



## Emotional reaction in nursing home residents with dementia-associated apathy: A pilot study



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### ABSTRACT

**Introduction:** Conventionally apathy is defined as a symptom primarily characterized by loss of feelings and emotional display and is the most common behavioural symptom in dementia patients. Neuronal network of emotions has ceased to function in patients suffering from dementia associated apathy.

**Objective and methods:** We measured changes in skin conductance and heart rate from  $n=12$  demented nursing home residents with clinical significant apathy (sumscore > 40 in the Apathy Evaluation Scale, AES) to images taken from the International Affective Picture System (IAPS, Lang et al., 2008). Additionally we used autobiographical material to study the responsiveness of the neuronal network of emotions and the adequacy of somatic indicators to demonstrate emotional reactions in individuals diagnosed with dementia and apathy.

**Results:** Analysis of the EDA data revealed a significant difference in the change of skin conductance between the different image categories. The autobiographical material generated the largest change in skin conductance. Analysis of the heart rate did not yield any significant difference between the image categories.

**Conclusions:** Our findings demonstrate that the neuronal network underlying emotion is still responsive in patients diagnosed with dementia associated apathy, although residents don't seem to be involved emotionally from an extraneous visual focus. Non pharmacological therapy approaches should deal with individual, familiar, autobiographic material to ensure a high level of emotional response and therefore reduce apathy severity.

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## 1. Introduction

Apathy is a term used by the Stoic philosophers to refer to the worthwhile condition of being free from emotions and passions. Today the term “apathy” refers to a loss of motivation, interest and concern and with a prevalence rate between 30–82% in dementia subjects. Prevalence rates vary depending on dementia severity, setting and assessment used, nevertheless apathy is considered the most common behavioral symptom in dementia (Boyle et al. 2005; Majic et al., 2010; Savva et al., 2009).

Apathy causes clinically relevant changes in occupational and social interactions (Starkstein and Leentjens, 2008). It places a greater burden on caregivers and might be a major stressor than many active neuropsychiatric behavioral symptoms (Kaufer et al., 1998). As it responds poorly to treatment, increased disability and reduced independence in activities of daily living are frequent

consequences (Brodaty and Burns, 2011). Added to this, is the distress experienced by caregivers on how best to interact with such patients (Kaufer et al., 1998). In spite of its prevalence and clinical significance, apathy is still poorly represented in the psychiatric disease classification systems. In addition there is an absence of evidence and guideline suggestions for dealing or treating apathy adequately. A lack of understanding and assessing apathy may lead caregivers and clinicians to “misinterpret the apathetic behavior, as laziness, deliberate opposition or lack of interest” (Landes et al., 2005, p 342).

Apathy is a multifaceted syndrome with affective, cognitive and behavioural components (Njomboro and Deb, 2014). Disturbance of affective-emotional processing seems to be the first in the series of three stages associated with apathy followed by disturbances of cognitive and auto-activation processing (Clarke et al., 2008; Seidl et al., 2007; Starkstein et al., 2006). As a diagnostic criterion of apathy Robert et al. (2009) suggest a loss of or diminished display of emotion. Similarly, Marin (1991) defines apathy as a lack of motivation, characterized by diminished

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goal-directed motor behavior, goal-directed cognition and emotional response. The loss of emotions that accompanies apathy is characterized by a blunting and flattening of affective responses (Sims, 2003). Other authors object, that the affective dimension of apathy is an interpretation more than an objective observation and therefore define the symptom as a “quantitative reduction of self-generated voluntary and purposeful behavior” (Levy and Dubois, 2006, p 916). Studies on clinical affective correlations of apathy paint a heterogeneous picture (Boyle et al., 2003): The inclusion of the emotional dimension as part of the definition of apathy has recently been called into question (Starkstein and Leentjens, 2008). To date, measurement of emotions has not been regularly correlated with measurements of apathy in dementia patients. In part this is due to the absence of valid operationalization of emotional functioning in this patient group. Another barrier is the difficulty in assessing emotional functioning in this patient group, as in most cases the assessment is confounded by the fact that many dementia patients receive medication, such as neuroleptics to treat agitation. Such medication modulates dopaminergic neurotransmission (Majic et al., 2010): Both generations of medication (first and second generation antipsychotics) tend to block D<sub>2</sub> receptors in the dopamine pathways of the brain. This means that dopamine released in these pathways has less effect. Dopamine regulates several physiological processes in the central and peripheral nervous systems and is associated with executive behavior control and cognition. A dysfunction of these neurocircuits is associated with impairments in motivation that underlie symptoms of apathy (Heinz et al., 1998). Neuroleptic medication impairs dopaminergic stimulation even further (Majic et al., 2010). Beside this, antipsychotics are combined with a fairly large increase in serious other adverse events in dementia.

Guidelines for the management of neuropsychiatric symptoms in dementia in general recommend non-pharmacological interventions as treatment option of first choice. In contrast, there is a lack of concrete suggestions for the treatment of a specific symptom, like apathy due to methodological limitations of the guideline-included studies (Vasse et al., 2012). Nursing home staff and therapists often feel helpless and frustrated when dealing with patients displaying apathy and do not know how to improve their motivation and general well-being: Apathetic patients often show hardly any internal motivation to act and rarely any reaction to external stimuli. So it can be unsatisfactory and discouraged for staff to interact with them. Knowing whether their emotional experience is still intact would give important information about their personal preferences for certain activities. Emotions are also the main indicators of affective disorders and an important source of information about their well-being (Vos et al., 2012). Because of communicative and cognitive limitations, relying on self-reports in this patient group to identify their emotional experience is problematic.

Somatic indicators (e.g. changes in skin conductance, pupil size or heart rate) have proven an effective and reliable source of information about the function of the neuronal mechanism of emotions in healthy subjects, as they are triggered by the autonomic nervous system (Oliveira-Silva and Goncalves, 2011). Such indicators can serve as a means to assess emotional processing in nursing home residents suffering from dementia associated apathy. Heart rate and skin temperature have been reported to indicate the emotional state of individuals with severe and profound intellectual disabilities (Vos et al., 2012). To date there are no studies investigating whether these indicators are applicable and valid in dementia subjects.

We were interested in whether affective reactions can be shown in humans with dementia associated apathy and whether these emotional responses differ between different stimuli. The

pilot study served as a proof-of-concept for a cohort study, aimed at addressing the following questions:

- Are somatic indicators (changes in skin conductance and heart rate) adequate to demonstrate emotional reactions in this patient group?
- Can emotional reactions in this patient group be elicited using standardized pictures from the IAPS (International Affective Picture System; Lang et al., 2008)?

In the work reported here, we examined affective reactions in dementia patients with apathy to pictures from the International Affective Picture System (IAPS; Lang et al., 2008) and contrasted their affective reactions to autobiographic material. An additional aim of the pilot study was to provide care-giving and management staff at the nursing home information on the participant's emotional reactions to different stimuli.

## 2. Materials and methods

### 2.1. Participants

A power analysis performed using GPower (Ver. 3.1; A. Bucher, University of Kiel, Germany), yielded a study population size of 10. Assuming a drop-out of 25% we increased this to 12 participants. The 12 participants (10 females) were recruited from a residential and nursing home in Switzerland. Their average age was 89.75, range 77–97. All were diagnosed with mild to severe dementia and exhibited apathetic behavior, as assessed using the German version of the Apathy Evaluation Scale (AES) (Lueken et al., 2006). Participants had an AES score of 40 and above. We independently assessed cognitive ability using the Mannheim implementation of the Mini-Mental Test (Arbeitsgruppe Psychogeriatric, ZI Mannheim, J 5, D-68159 Mannheim, Germany). The mean MMS was 12.2, range 0–25.

The protocol was approved by the ethics committee of the canton St. Gallen (EKSG 13/066). In addition, consent was obtained from close family members or legal representatives.

### 2.2. Electrodermal activity and heart rate measurement

Electrodermal activity (EDA) was measured by placing an electrode each on the middle (D3) and ring finger (D4) and connecting them to an amplifier (QuickAmp, MES, Gilching, Germany). Heart rate (HR) was measured using an infra-red blood-oxygen saturation sensor (SaO<sub>2</sub>) attached to the index finger (D2). EDA and HR were recorded at a frequency of 125 Hz using commercial software (Vision Recorder Ver 1.2; Brain Products, Munich, Germany) and stored on the hard disk drive of a laptop PC.

### 2.3. Stimulus material

We selected images from the categories “Valence” (ranging from pleasant to unpleasant) and “Arousal” (ranging from calm to excited) of the International Affective Picture System (IAPS; Lang et al., 2008). In each case the chosen pictures had the largest SAM-score (Self-Assessment Manikin, SAM, an affective rating system devised by Bradley and Lang, 2002), a 9-point rating scale for each dimension in their respective category in a norm sample: Three pictures were chosen with a maximum norm score in Valence, three with a neutral score and three with a minimum score and the same for Arousal. The IAPS identification number of each image, as well as its Valence and Arousal score is listed in Table 1.

In addition we included autobiographic material which was obtained from close family members. All material was presented a

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