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A new conceptualization of alexithymia in the general adult population: implications for research involving older adults[B]

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Abstract

Objective: The purpose of this study is to test the validity of existing conceptualizations of the alexithymia concept, with particular reference to aging. **Methods:** Two hundred and forty-eight healthy adults completed measures of alexithymia and psychosocial functioning; younger and older adults (n=121) also completed a measure of emotional responsiveness. **Results:** Older adults engaged in less introspective thought traditionally thought to denote increased alexithymia. However, reduced introspection was associated with improved mental wellbeing, and, thus, could not be construed as a deficit. Difficulty identifying and describing emotions did not differentiate older and younger adults, but were both associated with heightened depression, anxiety, and poor perceived quality of life. **Conclusions:** In clinical practice and research, the Toronto Alexithymia Scale (TAS) is almost exclusively used, with "total" score typically used to index alexithymia. As one of the subscales of the TAS measures reduced introspection, calculating total scores may not be appropriate and may particularly overestimate levels of alexithymia in older adulthood.

Keywords: Aging; Alexithymia; TAS-20

Introduction

Alexithymia is characterized by a reduction or absence of the tendency to think about emotions, engage in fantasizing, as well as a deficit in the ability to consciously experience, describe, and identify emotions [1]. Increasingly, attention has been focused on the assessment of alexithymia, as it has been associated with increased depression [2], anxiety [3], reduced life satisfaction [4], and somatic illness (see Ref. [5]). In both clinical and nonclinical research, the Toronto Alexithymia Scale (TAS [6]) is by far the most extensively used measure of this construct. The most recent 20-item version (TAS-20) consists of three subscales: "difficulty identifying emotions" (DIE), "difficulty describing emotions" (DDE), and "externally oriented thinking" (EOT). Whereas DIE refers to problems distinguishing between emotions and bodily sensations, as well as problems distinguishing between different emotions, DDE measures an inability to verbally express emotions. Externally oriented thinking refers to a concrete nonintrospective cognitive style. The original version of the TAS-20 consisted of 26 items (the TAS-26), and included a fourth component that tapped daydreaming. Although Parker et al. [7] suggest that the EOT subscale indirectly assesses reduced fantasy, others have argued that the elimination of items that directly tap impoverishment of fantasy means that the TAS-20 does not measure alexithymia as originally defined [8,9].

Bermond [10] has also argued that there is an important distinction to be made between the cognitive, evaluative component, and the emotional component of alexithymia. In a factor analytic study of the Bermond-Vorst Alexithymia Questionnaire (BVAQ [11]) in a sample of healthy adults, it

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was found that two subscales, emotionalizing (the degree to which emotion inducing events elicit emotional arousal) and fantasizing (the degree of imaginal activity), loaded on a dimension that was argued to constitute the emotional component of alexithymia. The subscales that assessed the capacity to identify, verbalize, and analyze emotions loaded on a second distinct dimension that was labeled as the cognitive component. These aspects of the cognitive component have been argued to broadly correspond to the DIE, DDE, and EOT dimensions of the TAS-20, respectively [11]. It is suggested that the TAS-20 therefore emphasizes the cognitive aspect of alexithymia and does not represent a good marker of the emotional component [1,11]. Although Muller et al. [12] found that a five-factor structure corresponding to the five putative subscales of the BVAQ represented a good fit to data obtained from 370 psychiatric inpatients, the validity of the cognitive/emotionalizing dimensions was not specifically assessed. However, Morera et al. [13] specifically questioned whether the fantasizing and emotionalizing subscales of the BVAQ should be regarded as unique dimensions, or correlates, of alexithymia, following the finding of unexpected patterns of relationships between these subscales and measures of neuroticism and depression.

Indeed, Parker et al. [7] argue that the core disturbance in alexithymia is a deficit in the cognitive processing and regulation of emotions, and that the capacity to experience emotions should be regarded as an epiphenomenon of the disorder; this suggests that the TAS-20 may be an effective measure of the core components of alexithymia. However, an increasingly prominent alternative view is that alexithymia fundamentally reflects a deficit in the capacity to consciously experience emotional feelings in the context of autonomic activation arising from emotional arousal [14]. Indeed, original descriptions highlighted the fact that clinical manifestations of the disorder may be associated with a diminution or complete loss of conscious emotional experience [15,16].

Lane et al. [14] suggest that the alexithymic individual's experience of emotion is undifferentiated and involves a focus on somatic sensation as opposed to consciously experienced emotions. It is argued that this is demonstrated indirectly by the association between alexithymia and deficits in the ability to perceive exteroceptive emotional cues. Moreover, deficits in the conscious awareness of emotions have been particularly linked to the anterior cingulate cortex [17], and a relationship between alexithymia and abnormalities in this region has been identified [18]. In a recent review of neurobiological studies, Larsen et al. [1] specifically recommended that "... follow-up studies should monitor subjects according to both the cognitive and emotional characteristics of alexithymia" (p. 533).

However, it has long been accepted that there are problems with *recall*-based self-report measures of emotional experience. As Nisbett and Wilson [19] point out, there is little reason to assume that affect is stored directly in memory. Recall-based self-report measures of emotion are reliant on memory, aggregation of past emotions into a coherent whole, and may be particularly influenced by salient recent events. It is therefore somewhat surprising that no study to date has specifically assessed the putative emotionalizing dimension of the alexithymia construct using *on-line* self-report measures of emotional experience.

In addition, the relationship between alexithymia and age is of particular interest because the few studies that have assessed alexithymia in older adulthood suggest that, as for younger adults, there may be a negative relationship with mental well-being, such as depression [20,21], as well as poor perceived somatic health [22]. Moreover, alexithymic behavior may actually be more pronounced in older adulthood, as there is evidence of age-related declines in the perception of emotions [23,24]. However, an age-related reduction in the experience of alexithymia may also be anticipated. Alexithymia is considered by some to be a disorder of affect regulation [25], and there is evidence of age-related improvements in emotional control [26]. To date, few studies have explored the relationship between alexithymia and aging, and those that have done so have failed to yield consistent results (see Refs. [20,21,27,28]. As Waldstein et al. [21] note, "...little is known about the construct of alexithymia in older adults" (p. 598).

Research issues to be addressed

Assessment of construct validity of the TAS-20 and Fantasy subscales

Alternate structures of the alexithymia concept have been proposed. Thus, the first aim was to evaluate competing models of the latent structure of the most widely used measure, the TAS-20, and assess its relationship to fantasizing. The daydreaming subscale of the TAS-26 correlates highly with social desirability, and only weakly with other subscales of the TAS-20 [29]. Therefore, to tap fantasizing, the Fantasy subscale from the Interpersonal Reactivity Inventory (IRI) [30] was selected. This measures the tendency to transpose oneself imaginatively into the emotions and behavior exhibited by fictitious characters.[1]

Relationship between different characteristics of alexithymia

The second aim was to assess the degree of convergence between different aspects of the alexithymia concept. On the basis of prior research, it was anticipated that higher scores on the EOT subscale would be associated with a reduction in fantasizing [7,21], and that DIE and DDE would be positively correlated [31,32]. However, if, as has been suggested, fantasizing and emotional responsiveness

[1] It is of note that in the present study, the Fantasy subscale and a measure of social desirability were unrelated (r=−.09).

do conjointly define the emotional component of alexithymia [11], these may also be substantially correlated with one another.

Age effects on alexithymia

The third aim was to assess whether there are age-related changes in the cognitive and emotional components of the alexithymia concept. To date, no study has conducted such an assessment in a sample that includes adults older than 65. On the basis of prior research, it was predicted that the EOT subscale would be more strongly related to aging than either the DIE or DDE subscales [20,27]. Moreover, although Vorst and Bermond [11] found that fantasizing but not emotionalizing was significantly related to age, this result requires replication as the sample consisted of a positively skewed distribution of students (mean age=22). Because self-reports are potentially subject to socially desirable responding [33], we also explored whether any differences in alexithymia can be explained by this response bias.

Alexithymia, mental well-being, and quality of life

Finally, we investigated whether current emotional state and rated quality of life (QOL) are related to the emotional as well as to the cognitive dimensions of alexithymia. This is important as although alexithymia has been shown to predict general negative affect, and levels of depression and anxiety in older adults, virtually, all of these studies have used the TAS-20 as the only indicator of alexithymia.

Methods

Participants

Complete data from the TAS-20 and the Fantasy scales were collected from 248 members of the general adult population (59.7% female, 40.3% male). Most were recruited via advertisements in community newsletters by approaching various organizations (e.g., bowling clubs, local charitable organizations). These participants were remunerated for travel expenses. The remaining participants were undergraduate students who completed the study in return for course credits. The mean age of the participants was 43.5 years (S.D.=23.11) and ranged from 18 to 88 years. On average, participants had received 13.5 years of education (S.D.=2.90).

One hundred and twenty-one of these participants aged between 18 and 40 (younger group) or 60 or over (older group) were invited to a second testing session (see later). As before, each participant was remunerated for travel expenses. Sixty-three younger and 58 older participants were included; for the younger group, the mean age of the participants was 22.0 (S.D.=6.22); they had received 13.9 (S.D.=1.91) years of education, and 50.8% were female. The majority of participants (86%) in the younger group were undergraduate students. For the older group, the mean age of the participants was 72.1 (S.D.=6.46); they had received 12.5 years (S.D.=3.50) of education, and 50.0% were female.

Measures

The following measures were administered to all participants (n=248) in a counterbalanced order.

Toronto Alexithymia Scale

The TAS-20 represents by far the most widely used measure of this construct. Each item is rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores on each subscale are indicative of increased alexithymia. The reliabilities of the TAS-20 DIE, DDE, EOT, and Total scales were .86, .71, .61, and .83, respectively (Cronbach's α used for all measures of reliability).

Fantasy subscale from the IRI

The seven-item Fantasy subscale was selected to assess the capacity for imaginal activity. Participants are asked to indicate how well each of the seven statements describes them, with higher scores indicative of increased fantasizing. The reliability of the IRI subscale was .78.

Crowne-Marlowe Social Desirability (CMSD) Scale

A shortened version of the CMSD was employed, consisting of the seven items that Crawford and Heather [34] found to have the highest correlations with respondents' total score on the full version. The measure provides an assessment of the degree to which individuals need social approval. The reliability of the CMSD was .55.

Hospital Anxiety and Depression Scales [35]

The Hospital Anxiety and Depression Scales was developed to provide a brief means of identifying and measuring severity of depression and anxiety in non-psychiatric clinical environments. The respondent is asked to select the reply that most closely matches how they felt during the past week. The reliabilities of the Total score and the Depression and Anxiety subscales were .80, .68, and .79, respectively.

Positive and Negative Affect Schedule

The Positive and Negative Affect Schedule (PANAS) is a brief self-report measure of positive and negative affect developed by Watson et al. [36]. The "past week" time format was adopted. The PANAS is a reliable valid measure of the constructs; it was intended to assess [37]. In the present study, reliability was .89 and .86 for the PA and NA subscales, respectively.

LEIPAD

The LEIPAD is a 27-item self-report questionnaire developed by de Leo et al. [38] and provides an overall index of QOL. The measure has been validated cross-

culturally and is psychometrically sound [38]. In the present study, reliability was .86.

Emotional responsiveness

As noted previously, it is probable that recall-based measures of the emotionalizing dimension may be particularly subject to memory biases and distortions. Thus, participants' degree of emotional responsiveness was assessed by asking participants to provide immediate self-report assessments of emotional experience following a standardized mood induction procedure.

Participants who were younger (n=61) or older (n=58) according to the criteria specified earlier were invited to the second testing session, conducted within a short duration of the first (typically within a day or two). Participants were first asked to indicate the degree to which they felt angry, upset, sad, and annoyed on rating scales from 0 (not at all) to 7 (very) to establish baseline levels of emotional experience. Participants were then asked to watch a short extract from the movie "Cry Freedom." (Only two younger and three older participants had previously seen this movie.) This depicted the shooting of children during the Soweto Massacre in South Africa, and lasted four and a half minutes. Gross and Levenson [39] identified this clip as eliciting high levels of negative affect, a finding replicated in our own pilot testing with younger and older adults. To obtain an "emotional responsiveness" score, immediately after watching the video-clip, participants were asked to self-rate the degree to which they felt angry, upset, sad, and annoyed on the same rating scale. The mean score across these four outcome measures was used as the dependent measure for emotional responsiveness. Cronbach's α for the total score was .89. Although the analyses reported in this study did not take baseline scores into account, partialling out these scores does not substantially or significantly alter any of the results obtained.

Confirmatory factor analysis

Basic statistical analyses were conducted using SPSS Version 8. CFA (robust maximum likelihood) was performed on the variance-covariance matrix of the items using EQS for Windows Version 5.4 [40]. The fit of CFA models was assessed using the standardized root mean squared residual (SRMR) and the root mean squared error of approximation (RMSEA). The RMSEA is sensitive to misspecified factor loadings, the SRMR to misspecified factor covariances [41]. Hu and Bentler [41,42] demonstrated using Monte Carlo analyses that the combination of the SRMR and RMSEA minimizes rejection of good fitting models, yet possesses optimal sensitivity to model misspecification. A cutoff value close to .08 or below is recommended for the SRMR [41]; an RMSEA of <.10 is considered good and <.05 very good [43]. The χ^2 difference test was used to test for differences in the fit of nested models. (A model is considered to be nested within another model if it differs only in imposing additional constraints on the relationships between variables specified in the initial model.) For a fuller outline of all these statistics, see Ref. [37].

Parameterization of competing models

Competing models of the latent structure of the TAS-20 have been proposed; CFA was therefore used to evaluate different models that additionally incorporate the Fantasy dimension. The first model (Model 1) expressed the hypothesis that the variance in DIE, DDE, EOT, and Fantasy subscale scores can be partitioned into a single factor plus error variance associated with each individual item. It is standard practice to test the fit of a single-factor model because it is the most parsimonious of all possible models. Model 2 expressed the hypothesis that the DIE, DDE, EOT, and Fantasy subscales measure four distinct but correlated factors; this would be in keeping with the theoretical orientation underlying the original factor structure of the TAS-26. Therefore, in this model, all items were constrained to load only on the factors corresponding to their respective subscales.

Model 3 tested a correlated three-factor model in which items in the EOT and Fantasy subscales were each permitted to load on two separate factors (i.e., there were distinct EOT and Fantasy dimensions). However, DIE and DDE items were constrained to be indicators of a single dimension (DIE/DDE). Testing this model was important as it has been found that items on the DIE/DDE subscales do not tap distinct latent structures, but a single shared dimension [30,31]. Finally, in Model 4, again, three factors were specified, but this time, in addition to distinct DIE and DDE dimensions, a collapsed EOT/Fantasy dimension was specified. As noted, Parker et al. [7] have argued that the EOT subscale represents an indirect measure of imaginic activity; this model permits an assessment of whether the EOT and Fantasy subscales index the same underlying factor.

Results

Confirmatory factor analytic results

The fit statistics for the CFA models are presented in Table 1. It can be seen that the single-factor model (Model 1) had very poor fit. Model 2 expressed the original hypothesis that the DIE, DDE, EOT, and Fantasy subscales tap distinct factors. For this model, the SRMR of .070 and RMSEA of .059 both indicate a good fit [40,41].

Models 3 and 4 both consisted of three correlated factors, but whereas the former constrained DIE and DDE items to load on only a single dimension, the latter constrained EOT and Fantasy items to load on a single factor. It can be seen that relative to Model 2, both of these models have a substantially poorer fit. Furthermore, as noted, inferential statistics can be applied to compare nested models. Models 3

Table 1
Fit indices for confirmatory factor analytic models (n=248)

Model	χ^2	*df*	CFI	SRMR	RMSEA	90% CIs RMSEA Lower	90% CIs RMSEA Upper
1. Single factor	1207.7	324	.519	.130	.105	.099	.111
2. DIE, DDE, EOT, and Fantasy as correlated factors	589.8	318	.852	.070	.059	.051	.066
3. DIE/DDE, EOT, and Fantasy as correlated factors	655.4	321	.818	.078	.065	.058	.072
4. DIE, DDE, and EOT/Fantasy as correlated factors	664.4	321	.813	.081	.066	.059	.073

and 4 are each nested within Model 2. χ^2 Difference tests indicated that Model 2 represented a significantly better fit than either Model 3 or Model 4 (both P's<.001).

However, the global fit index of a model is only one indicator of the fit of the model with the data. Thus, factor loadings for each of the models tested are presented in Table 2. It can be seen that the loadings for Model 1 are consistent with the poor global fit indices reported for this model: 15 items load weakly (<.30). Model 2, which was identified as optimal in terms of global fit indices, has a good fit in terms of factor loadings, with only two items loading weakly. Furthermore, the factor loadings for Model 2 are, on average, slightly higher than those for either Model 3 or Model 4.

With respect to correlations between the latent factors, DIE and DDE were substantially correlated (r=.79). The next strongest correlation was between the EOT and Fantasy subscales (r=−.57). The relationship between fantasizing and both DIE and DDE was minimal (r=.06 and −.19, respectively), and EOT was also weakly correlated with DIE (r=.18). Externally oriented thinking and DDE were more strongly related (r=.45).

Table 2
Factor loadings from confirmatory factor analysis for all four models

Subscale item number	Model 1	2	3	4
TAS DIE				
1	.65	.67	.67	.67
3	.62	.64	.62	.64
6	.67	.70	.68	.70
7	.67	.70	.67	.70
9	.71	.76	.73	.76
13	.78	.76	.77	.76
14	.60	.60	.60	.60
TAS DDE				
2	.65	.69	.65	.69
4	.32	.42	.32	.43
11	.68	.76	.67	.76
12	.37	.43	.36	.43
17	.47	.56	.45	.54
TAS EOT				
5	.06	.26	.25	−.23
8	.18	.37	.38	−.20
10	−.03	.31	.30	−.32
15	.21	.60	.60	−.33
16	.12	.52	.54	−.37
18	.13	.29	.29	−.26
19	.17	.46	.44	−.32
20	.17	.47	.47	−.36
IRI fantasizing				
1	.13	.45	.44	.44
5	.03	.61	.61	.61
7	−.11	.48	.48	.47
12	−.06	.43	.43	.41
16	.02	.61	.62	.58
23	−.11	.75	.75	.73
26	−.05	.76	.77	.75

Emotional responsiveness in relation to other characteristics of alexithymia

Degree of emotional responsiveness, as indexed by the video ratings, was unrelated to the other putative aspects of alexithymia; correlations with DIE, DDE, EOT, and Fantasy were .06, .09, .08 and −.02, respectively (based on 121 participants). It might be argued that because the target emotions predominantly induced by Cry Freedom are anger and sadness, the results may change when intensity ratings for anger and sadness are used as indicators of emotional responsiveness. Additional analyses indicated that using sadness or anger as the target emotion of interest, correlations with DIE, DDE, EOT, and Fantasy remain low (r's ranged from −.09 to .09).

Age effects

Means and S.D.s for each measure of alexithymia are presented in Table 3, along with the results of analysis of variance (ANOVA). The standardized difference between the younger and older groups on each measure is also presented, expressed as Cohen's d. In terms of effect size, Cohen [44] regards 0.2 as small, 0.5 as moderate, and 0.8 as large. Older adults considered themselves to be better at identifying

Table 3
Means and S.D.s for indices of alexithymia as a function of age, results of analyses of variance, and effect sizes (n=121)

	Younger		Older		ANOVA results		
	M	S.D.	*M*	S.D.	*F*(1,119)	*P*	Cohen's *d*
Cognitive component							
DIE	18.2	5.36	16.1	5.77	4.4	.038	0.39
DDE	14.5	4.06	13.4	3.10	3.0	.086	0.32
EOT	19.5	3.80	22.9	3.02	28.9	<.001	0.99
Emotional component							
Fantasy	16.5	5.54	11.4	5.01	27.8	<.001	0.97
Emotionalizing	4.2	1.69	5.3	1.79	10.9	.001	0.61

Maximum possible values for the DIE, DDE, EOT, Fantasy, and emotionalizing measures are 35, 25, 40, 28, and 7, respectively.

Table 4
Correlations between measures of alexithymia and mental well-being

Alexithymia measure	N	Mental well-being				
		PA[a]	NA[b]	Anxiety	Depression	QOL
DIE	248	−.21**	.25**	.35**	.22**	−.32**
DDE	248	−.10	.37**	.27**	.17**	−.28**
EOT	248	−.07	−.15*	−.25**	.08	.06
Fantasy	248	−.05	.09	.25**	.00	−.11
Emotionalizing	121	.22*	−.07	−.03	−.04	.12

[a] Positive affect.
[b] Negative affect; QOL=quality of life.
* $P<.05$.
** $P<.01$.

emotions, but there was no significant age effect for DDE. Older adults also reported an increased tendency to engage in EOT, heightened emotional responsiveness, but a significantly reduced tendency to engage in fantasizing. To ascertain whether any of the observed age differences in reported alexithymia could be attributable to social desirability effects, a series of analyses of covariance was carried out controlling for scores on the CMSD. The introduction of this covariate removed only one effect, namely, the age difference for DIE.

Alexithymia and well-being

In Table 4, correlations between the alexithymia measures and well-being measures are reported. The TAS-20 DIE and DDE subscales are significantly correlated with all indices of well-being and QOL, except for positive affect. Higher scores on DIE and DDE are associated with poorer mental well-being. However, higher scores on the EOT are associated with *reduced* anxiety and negative affect, whereas higher Fantasy scores are associated with *increased* anxiety. Higher emotional responsiveness is associated with significantly greater positive affect.

Correlations were calculated separately for each of the two age groups between alexithymia and well-being. The basic pattern of results was similar for the two age groups. However, DIE and DDE were more strongly correlated with depression and anxiety in the younger age group, and higher perceived QOL was significantly associated with increased DIE and DDE in the younger but not in the older age group. Increased difficulty in identifying and describing emotions may therefore be particularly associated with negative implications for mental health and well-being in younger adults.

Discussion

Psychometric properties of the TAS and Fantasy subscales

As has been found in prior empirical research, CFA revealed that DIE and DDE were substantially correlated, indicating that the abilities to identify and describe emotions are strongly associated with one another. Moreover, fantasizing was most strongly related to the EOT scale. As this correlation was negative, reduced levels of imaginic activity (thought to denote increased alexithymia) are associated with an increased predilection toward concrete reality-based thinking (also considered to denote increased alexithymia).

Nevertheless, despite these correlations, the reductions in fit when attempts were made to collapse DIE and DDE (Model 3) or EOT and Fantasy (Model 4) onto a single dimension were substantial, indicating that the four subscales do index distinct, although in some instances, highly correlated, factors. Moreover, the hypothesis that the four subscales tap a single factor (Model 1) was also found to be untenable. Model 2, an oblique four-factor model, encapsulated the hypothesis that alexithymia consists of four distinct but correlated factors: DIE, DDE, EOT, and fantasizing. This proved the optimal fit and qualified as a good fit according to accepted criteria [41,42].

It might be argued that the high correlation between DIE and DDE, coupled with the importance of taking into account parsimony, favors Model 3. However, although the correlation between the latent factors indicates that much of the variance between these two constructs was shared, a substantial proportion (37.6%) was unique. Thus, the significant reduction in fit that was observed when DIE and DDE were constrained to load on one factor, as well as the overall lower factor loadings, suggests that it is important to retain the distinction between DIE and DDE.

An emotional dimension of alexithymia?

Emotional responsiveness was unrelated to DIE, DDE, EOT, and Fantasy, suggesting that emotionality may tap an aspect of alexithymia that is independent of more "cognitive" aspects of alexithymia. Alternatively, the failure to find any correlation between emotional responsiveness and the subscales of the TAS-20 could be interpreted as evidence that the measure of emotional responsiveness selected in the present study did not adequately tap the construct it was intended to represent. Indeed, the current emotionality measure taken from simple self-ratings of response to a standard situation is likely to reflect only a single aspect of an individual's emotional experience. This is in contrast to the complex self-reflective questions of the TAS-20 which ask for a conscious summarizing over many different emotional encounters. However, the Levels of Emotional Awareness Scale (LEAS [45]) has also been shown in some studies to be only weakly related to the TAS-20. Waller and Scheidt [46], for instance, found DIE and DDE to be unrelated to LEAS scores in a sample of participants with somatoform disorders.

An alternative possibility, however, is that the self-report alexithymia measures (TAS and Fantasy) may themselves

be neither valid nor reliable. Indeed, a limitation of the present study is that the TAS-20 and IRI-fantasizing subscales are self-report measures, and, with the exception of the emotional responsiveness measure, were used in combination with other self-report measures. As noted earlier, recall-based measures of emotional experience are particularly susceptible to memory biases and distortions, and for this reason, an on-line assessment of emotional responsiveness was employed in the present study. However, there are also potential problems with the self-report assessment of other dimensions of alexithymia. For this approach to be valid, participants must be able to accurately identify, monitor, and report their emotional states. As Lane et al. [47] note, this might not be possible, particularly for highly alexithymic participants. It has been suggested that self-report measures of alexithymia might not assess the ability to understand and describe difficulties in understanding and communicating emotions, but instead deficits in the awareness of these specific difficulties [12]. It is not possible to disentangle these different possibilities in the present study.

Correlates of DIE, DDE, EOT, and fantasizing

Different measures of the alexithymia concept show different and in some cases opposite relationships with age. When social desirability effects were covaried, effects of age were significant for EOT, Fantasy, and emotional responsiveness, but not for identifying and describing emotions. Thus, whereas older adults do not differ from younger adults in the ability to identify or describe emotions, they engage in more EOT and fantasize less (both considered to be indicative of increased alexithymia). However, they also report higher emotional responsiveness in response to the behavioral measure, which is considered to denote reduced alexithymia.

Of particular interest was the finding that higher scores on the DIE and DDE subscales were associated with important markers of mental well-being, namely, negative mood and QOL outcomes; this is consistent with other empirical research [17,18,48]. Increased emotional responsiveness (indicating reduced alexithymia) was also specifically associated with increased positive affect. However, those who had higher EOT scores and reduced fantasizing—both usually seen as indicating higher levels of alexithymia—reported *lower* negative affect and less anxiety.

A refined model of alexithymia?

It may be that in healthy adults, the alexithymia construct can best be measured by DIE and DDE from the TAS. (A possible third component is the capacity to consciously experience emotions, but more research is needed to rigorously assess this possibility.) In our sample, the EOT and Fantasy subscales do not appear to be measuring alexithymia, but instead reflect a style of avoiding introspective thought that tends to be adopted more by older than by younger adults. This is not a "deficit"—it is associated with lower anxiety levels and reduced negative affect, and may therefore be separate from the alexithymia construct. Thus, using full-scale scores from the TAS-20 in samples drawn from the general population may be inappropriate, as the inclusion of the EOT subscale may provide misleading results.

In particular, pooling scores across the DIE, DDE, and EOT subscales from the TAS-20 may overestimate the incidence of alexithymia in older adults. This is because the present results clearly indicate that older adults engage in less introspection. These results are not unique: Gunzelmann et al. [20], for instance, found that only the EOT and daydreaming subscales of the TAS-26 were subject to age effects, indicating that older adults daydream less and engage in more EOT. Self-reported daydreaming, for example, has been shown to decline considerably across the adult life span [49].

However, an alternative possibility is that the EOT subscale is picking up on aspects of emotional or cognitive functioning that are different to those measured by the other two subscales. Although alexithymia is widely regarded as a trait construct [50,51], it has also been suggested that at the individual level, features of alexithymia may be state dependent, and in particular, dependent on depression [52]. Because the DIE and DDE subscales correlate with self-report measures of mood but the EOT subscale does not, it is possible that the EOT subscale is tapping into a unique emotional deficit that is less state dependent. Additionally, the EOT subscale does not require participants to make judgments about their own deficits with regard to the experience and expression of emotions, and so self-reporting for the EOT subscale may be more accurate than for the other subscales. Consistent with this possibility, Waller and Scheidt [46] found that the EOT subscale exhibits better convergent validity with objective measures of alexithymia, including the LEAS, relative to either the DIE or DDE subscales.

Conclusions and future directions

The TAS-20 and Fantasy subscale from the IRI tap four distinct factors corresponding to DIE, DDE, EOT, and Fantasy that relate differentially to age and psychosocial functioning, and are unrelated to emotional responsiveness. The pattern of correlations suggests that in the general population, the EOT and Fantasy subscales may not measure alexithymia, but a style of avoiding introspective thought that is adopted more by older than by younger adults. More research is needed to clarify the relationship between emotional responsiveness and alexithymia. Furthermore, it would be valuable to examine whether different measures of alexithymia such as the TAS-20 possess measurement and factorial invariance across different age groups.

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