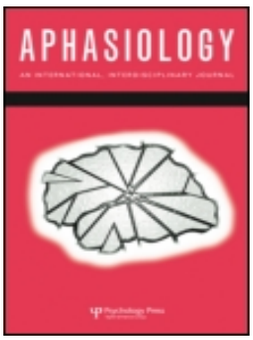

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Distinguishing clinical depression from early Alzheimer's disease in elderly people: Can narrative analysis help?

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Background: Differentiating the reversible cognitive symptoms associated with depression (DEP) from the irreversible dementia associated with early or mild Alzheimer's disease (AD) has proven to be challenging, particularly in elderly individuals. Most previous studies have focused on contrasting the cognitive profiles associated with these disorders, often yielding unreliable clinical differences. Although a limited set of studies have identified significant differences between DEP and early AD groups on both basic and high-level language production and comprehension tasks, none has included spoken discourse measures, and several limitations within these language studies indicate that further research is warranted.
Aims: This study examined whether depression is associated with a distinct pattern of discourse changes, and thus whether discourse analyses may help discriminate elderly individuals with DEP from those in the early stages of AD.
Methods & Procedures: Groups of elderly participants with DEP, mild AD, or no psychiatric or neurological diagnosis, who were matched for age and education level, completed a spoken narrative task and general cognition and high-level language tests. Quantitative, syntactic, and informativeness aspects of the discourse samples were analysed.
Outcomes & Results: Significant group differences were observed on the informativeness discourse measures, with AD participants producing less-informative samples than DEP and control participants. DEP and control groups did not significantly differ on any discourse variable.
Conclusions: Including discourse sampling and analyses, with a focus on informativeness, into comprehensive assessment protocols may lead to more accurate discrimination of DEP and early AD in the elderly.

Keywords: Dementia; Depression; Discourse analysis; Language.

Despite advances in biomedical assessment procedures, significant overlap in the behavioural and cognitive profiles associated with depression (DEP) and early or mild Alzheimer's disease (AD) in elderly people makes clinical discrimination of these disorders difficult (Caltagirone, Perri, Carlesimo, & Fadda, 2001; Dobie, 2002; Maynard, 2003; Saez-Fonseca, Lee, & Walker, 2007). For instance, both clinical populations demonstrate cognitive decrements in the domains of memory, attention, visuospatial ability, processing speed, and executive functioning as well as behavioural issues such as social withdrawal, anxiety, and apathy (Dobie, 2002; Lantz &

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Buchalter, 2001; Strang, Donnelly, Grohman, & Kleiner, 2002; Wright & Persad, 2007). Distinguishing these disorders is critical because the cognitive changes associated with DEP are reversible (i.e., they remit with antidepressants), in contrast to the irreversible cognitive consequences of AD.

Unfortunately, because of similar symptoms and because AD can only be definitely confirmed via histopathology findings, misdiagnosis may occur, leading to one or more of the following: (a) prescription of suboptimal or harmful drug and behavioural treatments; (b) provision of inaccurate prognostic information; (c) invalid legal competency rulings; or (d) failure to prevent co-morbidity effects, which in those with untreated depression can include an increased risk of suicide and in those with untreated AD, more rapid disease progression (Alexopoulos, 2003; Caltagirone et al., 2001; Conwell et al., 2000; Dobie, 2002; Lantz & Buchalter, 2001). Diagnostic errors are also problematic given the prevalence of these two disorders (Dobie, 2002). DEP associated with cognitive symptoms, also sometimes referred to as pseudodementia, was found to represent 18% of referrals to a memory clinic, with the diagnosis missed by the majority of those referring the cases (Ferran et al., 1996); other researchers have reported an even larger proportion of individuals with pseudodementia, with 32–41% of dementia cases referred for psychiatric services eventually receiving a diagnosis of DEP with reversible cognitive changes (Maynard, 2003; Rabins, 1981). Likewise the growing prevalence of AD has been well established, with some regions of the United States expected to experience double-digit percentage increases in AD cases between the years 2000 to 2025 (Alzheimer's Association, 2009). Currently, AD is estimated to account for at least 60% of all dementia cases in the elderly and to affect 5.3 million Americans.

Thus far, attempts to identify features that might distinguish DEP from early AD in a quick, accurate, and affordable manner have inordinately focused on cognitive skills and often failed to determine reliable clinical differences (Nathan, Wilkinson, Stammers, & Low, 2001; Roca et al., 2008; Strang et al., 2002; Wright & Persad, 2007). In contrast, only a limited set of studies have included language measures; these initial investigations have yielded significant differences between DEP and early AD groups on both basic and high-level language production and comprehension tasks, with relatively intact proficiency among individuals with DEP and deficits among those with AD (Boone et al., 1995; Crowe & Hoogenraad, 2000; Emery, 1999; Murray, 2002; Stevens, Harvey, Kelly, Nicholl, & Pitt, 1996). Several limitations within these language studies, however, indicate that further research is warranted. First, when language skills in DEP and AD have been compared, a restricted set of tasks has been utilised. Many researchers have used only confrontation naming and verbal fluency (e.g., Boone et al., 1995; Crowe & Hoogenraad, 2000), and only one study thus far has included high-level language tasks such as ambiguous sentence interpretation (Murray, 2002). Second, some contradictory outcomes have been reported. For example, Emery (1999) found that differences between AD and DEP groups were most apparent on basic (e.g., phrase completion naming task) rather than more complex language tasks (e.g., complex syntax comprehension), whereas Murray (2002) reported the opposite pattern. Third, no prior comparisons have included discourse measures, even though discourse analysis has proven useful in identifying AD in the very earliest stages of the disease (Forbes-McKay & Venneri, 2005), distinguishing individuals with genetic risk of AD from their healthy ageing peers (Taler & Phillips, 2008), and discriminating individuals with early AD from those with early vascular dementia (Gustaw & Domagala, 2002) or mild cognitive impairment (Bschor, Kuhl, & Reisches, 2001). Furthermore, Snowden and colleagues (1996) found that low idea

density in written narratives completed early in life correlated with poor cognitive function and development of AD in later life.

Accordingly, this study examined whether DEP is associated with a distinct pattern of discourse changes, and consequently whether inclusion of language sampling is warranted when attempting to discriminate DEP from early AD in elderly populations. Elderly individuals with DEP, early AD, or no psychiatric or neurological diagnoses completed a spoken narrative task in addition to formal tests of general cognition and language. The specific aims were (a) to compare the spoken narrative abilities of participants with DEP to those of participants with early AD and those of healthy ageing participants on quantitative, syntactic, and informativeness measures of verbal output, and (b) to determine if the spoken narrative abilities of the participants were related to any demographic variables and/or cognitive or language test performances.

METHOD

Participants

As shown in Table 1, participants included 18 with depression (DEP), 17 with AD, and 14 healthy adults (CON). Participants with DEP had been diagnosed by either a psychiatrist or general physician with major depression/unipolar or dysthymia according to DSM-IV criteria (Frances, Ross, & First, 1995); based on information from their initial interview for this study and review of their medical records, all participants with DEP had experienced recurrent episodes of depression and reported memory, concentration, and other cognitive problems. Each participant in the AD

TABLE 1
Group characteristics

Group	*Age (years)*	*Ed. (years)*	*Est. IQ*[1]	*Gender (M:F)*	*Geriatric dep. scale*[2]	*Hamilton dep. scale*[3]	*Dementia rating score*[4]
AD (n = 17)							
M	75.94	13.06	113.24	10:7	4.82	4.59	115.82
SD	6.64	2.41	8.14		3.26	3.37	9.79
Range	60–86	9–16	99–124		0–11	0–12	103–130
DEP (n = 18)							
M	73.78	14.89	116.24	4:14	14.94	25.89	135.72
SD	8.78	3.22	7.36		3.49	7.53	4.38
Range	61–90	10–20	102–125		11–21	16–36	129–143
Control (n = 14)							
M	73.50	14.36	116.61	6:8	2.64	2.21	139.43
SD	6.61	2.62	6.46		2.92	2.22	3.16
Range	61–83	12–18	105–125		0–10	0–6	132–143

[1]Estimated from a regression equation based on demographic variables such as occupation and years of education (Barona et al., 1984).

[2]Based on the participant's responses on the Geriatric Depression Scale (Yesavage et al., 1983), which consists of a set of yes–no questions, and on which scores above 11 are indicative of depression.

[3]Based on a trained rater's completion of the Hamilton Depression Rating Scale (Hamilton,1960) on which scores above 14 are indicative of depression.

[4]Based on the *Dementia Rating Scale* (Mattis, 1988). According to Shay et al. (1991), DRS scores can be categorised as normal (between 131 and 144, with 144 being the maximum score), mild dementia severity (between 130 and 103), or moderate dementia severity (less than 102).

group had been diagnosed by a psychiatrist and met NINCDS-ADRDA criteria for probable AD (McKhann et al., 1984). According to their caregivers and medical records, none of the participants with AD had a history of or currently presented with obvious clinical signs of depression. The medical histories of participants with DEP or AD indicated that other dementia aetiologies (e.g., tumour, vascular dementia) had been ruled out via null findings on laboratory and clinical tests. Inclusionary criteria for all participants included age 60 or older, English as a primary language, and no history of alcohol or substance dependency, head trauma, stroke, or language or learning disabilities. Additionally, all participants were required to pass the speech and visual discrimination subtests of the *Arizona Battery for Communication Disorders of Dementia* (ABCD; Bayles & Tomoeda, 1991) to ensure adequate aided or unaided hearing and vision to complete study tasks. Participants with AD also had to present with only a mild degree of cognitive impairment on the *Dementia Rating Scale* (DRS; Mattis, 1988), and those in the CON group had to show no evidence of current or past psychiatric or neurological disorder.

There were no significant differences ($p > .05$) among the three participant groups in terms of age, $F(2, 46) = 0.522$, years of education, $F(2, 46) = 1.965$, or estimated IQ (Barona, Reynolds, & Chastain, 1984), $F(2, 46) = 1.124$. The groups differed, however, in terms of gender representation, with more women than men in the DEP and CON groups but more men than women in the AD group. A significant group difference was observed on the DRS, $F(2, 46) = 60.630$, $p < .001$, with post hoc Tukey pairwise comparisons ($p < .016$, adjusted for three pair-wise comparisons) indicating greater levels of cognitive impairment among participants in the AD group versus those in the DEP and CON groups, and poorer performance by DEP versus CON participants.

Given the concerns raised regarding the validity of self-rating scales alone in dementia (e.g., Shankar & Orrell, 2000), all participants were evaluated for depression using both the *Hamilton* (Hamilton, 1960) and the *Geriatric Depression Scale* (GDS; Yesavage et al., 1983) (see Table 1). According to the cut-off scores of both depression measures, only participants in the DEP group presented with depression. Within the DEP group, 13 participants were taking an antidepressant; the remaining 6 DEP participants reported that they no longer took antidepressants because of the negative effects they had experienced when taking these drugs in the past.

Procedures

As part of a larger research project, all participants completed a battery of attention, language, and memory tasks with task administration split across two to three 1- to 2-hour sessions to avoid subject fatigue. Task order was randomised across participants to circumvent order effects. For the current study, tests of interest included the *Test of Language Competence - Expanded* (TLC-E; Wiig & Secord, 1989) to evaluate high-level language comprehension and expression abilities, and the ABCD to assess basic cognitive abilities including language, memory, and visuospatial skills. In subsequent analyses, only the Linguistic Expression subtest and Total scores of the ABCD and the Recreating Sentence subtest of the TLC-E were used because of their direct relation to language production skills. In addition to these structured tests, participants were asked to tell a story about what was happening in Norman Rockwell's painting "The Soldier" (1945). There was no time limit for completing the spoken narrative task, and the examiner gave no feedback concerning story accuracy or appropriateness but did utilise periodic back channels (e.g., "uhhuh", "I see").

Spoken narrative samples were audiotaped, transcribed, timed, and then coded via the CHAT (Codes for the Human Analysis of Transcripts) system for automatic analyses by various CLAN (Computerised Language Analysis) programs (MacWhinney, 2000). Each sample was analysed in terms of a number of quantitative, syntactic, and informativeness variables. Quantity of output variables included the total number of utterances and words and speaking rate. To determine these variables, each narrative sample was first segmented into utterances following the guidelines of Glosser and colleagues (Glosser, Wiener, & Kaplan, 1988) and Saffran and colleagues (Saffran, Berndt, & Schwartz, 1989); that is, syntactic and prosodic boundary features were first used to identify utterances, and if these features were ambiguous, pausal patterns and semantic features were additionally considered. When calculating word totals, the rules developed by Nicholas and Brookshire (1993) were used to make decisions regarding which words to include in the word counts.

To guide the analysis of syntactic variables, which included mean length of utterance (MLU), the proportion of grammatical utterances, and the proportion of complex sentences to grammatical sentences, the procedures of Thompson and colleagues (1995) and Saffran et al. (1989) were followed. All nonword and word fillers, false starts, and word repetitions were excluded from morpheme counts when determining MLU. To determine if an utterance was grammatically complete, it had to have at least one independent clause and no syntactic errors. To be considered a grammatically complex sentence, the grammatically complete utterance had to contain at least one embedded clause or have a non-canonical form.

Three measures were used to evaluate the informativeness of the narrative samples. First, the percentage of correct information units (%CIUs) was calculated for each sample. CIUs, defined as "words that are intelligible in context, accurate in relation to the picture(s) or topic, and relevant to and informative about the content of the picture(s) or the topic" (Nicholas & Brookshire, 1993, p. 348), were identified following the criteria of Nicholas and Brookshire; %CIUs were computed by dividing the total number of CIUs in a sample by the total word count for that sample. The second measure of informativeness was the number of performance deviations per minute (PDM). According to Brookshire and Nicholas (1995), performance deviations encompass non-informative output, including words that are excluded from CIU counts. The rule-based system of Brookshire and Nicholas was followed to identify performance deviations, including word and non-word fillers, part word productions, unintelligible output, unnecessary repetitions, irrelevant words (e.g., "I like Norman Rockwell"), revisions or false starts, vague or nonspecific vocabulary (e.g., "thing"), use of "and", and inaccurate output including paraphasias (e.g., "girl" for "woman"). The last informativeness measure was the proportion of uninformative utterances (Murray, 2000). Utterances were coded as uninformative if they were incomplete or abandoned (e.g., "The soldier was . . ."), extraneous or off-topic (e.g., "My cousins lived in a tenement"), or repetitions of previously stated content. To calculate the proportion of uninformative utterances, the total number of uninformative utterances in a sample was divided by the total number of utterances in that sample.

Inter- and intra-rater agreement

The narrative samples of two participants from each group (i.e., a total of six transcripts) were randomly chosen for re-transcription by a second listener naïve to the group membership of these participants. Point-to-point transcription agreement

for utterance boundaries and words was 97% (range = 90–100%) and 93% (range = 87–100%), respectively. The majority of transcription disagreements concerned the presence or type of word and non-word fillers; all disagreements were resolved through discussion prior to further analysis of the samples.

A second set of six transcripts (i.e., the samples of two participants from each group) was randomly chosen for re-scoring by a second rater naïve to the group membership of these participants. Point-to-point inter-rater agreement was 100% for utterance counts, 99% for total word counts (range = 96–100%), 96% for grammatical sentences (range = 86–100%), 92% for grammatically complex sentences (range = 84–100%), 92% for CIUs (range = 81–100%), 98% for performance deviations (range = 96–100%), and 100% for informative utterances.

To examine intra-rater agreement, a third set of six transcripts (i.e., two participants from each group) was randomly selected for re-scoring by the original rater, at least 3 weeks following the initial coding of the transcripts. Point-to-point intra-rater agreement was 100% for utterance counts, 100% for total word counts, 100% for grammatical sentences, 100% for grammatically complex sentences, 94% for CIUs (range = 80–100%), 99% for performance deviations (range = 98–100%), and 100% for informative utterances.

Statistical analyses

Prior to completing statistical analyses, *Fmax* (the ratio of the largest to the smallest variance) was calculated for each variable to evaluate whether the ANOVA assumption of variance homogeneity had been met (Keppel, 1991). Two language sample variables, %CIUs and the proportion of uninformative utterances, exceeded the *Fmax* criterion of 3; following arcsine transformation, however, *Fmax* for each of these variables fell below the criterion. All language sample and test data were then submitted to a series of one-way ANOVAs with group as the between-participants factor (i.e., DEP, AD, CON). Because numerous ANOVAs were planned, a conservative alpha level of $p < .005$ was adopted to guard against Type I error. Significant group effects were further analysed via independent, separate variance *t*-tests with an adjusted alpha level of $p < .016$ (i.e., $.05 \div 3$ between-group comparisons).

To identify factors that may be associated with spoken narrative skills, Pearson product–moment correlations were carried out between certain demographic and test battery variables and the narrative measures for which significant group differences were observed. Scatter diagrams and residual means and plots were checked prior to computing correlations to assure compliance with linear model assumptions (Verran & Ferketich, 1987).

RESULTS

Group data for the quantitative, syntactic, and informativeness variables analysed in the spoken narrative samples are displayed in Table 2. No significant group differences (i.e., $p > .005$) were identified for any of the quantitative or syntactic measures. In contrast, a significant group effect was observed for each informativeness variable: $F(2, 46) = 19.626$, $p < .001$, for %CIUs, $F(2, 46) = 9.994$, $p < .001$, for PDM, and $F(2, 46) = 26.112$, $p < .001$, for the proportion of uninformative utterances. Post-hoc testing indicated that the AD group produced smaller %CIUs, more PDM, and larger proportions of uninformative

TABLE 2
Group performances on language sample measures

		AD	*DEP*	*CON*
Quantitative aspects				
Total Words	*M*	161.53	244.06	270.14
	SD	83.98	125.99	100.77
	Range	83–337	100–638	121–469
Total Utterances	*M*	18.47	25.67	26.71
	SD	8.70	12.07	10.43
	Range	9–44	13–58	10–46
Speaking Rate	*M*	112.30	117.66	133.18
	SD	31.23	24.51	27.88
	Range	73–173	75–162	85–182
Syntactic aspects				
MLU	*M*	8.89	9.35	10.26
	SD	1.91	1.55	1.20
	Range	7–13	7–12	9–12
Prop. Grammatical	*M*	.84	.88	.84
Utterances	*SD*	.10	.10	.11
	Range	.70–1.0	.64–1.0	.63–1.0
Prop. Grammatically	*M*	.39	.42	.47
Complex Sentences	*SD*	.14	.15	.10
	Range	.19–.67	.22–.69	.31–.60
Informativeness aspects				
%CIUs	*M*	66.45	79.79	83.31
	SD	10.93	6.49	5.04
	Range	46–83	66–90	77–93
Performance	*M*	44.45	29.66	27.05
Deviations/min	*SD*	16.19	8.33	8.95
	Range	23–90	17–48	15–40
Prop. Uninformative	*M*	.31	.11	.06
Utterances*	*SD*	.15	.06	.05
	Range	0.0–.60	0.0–.23	0.0–.15

*Utterances rated as uninformative due to repetitive, irrelevant, and/or inaccurate content.

utterances compared to the DEP group, $t(29.1) = 4.416$, $t(23.6) = -3.366$, $t(19.9) = -4.900$, respectively, and the CON group, $t(27.7) = 5.736$, $t(26.2) = -3.693$, $t(20.3) = -6.075$, respectively. None of the between-group post-hoc comparisons for the DEP and CON groups was significant, although the difference between these groups' proportions of uninformative utterances did approach our adjusted alpha level ($p < .016$), $t(28.9) = -2.507$, $p = .018$, with the DEP group producing larger proportions of uninformative utterances.

Table 3 displays the group performances on the formal, structured tests. Significant group effects were found on the test scores of interest: Linguistic Expression, $F(2, 46) = 19.144$, $p < .001$, and Total Test scores of the ABCD, $F(2, 46) = 37.338$, $p < .001$, and the Recreating Sentences TLC-E subtest, $F(2, 46) = 38.551$, $p < .001$. Post-hoc testing revealed that the AD group obtained lower ABCD Linguistic Expression, $t(24.9) = -6.036$ and $t(28.1) = -3.659$, ABCD Total Test, $t(19.8) = -8.149$ and $t(27.1) = -5.830$, and TLC-E Recreating Sentences scores, $t(19.6) = -6.622$ and $t(20.2) = -6.745$, compared to the DEP and CON groups, respectively. The DEP

TABLE 3
Group performances on linguistic and cognitive tests

		AD	*DEP*	*CON*
ABCD				
Mental Status (max. 5)	*M*	3.06	4.33	4.85
	SD	1.03	0.90	0.36
	Range	2.0–5	3.0–5	4.0–5
Episodic Memory (max. 5)	*M*	3.14	4.43	4.66
	SD	0.34	0.43	0.32
	Range	2.6–3.8	3.6–5	4.2–5
Linguistic Expression (max. 5)	*M*	3.69	4.36	4.75
	SD	0.63	0.43	0.33
	Range	2.5–5	3.3–5	4.3–5
Linguistic Compreh. (max. 5)	*M*	3.98	4.556	4.80
	SD	0.81	0.56	0.19
	Range	2.2–5	3.0–5	4.4–5
Visuospatial (max. 5)	*M*	4.03	4.73	4.89
	SD	1.05	0.32	0.21
	Range	1.5–5	4.0–5	4.5–5
Total Score (max. 25)	*M*	17.94	22.68	23.89
	SD	2.84	1.84	0.90
	Range	12–22	19–24	22–25
TLC-E				
Ambiguous Sentences (max. 39)	*M*	14.35	30.33	32.29
	SD	6.88	7.70	4.20
	Range	3–27	16–39	25–39
Listening Comp.:	*M*	22.71	30.00	31.29
Making Inferences (max. 36)	*SD*	5.79	4.19	3.99
	Range	14–34	17–36	25–39
Oral Expression:	*M*	45.94	68.67	69.93
Recreating Sentences (max. 78)	*SD*	14.87	8.59	5.31
	Range	22–70	45–78	57–78

group also performed more poorly, $t(30) = -2.910$, on the ABCD Linguistic Expression scale compared to the CON group, but other DEP/CON group comparisons were not significant (i.e., $p > .016$).

For participants with AD there were modest associations between measures of narrative informativeness and ABCD test performances. That is, PDM was significantly correlated with ABCD Linguistic Expression, $r = -.503$, $p = .040$, and Total Test scores, $r = -.578$, $p = .015$, and both %CIUs and the proportion of uninformative utterances were significantly related to the ABCD Total Test score, $r = .489$, $p = .047$ and $r = -.489$, $p = .047$, respectively. For the DEP group, significant correlations were observed between %CIUs and education, $r = .497$, $p = .036$, and between GDS and PDM, $r = .493$, $p = .038$. Education was the only variable significantly correlated with informativeness (i.e., the proportion of uninformative utterances) in the control group, $r = -.547$, $p = .043$. It should be noted that for all three participants groups, the three informativeness measures were significantly (i.e., $p < .05$) correlated with each other.

DISCUSSION

This study explored whether inclusion of language sampling and analyses might assist with resolving the diagnostic quandary of discriminating DEP and early stage

AD in elderly individuals. Specifically, the spoken narratives of individuals with DEP, AD, or no psychiatric or neurological diagnosis (CON) were compared in terms of quantitative, syntactic, and informativeness language measures. The language analysis results indicated that measures of informativeness were most useful at distinguishing the AD and DEP groups. That is, participants with AD produced smaller %CIUs, higher rates of performance deviations, and larger proportions of uninformative utterances compared to either the DEP and CON groups; furthermore, differences between the DEP and CON groups on these informativeness measures were not significant. The other discourse measures appear to hold little diagnostic potential, at least when comparing narrative samples, as nominal syntactic or quantitative differences were observed among any of the groups.

These findings accord well with prior comparisons of spoken discourse in early AD versus normal ageing (Bschor et al., 2001; Forbes-McKay & Venneri, 2005) or versus vascular dementia (Gustaw & Domagala, 2002). Although some of these studies utilised different discourse tasks (e.g., conversation), they all documented that individuals with AD, even those in the very earliest stages of the disease, provided the least informative or efficient verbal output. Likewise, several researchers have previously reported relative preservation of language form in AD (Kemper, LaBarge, Ferraro, Cheung, & Storandt, 1993; Kempler, Curtiss, & Kackson, 1987). The current results also extend the DEP literature by examining discourse and identifying a spoken narrative pattern similar to that observed in healthy ageing, in terms of quantitative, syntactic, and informativeness measures. This finding of preserved spoken narrative skills accords well with prior evaluations of verbal output in elderly individuals with DEP, albeit previous researchers solely utilised single-word and isolated sentence production tasks (Crowe & Hoogenraad, 2000; Emery, 1999; Murray, 2002; Stevens et al., 1996). Meilijson and colleagues (Mailijson, Kasher, & Elizur, 2004) did include a psychiatric control group of individuals with mixed depression-anxiety in their study of conversational pragmatic skills in schizophrenia and reported higher degrees of pragmatic inappropriateness in their schizophrenic versus depression-anxiety group; although these findings suggest perseveration of pragmatic skills in the depression-anxiety group, these researchers provided no further information pertaining to this group's verbal output or ratings.

There has been little exploration of associations between discourse characteristics and cognitive and linguistic test performance in early AD, and given the dearth of DEP discourse data, no examination of such associations in elderly with DEP. In the current AD group, significant, albeit moderate correlations were observed between informativeness discourse measures and ABCD test scores. This outcome is consistent with previous findings and the proposition that language deficits in early AD reflect deterioration in the functioning of both linguistic and cognitive abilities (Emery, 1999; Taler & Phillips, 2008). For the DEP group, discourse informativeness was correlated with their depression ratings and like the control group, with education level. Similarly, associations between depression level and degree of cognitive impairment have been reported in the DEP literature (Wright & Persad, 2007). A relation between informativeness and education level suggests that premorbid or general cognitive factors, like in healthy ageing populations (Taler & Phillips, 2008), also contribute to discourse skills in elderly individuals with DEP.

Clinically, the current data suggest that including discourse sampling and analyses, with a focus on informativeness, into comprehensive assessment protocols may lead to more accurate discrimination of DEP and early AD in the elderly. Furthermore, it

is likely that only one informativeness measure needs to be analysed given that significant group effects were found for each informativeness measure and that significant correlations were found among the three informativeness measures for each participant group. However, before definitive clinical recommendations can be offered, several lines of research should be pursued to validate and extend the current findings. First, further research is needed to assure that the present findings do not underestimate the effects of DEP on discourse. For instance, there was a non-significant (i.e., $p = .018$) trend for participants with DEP to produce larger proportions of uninformative utterances compared to CON participants, and there was a modest positive correlation between depression measures and performance deviations per minute. Therefore it is plausible that both antidepressant use and relatively mild levels of depression among our DEP participants moderated the effects of depression on their narrative samples, and consequently that discourse changes might be more conspicuous in elderly individuals who have more severe levels of depression or do not take medication for their depression. Second, it should be determined whether the same discourse patterns across groups are observed when different discourse genres are utilised. For example, given that processing speed appears particularly vulnerable in elderly individuals with DEP (e.g., Murray, 2002; Nathan et al., 2001), language samples elicited during conversation or service encounters, which have inherent time demands, might yield more perceptible language changes in this clinical group. Likewise, more complex discourse tasks (e.g., unshared vs shared context conditions; picture sequences vs single picture) have greater discourse organisation and informativeness demands (Olness, 2006), and have been found to elicit poorer discourse performances from individuals in the early stages of AD (Ehrlich, Obler, & Clark, 1997; Forbes-MacKay & Venneri, 2005; March, Wales, & Pattison, 2006); thus these tasks might accentuate differences among AD, DEP, and CON groups. Finally, as elderly individuals with DEP and concomitant cognitive deficits appear to be at greater risk for developing irreversible dementia compared to their non-depressed peers and to elderly individuals with DEP but no concomitant cognitive changes (Alexopoulos, 2003; Dobie, 2002; Saez-Fonseca et al., 2007), future studies, ideally longitudinal in design (Crowe & Hoogenraad, 2000; Wright & Persad, 2007), are needed to explore whether and which discourse measures might help identify when DEP is most likely to lead to dementia.

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