Moral Judgment in Old Age: Evidence for an Intent-to-Outcome Shift

Francesco Margoni*

Janet Geipel*

Constantinos Hadjichristidis

Luca Surian

Author Note

Francesco Margoni and Luca Surian, Department of Psychology and Cognitive Sciences, University of Trento. Janet Geipel, Department of Psychology, The University of Chicago. Constantinos Hadjichristidis, Department of Economics and Management, University of Trento, and Centre for Decision Research, Leeds University Business School, University of Leeds.

Correspondence concerning this article should be addressed to Janet Geipel, Department of Psychology, The University of Chicago, E-mail: jgeipel@uchicago.edu, or to Francesco Margoni, University of Trento, Department of Psychology and Cognitive Sciences, E-mail: francesco.margoni@unitn.it

*These authors contributed equally.

Abstract

Younger (21–39 years) and older (63–90 years) adults were presented with scenarios illustrating either harmful or helpful actions. Each scenario provided information about the agent's intention, either neutral or valenced (harmful/helpful), and the outcome of his or her action, either neutral or valenced. Participants were asked to rate how morally good or bad the agent's action was. In judging harmful actions, older participants relied less on intentions and more on outcomes compared to younger participants. This age-related difference was associated with a decline in older adults' theory of mind abilities. However, we did not find evidence of any significant age-related difference in the evaluations of helpful actions. We argue that the selective association of aging with changes in the evaluation of harmful but not helpful actions may be due also to motivational factors and highlight some implications of the present findings for judicial systems.

Keywords: morality, mental state, intention, deliberation, theory of mind

Moral Judgment in Old Age: Evidence for an Intent-to-Outcome Shift

Despite the theoretical and applied significance of understanding how old adults make ethical evaluations, the issue of whether and how moral judgment changes with aging remains relatively unexplored. Here we examined whether a central aspect of younger adults' moral judgment, that it predominantly relies on intentions, is preserved in old adulthood.

Moral judgment involves the consideration of mental state information such as an agent's intentions, beliefs, and desires (for a review see Young & Tsoi, 2013). For example, people typically judge *intentionally* harmful acts (e.g., willfully poisoning someone) as morally worse than *accidentally* harmful acts (e.g., unintentionally poisoning someone). This *intent-based moral judgment* develops between the ages of 5 and 6 (Cushman, Sheketoff, Wharton, & Carey, 2013; Killen, Mulvey, Richardson, Jampol, & Woodward, 2011; Margoni & Surian, 2017). Prior to that age, moral judgment elicited through verbal descriptions is predominantly outcome-based, although some sensitivity to intentions in evaluative tasks has been found in young children (Nobes, Panagiotaki, & Bartholomew, 2016; Yuill, 1984; Yuill & Perner, 1988) and even infants (Hamlin, 2013; Woo, Steckler, Le, & Hamlin, 2017). This *outcome-to-intent shift* is a well-known phenomenon in the developmental literature and it is currently debated whether it is best accounted by a conceptual change (Cushman et al., 2013) or by an improvement in theory of mind abilities and executive functions (Margoni & Surian, 2016a).

A direct implication of the latter view is that age differences in intent-based moral judgment may be observed not only in childhood, but also in old age. Since aging is associated with a decline in cognitive abilities, such as theory of mind skills, processing speed, working memory and other executive functions (for reviews see Henry, Phillips, Ruffman, & Bailey, 2013; Reuter-Lorenz & Sylvester, 2005), assuming that intent-based moral judgment is more

cognitively demanding than outcome-based judgment, we predicted that (a) older adults would make less intent-based moral judgments than younger adults, and (b) this difference would be associated with older adults' diminished theory of mind and executive functioning abilities.

Indirect support for (a) comes from studies focusing on older adults' moral judgment and reasoning. First, a longitudinal study showed that while moral reasoning skills generally improve through the lifespan—in terms of Kohlberg's (1969) stages of moral development—they diminish in old adulthood (Armon & Dawson, 1997). Second, studies reported that older adults are less able to take others' perspectives into account during social and moral tasks and to engage in role taking (Chap, 1986; Chen & Blanchard-Fields, 2000; Ligneaur-Herve & Mullet, 2005; Pratt, Diessner, Hunsberger, Pancer, & Savoy, 1991; Pratt, Diessner, Pratt, Hunsberger, & Pancer, 1996). These findings suggest that older adults may encounter difficulties in integrating mental state information in their moral judgments. Third, older and younger adults show a similar increased recall for morally charged information relative to non-moral information, but older adults show a facilitation in drawing moral inferences about the agents' character (e.g. inferring that 'Sam is caring' from 'The daughter falls, Sam picks her up and rocks her'; Narvaez, Radvansky, Lynchard, & Copeland, 2011). If older adults tend to automatically infer an agent's moral character from his or her actions, then they may focus less on an agent's intentions.

At present, only Moran, Jolly, and Mitchell (2012) directly investigated whether older adults are less likely than younger adults to make an intent-based moral judgment. Older and younger adults were asked to judge the moral permissibility of a series of harmful actions. Moral scenarios contained information about an agent's intention (neutral vs. harmful) along with the action's outcome (neutral vs. harmful). Participants performed the moral judgment task inside an

MRI scanner and under time pressure. Unlike younger participants, older adults relied less on intentions than on outcomes in their moral evaluations. Using functional magnetic resonance imaging (fMRI), the authors additionally found that this effect was associated with age-related impairments in the dorsal sub-region of the medial-prefrontal cortex (MPFC), a brain region that has been related to mental state reasoning. Moran et al. (2012) thus proposed that aging differences in moral judgment are related to theory of mind impairments but also discussed the possibility that they may also be related to a more general cognitive decline.

The main aims of the present study were (1) to consolidate the behavioural findings of Moran et al. (2012), (2) to elucidate the mechanisms underpinning the age-related differences in moral judgment, and (3) to assess the pervasiveness of the intent-to-outcome shift in the old age. With regard to the first aim, we note that the age-related differences found by Moran et al. (2012) may be entirely due to the time constraints imposed in that study. Since older adults show a decline in information processing speed (Salthouse, 2004), the time constraints may have promoted shallow processing, which has been shown to favour outcome-based moral judgment (Buon, Jacob, Loissel, & Dupoux, 2013). Here we did not impose time constraints and tested participants in a more naturalistic context (outside an MRI scanner). With regard to the second aim, we included tasks assessing theory of mind, processing speed (as an indicator of general cognitive ability), and executive functions. We also measured empathic concern because it has been shown to influence moral judgment (Gleichgerrcht & Young, 2013; Patil, Calò, Fornasier, Cushman, & Silani, 2017; Patil & Silani, 2014) and to increase with age (e.g., Sze, Gyurak, Goodkind, & Levenson, 2012).

With regard to the third aim, along with harm scenarios we examined help scenarios. A straightforward extension of Moran et al. (2012) is that older adults' moral judgment would

exhibit a reduced reliance on intentions also for help scenarios. However, there are theoretical grounds to expect that age-related differences may be more prominent in harm than in help scenarios. Specifically, older adults, as opposed to younger adults, are less motivated to focus on negative information (Charles, Mather, & Carstensen, 2003; but see Vicaria & Isaacowitz, 2016), and less likely to exert effort on unpleasant tasks (Bruine de Bruin, McNair, Taylor, Summers, & Strough, 2015). If older adults perceive the evaluation of harm scenarios as an unpleasant task, they might process them in a shallow manner (Buon et al., 2013). Hence, an age-related decrease in intent-based judgment may be more prominent in harm than in help scenarios.

Methods

Participants

The sample size was determined by an a-priori power analysis using *G*Power* (Faul, Erdfelder, Lang, & Buchner, 2007) for a mixed-factor analysis of variance testing the interaction between the within subject variable and the between subject variable. To detect a small to medium effect size (f = .20, based on Moran et al., 2012) with alpha set at .05, a power of .95, number of groups = 2, number of measurements = 4, correlation among measurements = .4 (estimated), and a nonsphericity correction e = 1.0, a minimum sample size of 56 participants was required. No interim or stopping rules were applied.

We recruited 60 participants: 30 younger adults (20 females, M_{age} = 29.4 years, SD_{age} = 5.0, age range: 21–39 years), and 30 older adults (24 females, M_{age} = 77.5 years, SD_{age} = 10.3, age range: 63–90 years). The younger participants were recruited through flyers posted at the campus of the University of Trento, while the older participants through a local cultural association for old people. All participants took part in the study on a voluntary basis. On average participants indicated that they had 11.7 years of school education (older participants, M = 8.80 years, SD = 3.50, CI [7.49, 10.11]; younger participants, M = 14.63 years, SD = 2.54, CI

[13.69, 15.58]). The difference in education between the age groups was significant, $t(58) = 7.39$, $p < .001$, $d = 1.91$, but did not influence intent-based moral judgment (see Supplementary Material 1 for detailed analyses). Therefore, we did not include this factor in the analyses below. The local University Ethics Committee approved the research protocol of the present study.

Materials and Procedure

The experiment was conducted in a single session that lasted about 60 minutes. Participants were asked to complete a moral judgment task and then a battery of tasks measuring individual differences. The study protocol was pre-registered (https://aspredicted.org/tkdja.pdf).

Moral judgment task. We used a set of eight scenarios (adapted from Young, Scholz, & Saxe, 2011; see Supplementary Material 2 for the complete battery), four involved potentially harmful actions (harm scenarios) and the other four potentially helpful actions (help scenarios). For each scenario, we constructed four versions by varying orthogonally the agent's intention (neutral or valenced) and the action's outcome (neutral or valenced): a neutral-intention/neutral-outcome, neutral-intention/valenced-outcome, valenced-intention/neutral-outcome, and valenced-intention/valenced-outcome version. Notice that for harm scenarios 'valenced' signifies 'harmful', whereas for help scenarios it signifies 'helpful'. Notice also that for each scenario, agents produced either a valenced or a neutral outcome, and *believed* they were causing a valenced (negative in harm scenarios, positive in help scenarios) or a neutral outcome. That is, stories did not explicitly state the agents' intentions; participants had to infer them, as it is often the case in real-life interactions. Each participant evaluated four positive and four negative versions, one version for each scenario, thus eight stories. Participants judged a different version for each positive or negative scenario. Across participants, we rotated the version selection following a Latin square design.

Following each harm scenario, participants were asked to judge the moral badness of the described action ("How morally bad was the [agent's action]?") and how much it should be punished ("How much punishment does the [agent's action] deserve?"). Following each help scenario, participants were instead asked to judge the moral goodness of the action ("How morally good was the [agent's action]?") and how much it should be rewarded ("How much reward does the [agent's action] deserve?"). Participants answered all questions on a scale that ranged from 0 (*not at all*) to 10 (*very much*). For the sake of brevity, we omit the results of the punishment/reward judgments. Note that the pattern of the results was similar to that of the badness/goodness judgments (for details see Supplementary Material 1). The order of scenarios (harm first vs. help first) and test questions (bad/good first vs. punishment/reward first) was counterbalanced across participants.

Individual differences tasks. Following the moral judgment task, participants completed tasks measuring individual differences in theory of mind, empathic concern, processing speed, and executive function.

Theory of mind. Participants received the Italian version of the Reading the Mind in the Eyes test (RME, Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Serafin & Surian, 2004). In the RME, participants have to choose which one among four words best describes the mental or emotional state of a person on the basis of a picture of his or her eye-gaze. Participants were presented with 36 different pictures, and subsequently made 36 choices.

Empathic concern. Participants were presented with the empathic concern subscale of the Interpersonal Reactivity Index (IRI-EC; Davis, 1980). This subscale consists of seven items that are rated on a 5-point scale, which ranges from 1 (*does not describe me well*) to 5 (*describes*

me well). This subscale assesses participants' self-reported feelings of sympathy and concern for unfortunate others.

Processing speed. We asked participants to complete the Digit Symbol Substitution Test (DSST of the WAIS; Wechsler, 1981). Participants were asked to complete as many items as possible within 90 seconds. This test consists of a code table displaying nine different pairs of digits and symbols. The rows of the table consist of 94 double boxes with a digit and a white space next to it. Participants are asked to fill the white space next to each digit with the appropriate symbol based on the code table.

Executive functions. Participants also received the Wisconsin Card Sorting Test (WCST; Heaton, 1995). Participants are asked to sort cards containing coloured geometric forms of different shapes and numbers to four target cards. Participants are informed whether each sort is correct or incorrect. Once a participant has reached a certain number of correct sorts, the rule is changed and the participant must apply the new rule.

Results

As a screening tool for dementia we employed the Mini-Mental Status Examination (MMSE; Folstein, Folstein, & McHugh, 1975). MMSE scores may reveal severe impairment/dementia (0-9), moderate impairment (10-16), mild impairment (17-19), suspected impairment (20-24), and no impairment (24 to 30). Three participants in the older group showed a suspected impairment, with scores between 20 and 24, while the rest had scores higher than 24. Excluding these three participants from the data analyses had no effect on the main pattern of the results. Thus, below we report the analyses on the full sample.

Moral Judgments

We analysed moral judgments with two separate 2 (Age: Old vs. Young) × 2 (Intention: Neutral vs. Valenced) × 2 (Outcome: Neutral vs. Valenced) mixed-factor analyses of variance

(ANOVA), one for harm scenarios (moral badness judgments) and one for help scenarios (moral goodness judgments). Age was a between-participants factor while the other factors were repeated measures.

The analysis on moral badness judgments revealed a main effect of intention, $F(1, 56) = 138.52$, $p < .001$, $f = 1.57$, which was qualified by a significant Age × Intention interaction, $F(1, 56) = 42.02$, $p < .001$, $f = 0.87$ (see Figure 1, and Table S1 in Supplementary Material 1), whereby older participants were less affected by the agent's intentions ($M_{valenced} = 7.00$, CI[6.29, 7.71], $M_{neutral} = 5.02$, CI[4.20, 5.83]) than younger participants ($M_{valenced} = 8.24$, CI[7.53, 8.96], $M_{neutral} = 1.40$, CI[0.58, 2.21]). Next, we examined whether older participants, as compared to younger participants, judge *outcomes* as more morally bad. We found a main effect of outcome, $F(1, 56) = 35.19$, $p < .001$, $f = 0.79$, which also was qualified by a significant Age × Outcome interaction, $F(1, 56) = 12.51$, $p = .001$, $f = 0.47$. Older participants were more influenced by whether an outcome was valenced or neutral ($M_{valenced} = 8.16$, CI[7.41, 8.91], $M_{neutral} = 3.86$, CI[2.93, 4.79]) than younger participants ($M_{valenced} = 5.36$, CI[4.61, 6.11], $M_{neutral} = 4.28$, CI[3.34, 5.21]). There was also a significant Intention × Outcome interaction, $F(1, 56) = 4.09$, $p = .048$, $f = 0.27$. Intentions exerted a stronger influence on actions that resulted in neutral outcomes ($M = 6.57$, CI[5.71, 7.43] vs. $M = 1.57$, CI[0.81, 2.33]) than actions resulting in valenced outcomes ($M = 8.67$, CI[7.99, 9.35] vs. $M = 4.85$, CI[4.10, 5.59]). There was no significant Age × Intention × Outcome interaction, $F(1, 56) = 2.58$, $p = .114$, $f = 0.21$. Finally, there was a main effect of age, $F(1, 56) = 9.37$, $p = .003$, $f = 0.41$. Overall, older participants gave higher moral badness ratings ($M = 6.01$, CI [5.46, 6.56]) than younger participants ($M = 4.82$, CI [4.27, 5.37]).

Moral goodness judgments were also analysed with a 2 (Age: Old vs. Young) × 2 (Intentions: Neutral vs. Valenced) × 2 (Outcome: Neutral vs. Valenced) mixed-factor analysis of

variance (ANOVA). The analysis revealed a main effect of intention, $F(1, 56) = 102.58$, $p < .001$, $f = 1.35$, but no significant Age × Intention interaction, $F(1, 56) = 2.88$, $p = .095$, $f = 0.23$ (see Figure 1). Moreover, there was a significant main effect of outcome, $F(1, 56) = 46.51$, $p < .001$, $f = 0.91$, but no significant Age × Outcome interaction, $F(1, 56) = 2.90$, $p = .094$, $f = 0.23$. There was also a significant Intention × Outcome interaction, $F(1, 56) = 51.57$, $p = .010$, $f = 0.35$. Intentions exerted a stronger influence on actions that resulted in neutral outcomes ($M = 7.36$, CI[6.49, 8.24] vs. $M = 1.98$, CI[1.16, 2.81]) than on actions resulting in valenced outcomes ($M = 9.06$, CI[8.61, 9.52] vs. $M = 5.57$, CI[4.48, 6.65]). There was no significant Age × Intention × Outcome interaction, $F(1, 56) = 1.02$, $p = .316$, $f = 0.47$. Finally, there was no main effect of age, $F(1, 56) = 0.13$, $p = .725$, $f = 0.04$ (see also Table S2 in Supplementary Material 1 which displays all main effects and interaction effects).

[Insert Figure 1 about here]

To gain a better understanding of the different impact age has on the moral evaluation of harm and help scenarios, we also conducted separate analyses by age group. Each analysis examined the relative impact of intentions on the moral evaluation of help and harm scenarios. For each type of scenario, we subtracted a participant's mean moral judgment assigned to scenarios with neutral intentions from that assigned to scenarios with valenced intentions. These composite scores represent the impact intentions have on moral judgments, with higher scores indicating greater impact. For older participants, the analysis revealed a *lower* impact of intent-based information for harm scenarios ($M = 2.02$, CI [0.78, 3.26]) than for help scenarios ($M = 3.73$, CI [2.32, 5.14]), $t(29) = 2.57$, $p = .016$, $d = 0.48$. For younger participants, we observed the opposite pattern; that is, a *higher* impact of intent-based information for harm scenarios ($M =$

6.63, CI [5.71, 7.55]) than for help scenarios (M = 5.18, CI [4.16, 6.20]), $t(29) = 2.27$, $p = .031$, $d = 0.56$.

In sum, in regards to our main hypothesis, older participants' moral judgments were less intent-based and more outcome-based than younger participants' moral judgments. Interestingly, this age difference was restricted to harm scenarios.

Correlations Between Age, Intent-based Moral Judgment, Theory of Mind, Empathic Concern, Processing Speed, and Executive Functions

Table 1 shows correlations between age, intent-based moral judgment separately for harm and help scenarios (i.e., mean moral score for scenarios with valenced intentions minus mean moral score for scenarios with neutral intentions), and the measures used to examine theory of mind, empathic concern, processing speed, and executive functions. Age was entered as a binary variable (0 = Young, 1 = Old). Moral badness judgments were negatively correlated with age, whereas moral goodness judgments were not significantly correlated with age. Age was negatively correlated with theory of mind, processing speed, and executive functions, but positively correlated with empathic concern. Performance in theory of mind, processing speed and executive functions tasks were positively associated with one another.

[Insert Table 1 about here]

Linear Regressions Predicting Intent-based Moral Judgment

We conducted two multiple regression analyses, one for moral badness judgments and one for moral goodness judgments. The analysis using moral badness judgments as the outcome variable indicated that there was a collective significant effect between age, theory of mind,

empathic concern, processing speed, and executive functions, $F(5, 44) = 8.24$, $p < .001$, $R^2 = .48$. Analyses of the individual predictors indicated that age, $\beta = .37$, $t(48) = 2.08$, $p = .043$, and theory of mind, $\beta = .25$, $t(48) = 2.10$, $p = .041$, were the only significant predictors in the model.

Results of the multiple linear regression using moral goodness judgments as the outcome variable indicated that there was a collective marginally significant effect of age, theory of mind, empathic concern, processing speed, and executive functions, $F(5, 44) = 2.42$, $p = .051$, $R^2 = .22$. Analyses of the individual predictors indicated that only theory of mind, $\beta = .33$, $t(48) = 2.22$, $p = .032$, was a significant predictor in the model.

Relationship Between Age, Intent-based Moral Judgment, Theory of Mind, Empathy, Processing Speed, and Executive Function

We next focused on harm scenarios and examined whether age differences in theory of mind, empathy, processing speed, and executive function statistically contribute to age differences in intent-based moral judgment. We did not perform a similar analysis for help scenarios as we did not detect age differences in these scenarios. We used 10,000 bootstrapping resamples (Preacher & Hayes, 2008). As our outcome variable, we used the intent-based moral judgment score (i.e., mean moral score for scenarios with valenced intentions minus mean moral score for scenarios with neutral intentions). Age was entered as a binary variable (0 = Younger participants, 1 = Older participants). The relationship between age and moral judgment, $b = –3.13$, 95% CI [–4.650, –1.60], was reduced after taking into account theory of mind, empathy, processing speed, and executive functions, $b = –1.81$, 95% CI [–4.380, 0.347] (see Figure 2). However, only the decline in theory of mind ability significantly reduced the relationship between age and moral judgment, $b = –0.54$, 95% CI [–1.684, –0.004].

[Insert Figure 2 about here]

Discussion

In the present study we investigated whether older and younger adults' moral judgments differ in the extent to which they rely on intentions and outcomes. For harmful actions, we predicted and found that older adults rely less on intentions and more on outcomes than younger adults. We also found that this effect was associated with older adults' decline in theory of mind abilities. For helpful actions, however, we observed no significant age-related differences. An additional finding was that while older adults relied more on intentions when evaluating helpful versus harmful actions, younger adults exhibited the opposite pattern.

The age-related decline in theory of mind abilities observed in the present study is consistent with previous research (for a meta-analysis, see Henry et al., 2013). With respect to harmful actions, our research adds that this decline is associated with older adults' reduced reliance on intentions in the generation of moral judgments. Although we found no evidence that executive control contributes to the age-related differences in intent-based moral judgment, this could be due to the specific executive control measure we used. Future studies could explore this possibility by using different measures. Overall, the present findings are consistent with current processing models of moral judgments that emphasize the role played by cognitive abilities external to the moral domain, such as theory of mind (Buon, Seara-Cardoso, & Viding, 2016; Margoni & Surian, 2016a, b; Young, Cushman, Hauser, & Saxe, 2007).

Now, one may ask whether the theory of mind decline in later years impacts on the decoding of agents' intentions or selectively impacts on the integration of such input into the moral evaluation (Buon et al., 2016). Our results are more consistent with the latter possibility. Older adults relied less on intentions, as compared to younger adults, but only when judging

harm scenarios. When evaluating help scenarios, older adults were as capable of decoding and integrating agents' intentions in their moral evaluations as were younger adults. Recall that participants had to infer agents' intentions from their beliefs and the story itself.

The present finding that age is differentially linked to changes in intent-based moral judgments for harm and help scenarios may be explained by motivational factors. It is possible that older participants' motivation to expend cognitive effort on harm scenarios was reduced as compared to help scenarios. Since shallow processing of harmful actions has been linked to a reduced consideration of intentions (Buon et al., 2013), a reduced motivation to focus on the task could explain why age-related differences were not observed for help scenarios. These findings can thus be interpreted in light of the socioemotional selectivity theory (Carstensen, 2006), which holds that older adults are characterized by a motivation to optimize their emotional wellbeing in the 'here and now', possibly because they recognize that the end of life nears (Carstensen, 1992). Older adults can optimize their wellbeing also by expending less effort on tasks that trigger negative feelings such as ones depicting harmful actions (e.g., Bruine de Bruin et al., 2015).

Specifically, Buon et al. (2013) proposed that when people morally evaluate harmful actions they automatically assign causal responsibility to an agent based on the outcomes of his or her action, which they may later revise—if they have enough cognitive resources—in light of the agent's intention. Indirect evidence for this conjecture comes from research showing that using a foreign language (which adds cognitive load) prompts more outcome-based moral judgments (Geipel, Hadjichristidis, & Surian, 2016). In relation to the harm scenarios of the present study, older participants may have skipped the adjustment process, which would explain their lower reliance on intentions. So, both a decline in theory of mind and motivational factors

likely contribute to the particular pattern of results we found in the current study. Motivational factors may have interacted with cognitive aging and facilitated an intention-to-outcome shift in later years for harm scenarios.

Finding evidence of an intent-to-outcome shift that is at least in part explained by ancillary changes occurring outside the moral domain can also be helpful in deciding between a view positing conceptual changes in the development of intent-based moral judgment (Cushman et al., 2013) and a view positing conceptual continuity (Margoni & Surian, 2016a; see also Osman & Wiegmann, 2017). While the latter view can naturally accommodate the current findings, as changes in moral evaluations can result from changes in theory of mind or executive functions occurring both during early and later years of life, the former view must posit a complex explanation that entails a series of conceptual changes, reflected in changes from an early-emerging tendency to privilege intentions over outcomes (Hamlin, 2013; Woo et al., 2017) to a reversal of this tendency during early preschool years; to a reinstatement of the initial tendency at 5-6 years (Cushman et al., 2013; Margoni & Surian, 2017); and, finally, a further reversal of this tendency at old age.

In the present research we also found that younger adults relied more on intentions when morally evaluating harmful rather than helpful actions. This finding is consistent with neuroimaging, event-related potentials (ERPs) and behavioural research (e.g., Gan, Lu, Li, Gui et al., 2016; Pizarro, Uhlmann, & Salovey, 2003; Young, Scholz, & Saxe, 2011). A possible reason why younger adults relied less on intentions for helpful actions is that positive information signals safety, and hence less need to scrutinise circumstances such as the intention of an agent (Pizarro et al., 2003, and Gan et al., 2016, offer alternative explanations).

Focusing on harmful actions, the finding that older adults rely less on intentions than younger adults carries important implications. Consider, for example, a jury member who has to evaluate whether an accused is guilty beyond reasonable doubt. A critical component for assigning criminal liability is that the accused acted with a guilty mind. The present results suggest that older adults may attend less to the intentions of the accused and more to the negative outcomes that his or her actions produced. Put simply, the present findings imply that older adults may be more likely to convict. This is precisely what a recent study found scrutinizing data from more than 700 felony trials in Florida (Anwar, Bayer, & Hjalmarsson, 2014). This has implications for several judicial systems. In England and Wales, for example, citizens up to the age of 70 are allowed to sit in a jury and this limit is set to raise to 75 years. In the US, Federal courts in more than half of the states disallow age-exemptions from jury service.

Limitations

The main limitation of the present study concerns its cross-sectional design. The age-related differences found with harmful actions may be driven not by age per se, but by some other factors related to age. For example, they may reflect a cohort effect. Perhaps older adults belong to a more consequentialist, outcome-focused, generation than younger adults. However, this possibility is inconsistent with the results reported by Arutyunova, Alexandrov, and Hauser (2016) who found that, when evaluating trolley dilemmas, older adults turned out to be more deontological and *less* consequentialist than younger adults (see also Hannikainen, Machery, & Cushman, 2018, who argue that younger cohorts are becoming more utilitarian). Future studies could investigate whether these effects generalize to the evaluation of other moral cases, in particular ones likely to be encountered in everyday situations.

Another limitation of the present study is that we do not offer direct evidence that the reported age-related differences are related to motivational factors, or that older adults expend less cognitive effort when evaluating harm scenarios. Future studies could investigate these claims, for example, by timing how long participants engage with harm and help scenarios (Gan et al., 2016). Future studies could also employ process-tracing methods, such as eye-tracking, to measure the extent to which participants attend to negative and positive information.

Lastly, with respect to the relationship between theory of mind, empathy and moral judgment, we note that in the current study we measured theory of mind skills with a perceptual task often used to assess the recognition of complex emotional states (also seen as 'cognitive empathy'), rather than with an inferential, verbal task, more focused on the understanding of epistemic mental states such as knowledge and belief (Oakley, Brewer, Bird, & Catmur, 2016). Future research could fruitfully extend the current findings by testing the role of different theory of mind abilities and components of empathy. In the current study we included an empathy measure, empathic concern, and found that it does not predict intent-based moral judgment. Notice, however, that this particular measure is believed to tap on 'affective empathy'. Thus, although the current study suggests that age differences in intent-based moral judgment were not due to differences in the affective component of empathy, it also suggests that they might be due, at least in part, to differences in cognitive empathy.

Conclusion

We investigated whether aging is associated with an intent-to-outcome shift in moral judgment and found evidence for such a shift in harm but not in help scenarios. We propose that the age-related differences in moral evaluation depend both on cognitive and motivational factors. Specifically, although older adults are capable of emphasizing intentions in their moral

evaluations, they are less likely to do so in contexts involving harmful actions, possibly because less reflection on these contexts protects their emotional wellbeing. Interestingly, many important decisions, such as jury decisions, concern negative contexts. The present findings can inform psychological theories of moral judgment, aging research, and public policy for issues such as jury selection.

Acknowledgement

We thank Elisabeth S. Blanke for valuable comments on an earlier draft and Veronica Postal for assisting with data collection.

Electronic Supplementary Material

Supplementary Material 1—Additional results

Supplementary Material 2—Complete battery of scenarios

Supplementary Material 3—Raw data

References

Anwar, S., Bayerand, P., & Hjalmarsson, R. (2014). The role of age in jury selection and trial outcome. *Journal of Law and Economics*, *57*, 1001–1030. https://doi.org/10.1086/675257

Armon, C., & Dawson, T. L. (1997). Developmental trajectories in moral reasoning across the life span. *Journal of Moral Education*, *26*, 433–453. https://doi.org/10.1080/0305724970260404

Arutyunova, K. R., Alexandrov, Y. I., & Hauser, M. D. (2016). Sociocultural influences on moral judgments: East–West, male–female, and young–old. *Frontiers in Psychology*, *7*, 1334. https://doi.org/10.3389/fpsyg.2016.01334

Baron-Cohen, S., Jolliffe, T., Mortimore, C., & Robertson, M. (1997). Another advanced test of theory of mind: Evidence from very high functioning adults with autism or Asperger syndrome. *Journal of Child Psychology and Psychiatry*, *38*, 813–822. https://doi.org/10.1111/j.1469-7610.1997.tb01599.x

Bruine de Bruin, W., McNair, S. J., Taylor, A. L., Summers, B., & Strough, J. (2015). "Thinking about numbers is not my idea of fun": need for cognition mediates age differences in numeracy performance. *Medical Decision Making*, *35*, 22–26. https://doi.org/10.1177/0272989x14542485

Buon, M., Jacob, P., Loissel, E., & Dupoux, E. (2013). A non-mentalistic cause-based heuristic in human social evaluations. *Cognition*, *126*, 149–155. https://doi.org/10.1016/j.cognition.2012.09.006

Buon, M., Seara-Cardoso, A., & Viding, E. (2016). Why (and how) should we study the interplay between emotional arousal, Theory of Mind, and inhibitory control to understand moral cognition? *Psychonomic Bulletin & Review*, *23*, 1660-1680. http://dx.doi.org/10.3758/s13423-016-1042-5

Carstensen, L. L. (1992). Social and emotional patterns in adulthood: Support for socioemotional selectivity theory. *Psychology and Aging, 7,* 331–338. https://doi.org/10.1037//0882-7974.7.3.331

Carstensen, L. L. (2006). The influence of a sense of time on human development. *Science, 312,* 1913–1915. https://doi.org/10.1126/science.1127488

Chap, J. B. (1986). Moral judgment in middle and late adulthood: The effects of age-appropriate moral dilemmas and spontaneous role taking. *International Journal of Aging and Human Development, 22,* 161-171. https://doi.org/10.2190/a34t-a3q3-umef-39eb

Charles, S. T., Mather, M., & Carstensen, L. L. (2003). Aging and emotional memory: the forgettable nature of negative images for older adults. *Journal of Experimental Psychology: General, 132,* 310–324. https://doi.org/10.1037/0096-3445.132.2.310

Chen, Y., & Blanchard-Fields, F. (2000). Unwanted thought: Age differences in the correction of social judgments. *Psychology of Aging, 15,* 475-482. https://doi.org/10.1037//0882-7974.15.3.475

Cushman, F., Sheketoff, R., Wharton, S., & Carey, S. (2013). The development of intent-based moral judgment. *Cognition, 127,* 6–21. https://doi.org/10.1016/j.cognition.2012.11.008

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology, 10,* 85. https://doi.org/10.1037//0022-3514.44.1.113

Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39,* 175–191. https://doi.org/10.3758/bf03193146

Folstein, M., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12,* 189–198.

Gan, T., Lu, X., Li, W., Gui, D., Tang, H., Mai, X., Liu, C., & Luo, Y-J. (2016). Temporal dynamics of the integration of intention and outcome in harmful and helpful moral judgment. *Frontiers in Psychology, 6,* 2022. https://doi.org/10.3389/fpsyg.2015.02022

Geipel, J., Hadjichristidis, C., & Surian, L. (2016). Foreign language affects the contribution of intentions and outcomes to moral judgment. *Cognition, 154,* 34-39. https://doi.org/10.1016/j.cognition.2016.05.010

Gleichgerrcht, E., & Young, L. (2013). Low levels of empathic concern predict utilitarian moral judgment. *PloS One, 8,* e60418. https://doi.org/10.1371/journal.pone.0060418

Hamlin, J. K. (2013). Failed attempts to help and harm: Intention versus outcome in preverbal infants' social evaluations. *Cognition, 128,* 451–474. https://doi.org/10.1016/j.cognition.2013.04.004

Hannikainen, I. R., Machery, E., & Cushman, F. A. (2018). Is utilitarian sacrifice becoming more morally permissible? *Cognition, 170,* 95-101. https://doi.org/10.1016/j.cognition.2017.09.013

Heaton, R. K. (1995). *Wisconsin Card Sorting manual.* Odessa, FL: Psychology Assessment Resources.

Henry, J. D., Phillips, L. H., Ruffman, T., & Bailey, P. E. (2013). A meta-analytic review of age differences in theory of mind. *Psychology and Aging, 28,* 826–839. https://doi.org/10.1037/a0030677

Killen, M., Mulvey, K. L., Richardson, C., Jampol, N., & Woodward, A. (2011). The accidental transgressor: Morally-relevant theory of mind. *Cognition, 119*, 197–215. https://doi.org/10.1016/j.cognition.2011.01.006

Kohlberg, L. (1969). Stage and sequence: The cognitive-developmental approach to socialization. In D. Gosh (Ed.), *Handbook of socialization theory and research*, (pp. 347-480). Chicago: Rand McNally.

Ligneau-Herve, C., & Mullet, E. (2005). Perspective-taking judgments among young adults, middle-aged, and elderly people. *Journal of Experimental Psychology: Applied*, 11, 53-60. https://doi.org/10.1037/1076-898x.11.1.53

Margoni, F., & Surian, L. (2016a). Explaining the U-shaped development of intent-based moral judgments. *Frontiers in Psychology, 7*, 219. https://doi.org/10.3389/fpsyg.2016.00219

Margoni, F., & Surian, L. (2016b). Mental state understanding and moral judgment in children with Autistic Spectrum Disorder. *Frontiers in Psychology, 7*, 1478. https://doi.org/10.3389/fpsyg.2016.01478

Margoni, F., & Surian, L. (2017). Children's intention-based moral judgments of helping agents. *Cognitive Development, 41*, 46-64. https://doi.org/10.1016/j.cogdev.2016.12.001

Moran, J. M., Jolly, E., & Mitchell, J. P. (2012). Social-cognitive deficits in normal aging. *The Journal of Neuroscience, 32*, 5553–5561. https://doi.org/10.1523/jneurosci.5511-11.2012

Narvaez, D., Radvansky, G. A., Lynchard, N. A., & Copeland, D. E. (2011). Are older adults more attuned to morally charged information? *Experimental Aging Research, 37*, 398-434. https://doi.org/10.1080/0361073x.2011.590756

Nobes, G., Panagiotaki, G., & Bartholomew, K. J. (2016). The influence of intention, outcome and question-wording on children's and adults' moral judgments. *Cognition, 157,* 190-204. https://doi.org/10.1016/j.cognition.2016.08.019

Oakley, B. F., Brewer, R., Bird, G., & Catmur, C. (2016). Theory of mind is not theory of emotion: A cautionary note on the Reading the Mind in the Eyes Test. *Journal of Abnormal Psychology, 125,* 818-823. https://doi.org/10.1037/abn0000182

Osman, M., & Wiegmann, A. (2017). Explaining moral behavior: A minimal moral model. *Experimental Psychology, 64,* 68-81. https://doi.org/10.1027/1618-3169/a000336

Patil, I., Calò, M., Fornasier, F., Cushman, F., & Silani, G. (2017). The behavioral and neural basis of empathic blame. *Scientific Reports, 7,* 5200. https://doi.org/10.1038/s41598-017-05299-9

Patil, I., & Silani, G. (2014). Alexithymia increases moral acceptability of accidental harms. *Journal of Cognitive Psychology, 26,* 597-614. https://doi.org/10.1080/20445911.2014.929137

Pizarro, D.A., Uhlmann, E., & Salovey, P. (2003). Asymmetry in judgments of moral blame and praise: The role of perceived metadesires. *Psychological Science, 14,* 267–272. https://doi.org/10.1111/1467-9280.03433

Pratt, M. W., Diessner, R., Hunsberger, B., Pancer, S. M., & Savoy, K. (1991). Four pathways in the analysis of adult development and aging: Comparing analyses of reasoning about personal-life dilemmas. *Psychology and Aging, 6,* 666-675. https://doi.org/10.1037//0882-7974.6.4.666

Pratt, M. W., Diessner, R., Pratt, A., Hunsberger, B, & Pancer, S. M. (1996). Moral and social reasoning and perspective taking in later life: A longitudinal study. *Psychology and Aging, 11*, 66–73. https://doi.org/10.1037//0882-7974.11.1.66

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891. https://doi.org/10.3758/brm.40.3.879

Reuter-Lorenz, P. A., & Sylvester, C. Y. (2005). The cognitive neuroscience of aging and working memory. In: Cabeza R, Nyberg L, Park D, editors. *The cognitive neuroscience of aging* (pp. 186-217). New York: Oxford University Press.

Salthouse, T. A. (2004). What and when of cognitive aging. *Current Directions in Psychological Science, 13*, 140–144. https://doi.org/10.1111/j.0963-7214.2004.00293.x

Serafin, M., & Surian, L. (2004). Il Test degli Occhi: uno strumento per valutare la 'teoria della mente'. *Giornale Italiano di Psicologia, 31*, 213–236.

Sze, J., Gyurak, A., Goodkind, M. S., & Levenson, R. W. (2012). Greater prosocial and empathic responding in late life. *Emotion, 12*, 1129–1140. https://doi.org/10.1037/a0025011

Vicaria, I. M., & Isaacowitz, D. M. (2016). Age-related changes in motivation: Do they influence emotional experience across adulthood and old age? In T. S. Braver (Ed.), *Motivation and Cognitive control* (pp. 361-380). New York: Psychology Press.

Wechsler, D. (1981). *Manual for the Wechsler Adult Intelligence Scale—Revised*. New York: Psychological Corporation.

Woo, B. M., Steckler, C. M., Le, D. T., & Hamlin, J. K. (2017). Social evaluation of intentional, truly accidental, and negligently accidental helpers and harmers by 10-month-old infants. *Cognition, 168*, 154-163. https://doi.org/10.1016/j.cognition.2017.06.029

Young, L., Cushman, F., Hauser, M., & Saxe, R. (2007). The neural basis of the interaction between theory of mind and moral judgment. *Proceedings of the National Academy of Sciences of the United States of America, 104,* 8235–8240. https://doi.org/10.1073/pnas.0701408104

Young, L., Scholz, J., & Saxe, R. (2011). Neural evidence for "intuitive prosecution": The use of mental state information for negative moral verdicts. *Social Neuroscience, 6,* 302-315. https://doi.org/10.1080/17470919.2010.529712

Young, L., & Tsoi, L. (2013). When mental states matter, when they don't, and what that means for morality. *Social and Personality Psychology Compass, 7,* 585–604. https://doi.org/10.1111/spc3.12044

Yuill, N. (1984). Young chidren's coordination of motive and outcome in judgments of satisfaction and morality. *British Journal of Developmental Psychology, 2,* 73–81. https://doi.org/10.1111/j.2044-835x.1984.tb00536.x

Yuill, N., & Perner, J. (1988). Intentionality and knowledge in children's judgments of actors responsibility and recipients emotional reaction. *Developmental Psychology, 24,* 358–365. https://doi.org/10.1037//0012-1649.24.3.358

Table 1

Correlations Between Age, Intent-based Moral Judgment, Theory of Mind, Empathy, Processing Speed, and Executive Function.

	1	**2**	**3**	**4**	**5**	**6a**	**6b**
1. Age	--						
2. Theory of Mind	**–.45****	--					
3. Empathic concern	**.30***	–.13	--				
4. Processing Speed	**–.81****	**.52****	**–.32***	--			
5. Executive function	**–.55****	**.32***	–.23	**.60****	--		
6. Intent-based moral judgment							
(a) harm scenarios	**–.63****	**.44****	–.24	**.52****	**.37****	--	
(b) help scenarios	-.22	**.29***	–.12	**.38****	.20	**.40****	--

Note. Age is a binary variable (0 = Younger participants, 1 = Older participants); * = $p < .05$; ** = $p < .01$.

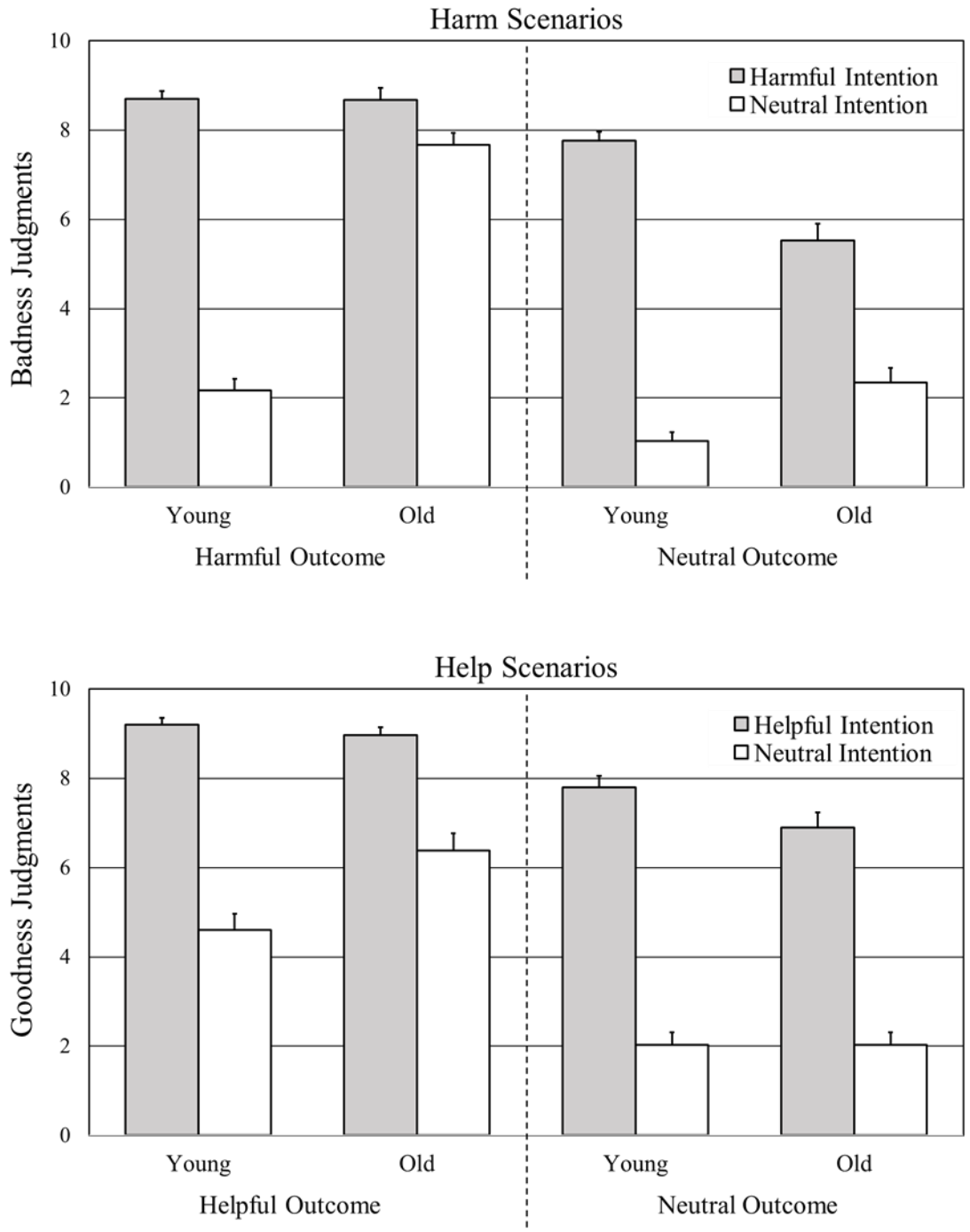

Figure 1. Moral badness judgment ratings (top panel) and moral goodness judgment ratings (bottom panel) by age, intention, and outcome. Error bars indicate standard error of the mean.

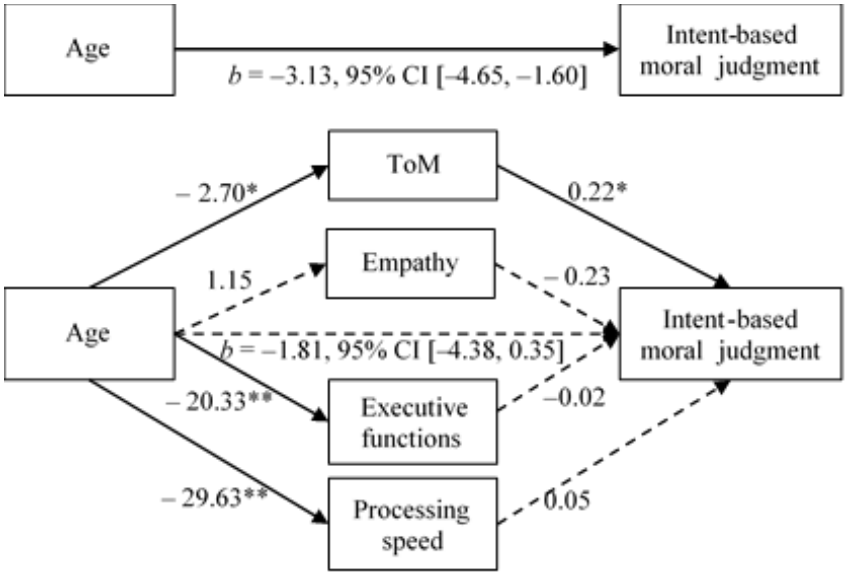

Figure 2. Regression coefficients and bootstrap confidence intervals for the association between age and intent-based moral judgment for harm scenarios as mediated by theory of mind, empathy, executive functions, and processing speed.