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Alexithymia and Aging:

A Neuropsychological Perspective

MariaLuisa Onor, MD, PhD^{*}, Marianna Trevisiol, PsyD^{*}, Mariangela Spano, MD^{*}, Eugenio Aguglia, MD^{*}, and Sergio Paradiso, MD, PhD[†]

^{*}Department of Clinical, Morphological and Technological Sciences—U.C.O. of Clinical Psychiatry—University of Trieste, Trieste, Italy

[†]Department of Psychiatry, University of Iowa, Iowa City, IA

Abstract

Consistent with the emotional changes associated with later life, higher alexithymia scores are widely reported in older adults, but their significance has not been fully examined. We posited that association between alexithymia and poorer neurocognition would support the deficit nature of alexithymia in later life. Widely used neurocognitive tests assessing the relative integrity of the left and right hemisphere functions were used to examine the extent to which alexithymia of older age is associated with poor left or right hemisphere functioning. Healthy community-dwelling volunteers (20 young and 20 elderly subjects) were studied with the 20-item Toronto Alexithymia Scale. Neurocognitive competence was assessed using a neuropsychological battery measuring attention, language, memory, visuospatial abilities, and executive functions. Neurocognitive abilities were strongly age-related and indirectly correlated with alexithymia. Alexithymia total score appeared to be uniquely predicted by Raven Matrices and Rey's Figure Recall. These results support the deficit hypothesis alexithymia of older age.

Keywords

Aging; alexithymia; neuropsychology; Raven Colored Progressive Matrices; Rey's Complex Figure; story recall; memory

Cognitive and emotional changes accompany the aging process (Ruffman et al., 2008). Although age-related cognitive changes in memory and information processing speed are relatively well-established (Caserta et al., 2009), the nature of emotion processing in older age has been ground for controversy (Tessitore et al., 2005; Keightley et al., 2007). Complexity and intensity of self-reported emotional experiences change with age. Where the investigators' opinions begin to differ is on the interpretation of these changes (Isaacowitz et al., 2007). Some authors have argued that in older age individuals are less influenced by negative emotions (Charles and Carstensen, 2008) as a result of improved emotion regulation and use of effective emotional strategies (Nielsen et al., 2008). Others, adopting a neuropsychological and neuroanatomical model of aging, have posited that emotional changes may not fully represent the result of improved adaptive strategies and invoke age-related neuroanatomical alterations in limbic structures (Paradiso et al., 2008; Rajah et al., 2009). In the end, the significance of the emotional changes in later life remains open to interpretation.

The construct of alexithymia is particularly suited to examine the relationship between aging and emotion processing. The term alexithymia originated in the psychodynamic community to identify individuals not appropriate for insight-oriented psychotherapy (Sifneos, 1973) because of difficulty in experiencing and verbally reporting emotions (Taylor and Doody, 1982) and has been linked to emotion perception and awareness (Marty and de M'uzan, 1978). Consistent with the emotional changes associated with later life, higher alexithymia scores are widely reported in older adults (Parker et al., 1989; Lindholm et al., 1990; Pasini et al., 1992; Joukamaa et al., 1996; Lane et al., 1998; Salminen et al., 1999; Kokkonen et al., 2001; Gunzelman et al., 2002; Matilla et al., 2006). Alexithymia constitutes a general risk for mental and physical health. Studies on individuals with elevated alexithymia have found that these persons suffer from associated psychiatric (Loas et al., 2000; Waller and Scheidt, 2004; Parker et al., 1993; Zlotnik et al., 2001; Taylor et al., 2006) and medical disorders (Portincasa et al. 2003; Julia et al., 1999; Porcelli et al., 1995).

With respect to alexithymia in older age, several important questions remain unanswered. Does alexithymia in older age represent a construct germane to alexithymia in youth? It is plausible that older individuals report high alexithymia scores because they are less influenced or less inclined to reporting their (negative?) emotions. May alexithymia scores be inflated in later life as a result of improved emotion regulation and use of more effective emotional strategies acquired as a function of older age? (Charles and Carstensen, 2008).

Research has shown that in older age, higher alexithymia scores are partly explained by gray matter reduction in the anterior cingulate cortex (Paradiso et al., 2008), consistent with the role of this brain structure in emotional awareness (Mc Rae et al., 2008). This suggests that in older age alexithymia may indeed not underlie adaptive emotional mechanisms. However, we believe that this issue is not settled. For this reason, we carried out a study comparing older and younger volunteers on alexithymia and neurocognitive measures. The general hypothesis that greater alexithymia of older age is associated with age-related differences in neurocognitive performance was tested. We posited that association between poorer neurocognition and alexithymia in older age would constitute further information in support of the deficit nature of alexithymia in later life.

Relative laterality hypotheses may also be posited. The neural underpinnings of alexithymia are beginning to be understood (Lane et al., 1996). Where alexithymia is secondary to focal brain lesions, these include emotion-sub-serving regions in the right hemisphere (Spalletta et al., 2001), which may undergo alterations as a result of the aging process (Brown, 1975) therefore accounting both for the age-related alexithymia and lateralized neurocognitive changes. On the other hand, alexithymia has been associated with verbal deficits (Lamberty and Holt, 1995), therefore a relative left hemisphere dysfunction is also plausible. Based on these literature findings, widely used neurocognitive tests assessing the relative functional integrity of the left (e.g., Story recall) (Spinnler and Tognoni, 1987) and right hemisphere (e.g., Rey's Figure Recall) (Rey, 1941; Osterrieth, 1944) were used to examine the extent to which alexithymia of older age is associated with lateralized functional changes.

METHODS

The study was conducted on 40 healthy volunteers selected from the general population through advertisement: 20 were younger (mean age 27.3, $SD = 2.1$; education 14.7, $SD = 2.4$) and 20 were older (mean age 65.4, $SD = 7.4$; education 10.1, $SD = 4.1$). As expected, there was a significant group difference in age ($U 0.0$; $Z -5.4$; $p = 0.001$) and a difference in education ($U 78.5$; $Z -3.5$; $p = 0.001$). All subjects screened negative for present or past history of psychiatric disorders (including substance dependence, mood, anxiety, and psychotic disorders) assessed using the modified Structured Clinical Interview for DSM–

IV–TR Axis I Disorders (APA, 2000), and major medical and neurological illness. Among older subjects, 2 persons had a diagnosis of essential hypertension.

Because we intended to study “normal” aging, great effort was expended to exclude individuals with even very mild cognitive impairment. This was attained as follows. Subjects reporting subjective cognitive impairment, as well as subjects with clinician-established diagnosis of possible Mild Cognitive Impairment (Petersen et al., 2001) and/or dementia (DSM-IV) were excluded. In addition, subjects with less than a perfect score on Mini Mental State Examination (Folstein et al., 1975), Basic Activities of Daily Living (ADL) (Katz et al., 1970), and Instrumental Activities of Daily Living (Lawton and Brody, 1969) were excluded. In addition, subjects scoring 0.5 *SD* below standardized means (for age and education) on any of the administered cognitive tests were excluded. All subjects had negligible depression as assessed by the Hamilton Depression Scale (Hamilton, 1960) (younger volunteers mean = 0.25, *SD* = 0.44) and Geriatric Depression Scale (Yesavage et al., 1982) (older volunteers mean = 1.90, *SD* = 0.96).

Severity of alexithymia was measured using the 20-item Toronto Alexithymia Scale (TAS-20) (Bagby et al., 1990). This widely used questionnaire is based on a 5-point Likert scale where each value corresponds to a specific statement (1 = completely disagree; 2 = partly disagree; 3 = neither agree nor disagree; 4 = partly agree; 5 = completely agree). The TAS-20 has consistently been shown in factor analytic studies (Bagby et al., 1994) to assess 3 dimensions of alexithymia: difficulty in identifying feelings and distinguishing them from bodily sensations of emotions (DIF), difficulty in describing feelings (DDF), and externally oriented thinking (EOT).

Neurocognitive competence was assessed using a comprehensive neuropsychological battery examining the following cognitive functions: attention, language, memory, visuospatial abilities, executive functions. Tests examined in the present report included Story Immediate and Delayed Recall (Spinnler and Tognoni, 1987); Rey’s Figure Recall (Rey, 1941; Osterrieth, 1944); Raven Colored Matrices (Raven, 1936); Verbal Fluency Test (FAS) (Spinnler and Tognoni, 1987), Categorical Word Production (Spinnler and Tognoni, 1987), Trail Making Test A and B (Spinnler and Tognoni, 1987), Attentional Matrix I-II-III (Spinnler and Tognoni, 1987).

Statistical Analysis

Mann-Whitney *U* was used to compare young and older volunteers on continuous variables (i.e., alexithymia and neuropsychological variables). Spearman correlation coefficients were computed to determine the strength of the association between TAS-20 total score and the 3 TAS factors with education and with the neuropsychological variables showing a significant age group effect. A conservative 2-tailed alpha level of 0.01 was chosen to limit the probability of type I error. Linear regression model(s) were planned to determine the independent degree of association of neuropsychological measures with alexithymia.

RESULTS

TAS-20 total score and 3 alexithymia factors (DIF, DDF, and EOT) showed significant age effects (Table 1). Education inversely correlated with TAS-20 total score ($r = -0.58$, $p < 0.001$) and all TAS Factors ($-0.49 < r_s < -0.55$, $p < 0.001$). Results of the neuropsychological evaluation are reported in Table 2. Significant age effects were found for Story Immediate/Delayed Recall, Rey Figure Delayed Recall, and Raven Colored Matrices (Table 2). No other differences were found to be statistically significant. Correlations between TAS-20 Total Score and TAS Factors with neuropsychological variables showing age-group differences are shown in Table 3. Story Immediate/Delayed

Recall, Rey Figure Delayed Recall, and Raven Colored Matrices correlated significantly with TAS-20 Total score and all alexithymia factors (Table 3).

To establish what neurocognitive test uniquely predicted alexithymia, linear regression models predicting TAS-20 total score were computed. First education, Story Immediate/Delayed Recall, Rey's Figure Delayed Recall, and Raven Colored Matrices were examined in block as dependent variables. Age was not included as predictor because of its meaningful association with the neuropsychological variables. This model showed an overall $r = 0.87$ ($R^2 = 0.77$) [$F(4,35) = 29.1$, $p < 0.001$]. Standardized beta for education was 0.42 [$t(1,39) = -4.9$ $p < 0.001$], for Story Immediate/Delayed Recall was -0.11 [$t(1,39) = 1.1$ $p > 0.2$], for Rey Figure Recall was -0.32 [$t(1,39) = -3.69$ $p < 0.001$], and for Raven Matrices was 0.48 [$t(1,39) = -4.9$ $p < 0.001$]. Education, Story Immediate/Delayed Recall, Rey's Figure Delayed Recall, and Raven Colored Matrices were also entered independently in 2 hierarchical models. In one, Story Immediate/Delayed Recall was entered right after education and in the second model was entered last. The order of the independent variables partially changed the results. Story Immediate/Delayed Recall entered as a next variable after education showed an adjusted $R^2 = 0.47$ (R^2 change = 0.2) [$F(1,37) = 14.0$, $p < 0.001$]. Rey's Figure (adjusted $R^2 = 0.57$, R^2 change = 0.11) [$F(1,36) = 10.1$, $p = 0.003$] and Raven Matrices (adjusted $R^2 = 0.74$, R^2 change = 0.16) [$F(1,35) = 24.3$, $p < 0.001$] showed also significant effects. However, when Story Recall was entered last, Raven Matrices, and Rey's Figure Delayed recall uniquely predicted TAS-20 total score but story recall failed to individually account for variance in alexithymia (Table 4). The Raven Matrices accounted for about 36% of the variance in alexithymia after controlling for education and Rey's Figure Recall for an additional 10% (Table 4).

In summary, neurocognitive abilities found to be strongly age-related were also highly inversely correlated with alexithymia total scores and individual factors. In addition to education, alexithymia total score appeared to be uniquely predicted by Raven Matrices and Rey's Figure Recall.

DISCUSSION

The present study showed that older volunteers carefully screened for cognitive impairment scored higher on a widely used measure of alexithymia compared with younger counterparts. This result confirms the association between older age and alexithymia reported in earlier epidemiological studies (e.g. Gunzelman et al., 2002; Matilla et al., 2006). The novel finding in the present study is the covariance between poorer neurocognitive performance and higher alexithymia scores in this broad age range sample. Both relatively left and right lateralized neurocognitive functions were poorer in older subjects and significantly correlated with alexithymia total score and individual factors. Predominantly right hemisphere functions (visual memory and nonverbal general intelligence) were uniquely associated with alexithymia. These findings suggest a common substrate for right lateralized neurocognitive deficit, higher alexithymia and age-associated right hemisphere decline (Dolcos et al., 2002; Cabeza, 2002).

To our knowledge, this is the first study to report greater alexithymia scores in older adults who were carefully screened for minimal cognitive deficit. Therefore, on one hand in this sample gross cognitive impairment (e.g., dementia) cannot be ascribed as mechanisms for higher alexithymia in older age because the scores were well within normative values. On the other hand, age-related differences in lateralized neurocognitive tests predicted higher alexithymia scores.

Before discussing the results of this paper some caveats need to be acknowledged. First, it should be noted that the severity of alexithymia found in this sample of older adults of a Northern Italian city did not fall in the pathological range (Taylor et al., 1993). Second, cohort effects on alexithymia cannot be definitely excluded. It is established, however, that older (>65 years of age) adults examined 13 years apart tend to report less sadness (Gallo et al., 1997) and may therefore also have generalized difficulty reporting emotions. Alexithymia may be associated with lower education (Pasini et al., 1992), but in our sample cognitive abilities correlated with alexithymia after controlling for education.

Alexithymia in older age was associated with relatively lateralized left hemisphere functions (i.e., verbal memory). This association is not novel, but constitutes novelty in the context of alexithymia and aging. The association between alexithymia and verbal abilities has been reported in a sample of veterans (Lamberty and Holt, 1995) and in traumatic brain injury (Wood and Williams, 2007), and is consistent with the inability to describe feelings constituting a facet of alexithymia. Performance on verbal abilities failed to reach statistical significance in a model including right hemisphere lateralized functions (i.e., visual memory and nonverbal intelligence) suggesting that alexithymia is perhaps more strongly and uniquely tied with functions of the right hemisphere. These findings are consistent with lesion (Spalletta et al., 2001) and aging studies (Paradiso et al., 2008), reporting alterations of right hemisphere structures in association with alexithymia. These findings are not consistent with the notion of a generalized age-related greater ability to modulate emotions (Charles and Carstensen, 2008).

In summary, the present study confirms the association between alexithymia and older age. This study suggests that alexithymic features in healthy aging, albeit not in the pathological range, may be associated with relatively weaker neuropsychological performance especially in domains supported by right hemisphere functioning.

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TABLE 1

Alexithymia in Younger and Older Volunteers

	Younger Means (SD)	Older Means (SD)	
TAS-20 total	21.90 (1.97)	37.05 (4.89)	U = 0 z = -5.4 p = 0.001
Difficulty in identifying feelings	7.55 (0.94)	11.95 (3.05)	U = 13.5 z = -5.1 p = 0.001
Difficulty in describing feelings	5.70 (0.80)	9.30 (2.07)	U = 15.00 z = -5.1 p = 0.001
Externally oriented thinking	8.65 (1.30)	15.80 (2.52)	U = 2.5 z = -5.2 p = 0.001

TAS-20 indicates Toronto Alexithymia Scale—20 items.

TABLE 2

Neuropsychological Evaluation

Domain and Task	Younger (n = 20) Means (SD)	Older (n = 20) Means (SD)	
1. Attention			
Matrices total score	59.3 (0.92)	58.5 (1.35)	U = 130.0 z = -2.0 p = 0.060
2. Language			
Verbal fluency (phonological cluster)	49.20 (6.45)	42.65 (10.45)	U = 111 z = -2.4 p = 0.015
Verbal fluency (categories)	46.40 (4.12)	42.00 (6.03)	U = 114.5 z = -2.3 p = 0.020
3. Verbal and visual memory			
Story Immediate/Delayed Recall *	15.95 (0.67)	14.73 (1.46)	U = 76.00 z = -3.6 p = 0.001
Rey's Figure Delayed Recall *	30.35 (1.98)	27.57 (2.56)	U = 89.5 z = -3.01 p = 0.001
4. Visuospatial			
Rey's Figure Copy	36.00 (0.00)	35.85 (0.48)	U = 180.00 z = -1.432 p = 0.602
Raven Colored Matrices *	35.85 (0.36)	34.05 (1.93)	U = 65.0 z = -4.02 p = 0.001
5. Executive functions/psychomotor speed			
Trials A	39.45 (12.67)	40.65 (13.50)	U = 191.00 z = -0.244 p = 0.820
Trials B	70.65 (15.97)	83.40 (34.35)	U = 166.00 z = -0.921 p = 0.369

* indicates statistically significant.

TABLE 3

Correlations Between Alexithymia and Neurocognition

Variables	TAS-20 Total Score	Difficulty in Identifying Feelings	Difficulty in Describing Feelings	Externally Oriented Thinking
Story Immediate/Delayed Recall	-0.526 *	-0.269	-0.607 *	-0.526 *
Rey's Figure Delayed Recall	-0.477 **	-0.532 ***	-0.456 **	-0.331 **
Raven Colored Matrices	-0.662 ***	-0.513 *	-0.684 ***	-0.756 ***

TAS-20 indicates Toronto Alexithymia Scale-20. N = 40.

Spearman's correlations are reported, significance

*
 $p = 0.001$,**
 $p < 0.05$,***
 $p < 0.001$.

TABLE 4

Neurocognitive Predictors of Alexithymia

Model	R	R ² Change	F	p
Education	0.546	0.298	16.2	<0.001
Raven Colored Progressive Matrices	0.813	0.362	39.4	<0.001
Rey's Figure Delayed Recall	0.872	0.100	14.9	<0.001
Story Immediate/Delayed Recall	0.888	0.028	2.3	>0.1