argued that older adults’ accumulated life experience may explain why they perform better on judgments and decisions in social contexts (Hess 2005). Older adults’ ability to rely on past experience may also reduce their reliance on cognitive deliberation and therefore help them to adapt to age-
related cognitive decline (Mata et al. 2007). Age-related improvements in crystallized cognitive abilities have been associated with good performance on financial decisions, and may counteract age-related decline in fluid cognitive abilities (Li et al. 2013, 2015). As a result, it has been argued that peak performance for financial decision making occurs when people are in their 50s (Agarwal et al. 2009).

Older adults are also better able than younger adults to discontinue commitments to failing plans, even in the face of irrecoverable prior losses or ‘sunk costs’ (Bruine de Bruin et al. 2014b; Strough et al. 2008). In part, older adults’ ability to avoid this ‘sunk cost bias’ may be due to age-related changes in semantic memory -- which may store knowledge about the normative sunk-cost rule (Del Missier et al. 2013). Additionally, as noted below, older adults may also have acquired better emotion regulation, which can help them to overcome concerns about irrecoverable losses (Bruine de Bruin et al. 2014).

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, which occurs in weather forecasting but is rare in most other domains (Keren 1991). Repeated exposure to misinformation can even increase 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.

**Emotions and decision making**

People’s judgments and decisions are influenced by their emotions, which often emerge before cognitive deliberation has even been 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 (Slovic et al. 2002). Incidental emotions influence decisions despite being unrelated to the task at hand, such as when investors’ positive emotional responses to the weather lead to more optimistic trading
decisions (Hirshleifer and Shumway 2003). Although emotions were originally seen as
distracting people from cognitive deliberation and threatening the quality of their decisions, it
has recently been posited that emotions can also improve the quality of decisions, by focusing
attention and improving information processing (Peters 2006).

**Age differences in emotions**

As people age, they develop a deeper understanding of emotion states (Labouvie-Vief
et al. 1989). Older adults also have better emotion regulation in the face of adversity,
showing a focus 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 sixties, and older people generally report experiencing more positive
than negative emotions (Carstensen, et al. 2000; Charles et al. 2001).

Older adults’ better emotion regulation may benefit decisions. Indeed, it may help
older adults to be less concerned about irrelevant ‘sunk costs’ as compared to younger adults
(Bruine de Bruin et al. 2014). As explained below, older adults also regulate their mood by
paying more attention to positive-emotional information than to negative-emotional
information (Carstensen and Mikels 2005; Mather and Carstensen 2005). Such a selective
focus on positive information may have detrimental or beneficial effects, depending on its
relevance to the decision at hand.

**Motivation and decision making**

Performance on intelligence tests and complex numerical tasks is partly influenced by
motivation (Duckworth et al. 2011). Indeed, cognitively demanding computational tasks can
be frustrating (Fagerlin et al. 2007), with performance being better among younger
individuals, who seem to be more motivated to think hard about difficult problems (Bruine de
Bruin et al. 2015). Such ‘need for cognition’ (Cacioppo and Petty 1982) may also help
decision makers to be unaffected by how decisions are framed (Smith and Levin 1996,
though see Levin et al. 2002). Indeed, decision makers respond differently to medical treatments that are described as “95% effective” than “5% ineffective (Levin et al. 1988), perhaps because they assume that these descriptions reflect genuine recommendations (McKenzie 2004).

When making choices, not all decision makers will be motivated to systematically compare all the available options and identify the very best (Schwartz et al. 2002). Instead of ‘maximizing’ they may prefer ‘satisficing,’ by selecting an option that is ‘good enough’ on key attributes (Simon 1956). Although maximizing should typically lead to better decision outcomes, satisficing may actually turn out better 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 put them at risk for regret, dissatisfaction, and clinical depression (Bruine de Bruin et al., forthcominga; Iyengar et al. 2006; Schwartz et al. 2002). Hence, decision makers who are less motivated to spend effort do not necessarily experience worse outcomes.

Age differences in motivation

As people get older, they may experience cognitively complex tasks as increasingly demanding, as seen in relative increases in systolic blood pressure (Ennis et al. 2013; Hess and Ennis 2012). Perhaps to reduce cognitive effort, older adults choose less effortful decision strategies, by for example ‘satisficing’ rather than ‘maximizing’ (Bruine de Bruin et al. forthcomingb). Additionally, older age is associated with considering less information and comparing fewer options (Chen and Sun 2003; Johnson 1990). However, older adults do invest more effort when they are explicitly asked to do so (Kim et al. 2005) and when tasks are more relevant (Hess et al. 2013).

While younger adults are still in the mind set of exploring different experiences, older adults become more motivated to optimize positive-affective experiences in the limited time
they have left to live (Carstensen 1995). These changing goals have been associated with older adults’ increased attention for positive than for negative information (Carstensen and Mikels 2005; Mather and Carstensen 2005). Perhaps as a result, older adults are less likely than younger adults to remember negative information, but remember positive information just as well (Mikels et al. 2005). Older adults’ better memory for positive information also increases their feelings of choice satisfaction (Kim et al. 2008). Of course, a selective focus on positive information may not always be beneficial for every decision task (Carstensen and Mikels 2005; Mather and Carstensen 2005).

Suggestions for interventions

If people experience difficulties in making their decisions, interventions may be needed. 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 make initial suggestions for potential interventions, which of course 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 (Park et al. 2007). Cognitive skills training for older adults tend to focus on teaching strategies for counteracting age-related decline 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).

However, it has been posited that older adults may find deliberate cognitive training aversive (Mata et al. 2007). Perhaps due to concerns about age-related cognitive declines, older adults do not feel confident about their performance on cognitively demanding decision
tasks (Bruine de Bruin et al. 2012). Older adults 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). Older adults also have a tendency to rely on written notes to aid their consumer decisions (Cole and Balasubramanian 1993; Morrow 2003). Web-based decision aids also bring promise for supporting older adults’ decisions, as long as they are easy to use (Morrow 2003). Adults of all ages may benefit from icon arrays that visually display risk information, showing icons for individuals with negative outcomes as part of a larger set of icons representing the overall at-risk population (Galesic et al. 2009). However, 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 presented 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. forthcoming). Thus, various intervention strategies may be useful for confronting low motivation among decision makers.
Interventions targeting experience-based knowledge

Deliberate practice from an early age can provide people with the experience-based knowledge needed to make decisions in specific domains (Ericsson et al. 2007). As noted, decision-making competence has successfully been included in the high-school curriculum (Jacobson et al. 2012). Youth development accounts, practical financial interventions, and financial education bring promise for promoting better financial decisions (Lusardi 2003, Shobe and Sturm 2007). Teaching simple rules may be more effective than teaching complex rules, which can create cognitive overload and choice avoidance (Schwartz 2004). 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 especially 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 that is acquired with age, older adults may be able to counteract age-related declines in the ability to cognitively deliberate (Agarwal et al. 2009, Li et al. 2013, 2015).

Interventions targeting emotions

Individuals who have received 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 (Carpenter et al., 2009). Although negative mood inductions increase efforts into 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 aged 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 improve their performance on cognitive tasks (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 to overcome the sunk-cost bias (Bruine de Bruin et al. 2014). Thus, promoting positive mood among older adults may potentially improve their decision-making competence.

**Interventions targeting motivation**

Interventions may not be effective if people lack the motivation to put in the effort. Providing financial incentives for better academic test performance motivates better academic test performance among young people (Duckworth et al. 2011). However, it has been suggested that financial incentives can 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, it has been suggested that information be made personally relevant (Strough et al. 2015). Adding the personal narratives of others may actually compel people of all ages to engage with presented information, though it may distract from decision-relevant statistical facts (Bekker et al. 2015).

The instructions provided as part of a decision aid can also influence 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). Instructions to form goal intentions are especially promising for helping older adults with their decisions, because they require little cognitive deliberation but rather increase the automatic responding to relevant environmental cues (Park et al. 2007).

Older adults may also 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, it might be an option to delegate decisions to others (Finucane et al. 2005; Mather 2006; Yates and Patalano 1999). 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).

People of all ages who feel unmotivated to make a specific decision may also welcome like ‘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 2012). However, not everyone will welcome
the liberal paternalism of ‘nudge’ interventions (Thaler and Sunstein 2003).

**Limitations and next steps**

A recent edited book on aging and decision making has highlighted increased
attention for this topic (see Hess et al. 2015). Yet, a main limitation is that most studies to
date have been conducted on cross-sectional rather than on longitudinal samples, leaving the
possibility that any differences between age groups reflect mere generational effects (e.g.,
Schaie 1965). Indeed, it is possible that, as they age, current generations will prefer more
autonomy and choice than previous generations. 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. Although performance on hypothetical decision-making
tasks has been linked with better real-world decision outcomes (Bruine de Bruin et al. 2007;
Weller, Moholy, and Levin 2015), it is important to expand measurement to real-world
decisions. Additionally, a better understanding is needed of the skills that support decision-
making competence in older age, as well as their interaction. Age-related cognitive declines
are well-documented, through a battery of validated measures of fluid cognitive ability,
working memory, and executive functioning (Salthouse 2004). By comparison,
understanding and measurement is less developed for the skills that may potentially improve
with age to benefit older adults’ decisions. The measures that are currently being used to
assess decision-relevant experience, emotions, and motivation are mostly based on self-
reports rather than actual performance (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).

Perhaps the most important next step is to develop and test interventions for improving decisions across the life span. Here, I made initial suggestions for addressing age-related changes in cognitive deliberation, experience, emotions, and motivation. Of course, these suggestions should focus on the needs of specific audiences, and be tested for effectiveness before they are disseminated (Bruine de Bruin and Bostrom 2013). Ultimately, research on age differences in decision-making competence should help people of all ages to make better decisions, thus obtaining better life outcomes and overall well-being.
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