

Social Inappropriateness, Executive Control, and Aging

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Age-related deficits in executive control might lead to socially inappropriate behavior if they compromise the ability to withhold inappropriate responses. Consistent with this possibility, older adults in the current study showed greater social inappropriateness than younger adults—as rated by their peers—and this effect was mediated by deficits in executive control as well as deficits in general cognitive ability. Older adults also responded with greater social inappropriateness to a provocative event in the laboratory, but this effect was unrelated to executive functioning or general cognitive ability. These findings suggest that changes in both social and cognitive factors are important in understanding age-related changes in social behavior.

Keywords: social inappropriateness, executive functioning, stereotyping and prejudice

Like executives in a complex organization, the mental processes known as executive functions are responsible for coordinating and integrating the basic cognitive processes with which people navigate their everyday lives. Thus, rather than being considered a unitary ability, executive functions refer to the ensemble of higher order processes that permit contextually sensitive, flexible behavior. Because executive functions impose particular demands on frontal neural substrates, and because these structures are subject to localized and early age-related deterioration, aging has been linked to diminished executive control (Dempster, 1992; Hasher, Zacks, & May, 1999). In some cases, these age-related declines overlap with more general cognitive deficits, but executive functions also show independent declines with age (Phillips & Henry, in press).

Executive control is not only important for regulating cognitive activity but it also plays a central role in social functioning. Indeed, many theorists believe that it was the demands of social living that led to the development of such large frontal lobes in humans (Dunbar & Shultz, 2007), and there is considerable evidence for social abnormalities in populations with executive function impairment (Stuss & Levine, 2002). Thus, despite the fact that aging is associated with improved socioemotional functioning in a variety of domains (Blanchard-Fields, 2007; Phillips, Henry, Hosie, & Milne, 2008), age-related executive deficits have the potential to

disrupt social behavior. Consistent with this possibility, evidence suggests that reduced executive functioning might underlie some specific social problems associated with aging, such as off-target verbosity (Pushkar et al., 2000), increased stereotyping and prejudice (von Hippel, Silver, & Lynch, 2000), inappropriate discussion of private events in public settings (von Hippel & Dunlop, 2005), and greater difficulty taking the perspective of another (Bailey & Henry, 2008).

This logic and these findings suggest that age-related changes in frontal lobe integrity might lead to impaired social functioning via reduced executive control, but the evidentiary basis for this possibility remains slim. Although von Hippel and colleagues found that executive functioning mediates age-related increases in stereotyping and prejudice (von Hippel et al., 2000) and inappropriate discussion of private events in public settings (von Hippel & Dunlop, 2005), the executive functioning measures in this research are not widely used in the neuropsychology literature, and thus their sensitivity and validity as markers of this construct remain unclear. Additionally, each study documented mediation with but a single measure of executive functioning, and in von Hippel and Dunlop's (2005) study, two additional executive functioning measures failed to mediate the effect of aging on social inappropriateness. Finally, this earlier research did not screen for dementia, and thus it is possible that the underlying source of social inappropriateness and executive decline in these studies was incipient dementia. This possibility is mitigated somewhat by the finding that among younger adults executive functioning also predicted prejudice (von Hippel et al., 2000), as well as socially inappropriate responses to a culturally significant but unappealing food (von Hippel & Gonsalkorale, 2005). Nevertheless the relative contributions of executive and general cognitive decline to social inappropriateness in older adulthood remain to be directly tested. Thus, the goals of the present research were to use validated measures of executive control from the neuropsychology literature to examine the relationship between executive functioning and socially inap-

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propriate behavior, while simultaneously considering the impact of general cognitive functioning. Our final aim was to broaden the assessment of social functioning through the development of a more general measure of socially inappropriate behavior than that used in previous research.

Method

Participants

One hundred and eleven adults between the ages of 33 and 95, with oversampling of adults over the age of 65 ($M = 68.9$, $SD = 14.67$, 66 female), participated in exchange for AU\$20 (~US\$16). All participants were community dwelling and were recruited from apartment complexes, community centers, and retirement villages in the Sydney, Australia, metropolitan area.

Procedure and Measures

At the recruitment interview participants were asked to bring a close friend or spouse with them. During the testing session, this person was seated in a separate room and completed a proxy measure of social functioning. After providing consent for participation and videotaping, participants completed a screening tool for dementia, followed by measures of executive functioning. Participants then completed a measure of processing speed, after which they were exposed to an event designed to provoke a socially inappropriate response.

Dementia Screening

We used Addenbrooke's Revised Cognitive Examination (ACE-R; Mathuranath, Nestor, Berrios, Rakowicz, & Hodges, 2000) to quantify general cognitive status. The ACE-R has been shown to have high reliability and is sensitive to the presence of dementia (Mathuranath et al. 2000). Scores range from 0 to 100.

Executive Functioning

Phonemic fluency is one of the most validated measures of executive functioning and is particularly sensitive to frontal lobe integrity (Henry & Crawford, 2004). In the present study, we used the letters *F*, *A*, and *S* to assess phonemic fluency, with participants given 1 min to produce as many words as possible beginning with each letter. The Trail Making Test (TMT) was given either before or after the fluency measure as an additional measure of executive functioning. This test also imposes particular demands on frontal neural substrates (Zakzanis, Mraz, & Graham, 2005). In Part A, participants are required to draw lines to connect consecutively numbered circles; in Part B, participants must connect consecutively numbered and lettered circles, by alternating repeatedly between the numeric and alphabetic sequences. Two scores are derived; a timing score and an error score. To minimize the impact of visual search and processing speed on these scores, we regressed each score from Part B on the comparable score from Part A, and the residual from this analysis served as the measure of executive functioning.¹ Both phonemic fluency and the TMT predict off-target verbosity in older adults (Pushkar et al., 2000), suggesting that these measures may tap cognitive operations that are important for social control.

Speed

We assessed processing speed with the Speeded Pattern Comparison Task (Salthouse & Babcock, 1991). Participants viewed 30 pairs of figures on a computer, one pair at a time, and indicated as rapidly as possible whether the patterns were the same or different.

Social Inappropriateness

Two measures of social inappropriateness were created for this research. One was an online (i.e., real time) assessment, and the other involved peer reports. The Peer-Report Social Functioning Scale (see the Appendix) includes questions that asked participants' peers about the degree to which the participants engaged in a variety of socially inappropriate, appropriate, and prejudicial behaviors. The items in this scale were based on previous research documenting various inappropriate behaviors sometimes displayed by older adults, for example, excessive verbosity (Pushkar et al., 2000), gratuitous argumentation, (Furnham & Pendleton, 1983; von Hippel, 2007), public inquiry about private matters (von Hippel & Dunlop, 2005), and stereotyping and prejudice (von Hippel et al., 2000). Additional items were developed from focus groups of older adults. The final version included a 10-item subscale that taps Social Inappropriateness ($\alpha = .87$), a 17-item subscale that taps Social Appropriateness ($\alpha = .92$), and a 3-item subscale that taps Stereotyping and Prejudice ($\alpha = .75$). The scale also included filler items that allow participants' peers to report positive aspects of the participants, which were intended to help alleviate feelings of guilt that might otherwise emerge from reporting negative behaviors. Items were intermixed and presented to peer raters in a single questionnaire, with responses provided on a 4-point scale with the verbal labels, *never*, *rarely*, *occasionally*, *frequently*. Responses were recoded as necessary so that higher scores are indicative of higher levels of Social Inappropriateness, Social Appropriateness, and Stereotyping and Prejudice, respectively.

The goal of the online measure was to present participants with an unexpected situation intended to provoke a socially inappropriate response (as in von Hippel & Gonsalkorale, 2005). Immediately after the Speeded Pattern Comparison Task a screen-saver image appeared on the computer screen, in which the experimenter (a Caucasian female, age 21) was depicted with an Aboriginal man who appeared to be about 40, with a border in the shape of a love heart around them. This screen saver implied that the experimenter (who was still present in the room) was romantically involved with the older Aboriginal man and that this information was unintentionally revealed to participants. Reactions to this image were video recorded, coding of which indicated that all participants noticed the screensaver image.

Reactions to the screen saver were rated by two older adults (a 76-year-old male and a 70-year-old female). These volunteers were blind to the aims of the study and gave independent ratings of the participants' reactions. Raters responded to the statement, "The person expressed disgust or disapproval" on a scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Raters provided a single score based on verbal and nonverbal behaviors (see von Hippel & Gonsalkorale, 2005). Interrater reliability was high ($r = .91$).

¹ Results were equivalent when raw scores instead of residuals were used from the TMT.

Results

Correlations between all of the variables are presented in Table 1. Four sets of correlations are worthy of note. First, the correlations were essentially equivalent between the three measures of executive functioning (with the expected difference in sign between fluency and TMT measures) and the three proxy measures of social functioning. Because the executive functioning measures were also somewhat intercorrelated, a composite executive functioning measure was created from the standardized version of the three executive function variables (with the sign reversed on the fluency measure). The creation of this composite measure of executive functioning also enabled us to examine whether executive functioning in general mediates the relationship between age and social inappropriateness, without pitting the different measures of executive control against each other in their role as mediators.

Second, responses showing disgust/disapproval to the interracial couple in the screen saver were correlated with the Social Appropriateness Scale, Social Inappropriateness Scale, and the Stereotyping and Prejudice Scale, suggesting that negative reactions to the interracial couple might have been driven by cultural mores and social expectations as well as prejudice. To test this possibility, we regressed disgust/disapproval of the interracial couple on the Stereotyping and Prejudice Scale and the Social Appropriateness Scale in one analysis, and on the Stereotyping and Prejudice Scale and the Social Inappropriateness Scale in a second analysis. These analyses revealed that Stereotyping and Prejudice was a significant predictor ($\beta = .22, p < .05$) of disapproval, but Social Appropriateness was not ($\beta = -.10, p > .30$) when we included these two scales as simultaneous predictors. Neither Stereotyping and Prejudice ($\beta = .25, p < .09$) nor Social Inappropriateness ($\beta = .03, p > .80$) was a significant predictor of disapproval when we included these two scales as simultaneous predictors. These preliminary findings suggest that negative responses to the interracial couple were primarily driven by stereotyping and prejudice.

Third, the ACE-R was correlated with two of the three peer-report measures of social functioning and was marginally correlated with responses to the screen saver. Fourth, the three peer-report measures of social functioning were strongly intercorrelated. Consequently, to enhance stability of the peer-report measure and reduce the number of relationships examined, we created a composite Social Functioning Scale score. Items that compose the Social Inappropriateness Scale and the Stereotyping and Prejudice Scale were reverse scored, and then we averaged all of the individual items together to form an unweighted mean, so that a higher score on the total scale was indicative of better social functioning ($\alpha = .94$).²

The next step in the analyses was to estimate a series of regression-based causal models, as outlined by Baron and Kenny (1986), to assess whether the effect of age on social functioning was mediated by executive functioning and/or general cognitive ability. We estimated two sets of regression equations to examine this question, one with the Social Functioning Scale as the dependent measure and one with the online responses to the interracial couple as the dependent measure. In the first step of these two models, the measure of social functioning was regressed on age. In the second step, the measure of general cognitive ability and the composite measure of executive functioning were regressed on age. In the third and final step of these models, the measures of

social functioning were regressed on age, general cognitive ability, and the composite measure of executive functioning.

If executive functioning mediates the effect of age on social functioning, then the relationship between age and social functioning should diminish when executive functioning is included in the model. Furthermore, if the mediating effect of executive functioning is independent of general cognitive decline, then the mediated effect from age through executive functioning to social functioning should be significant. To ensure that these relationships were not unduly influenced by gender, education, or processing speed, we estimated these models with these three variables included as predictors in the models. In none of these models were any of these control variables significant predictors of social functioning, so they have been removed from the final models for the sake of clarity.

Figure 1 presents the results of these causal models. As can be seen in Figure 1A, age was a significant predictor of the Social Functioning Scale without the mediators in the model, but the effect of age was completely mediated by executive functioning and general cognitive ability. Sobel tests revealed that the composite measure of executive functioning and the ACE-R were both significant mediators of the effect of age on the Social Functioning Scale (see Figure 1A). These data indicate that deficits in executive functioning and general cognitive ability both contribute to age-related changes in social behavior.³ Finally, although age exerted a significant direct effect on negative responses to the screen saver, neither the composite measure of executive functioning nor the ACE-R mediated this effect (see Figure 1B).

Discussion

The current findings add to a growing literature suggesting that age-related declines in executive control have implications for social functioning. Older adults were rated by their peers as engaging in more socially inappropriate behavior than younger adults, and these age-related changes were completely mediated by changes in executive functioning and general cognitive ability. This finding indicates that older adults who performed well on measures of executive functioning and general cognitive ability were just as socially appropriate as younger adults. Nevertheless, older adults also showed greater social inappropriateness when provoked in the laboratory, but in this case the effect of age was not mediated by executive functioning or general cognitive decline. Thus, it may be that some age changes in social inappropriateness are unrelated to cognitive functioning, or alternatively it may simply be the case that a single behavior is more difficult to predict than composite behaviors exhibited across a variety of situations (see Fishbein & Ajzen, 1975).

² Results of the mediation analyses were equivalent when the means from the three scales, rather than the individual items, were averaged together, except that the mediating role of the ACE-R was slightly reduced.

³ Follow-up analyses conducted with the separate subscales indicated that executive functioning significantly mediated the association between age and Social Inappropriateness and between age and Stereotyping and Prejudice, and that executive functioning and the ACE-R both significantly mediated the association between age and Social Appropriateness. Thus, general cognitive functioning may be more relevant to understanding age-related changes in socially appropriate than socially inappropriate behavior.

Table 1
Correlations Between Measures of Social and Cognitive Functioning

Variable	1	2	3	4	5	6	7	8	9	10
1. Age	68.9 (14.67)									
2. ACE-R	-.28	87.3 (11.12)								
	.003									
3. SI scale	.20	-.27	1.9 (0.53)							
	.038	.004								
4. SA scale	-.18	.36	-.53	3.7 (0.36)						
	.056	<.001	<.001							
5. S&P scale	.18	-.15	.73	-.48	2.0 (0.73)					
	.055	.124	<.001	<.001						
6. Online SI ^a	.33	-.18	.22	-.20	.27	2.6 (0.98)				
	.001	.071	.026	.036	.005					
7. FAS	-.31	.30	-.27	.31	-.18	-.21	40.6 (12.92)			
	.001	.002	.005	.001	.067	.028				
8. TMT time ^b	.17	-.14	.27	-.18	.23	.07	-.13	0.0 (3.37)		
	.089	.144	.005	.060	.019	.512	.184			
9. TMT error ^b	.29	-.23	.21	-.22	.19	.09	-.28	.33	0.0 (2.00)	
	.003	.016	.032	.022	.052	.382	.004	.001		
10. Speed	.44	-.36	.13	-.13	.12	.23	-.39	.11	.35	2.5 (0.92)
	<.001	<.001	.169	.198	.238	.018	<.001	.261	<.001	

Note. The value reported below each correlation is the *p* value; values on the diagonal are means (with standard deviations in parentheses). For all measures, higher scores denote higher levels of the construct of interest (or in the case of the cognitive measures, better performance). The only exception is for the speed (measured in seconds) and the Trail Making Test (TMT) time and error residual scores, for which higher scores denote poorer performance. ACE-R = Addenbrooke's Revised Cognitive Examination; SI = Social Inappropriateness Scale; SA = Social Appropriateness; S&P = Stereotyping and Prejudice; FAS = phonemic fluency.

^a Responses showing disgust/disapproval. ^b Residual scores derived by regressing each score from Part B on the comparable score from Part A.

At first blush these data might appear inconsistent with studies that have documented age-related gains in socioemotional functioning (Blanchard-Fields, 2007; Phillips et al., 2008). We would suggest, however, that in combination with previous research, the current findings suggest that social functioning in older adulthood might emerge from competing sources. On the one hand, greater life experience and the wisdom that comes with it can lead people to prioritize emotion-related goals, thereby facilitating social interaction. On the other hand, losses in executive functioning and general cognitive abilities appear to disrupt social functioning. There is no reason why these changes should not emerge relatively independently of one another. Thus, depending on the relative strength of these facilitating versus debilitating changes, older adults might show losses or gains in social functioning or indeed might show no overall gains or losses despite underlying counter-currents (von Hippel, Henry, & Matovic, 2008).

Nevertheless, the present data and previous research (Pushkar et al., 2000; von Hippel & Dunlop, 2005) suggest that social inappropriateness is one aspect of socioemotional functioning where the costs of executive deficits outweigh the advantages conferred by greater life experience. As a consequence, older adults appear to be more likely to engage in certain socially inappropriate behaviors, and this change might occur despite their best intentions to the contrary. Although such a possibility would be of interest in any age group, it is particularly poignant among the elderly, who depend on social integration with their peers to keep loneliness at bay (Pinquart & Sörensen, 2001) and who are likely to be excluded by their peers if they do not provide them with positive emotional support (Carstensen, Fung, & Charles, 2003). Indeed, the results of von Hippel and Dunlop (2005) suggest that older adults in particular feel less close to those who engage in the sort of socially inappropriate behaviors documented in the current

study. Thus, it appears that the socially inappropriate behaviors documented in the current research represent meaningful indicators of socioemotional functioning, although they do not negate other findings of enhanced socioemotional functioning among older adults (e.g., Blanchard-Fields, 2007; Carstensen et al., 2003; Phillips et al., 2008).

Indeed, one prediction that could be derived from socioemotional selectivity theory (Carstensen et al., 2003) is that older adults will exert considerable cognitive resources to control socially inappropriate behaviors when engaging with those who are central to their social network, but they may be less attentive to offending more peripheral social partners. In the present study, although the proxy measure was completed by close friends or spouses, it did not inquire about personal experiences of being offended by the participant. Thus, the questionnaire could have been completed by recalling observations of the participants' behavior toward others. An interesting avenue for future research would be to assess whether social inappropriateness in older adulthood varies as a function of the target of the socially inappropriate behavior.

Caveats

Most importantly, the current data were collected cross-sectionally, and thus longitudinal work is necessary to corroborate the findings of the causal models. Furthermore, it would be helpful to differentiate the effects of executive functioning from other consequences of age-related frontal lobe atrophy, such as deficits in perspective taking (Bailey & Henry, 2008) and affect recognition (Ruffman, Henry, Livingstone, & Phillips, 2008). It would also be helpful to differentiate the effects of cognitive changes with age from those of motivational ones, as motivational and cognitive processes undoubtedly interact in shaping social functioning.

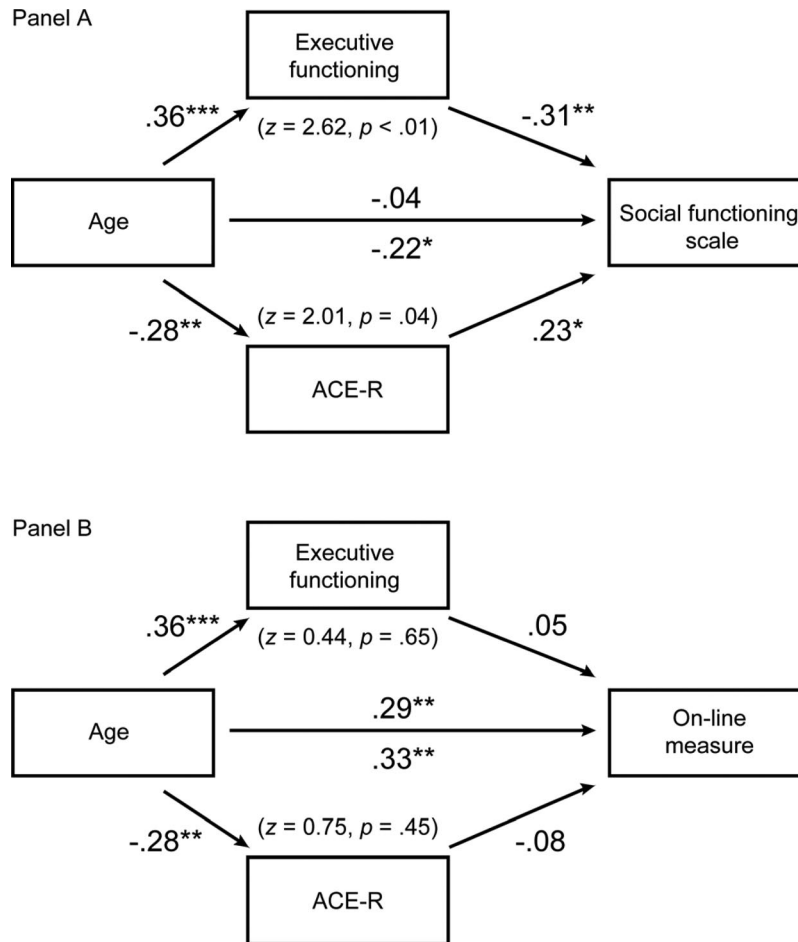


Figure 1. Path analyses depicting the mediated effect of age via Addenbrooke's Revised Cognitive Examination (ACE-R) and executive functioning on the Social Functioning Scale (A) and on the online measure of social inappropriateness (B). Path coefficients are standardized beta weights. The z values (and associated p values) refer to Sobel test results, assessing the significance of the role of each mediator. In Panels A and B, two direct effects of age on the Social Functioning Scale and online measure of social inappropriateness are included. In each of these panels, the coefficient below the path is without any mediators in the model, and the coefficient above the path is with executive functioning and ACE-R included as mediators. * $p < .05$. ** $p < .01$. *** $p < .001$.

One such motivational process that might appear to be an obvious candidate for study is age changes in impression management concerns. That is, perhaps older adults just do not care as much as younger adults about what others think of them or their social gaffes. This possibility is intuitively compelling but is inconsistent with the findings of von Hippel et al. (2000), in which older adults were more concerned than younger adults about controlling their prejudicial reactions and more concerned than younger adults about managing a positive impression (this latter finding with impression management has been replicated in a representative national sample by von Hippel, Radvansky, & Copeland, 2008). Additionally, some of the social behaviors that older adults' peers ascribed to them in the current research are the very ones that older and younger adults both agree are highly socially inappropriate (von Hippel & Dunlop, 2005). Thus, although there is clearly room for motivational factors to lead to age-related changes in social inappropriateness, future researchers will need to delineate what those motivational factors might be.

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Appendix

The Peer-Report Social Functioning Scale

Social Inappropriateness Scale

1. Enquires about potentially embarrassing issues in public?
2. Comments negatively on someone else's physical appearance (e.g., weight gain, body odour, bad haircut/style)?
3. Talks for extended periods of time without allowing others to engage in the conversation?
4. Embarrasses people unintentionally?
5. Comments on someone else's choice of clothing in a negative way (e.g., under/over dressed, too revealing, too tight)?
6. Engages in extended speech that generally lacks focus and coherence?
7. Hurts other people's feelings without meaning to?
8. Prys into other people's business?
9. Says socially inappropriate things without meaning to?
10. Discusses his/her own financial success (e.g., annual salary, value of share portfolio, how much his/her house sold for)?

Social Appropriateness Scale

1. Speaks positively about others?
2. Lets other people have their say?
3. Notes when a situation is a sensitive one?
4. Actively engages people in conversations so that they do not feel left out?
5. Makes sure not to raise topics that could come across as offensive to others?

6. Comforts people when they are upset?
7. Goes out of his/her way to help others?
8. Thinks of other people before thinking about himself/herself?
9. Compliments others?
10. Is patient with others?
11. Tries to instill good values onto people close to him/her?
12. Remembers people's names?
13. Is generous with his/her time?
14. Considers other people's point of view?
15. Is discreet about asking potentially embarrassing questions?
16. Makes an effort to remember details about people's lives?
17. Takes the time to explain something to someone if he/she does not understand?

Stereotyping and Prejudice Scale

1. Ignores stereotypes when making decisions about people?
2. Demonstrates prejudicial beliefs and/or relies on stereotypes when making a decision about someone?
3. Comments on someone else's race in a negative way?

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