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Research report

Dissociable morphometric profiles of the affective and cognitive dimensions of alexithymia

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ABSTRACT

Alexithymia ("no words for feelings") is a psychological construct that can be divided in a cognitive and affective dimension. The cognitive dimension reflects the ability to identify, verbalize and analyze feelings, whereas the affective dimension reflects the degree to which individuals get aroused by emotional stimuli and their ability to fantasize. These two alexithymia dimensions may differentially put individuals at risk to develop psychopathology. However, their neural correlates have rarely been investigated. The aim of the current study was to investigate whether the cognitive and affective alexithymia dimension are associated with unique anatomical profiles. Structural MRI scans of 57 participants (29 males; mean age: 34) were processed using a voxel-based morphometry (VBM) – Diffeomorphic Anatomical Registration Through Exponentiated Lie algebra (DARTEL) approach. Multiple regression analyses were performed to examine the common and specific associations between gray and white matter volume and alexithymia subdimensions. The results revealed that the cognitive dimension was related to lower dorsal anterior cingulate volume. In contrast, the affective alexithymia was associated with lower gray matter volume in the medial orbitofrontal cortex (OFC) and lower white matter volume in the superior longitudinal fasciculus (SLF) near the angular gyrus. No relationship between corpus callosum volume and alexithymia was observed. These results are

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consistent with the idea that there are two separable neural systems underlying alexithymia. This finding might encourage future research into the link between specific alexithymia subtypes and the development of psychopathology.

1. Introduction

With a prevalence rate of ten percent in the general population (Salminen, Saarijärvi, Toikka, & Kauhanen, 1999), alexithymia ("no words for feelings") is considered a risk factor for a range of neurological and psychiatric disorders (Taylor, Bagby, & Parker, 1997). Alexithymia is a dimensional psychological construct that is characterized by difficulties identifying and describing one's feelings as well as difficulty distinguishing them from bodily sensations of arousal. Alexithymia has further been associated with a lack of imagination and an externally oriented thinking style with reduced capacities of introspection (Sifneos, 1973; Vorst & Bermond, 2001).

However, it is suggested that alexithymia is not a uniform construct, but may instead comprise of an affective and a cognitive dimension (Vorst & Bermond, 2001). The affective dimension refers to the level of subjective emotional experience and consists of the factors emotionalizing (the degree to which someone is emotionally aroused by emotion-inducing events) and fantasizing (the degree to which someone is inclined to imagine, day-dream etc.). The cognitive dimension refers to the processing of emotions at a cognitive level and consists of the factors identifying, analyzing and verbalizing feelings. Based on these dimensions, Bermond et al. (2007) proposed to distinguish subtypes of alexithymia which seem to be differentially associated with psychopathology. Type 1 alexithymia is characterized by high scores on both the affective and the cognitive dimension (i.e., both emotional experience and the cognitions accompanying the emotions are impaired) and has been suggested to relate to schizoid personality disorder and psychopathy (Moormann et al., 2008a). Type 2 alexithymia is characterized by intact or even heightened levels of emotional experience, while cognitive emotion processing is reduced, and is associated with Borderline Personality disorder and schizophrenia (Moormann et al., 2008a; Van der Meer, Van't Wout, & Aleman, 2009). Thus, the two alexithymia dimensions might put individuals at risk for developing psychopathological disorders in different ways.

Brain regions that are thought to underlie alexithymia include both (sub)cortical regions and white matter tracts. One of the oldest theories regarding the anatomical correlates of alexithymia suggests that abnormal corpus callosum morphometry may hamper interhemispheric communication subserving cognitive processing of emotions (Gazzaniga & LeDoux, 1978), thereby contributing to the cognitive dimension (Larsen, Brand, Bermond, & Hijman, 2003) and type 2 alexithymia (Houtveen, Bermond, & Elton, 1997). Besides the corpus callosum, several gray matter regions are thought to be related to alexithymia. It has been proposed that dysfunction of the anterior cingulate cortex (ACC) relates to both cognitive and emotional aspects of alexithymia (Bermond, Vorst, & Moormann, 2006; Lane, Ahern, Schwartz, & Kaszniak, 1997; Larsen et al., 2003; Wingbermühle, Theunissen, Verhoeven, Kessels, & Egger, 2012) given its involvement in emotional experience (Milad et al., 2007) and cognitive demanding emotional tasks (Phan, Wager, Taylor, & Liberzon, 2002). However, results relating ACC volume to alexithymia are ambiguous. For example, positive correlations between alexithymia and ACC surface have been reported (Gündel et al., 2004), while others reported lower volume in this area (Borsci et al., 2009; Ihme et al., 2013; Koven, Roth, Garlinghouse, Flashman, & Saykin, 2011; Paradiso, Vaidya, McCormick, Jones, & Robinson, 2008; Sturm & Levenson, 2011) or were unable to find any significant association (Heinzel et al., 2012). Furthermore, previous studies associated alexithymia with lower gray matter in the orbitofrontal cortex (OFC), insula, and amygdala (Borsci et al., 2009; Ihme et al., 2013), whereas another study reported increased volume in the insula associated with alexithymia (Zhang et al., 2011). These regions are involved in primary emotion identification and in the generation of emotional states (Adolphs, 2002; Phillips, Drevets, Rauch, & Lane, 2003; Vuilleumier, 2005) and are thought to underlie both the affective and cognitive alexithymia dimension (Wingbermühle et al., 2012). However, it has also been proposed that dysfunctioning of specifically the medial OFC would be associated with solely the affective dimension (Bermond et al., 2006).

As reported above, previous studies on the structural correlates of alexithymia have produced equivocal results. One explanation for this might be that all these studies used the TAS-20 scale, which assesses the cognitive alexithymia dimension only. As previously suggested by Koven et al. (2011), assessing specific dimensions of emotional constructs, including alexithymia, instead of examining it as a unitary construct, can provide a more nuanced view and can indicate whether there are separate neural correlates underlying different alexithymia dimensions. Furthermore, a recent study revealed that the two alexithymia dimensions may indeed be related to different gray matter (GM) volumes (Goerlich-Dobre, Bruce, Martens, Aleman, & Hooker, 2013). It was shown that cognitive alexithymia, as examined by the TAS-20, might be more associated with larger insula volume, while affective alexithymia seemed to be related to larger cingulate volume. This, together with the suggestions that the affective alexithymia dimension may differentially affect the processing of emotions and seems to be related to separate neural correlates (Bermond, Bierman, Cladder, Moormann, & Vorst, 2010; Goerlich, Aleman, & Martens, 2012; Moormann et al., 2008b; Pouga, Berthoz, de Gelder, & Grzes, 2010), indicates that the lack of controlling for scores on the affective dimension may have confounded previous findings.