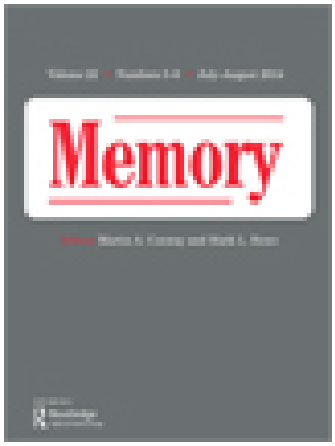

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Ageing and the group-reference effect in memory

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Ageing and the group-reference effect in memory

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The present study examines age differences in the memory benefits from group-referncing. While prior work establishes that the memory performance of younger and older adults similarly benefits from relating information to the self, this study assessed whether those benefits extend to referencing a meaningful group membership. Young and older adult participants encoded trait words by judging whether each word describes themselves, describes their group membership (selected for each age group), or is familiar. After a retention interval, participants completed a surprise recognition memory test. The results indicate that group-referencing increased recognition memory performance compared to the familiarity judgements for both young and older groups. However, the group-reference benefit is limited, emerging as smaller than the benefit from self-referencing. These results challenge previous findings of equivalent benefits for group-referencing and self-referencing, suggesting that such effects may not prevail under all conditions, including for older adults. The findings also highlight the need to examine the mechanisms of group-referencing that can lead to variability in the group-reference effect.

Keywords: Memory; Ageing; Group-referencing; Self-referencing; Group identity

When you encounter a piece of information that is reminiscent of your college fraternity or sorority friends, or reminds you of your hometown, you automatically engage in a qualitatively different thinking process than encountering information that lacks personal relevance (Kesebir & Oishi, 2010). This automatic processing of stored knowledge related to your friends or hometown could naturally lead to better memory for the novel information. Thus, whether or not new information is personally relevant critically impacts memory processes, and potentially offers a route to help ageing populations suffering from memory deficits.

This phenomenon has long been scrutinised using the self-reference research paradigm, in which participants encode information in reference to the self. Information that is connected to the self allows for more efficient and deeper processing and encoding which facilitates later recall and recognition (see Symons & Johnson, 1997 for review). This benefit from the self-reference effect remains robust with age, improving memory relative to other conditions, although an age gap typically persists in memory, with poorer overall performance for older compared to younger adults (Glisky & Marquine, 2009; Gutchess, Kensinger, Yoon, & Schacter, 2007; Mueller, Wonderlich, & Dugan, 1986; Yang, Truong, Fuss, & Bislimovic, 2012). There is also some evidence that self-referencing is a spontaneous and effortless process (Yang et al., 2012), which converges with literature suggesting that memory functions are relatively preserved with age when they involve automatic processes or affective and value-based information (May, Rahhal, Berry, & Leighton, 2005; Rahhal, May, & Hasher, 2002). That is, the self-reference effect

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could be preserved across the lifespan due to its affective and personally meaningful properties.

The memory benefits from self-reference have been found to extend to those with whom we are close (e.g., spouse or sibling). When participants are asked to encode information in relation to a close other, the overlaps in self and other representations are believed to facilitate memory processes. While the benefits do not always match the level of benefit seen from self-reference, close other-reference does lead to better memory than other semantic encoding tasks (Aron, Aron, Tudor, & Nelson, 1991).

However, self and other-referencing paradigms in which participants are typically asked to encode new information in reference to the self (e.g., "Does this word describe you?") or a close other (e.g., "Does this word describe your close other?") do not fully capture the range of ways in which one can conceptualise of the self. People can define themselves as a part of collective entity as well as a differentiated, individuated personal entity (see Brewer, 1991 for a review). The latter is the level of the self typically represented in self-reference research paradigms (Johnson et al., 2002). Although culture affects the extent to which each level of the self is prioritised (see Markus & Kitayama, 1991; Triandis, 1989 for reviews), these different self-definitions can universally coexist within an individual. Although situations and cultural contexts dictate which level of the self is most dominant in daily life, individuals shift among multiple social identities, such as mother of a family, employee of a certain company, or citizen of a nation, beyond one's personal identity. Furthermore, personal and collective identities activate distinct cognitive representations pertaining to self-concepts that emerge spontaneously. For instance, participants primed with personal self-concept retrieved more cognitions about the private self (e.g., I am brave) whereas those primed with collective self-concept retrieved more cognitions about the collective self (e.g., I am a son) (Trafimow, Triandis, & Goto, 1991). Thus, it is important to also measure the degree of mnemonic benefits that social aspects of the self can provide. For example, prior research demonstrates that for college students, encoding information in reference to the general population at their university enhanced later recall of the information to the same level as self-referencing. Moreover, the effect of group-referencing memory (e.g., "my family") was also found to be superior when compared to information that was encoded in reference to highly familiar "other" groups (e.g., the Simpson Family from TV) or to a highly familiar "other" (e.g., Homer Simpson; Bennett, Allan, Anderson, & Asker, 2010). Taken together, these results suggest that one's collective identity is just as effective for an encoding device as the individual self-concept (Johnson et al., 2002).

Extending the study of group-referencing to older populations is of interest given changes in social identity across the lifespan. One might expect that social identities in older adults would shrink due to the reduced social engagements that occur in conjunction with retirement from work and increased physical immobility (Whitbourne, 2007). However, *socio-emotional selectivity theory* (SST) postulates that perceiving the time remaining in one's life as limited motivates older adults to allocate more resources to emotionally meaningful relationships. Thus, declines in the number of social relationships might not be due to older adults' decreased motivation to engage in social groups, but instead reflect their enhanced selectivity to focus on personally meaningful group memberships more than young adults (Carstensen, 1992, 1995; Carstensen, Isaacowitz, & Charles, 1999). Group memberships maintained in later life are more likely to reflect personally significant identities and to be emotionally rewarding compared to the broader group affiliations one has in youth. In accord with SST, a more selective group identity might be linked to prioritised information processing over other information, which leads us to predict that older adults will exhibit group-referential memory benefits for personally meaningful group memberships. Furthermore, based on the findings of a positivity effect in older adults' memories (Mather & Carstensen, 2005), older adults' memory advantage from group-referencing could be heightened for positive words compared to negative ones. However, previous work has also shown that older adults may be susceptible to increases in false alarms (FAs) for positive words (Piguet, Connally, Krendl, Huot, & Corkin, 2008). It is possible that this increase in FAs could detract from overall accurate memory performance.

If older adults place particular importance on maintaining and reinforcing meaningful social relationship, as suggested by SST, they may capitalise on the affective and relational significance of group membership. A substantial body of work has directly documented the effects of social ties on cognitive ageing (Haslam, Jetten, Postmes, & Haslam, 2009; Seeman, Lusignolo, Albert, & Berkman, 2001). There are protective effects of social integration with respect to lower risk for

dementia (Haslam et al., 2010; Scott & Clare, 2003). Some evidence shows that levels of social engagement and perceptions of emotional support are predictors of cognitive decline (Seeman et al., 2001). These findings suggest that the affective and relational engagement aspects of group memberships could play a role in maintaining cognitive function (Haslam et al., 2010).

As with self- and other-reference, group-referencing is expected to draw on memory principles such as elaboration, increased accessibility, organisation, evaluative processing and deeper information processing (Anderson & Reder, 1979; Ferguson, Rule, & Carlson, 1983; Keenan, Golding, & Brown, 1992; Klein & Kihlstrom, 1986; Rogers, Kuiper, & Kirker, 1977). But it may be the social factors that uniquely support memory for group, as opposed to self-referenced information. In conjunction with the *self-identity theory,* which holds that people behave favourably towards the group they belong to so as to enhance self-esteem (Tajfel, 1981), the contribution of evaluative processes to the group-reference effect may be especially important to consider with ageing due to relatively spared emotional resources compared to cognitive resources. Thus, older adults should obtain mnemonic benefits from processing information in reference to a group membership compared to drawing on general semantic processes. Group membership may also enhance memory performance due to the ways that identity can shape cognitive representations (Aron et al., 1991, 2004; Smith & Henry, 1996; Tropp & Wright, 2001). For instance, people who are strongly attached to a group are more likely to have overlapping cognitive representations between themselves and the other group members than those who were loosely attached to the group (Tropp & Wright, 2001). This suggests that self-relevant processes would be applied to group-referencing in such cases.

The present study investigates whether group-referencing can serve as an effective memory aid for older adults, and explores how group-referential memory may change with age. We extend the study of group-referencing to ageing populations and also extend previous studies of group-referencing in young adults by adopting measures of recognition memory, as opposed to recall measures. Previous work shows mixed results in the use of recall and recognition with greater self-reference benefit in recognition tasks when the self-reference is compared to other-reference but greater self-reference benefit in free recall tasks when self-reference is compared to semantic reference (see Symons & Johnson, 1997 for review). Most self-reference literature uses recognition tests, and we wanted to be able to relate our findings to this literature. Furthermore, given that older adults tend to show pronounced impairments with free recall (Craik & McDowd, 1987), using recognition gives older adults the best opportunity to benefit from a group-reference strategy.

In selecting appropriate reference groups, we chose belonging to a learning community for both younger and older adults, as this group membership had been found to enhance young adults' memory in previous work (Johnson et al., 2002). While the family has also been used in prior work, we wanted to avoid confounds with different conceptualisations and structures of family between two age groups. We investigated how a group-referencing encoding strategy benefits memory in younger and older adults, compared to self-reference and a semantic encoding condition. While previous work has shown that group-reference effects can equal those from self-reference, Johnson et al. (2002) also found that such benefits do not hold true for all group referents. As a result, we expect to find that self-reference leads to better memory than group, but that memory for group will be better than that for semantic encoding.

Finally, we investigated whether the positivity effect emerges with age in this paradigm. The positivity effect that favours positive over negative stimuli during cognitive processes of older adults has been identified with various memory processes including working memory (Mikels, Larkin, Reuter-Lorenz, & Carstensen, 2005), long-term memory (Charles, Mather, & Carstensen, 2003) and autobiographical memory (Kennedy, Mather, & Carstensen, 2004) although this effect may not emerge consistently in the false memory literature (Fernandes, Ross, Wiegand, & Schryer, 2008; Piguet et al., 2008) and in self-reference research (Glisky & Marquine, 2009; Gutchess et al., 2007). Thus, investigating whether the positivity effect appears with group-reference memory may help understand the scope of positivity effects on memory processes.

METHODS

Participants

Seventy-two young participants (age range 18–22) at Brandeis University took part in the experiment

TABLE 1
Demographic information and mean (SD) test scores for young and older adults

	Young	*Older*
Age	19.69 (1.04)	73.80 (4.87)
N	72 (25M, 47F)	58 (21M, 37F)
Years of education*	13.56 (1.05)	17.71 (1.46)
Length of group membership (years)*	2.07 (0.91)	6.07 (3.73)
Digit comparison*	79.69 (14.23)	58.86 (10.31)
Shipley vocabulary*	32.11 (3.44)	37.76 (1.56)
MMSE	N/A	28.95 (1.10)

*Age difference is significant at $p < .05$.

in exchange for partial course credit or payment, and 61 older adults (age range 65–85) from the Brandeis Osher Lifelong Learning Institute (BOLLI) participated in the study in exchange for payment. Osher Lifelong Learning Institutes provides classes and other educational activities for adults participants, typically who are retired or semi-retired. Currently, there are 118 centres in the USA, coordinating educational activities emphasising group participation, leadership and socialisation. These group memberships were selected because both groups are primarily knowledge-seeking communities with relatively stable group memberships that encourage active learning and peer leadership through a wide range of extracurricular activities and diverse class offerings. Participants were native English speakers who had been currently enrolled in the affiliated group for at least one semester, which we considered to be a reasonable period to establish group memberships. Older adults also needed to score higher than 26 on the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) in order to screen out those who were cognitively impaired. Three older participants were excluded from data analysis based on these eligibility criteria. Demographic characteristics are presented in Table 1. Older adults were significantly more educated, $t(100.03) = 18.18$, $p < .001$, had a longer period of group involvement, $t(61.24) = 7.92$, $p < .001$, were slower on the digit comparison (Hedden et al., 2002) task, $t(126.66) = 9.67$, $p < .001$, and scored higher on the Shipley vocabulary test (Shipley, 1986), $t(101.72) = 12.36$, $p < .001$ than younger adults.

Materials

A set of 216 traits was selected from Anderson's (1968) norms to compose lists of stimuli for encoding and recognition phases. One hundred and eight trait words were presented at encoding and the other 108 trait words were used as lures at recognition. The study words were divided into three sublists (36 words each), matched on likeability and meaningfulness from the Anderson (1968) norms. Each sublist was assigned to one of the three encoding conditions (self-referencing, group-referencing and semantic encoding), and counterbalanced across participants. Counterbalancing order did not interact with valence or age, so is not considered in the results. Each sublist was composed of half positive (e.g., generous; pleasant) and half negative (e.g., jealous; rude) traits. The order of presentation was randomised for each word for each participant, with trials from different conditions intermixed throughout the study.

Procedure

Each participant completed the study individually in a cubicle equipped with a PC. After providing informed consent, participants performed the encoding tasks during which stimuli were presented at the top of the screen, with one of the following prompts appearing below: *Does this word generally describe yourself?*, *Does this word generally describe Brandeis students?* (*BOLLI members* for the older adult group) or *Is this word familiar?* Each of 108 stimuli was presented for 5 seconds, during which time participants responded to the judgement by pressing "yes" (Y key) or "no" (N key). Based on the low number of trials missing a response for the young ($M = 0.99$, SD = 1.24) and older adults ($M = 1.46$, SD = 1.54) and the average response times (millisecond) (young: $M = 2014.98$, SD = 340.54; older: $M = 2348.81$, SD = 299.38), this window was sufficiently long for younger and older adults to respond. After a 7-minute retention interval, during which participants completed

TABLE 2
Mean (SD) of "yes" endorsements of adjectives at encoding as a function of condition, valence and age

	Young			*Older*		
Valence	*Self*	*Group*	*Semantic*	*Self*	*Group*	*Semantic*
Positive	0.83 (0.13)	0.81 (0.15)	0.97 (0.06)	0.89 (0.09)	0.86 (0.15)	0.99 (0.03)
Negative	0.17 (0.12)	0.22 (0.17)	0.93 (0.13)	0.06 (0.06)	0.08 (0.11)	0.97 (0.05)

demographic and health forms, speed of processing and vocabulary tasks, all participants then completed the surprise self-paced recognition task. For each of 216 trait words, participants made a judgement as to whether the presented word is *Old* or *New*. The *Inclusion-of-Ingroup in the Self Scale* (IISS) (Tropp & Wright, 2001 based on Aron et al., 1991) was then administered to measure the level of closeness between the self and the target reference groups. The IISS asks participants to select from a series of Venn diagram-like overlapping circles to indicate how much their self-identity overlaps with their group identity. Finally, a questionnaire was administered to assess the level of engagement in the groups (i.e., length of membership, number of hours engaged in group activities). Finally, participants were debriefed and thanked for their participation in the study.

RESULTS

Ratings

In order to compare how younger and older adults[1] endorsed adjectives during encoding, we conducted a $3 \times 2 \times 2$ mixed ANOVA (Analysis of Variance) on the proportion of "yes" responses with encoding condition (self/group/semantic) and valence (positive/negative) as within subject factors and age (younger/older) as a between subjects factor. Because the proportion of yes and no responses sum to 1, aside from the very few trials that did not receive a response, this simplifies the presentation of the results. As is apparent in Table 2, nearly every word received a "yes" response in the familiarity (semantic) condition. Because this condition differed qualitatively from the others (all main effects and interactions involving condition were significant), we concentrated on a $2 \times 2 \times 2$ analysis of the data excluding the semantic condition. These analyses revealed a significant main effect of age, $F(1, 126) = 10.39$, $p < .01$, $\eta_p^2 = .08$, with young adults ($M = 0.51$, $SD = 0.06$) providing more "yes" responses than older adults ($M = 0.47$, $SD = 0.06$), and a main effect of valence, $F(1, 126) = 2428.47$, $p < .001$, $\eta_p^2 = .95$, with positive words ($M = 0.85$, $SD = 0.10$) receiving more "yes" responses than negative words ($M = 0.13$, $SD = 0.10$). These main effects were qualified by an interaction between valence and age, $F(1, 126) = 35.42$, $p < .001$, $\eta_p^2 = .22$, with older adults showing a stronger effect of valence (more "yes" responses to positive words and fewer to negative words) than young adults, consistent with the positivity bias literature. In addition, there was a significant interaction of condition and valence, $F(1, 126) = 9.02$, $p < .01$, $\eta_p^2 = .07$, such that there was a larger difference in the number of "yes" responses to positive words vs. negative words in the self-condition compared to the group condition. No other effects approached significance (see Table 2).

Recognition memory performance (hits—FAs)

In order to assess accurate memory performance, the ability to discriminate old from new words, a corrected recognition score was calculated by subtracting FAs from hit rates across encoding conditions for each participant. A $3 \times 2 \times 2$ mixed ANOVA was conducted with encoding condition (self/group/semantic) and valence (positive/negative) as within subject factors and age (younger/older) as a between subjects factor. See Figure 1 for hit minus FA scores. The main effect of age was significant, $F(1, 128) = 128.02$, $p < .001$, $\eta_p^2 = .50$, such that recognition performance was higher for the younger ($M = 0.51$, $SD = 0.17$) than the older

[1] $N = 56$ for older adults, because encoding files could not be recovered for two participants.

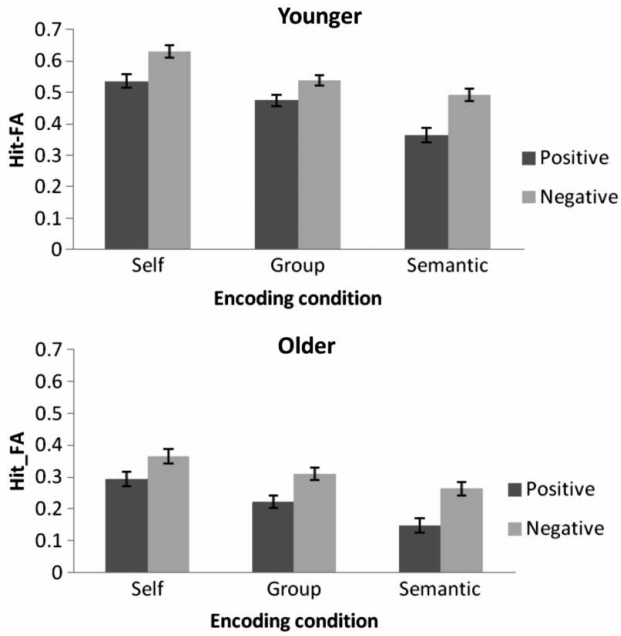

Figure 1. Recognition performance as a function of encoding condition and valence for each age group. Across age groups, the self-condition resulted in higher memory performance than the group condition, which resulted in higher memory performance than the semantic condition. Negative words were better remembered than positive words.

adults (M = 0.27, SD = 0.16). The main effect of the encoding condition was also significant, F (1.83, 234.69[2]) = 77.89, $p < .001$, $\eta_p^2 = .38$. Contrasts revealed that group-referential encoding led to better memory performance ($M = 0.39$, SD = 0.15) than the semantic judgements (M = 0.32, SD = 0.17), but memory performance with group-referential encoding was still poorer than with self-referencing ($M = 0.46$, SD = 0.17), all ps < .001. The main effect of valence was significant, F (1, 128) = 76.60, $p < .001$, $\eta_p^2 = .37$, which indicated higher memory performance for negative words ($M = 0.43$, SD = 0.16) than for positive words ($M = 0.34$, SD = 0.17). An interaction between encoding condition and valence was also significant, F (2, 256) = 4.27, $p < .05$, $\eta_p^2 = .03$. Follow-up analyses were conducted to investigate how the discrepancies in memory performance between negative and positive words differed across conditions. The results showed that the memory advantage for negative over positive words was larger for the semantic encoding condition than the group-referencing condition, F (1, 128) = 7.94, $p < .01$, $\eta_p^2 = .06$, as well as the self-referencing condition, F (1, 128) = 4.62, $p < .05$, $\eta_p^2 = .04$. The difference between negative and positive words did not vary between the self-referencing and group-referencing conditions ($F < 1$).

Additional analyses on hits and FAs

Additionally, we conducted separate ANOVAs on the hits and FA rates to understand how these scores differ across conditions with age. A mixed ANOVA for hit rates yielded a main effect of age, F(1, 128) = 35.67, $p < .001$, $\eta_p^2 = .22$, with younger adults making more hits ($M = 0.71$) than older adults ($M = 0.57$), a main effect of encoding, F (183, 234.2) = 77.90, $p < .001$, $\eta_p^2 = .38$, with highest performance for self-referencing ($M = 0.71$), group-referencing in the middle ($M = 0.64$), and poorest performance in the semantic condition ($M = 0.57$). A main effect of valence, F (1, 128) = 114.37, $p < .001$, $\eta_p^2 = .47$, was also found, indicating more hits for positive ($M = 0.70$) over negative words (M = 0.57). The main effects were qualified by the interaction of age with valence, F (1, 128) = 36.42, $p < .001$, $\eta_p^2 = .22$. When each group was examined separately, valence effects

[2]Mauchly's test indicated that the assumption of sphericity had been violated ($\chi^2 = 13.087$), therefore degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = .87$).

TABLE 3
Mean (SD) of hits and FAs as a function of encoding condition, valence and age

	Young				*Old*			
	Hits				*Hits*			
Valence	*Self*	*Group*	*Semantic*	*FAs*	*Self*	*Group*	*Semantic*	*FAs*
Positive	0.81 (0.15)	0.75 (0.14)	0.64 (0.18)	0.28 (0.07)	0.74 (0.17)	0.67 (0.20)	0.59 (0.21)	0.44 (0.19)
Negative	0.76 (0.21)	0.66 (0.14)	0.62 (0.17)	0.13 (0.12)	0.52 (0.20)	0.46 (0.21)	0.42 (0.20)	0.16 (0.09)

emerged as significant for both young, $F(1, 71) = 20.69$, $p < .001$, $\eta_p^2 = .23$, and older, $F(1, 57) = 83.50$, $p < .001$, $\eta_p^2 = .59$, adults. However, inspection of the effect sizes and means indicates that older adults have disproportionately more hits for positive than negative words, compared to young.

We also analysed FA rates. Because condition was assigned at encoding (based on the judgement participants made about the word), by definition it did not apply to the lure words, as they had not been studied. However, FA rates can still be compared across valence and age groups. A 2×2 mixed ANOVA for FA rates yielded a main effect of age, $F(1, 128) = 24.14$, $p < .001$, $\eta_p^2 = .16$, with older adults exhibiting higher FA scores ($M = 0.30$) than younger adults ($M = 0.20$), and a main effect of valence, $F(1, 128) = 397.12$, $p < .001$, $\eta_p^2 = .76$, with more FAs for positive ($M = 0.36$) than negative words ($M = 0.14$). There was an interaction of age and valence, $F(1, 128) = 38.95$, $p < .001$, $\eta_p^2 = .23$. Whereas FA rates for young and older adults were relatively similar for negatively valenced items, $t(98.61) = 1.78$, $p = .08$, older adults committed significantly more FAs for positively valenced items than young $t(92.39) = 5.70$, $p < .001$. Note that the high FA rates for positive items detracted from the benefit for positive items that was observed for hit rates, leading to overall higher memory discrimination for negative compared to positive items. See Table 3 for hit and FA rates across conditions.

Correlations with measures of group engagement

We conducted a preliminary analysis to assess whether group-referential memory performance varies depending on the level of self-group closeness across age groups. We did not find any indication that group-referential memory scores relate to the level of self-other closeness, as assessed with the IISS, for either age group (both rs $< .2$). We also examined whether group-referential memory scores vary depending on the length of group membership and the number of hours engaged in group activities per week. Corrected recognition scores for group-referencing were not significantly correlated with the length of group membership for either group, but were significantly correlated with the number of hours engaged in group activities per week for older, $r(58) = .30$, $p < .05$, but not younger, $r(72) = -.04$, $p > .20$, adults. Comparing the correlation coefficients across the two age groups yielded a marginal effect, Fisher's $z = 1.96$, $p = .05$, two-tailed.

DISCUSSION

In the present study, we investigated whether group-referencing provides memory benefits across young and older age groups. Younger adults outperformed older adults in overall memory performance but both groups saw a benefit to memory from self-reference. While this finding is consistent with prior work, we extended research to consider the contribution of group membership to memory. We found that group-referencing benefited young and older adults to the same extent. While group-referencing did not provide the same level of benefit as self-reference as was initially predicted, it did serve to enhance memory performance compared to a semantic condition. It is possible that the more efficient and deeper processing conveyed through self-referencing facilitated the recognition of information related to group membership over information that was judged on familiarity. However, the potentially heightened importance of social ties and group identity with age did not magnify group-reference effects for older adults.

The findings add to the evidence for age-equivalent benefits from self-referencing (Glisky & Marquine, 2009; Gutchess et al., 2007; Hamami, Serbun, & Gutchess, 2011; Rosa & Gutchess, 2011; Yang et al., 2012), while also revealing that referencing group identity, although not as effective as the self, can serve as a meaningful way to encode new information.

The present study adds to previous work with young adults which finds group-reference benefit is not the same for all group memberships. However, the current finding that group-referencing only leads to moderate mnemonic benefits that are greater than semantic but smaller than self-referencing conditions is discrepant with previous research indicating that college students showed greater recall for information that had been encoded with reference to their university membership to the same degree to which they mnemonically benefited from self-referencing (Johnson et al., 2002). This might be due to differences in the designs and samples across the two studies. For example, participants in our study encoded twice as many words and were tested with a recognition test (as employed in many studies of self-referencing) in order to compare our findings to previous self-reference literature, whereas the participants in Johnson et al. (2002) completed a free recall test. Additionally, participants in our study were tested alone while those in the previous study completed the tasks in small groups. It is possible that the presence of other students strengthened the group connection and facilitated performance at recall. It is also possible that subject groups differed in systematic ways across the two studies. Level of collective esteem, or sense of belonging among group members, would likely enhance participants' motivation in a group-referencing task (Doosje, Spears, & Ellemers, 1995; Tropp & Wright, 2001). It is also worth noting that the present sample was not recruited from a departmental subject pool, as was the case for the Johnson et al. (2002) study. As our sample required students to be enrolled for at least one semester, we had only a small number of freshman participants (13 out of 72) in our younger sample. Interestingly, the results of the one-way repeated measure ANOVA for the freshman group ($n = 13$) indicate that there is no significant difference ($p = .7$) between group-reference ($M = 0.52$, SD = 0.13) and self-referential memory ($M = 0.56$, SD = 0.17), possibly indicating that this subsample better converges with the Johnson et al. (2002) sample. Regardless of the potential differences across studies, the present findings suggest that group-referencing may not always be as beneficial as self-referencing for memory.

While we did not find the expected connection between level of self-group closeness and the magnitude of mnemonic benefits from group-referencing, we did see a correlation between level of group engagement, based on hours devoted to group activities per week, and memory performance among older adults. It is possible that the level of involvement and increased time spent with a group is more predictive particularly for older adults, who are more likely than younger adults to focus their time and energy on personally meaningful group memberships (Carstensen, 1992, 1995; Carstensen et al., 1999). It also could be the case that group-referencing differs from self and other-referencing in the processes required and information brought to bear, when considering a collective entity vs. a specific individual. Perhaps feeling close to the group operates differently from a feeling of closeness to an intimate individual (e.g., mother, spouse or close friend). As Symons and Johnson (1997) argued, information processing about specific people occurs more frequently than about a group of people in our daily life. The closer and more familiar the person is, the more organised and elaborated the information is about the individual, which could enhance other-reference effects to the same level as self-referencing. In contrast, when encoding information with reference to a university or group membership, individuals might rely on abstract cognitive representations rather than specific cognitive representations. This may also explain the different findings in between our study and Johnson et al. (2002). They noted that participants acknowledged thinking about specific members as well as the group as a whole when making their judgements. It may be easier, and therefore more beneficial in memory, to make judgements about an individual rather than an entire group.

In terms of valence effects, there was a negativity effect for corrected recognition scores across both age groups. The finding of superior memory for negative words compared to positive words across age groups seems to diverge from other ageing literature indicating that younger adults show greater memory performance for negative information than positive, whereas older adults show the reverse pattern (Charles et al., 2003; Mather & Carstensen, 2005),

however similar patterns of memory for negative over positive information has been shown in the self-referencing literature (Gutchess et al., 2007). While hit rates were higher for positive than negative words across the age groups and conditions, the higher corrected memory scores for negative words seem to be driven by the higher FA rates for positive words than negative words. Older adults in the present study exhibited substantially higher FA rates for positive words than negative words. This pattern is consistent with a number of other studies (Glisky & Marquine, 2009; Gutchess et al., 2007; Piguet et al., 2008). Interestingly, the domain of self-referencing seems prone to false memories, particularly with age, perhaps reflecting the chronic activation of concepts related to the self (Rosa & Gutchess, 2013). The high FA rates in this study, especially for positive words, suggest that trait words may also be chronically activated as a function of group affiliations, leading to heightened error rates.

Identifying appropriate controls and comparison conditions was a challenge for this study. The familiarity judgements may not have been an ideal semantic control condition, as participants overwhelmingly endorsed these items with "yes" responses. Selecting appropriate semantic conditions is often a challenge in the self-reference literature, but including a semantic control condition in addition to a self, group or other-person condition seems important to assess the comparability and limits of effects. We avoided a desirability or pleasantness rating because the meta-analysis by Symons and Johnson (1997) shows that the self-reference effect can be reduced compared to this condition, and we wanted to maximise differences between our semantic condition and the self and group-reference conditions.

Selecting comparable reference groups for young and older adults also posed challenges, and it is possible that features inherent to the specific groups selected differently affected younger and older adults. Perhaps older adults benefitted as much as younger adults as an effect of referencing a group with high personal meaning. Anecdotally, a number of older participants voluntarily expressed their happiness at being a part of the BOLLI community and their enjoyment of social relationships with group members. It is also possible that older adults who are actively engaged in an intellectual learning community differ from other older adults in the community in their ability to acquire group memberships and their cognitive functioning, thus making it unclear whether this pattern of results would generalise to other older adult samples. It is important to further assess the variables that contribute to group-referential memory throughout the lifespan.

CONCLUSIONS AND FUTURE DIRECTIONS

The current study contributes to the literature by demonstrating that group-referencing can benefit recognition memory more than semantic processing for both younger and older adults. While group-referencing did not serve to benefit memory in the same way as self-referencing for either younger or older adults, it is possible that older adults who remain actively involved with personally meaningful groups may be able to utilise this affiliation to assist them in processing and remembering new information. Further evaluating different aspects of group membership that contribute to group-reference effects across the lifespan would be a promising direction for future work, as well as extending research into populations that may particularly benefit from group-referencing. For example, cultures that emphasise collectivistic and interdependent values (Markus & Kitayama, 1991) could be expected to show an exaggerated group-reference effect, perhaps preserved across the lifespan. In Western cultures, it is possible that valued group memberships that challenge negative societal views about ageing (North & Fiske, 2012) can lead to a robust group-referencing benefit to memory into old age. Furthermore, social benefits for populations experiencing cognitive decline, such as dementia (Haslam et al., 2009, 2010; Seeman et al., 2001), could suggest that the group-referencing benefit might be larger in these groups, reflecting the heightened importance of social support from others and stable group memberships in the face of changes to the self-concept as a result of cognitive decline.

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