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RESEARCH ARTICLE

Exploring longitudinal changes in implicit awareness of dementia: An investigation of the emotional Stroop effect in healthy ageing and mild dementia

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Abstract

The aim of the study was to investigate responses to dementia-relevant words in healthy older people and to investigate changes in response over 20-months in people with early-stage dementia. An emotional Stroop task, using colour-naming dementia-relevant words, was used as an indicator of implicit awareness of dementia. Overall, 24 people with dementia and 24 healthy older people completed an emotional Stroop task (T1). People with dementia completed the same task again after 12 (T2) and 20 (T3) months. For people with dementia emotional Stroop performance was contrasted with ratings of explicit awareness based on a detailed interview at T1 and at T2. For healthy older people and people with dementia response times to dementia-relevant words were significantly longer than those for neutral words. The effect was absent for people with dementia at T3. This decline in the emotional Stroop effect was not associated with cognitive decline as measured by the MMSE. Ratings of explicit awareness showed no significant change over time. There was no association between explicit awareness and implicit awareness. Implicit awareness of the condition is evident in early-stage dementia and can be elicited even where there is reduced explicit awareness. The emotional Stroop effect for dementia-relevant words in people with dementia appears to decline over time,

independently of changes in MMSE score, suggesting that implicit awareness fades as time progresses.

KEYWORDS
Alzheimer's disease, awareness, dementia, emotional Stroop, longitudinal

INTRODUCTION

Awareness in people with dementia is usually assessed at an explicit level, involving some form of self-report such as evaluative judgements of cognitive or functional ability or ratings of actual performance (Alexander et al., 2021; Clare et al., 2005, 2011; Martyr et al., 2012, 2022; Martyr & Clare, 2018). Many people with dementia who may show limited explicit expression of awareness are nevertheless able to adapt their behaviour and activities which suggests an unconscious or implicit level of understanding of their condition (Weinstein, 1991); however, there has been little research employing the implicit system to investigate awareness in people with dementia. Cognitive models have been developed that propose mechanisms by which an implicit awareness system may operate in the absence of explicit awareness (Geurten, Salmon, & Bastin, 2021; Geurten, Salmon, Willems, & Bastin, 2021; Lenzoni et al., 2020; Morris & Mograbi, 2013), suggesting a pre-conscious process. Although an extensive literature shows that the implicit memory system is largely preserved in dementia, especially in the early stages (Cheston et al., 2019; Fleischman et al., 2005; Harrison et al., 2007; Mograbi & Morris, 2013), the functioning of the pre-conscious implicit awareness system in people with dementia is as yet little understood.

A task offering a potential method of investigating the implicit awareness system in dementia is the emotional Stroop. This variant of the classic Stroop effect (Stroop, 1935) gauges the interfering properties of emotionally salient words in a colour-naming task operating at an automatic pre-attentive processing level (Mogg et al., 1993; Ohman et al., 2001). Previous research employing the emotional Stroop with people with dementia has utilised emotionally negative, positive and neutral words to explore affective responses (e.g. happy, sad, *etc.*), and found that people responded slower to words that were emotionally negative (Doninger & Bylsma, 2007; Dudley et al., 2002; Meléndez et al., 2020). By using dementia-relevant words, the interference effect of the emotional Stroop could be used to measure awareness of the condition and its effects at an implicit level, with the hypothesis that an underlying awareness of the condition would lead to slowed responding. This effect can be considered an indicator of intact implicit awareness.

We have previously employed this unique extension of the emotional Stroop paradigm in a cross-sectional study and found that people with early-stage dementia responded more slowly to dementia-relevant words than to neutral words (Martyr et al., 2011) suggesting the presence of an emotional interference effect for dementia-relevant words. When participants with dementia were divided into five groups with varying degrees of explicit awareness of the condition and its impact, the emotional Stroop response did not differ among the groups, suggesting a dissociation between implicit and explicit awareness (Martyr et al., 2011). Few studies have investigated the longitudinal trajectory of explicit awareness in early-stage dementia, with the most rigorous of these suggesting that few changes are observed over a 1–2 year period despite an ongoing decline in cognitive function (Alexander et al., 2022; Clare, Nelis, Martyr, Whitaker, et al., 2012; Sevush, 1999); possible changes over time in implicit awareness have not hitherto been examined.

The emotional Stroop effect for dementia-relevant words is found in carers of people with dementia (Martyr et al., 2011). This phenomenon has however not been examined in healthy older people who are not carers of people with dementia. As a significant number of older people fear developing dementia (Kessler et al., 2012), and this fear can negatively affect many aspects of daily living (Farina et al., 2022), it is worthwhile to investigate the emotional Stroop effect in this population as well.

The present study investigated the emotional Stroop effect for dementia-relevant words, taken as an indicator of implicit awareness of dementia, in people with dementia and a comparison group of healthy older people, with the prediction that the effect will be present in both groups. The study also investigated how the emotional Stroop effect changed in people with dementia over time and how this compared with changes in explicit awareness over 20 months.

MATERIALS AND METHODS

Design

The Memory Impairment and Dementia Awareness Study (MIDAS) was a longitudinal, multi-method study of awareness in early-stage dementia, with investigation at entry and then at 12- and 20-month timepoints (Clare, Nelis, Martyr, Roberts, et al., 2012). This study presents data from all three timepoints. Ethical approval for MIDAS was granted by the Bangor University School of Psychology and the UK National Health Service research ethics committees. The non-matched comparison group was assessed at a single timepoint. Ethical approval for the comparison group study was granted by the Bangor University School of Psychology research ethics committee. All participants provided informed consent.

Participant recruitment

People with dementia

This study includes data from a subset of the MIDAS sample. In MIDAS, the participants completed the emotional Stroop procedure as part of a larger battery of tests and questionnaires focusing on awareness. Of the MIDAS sample of people with dementia ($n = 101$), 24 people with Alzheimer's disease or mixed Alzheimer and vascular dementia completed the emotional Stroop at all three timepoints. People with dementia were identified through the six memory clinics serving North Wales. At entry to the study people with dementia had to have a diagnosis of Alzheimer's disease or mixed Alzheimer's and vascular dementia (World Health Organization, 1992), a score of 18 or above on the Mini-Mental State Examination (MMSE; Folstein et al., 1975), the ability to communicate verbally in English, and the capacity to give informed consent. Exclusion criteria were concurrent major depression, psychosis or neurological disorder, and past history of neurological disorder or brain injury.

Comparison group

A convenience sample of 24 community-dwelling older people who were recruited for the study from local AgeWell centres, church groups or social clubs, or through local contacts or word of mouth formed the comparison group. To be included participants had to live independently in their own homes, have an MMSE score of 26 or above and be able to communicate verbally in English. No carers of the people with dementia sample were included in this group.

Measures

Dementia-relevant emotional Stroop

The emotional Stroop task with dementia-related words was administered to both groups as described previously (Martyr et al., 2011). The task was presented on three laminated A4 sheets; one baseline sheet

comprised XXXXs, one sheet contained neutral words (e.g. physical, borrowing, crunch, formality, fiction), and one other sheet contained dementia-relevant words (e.g. remember, forgetful, lapse, memory, recall). The words between sheets were matched for word length, frequency and number of syllables. Each sheet contained 50 stimuli pseudo-randomly ordered, in 10 rows of five, presented in five colours, blue, red, yellow, green and brown. To familiarise participants with the task and check that they could correctly label each of the five colours a short practice trial was administered prior to starting the experimental task. Participants were asked to read aloud the colour of each word; they were informed they would be timed and were instructed to respond as quickly and as accurately as they could. After completing the practice sheet participants were presented with the baseline sheet of XXXXs. They were then presented with the dementia-relevant and neutral words, and the order of presentation was counterbalanced between these two conditions. The time taken to reach the end of each sheet was recorded by stopwatch, including recording seconds and milliseconds from the stopwatch interface. The number of corrected errors (where an error was rectified before continuing) and uncorrected errors (where an error went unnoticed) were recorded for each set of words. Errors could occur because of either naming the wrong colour or saying the displayed word instead of the appropriate colour.

Explicit rating of awareness

Two separate semi-structured interviews were conducted with people with dementia and their carers at Time 1 (T1) and at Time 2 (T2). There was no semi-structured interview at Time 3 (T3). The T1 interview data have been described previously (Martyr et al., 2011), and included questions about current cognitive function, activities of daily living and social interactions, who first noticed the changes in memory and when, memory clinic attendance, and receiving the diagnosis. At T2, length of interviews ranged between seven and 45 min, with most lasting around 20 min. The interviews at T2 focused on any changes the interviewees had noticed since the previous interview. These changes included, for example, changes in memory, thinking, mood, activities of daily living, social interactions, and/or sense of self. If any changes were described by the participant, further questions were asked concerning how the changes affected them and their carer. At T1 and T2, the interviews with both the person with dementia and the carer were used to form an explicit rating of awareness for the person with dementia. Interviews were rated with the same five-point explicit awareness rating scale used at T1: 1 = no evidence of awareness; 2 = limited evidence of awareness; 3 = some evidence of awareness; 4 = moderate evidence of awareness; 5 = extensive evidence of awareness. Inter-rater reliability indices were calculated for a sample of the ratings and the percentage agreement for two raters was 88.9% agreement ($n = 18$; 16 agreements, 2 disagreements of one point only) and Cohen's Kappa = .85 (Cohen, 1960) indicating good inter-rater reliability (Landis & Koch, 1977).

Procedure

People with dementia were visited at home by two researchers, in most cases on two occasions at each timepoint. For people with dementia the emotional Stroop was usually conducted during the second visit. People in the comparison group were visited at home by a researcher and assessments were completed on one occasion.

Planned analysis

The analysis tested for the presence of a dementia-relevant emotional Stroop effect by comparing people with dementia and a comparison group, and for persistence of the effect over time for people with dementia only. To correct for colour-naming speed, time taken in the baseline (XXXX) condition was

subtracted from time taken in each of the two colour-word conditions (neutral and salient) and then divided by the baseline condition time to produce transformed time scores (Bondi et al., 2002). The transformed salient score was then subtracted from the transformed neutral score to produce a single transformed discrepancy score and equated to the formula: (salient − neutral)/baseline. *T*-tests were used to compare people with dementia and the comparison group.

Linear mixed-model analyses of data across timepoints were conducted using this transformed discrepancy score. Centred MMSE score (MMSE score was subtracted from the mean) was included as a covariate in the model. A chi-square test was used to investigate whether explicit awareness ratings had changed between T1 and T2. Finally, a one-way ANOVA was used to investigate differences between T2 explicit awareness interview ratings and an index score of T2 emotional Stroop responding. This index score was calculated using the formula: ([salient − baseline]/[neutral − baseline]) as described previously (Martyr et al., 2011).

RESULTS

Participants

The 24 people with AD ($n = 19$) or mixed dementia ($n = 5$) and the 24 people in the comparison group completed the emotional Stroop task. The mean age of people with dementia was 73.92 (9.20) at T1, and there were equal numbers of females and males, whereas the mean age of the comparison group was 71.54 (4.76) and there were slightly more males ($n = 14$) than females ($n = 10$). There was no statistically significant difference in age between the two groups, $t(34.47) = 1.12$, $p = .267$. Mean MMSE scores for people with dementia were 25.33 (2.91) at T1, 25.21 (3.28) at T2, and 23.67 (4.14) at T3, while mean MMSE score for the comparison group was 29.21 (.93). There was a significant difference between the two groups for MMSE scores, $t(27.65) = -6.21$, $p < .001$.

Stroop performance for people with dementia and the comparison group

The order of presentation of the emotional Stroop task had no effect on the transformed response times for either group. There were no sex differences in performance at any timepoint. People with dementia were slower to respond to both neutral and salient word conditions compared to the comparison group, see Table 1. There was a significant main effect for words, $F(1, 46) = 6.89$, $p = .012$ but there was no significant group effect, $F(1, 46) = 1.86$, $p = .179$, or an interaction effect, $F(1, 46) = .35$, $p = .555$. The lack of interaction suggests both groups showed the effect at the same level. There was no significant between-group difference for the neutral and salient conditions.

Longitudinal Stroop performance of people with dementia

Age did not correlate with transformed response time measures at T1, T2 or T3 and consequently was not included as a covariate. There were no significant correlations at any timepoint between MMSE scores and transformed emotional Stroop scores other than the significant correlation between transformed salient words at T1, $r(22) = -.46$, $p = .024$ which, despite the smaller sample size is consistent with the previous finding at T1.

The expected effect of a slower response to salient than to neutral words was found at T1 and T2 using mean transformed responses, whereas at T3 responding was slightly faster for salient words compared to neutral words; see Table 1. Linear mixed-model analysis found a significant effect of time, $F(2, 24.37) = 5.04$, $p = .015$. A significant main effect of condition was found at T1, $t(24.62) = 2.50$, $p = .020$ and at

TABLE 1 Raw and discrepancy mean response times and mean number of errors made by the comparison group and people with dementia across the three timepoints.

	Comparison group		People with dementia					
			Time 1		Time 2		Time 3	
	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range
Stroop raw (s)								
XXXX	32.54 (8.07)	23.02 to 62.06	49.70 (16.99)	29.89 to 91.14	54.64 (22.41)	32.07 to 127.78	55.34 (22.45)	33.28 to 107.45
Neutral	39.02 (8.10)	26.10 to 59.97	62.73 (25.05)	38.24 to 145.14	66.85 (26.84)	37.86 to 123.84	77.94 (44.00)	33.18 to 191.10
Salient	40.65 (9.66)	27.97 to 70.31	65.89 (25.48)	37.19 to 155.98	71.97 (32.24)	36.81 to 172.53	74.77 (39.63)	35.95 to 179.82
Transformed								
Neutral	.21 (.13)	−.03 to .53	.27 (.21)	−.03 to .70	.24 (.25)	−.04 to .93	.37 (.34)	−.04 to 1.11
Salient	.26 (.15)	.08 to .82	.34 (.24)	−.01 to .85	.35 (.41)	−.02 to 1.51	.34 (.30)	−.18 to 1.13
Discrepancy[a]	.05 (.13)	−.22 to .30	.07 (.18)	−.22 to .39	.11 (.26)	−.29 to 1.01	−.04 (.18)	−.43 to .28
Stroop errors[b]								
Uncorrected neutral	.08 (.28)	0 to 1	.25 (.53)	0 to 2	.25 (.53)	0 to 2	.46 (.83)	0 to 3
Uncorrected salient	.08 (.41)	0 to 2	.25 (.53)	0 to 2	.13 (.34)	0 to 1	.54 (.83)	0 to 2
Corrected neutral	.42 (.72)	0 to 3	.75 (.94)	0 to 3	.67 (1.05)	0 to 4	1.25 (1.75)	0 to 7
Corrected salient	.38 (.58)	0 to 2	.88 (1.19)	0 to 4	1.00 (1.38)	0 to 5	1.38 (2.20)	0 to 9

[a]Discrepancy equates to salient responses minus neutral responses.

[b]Errors could result from either naming the incorrect colour or saying the displayed word rather than naming the colour.

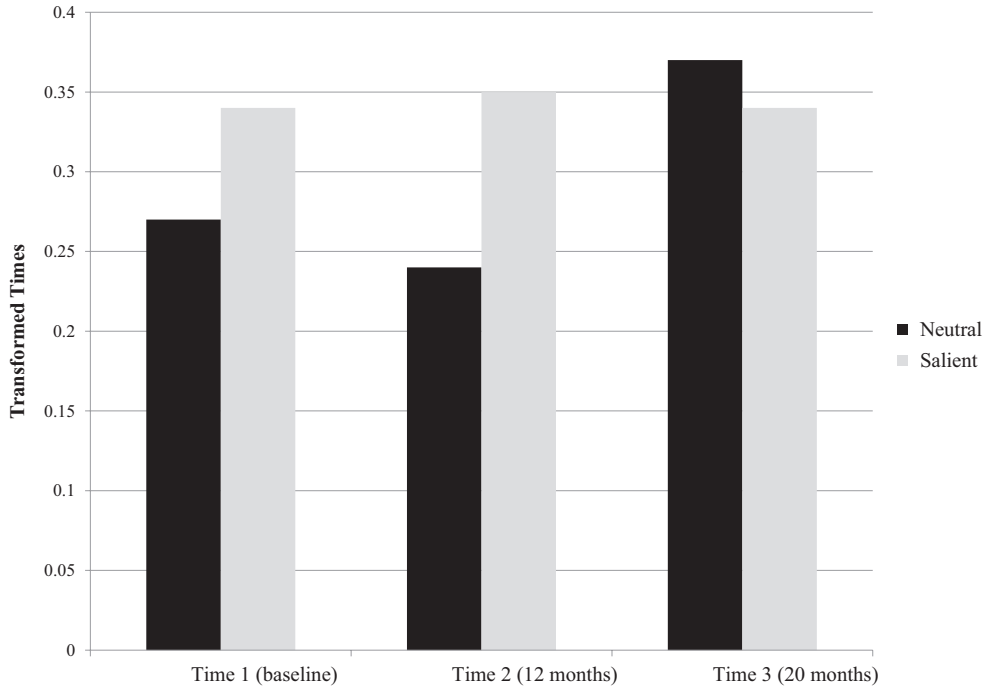

FIGURE 1 Transformed mean emotional Stroop response times for the neutral and salient word conditions at the three timepoints.

T2, $t(24.62) = 2.60$, $p = .015$, but not for T3, $t(22.43) = -1.03$, $p = .315$ suggesting that over time the emotional Stroop effect for dementia-relevant words is reduced in people with dementia; see Figure 1. Including centred MMSE score as a covariate had no significant effect on the results, $F(1, 34.91) = .02$, $p = .904$.

Relationship between the emotional Stroop effect and Time 2 explicit awareness rating

At T1, as previously reported, implicit awareness as indexed by emotional Stroop scores dissociated from explicit awareness ratings based on interview data. To investigate whether this dissociation changed over time the analysis was repeated at T2. First, an examination of whether the explicit awareness rating changed over time showed that ratings did not differ significantly across timepoints, $\chi^2(1) = 12.43$, $p = .190$.

Stroop index scores were calculated for the T1 and T2 timepoints for the 24 people with dementia. Mean Stroop index score for T1 was 1.67 (*SD* 1.63, range −.33 to 7.06). Mean Stroop index score for T2 was 1.39 (*SD* 2.34, range −3.13 to 8.67). Table 2 shows the mean Stroop index scores for participants scoring at each level on the explicit awareness rating; only one person was rated as showing no evidence of awareness at T2, so this person was included with the limited awareness group at this timepoint. A one-way ANOVA indicated that there was no difference between the four groups with regard to the index score at T1, $F(3, 20) = .49$, $p = .691$ and a further one-way ANOVA indicated that this was consistent with the index score analysis for T2; $F(3, 20) = .14$, $p = .936$. Therefore, consistent with the finding from T1, the emotional Stroop effect was retained across all levels of explicit awareness at T2.

TABLE 2 Mean Stroop index scores (with standard deviations and ranges) for participants scoring at each level on the rating of explicit awareness.

Explicit rating	Stroop index[a] mean score	*SD*	Range	*n*
Time 1				
1. No evidence of awareness	–	–	–	–
2. Limited evidence of awareness	1.11	1.49	−.33 to 2.64	3
3. Some evidence of awareness	1.81	1.58	.37 to 5.31	8
4. Moderate evidence of awareness	2.24	2.42	.59 to 7.06	6
5. Extensive evidence of awareness	1.26	.93	−.10 to 2.41	7
Time 2				
2. Limited evidence of awareness[b]	1.41	4.39	−3.13 to 8.67	5
3. Some evidence of awareness	.80	.57	.04 to 1.62	5
4. Moderate evidence of awareness	1.51	1.55	−.26 to 4.35	6
5. Extensive evidence of awareness	1.73	2.39	−.55 to 6.24	6

[a]Index scores were obtained using the following calculation: ([salient − XXXX]/[neutral − XXXX]).

[b]Includes one person with dementia who was rated as having no evidence of awareness at T2.

CONCLUSION

The findings extend our previous cross-sectional emotional Stroop study (Martyr et al., 2011) by investigating responses to dementia-relevant words in healthy older people and by investigating changes in response over 20-months in people with early-stage dementia. Healthy older people showed a processing bias to dementia-relevant words in a similar pattern to people with dementia and the extent of slowing was similar for both groups. The results were very similar to how carers of people with dementia responded previously (Martyr et al., 2011); and suggests that dementia-relevant words are salient for older people in general in addition to people with dementia. This finding may fit with the existing literature on worry or fear of dementia in healthy older people (Kessler et al., 2012), suggesting that responding to dementia-relevant words may be partially related to self-referential processing or rumination. For people with dementia, the emotional Stroop interference effect was present at T1 and T2 but was absent at T3; therefore, the emotional saliency of dementia-relevant words is shown to be replicated over the shorter time interval, but the effect appears to decline over time. The overall means for salient and neutral words illustrate this finding since at the first two timepoints responses were similar with responses to salient words slower than those to neutral words, suggesting awareness of dementia is retained and the implicit awareness system is intact, whereas at T3 responses are slower for neutral words than for salient words, reversing the effect. This absence of the Stroop effect at T3 indicates that dementia-relevant words may no longer affect people with dementia and suggests that the implicit awareness system may degrade over time. The reduction at T3 was not accompanied by a decline in MMSE score; the MMSE score had no effect on emotional Stroop responding at any timepoint, in contrast to results from studies that have investigated classic Stroop responding (Clare et al., 2016; Koss et al., 1984; Spieler et al., 1996).

The results suggest that over time dementia-relevant words may ultimately lose their emotional valence in people with dementia. It is worth noting that the transformed times for the salient words at all three timepoints largely did not change and the change at Time 3 was primarily due to slower responding to the neutral words. This suggests that slowing in processing speed may be one possible explanation, as mean scores and standard deviations for both sets of words increased over time. There may also be an increase in underlying executive dysfunction, since it has been suggested that executive functioning declines independently from MMSE score in people with dementia (Juby et al., 2002). Indeed, people with early Alzheimer's disease have been shown to significantly decline over 12 months on the classic Stroop task despite the sample mostly remaining in the mild stages (Perry & Hodges, 2000).

This suggests that there may be a performance decrement in specific neuropsychological tasks over time even where dementia severity remains relatively stable. This is consistent with the findings of the present study, suggesting that the underlying cognitive process or processes involved with responding on the classic Stroop and emotional Stroop tasks may decline independently of MMSE score. In a 5-year longitudinal study responding on the classic Stroop by people with Alzheimer's disease reduced over time (Grady et al., 1988). That study, however, did not include longitudinal information regarding MMSE score so it is difficult to determine whether the decline in Stroop responding was related to a decline in MMSE score or over time, though interestingly those who declined on the Stroop also displayed declines on other tests of executive function (Grady et al., 1988). Further research is needed to clarify the potential interrelationship between dementia-relevant emotional Stroop responding and executive function, especially since the emotional Stroop and the classic Stroop test are thought to be unrelated phenomena (Algom et al., 2004), with the latter often conceptualised as a test of inhibition (Clare et al., 2016; Martyr et al., 2019).

Emotional processing and/or emotional responses appear to change to some extent as people develop dementia (Allender & Kaszniak, 1989; da Silva et al., 2021; Drago et al., 2010; Hargrave et al., 2002), and these changes are related to change in cognition, although whether there is a decline in emotional processing or an increase in emotional indifference over time has yet to be established. The findings of the present study suggest that in people with dementia implicit responding to dementia-relevant words changes over time. It is however unclear whether this is due to an underlying decline in cognition or to a change in emotional processing. Changes in emotional processing are related to cognitive decline in dementia (Albert et al., 1991; Bucks & Radford, 2004; Cárdenas et al., 2021; Koff et al., 1999), although levels of awareness of emotional state appear similar in a group of people with mild dementia and a group of people with moderate dementia, with only a minimal decrease in awareness shown by the moderate dementia group (Lacerda et al., 2020). In the present study as responding was not related to MMSE score it is possible that explicit emotional responses, of the kind typically used to investigate emotional processes in dementia, are distinct from implicit responses investigated by the emotional Stroop for dementia-relevant words.

Responding on the emotional Stroop task was unrelated to levels of explicit awareness at T1 (Martyr et al., 2011), which is indicative of a dissociation between implicit and explicit awareness. The present study further extends this dissociation to T2. An important limitation of the present study is the lack of a qualitative interview at T3; consequently, the relationship between explicit and implicit awareness could not be investigated at the critical third timepoint where the Stroop effect degrades. Further research is needed to investigate whether the dissociation between explicit and implicit awareness remains once implicit awareness shows evidence of a decline. The lack of follow-up data for the group of healthy older people is also a limitation; it would be useful to know whether the effect changes over time in older people without dementia, in terms of having a more rigorous normative comparison. It is, however, less likely the control group would change in their performance over the time period between assessments. Another possible limitation concerns the MMSE scores of those able to complete the emotional Stroop task. The full MIDAS sample showed a significant decline in MMSE score over time (Clare, Nelis, Martyr, Whitaker, et al., 2012), and those with the lowest MMSE scores were also those most likely to be unable to complete the emotional Stroop task. This may limit the suitability of the task to investigate implicit awareness or to establish whether the implicit and explicit awareness systems continue to dissociate as dementia severity increases. A future study, for example, could include the salient and neutral words used in the emotional Stroop task as stimuli in a list learning memory test; it would be interesting to see whether the dementia-relevant words are more or less well remembered, and whether this relates to changes in the emotional Stroop performance over time. An additional study could also include a more comprehensive assessment of cognition over time, as well as including the salient and neutral words in a test of delayed and immediate memory but also with tests of executive function and processing speed. A brain imaging study suggests that the posterior cingulate cortex is activated when implicit awareness is intact for dementia-relevant words (Tondelli et al., 2022); it is noted that this study used different dementia-relevant words than the present study, so results may not be directly comparable.

Investigating change over time using brain imaging techniques may offer insights into the neurological changes in implicit awareness in people with dementia.

In conclusion, the emotional Stroop effect for dementia-relevant words is present in both healthy older people and people with early-stage dementia, but in people with dementia the effect declines over time and this decline may be partly independent of cognition. The findings also suggest that while implicit awareness as indicated by the emotional Stroop effect is retained, implicit and explicit awareness remain dissociated, indicating a preserved implicit awareness of the condition, with people with dementia responsive to material or concerns related to their condition. Further research is needed to identify why emotional Stroop effect declines between 12- and 20-month follow-ups and to explore the dissociation between implicit and explicit awareness as dementia progresses.

AUTHOR CONTRIBUTIONS

Anthony Martyr: Conceptualization; investigation; methodology; writing – original draft; data curation; formal analysis. **Sharon M. Nelis:** Conceptualization; investigation; methodology; data curation; writing – review and editing. **Robin G. Morris:** Conceptualization; investigation; methodology; writing – review and editing; funding acquisition. **Ivana S. Marková:** Conceptualization; investigation; funding acquisition; methodology; writing – review and editing. **Ilona Roth:** Conceptualization; investigation; funding acquisition; methodology; writing – review and editing. **Robert T. Woods:** Conceptualization; investigation; funding acquisition; methodology; writing – review and editing. **Linda Clare:** Conceptualization; investigation; funding acquisition; methodology; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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