Personality and Individual Differences 137 (2019) 80–85

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Seeing mixed emotions: Alexithymia, emotion perception bias, and quality in dyadic interactions☆

Konstantinos Kafetsios[a,*], Ursula Hess[b]

[a] University of Crete, Greece
[b] Humboldt University, Berlin, Germany

ARTICLE INFO

Keywords:
Emotion perception
Accuracy
Bias
Alexithymia
Social interaction

ABSTRACT

Alexithymia, the difficulty in identifying and describing emotions, has been found to contribute to problems in dyadic interactions and relationships. We studied the association between alexithymic tendencies, emotion perception biases and the quality of naturally occurring dyadic interactions. Participants completed the Toronto Alexithymia Scale (TAS), the Assessment of Contextualized Emotions, a laboratory task that assesses accuracy and bias (perceiving emotions additional to those communicated) in emotion perception, and the Faces part of the Mayer Salovey and Caruso Emotional intelligence Test followed by a 10-day event sampling study of the quality of their naturally occurring social interactions. The Difficulties in Identifying Feelings (DIF) subscale of the TAS was negatively related to all indices of quality of social interaction. DIF was positively and moderately strongly correlated with bias in emotion perception, and importantly, bias in emotion perception in the ACE-faces task mediated DIF effects on social interaction outcomes. Perceiving emotions additional to those communicated as measured in the ACE task is an important aspect of alexithymic tendencies and their effects on dyadic interactions.

1. Alexithymia, emotion perception bias, and quality in dyadic interactions

Alexithymia is a central personality construct that pertains to impaired abilities in experiencing and processing emotion, and is normally distributed in the population (Franz et al., 2008). The term literary means "absence of words for emotion" and refers to problems to understand and process emotion, to communicate emotions to others, and to comprehend peoples' internal motivations as well as difficulty in identifying own feelings, due to an "external" processing of events and behaviors (Taylor, Bagby, & Parker, 1997). Much of the research on alexithymia has focused on the psychological and physiological consequences of alexithymia. Yet, in recent years interest in the interpersonal consequences of alexithymia has increased (Foran & O'Leary, 2012; Grynberg et al., 2012; Vanheule, Desmet, Meganck, & Bogaerts, 2007). This interest is very much in tune with Sifneos' (1973) original observations that people with alexithymia show patterns of interpersonal interactions that are distant, withdrawn, and aloof. The present study relates emotion processing biases associated with alexithymia to people's experience of real-life interactions.

2. The interpersonal consequences of Alexithymia

Vanheule et al. (2007) found alexithymia to be associated with a number of interpersonal problems in a general (student) and a clinical-outpatients sample. In particular, alexithymia was associated with being cold or distant in interpersonal relationships and feeling socially inhibited in social interactions. Alexithymia was also found to contribute to lower social support (Humphreys, Wood, & Parker, 2009) and lower affection for others (Hesse & Floyd, 2011a). Alexithymia was associated with lower relationship satisfaction (Humphreys et al., 2009) in dating students, and this association was not mediated by negative affect, a finding that points to the cognitive consequences of alexithymia. In short, alexithymia has been consistently shown to contribute to problems in social and personal relationships.

Yet, much of this research is based on cross-sectional self-report studies which aggregate over experiences and do not allow to identify the exact processes responsible for the suggested linkage. Two studies

☆ The research was supported by a Basic Research Grant [KA 2756] to Prof. Kafetsios and Prof. Hess by the University of Crete and grant 50774769 from the PPP Program of the IKY-DAAD program to Kafetsios and Hess. A previous version of this paper was presented at the 2018 Consortium for Research on Emotion Conference, University of Glasgow, under the title: *Alexithymia, emotion perception bias, and quality in dyadic interactions: An event sampling study.*

* Corresponding author at: Psychology Department, University of Crete, Gallos Campus, Rethymno 74100, Greece.
E-mail address: k.kafetsios@psy.soc.uoc.gr (K. Kafetsios).

https://doi.org/10.1016/j.paid.2018.08.014
Received 25 May 2018; Received in revised form 11 August 2018; Accepted 22 August 2018
0191-8869/

have examined the interpersonal effects of alexithymia in real-time interactions. People who interacted with a member of the opposite sex higher in alexithymia reported being less attracted to them physically, socially, and in terms of the task at hand (Hesse & Floyd, 2011b). People with alexithymia were perceived as behaving in a less positive, intimate, or socially desirable manner, suggesting that alexithymia is associated with limitations in communication, which, in turn, can lead to relational difficulties. A daily diary study of dating couples found, especially men's, alexithymia to predict their partners' lower social support and intimacy, factors which further predicted partners' depressive symptoms (Foran & O'Leary, 2012). The authors theorized that persons with alexithymia do not use emotional information effectively, especially when stressed. Indeed, there is strong evidence that alexithymia is associated with lower empathy (Grynberg, Luminet, Corneille, Grèzes, & Berthoz, 2010; Moriguchi et al., 2007).

Taken together, the evidence suggests that alexithymia is associated with less emotional attunement in social interactions. The present study extends this work by examining how deficits in the accurate decoding of facial emotion expressions associated with alexithymia may account for deficits in real life social interactions. The accurate perception of facial emotion expressions in human interactions is very important for the regulation of emotion and the quality of social and personal relationships (Fischer & Manstead, 2008).

3. Alexithymia and emotion perception

Both in the general and in clinical populations individuals with high levels of alexithymia are less able to recognize emotional states (Parker, Taylor, & Bagby, 1993; Prkachin, Casey, & Prkachin, 2009). Yet, there are also studies that have found no significant differences in decoding accuracy for posed emotions as a function of alexithymia (McDonald & Prkachin, 1990). A recent review (Grynberg et al., 2012) concludes that there is “a consistent relationship between alexithymia and the abilities to decode others' emotions”(p. 14) and that alexithymia impairments are global, that is, they do not pertain to specific facial expressions of positive or negative emotions. However, the exact nature of why and how alexithymia is associated with inaccuracy in the perception of facial emotion expressions is unknown.

Grynberg et al. (2012) conclude that people higher in alexythimia (HA) “may not be impaired in detecting, matching, or even labeling EFEs [Expressions of Facial Emotions] *per se.* Instead, HA may have deficits in processing the perceptual properties of EFEs” (p. 14). There is evidence that individuals high in alexithymia have weaker perceptual representations of facial emotion expressions (Reker et al., 2010). In the same vein, Nook, Lindquist, and Zaki (2015) found that HA had problems to accurately detect emotion expressions based on facial visual stimuli but not when emotion labels were provided. In a clinical study individuals with severe alexithymia - although able to distinguish different facial expressions - were unable to consistently label the emotions depicted (Cook, Brewer, Shah, & Bird, 2013). Taken together, there is emerging evidence suggesting that conceptual processes of mislabeling emotion may be responsible for emotion perception biases found in alexithymia.

Therefore, classic methods of emotion perception detection may not be best suited to tap higher alexithymia deficiencies in emotion perception. This is because of the nature of the task and the type of information provided: posed expressions taken out of context to which one label from a given list has to be affixed. Accuracy in this task is defined as the ability to associate the “correct” label to the single emotion expression shown without social context (e.g., Ekman & Friesen, 1976;). However, the social context of emotion perception is important for the correct attribution of emotion labels and for emotion perception accuracy (Hess & Hareli, 2015). Observers tend to see *multiple emotions* even when judging emotional expressions considered to be “pure” (Yrizarry, Matsumoto, & Wilson-Cohn, 1998). This is especially the case in naturally occurring social interactions where people are likely to show subtle expressions that are open to different interpretations (Motley & Camden, 1988). Further, the presence of other persons during emotion perception, which is typical for everyday interactions, can also influence the emotion perception process (Masuda et al., 2008).

The present research tested the association between alexithymia and emotion perception using a novel test of contextualized emotion perception. The ACE (Assessment of Contextualized Emotions-faces), assesses both **accuracy** (perceiving the emotions communicated) and **bias** (perceiving emotions additional to those communicated), which constitute two distinct facets of emotion decoding with unique effects for dyadic interaction outcomes (Hess, Kafetsios, Mauersberger, Blaison, & Kessler, 2016). Research from our own labs has pointed to *social-contextual factors that can influence the accurate perception of emotion expressions*. For example, cultural emotion norms and the priming of relational or interdependent self-orientations impact attenting to the social context of emotion expression and the accurate perception of emotion expressions (Hess, Blaison, & Kafetsios, 2016; Kafetsios & Hess, 2013, 2015). Interestingly, Konrath, Grynberg, Corneille, Hammig, and Luminet (2011) found higher interdependence to be associated with higher alexithymia, suggesting that the two constructs may share similar biases in contextualized emotion perception.

The present research assessed relationships between alexithymic tendencies in identifying emotions, bias and accuracy in the ACE-faces task, and the quality of naturally occurring dyadic interactions. The ACE allowed us to assess different perceptual processes involved in the decoding accuracy of facial emotion expressions, and their consequences for the seamless functioning of interpersonal interactions. Following Nook et al. (2015) we maintain that conceptual processing is significantly involved in persons' with alexithymia impairment in emotion perception. Based on Nook et al. (2015) and Konrath et al. (2011), we expected that higher alexithymia will be associated with more bias when the opportunity to mislabel emotion is greater. The study reported here was part of a larger project focusing on the impact of emotion communication ability on everyday interactions (Hess, Kafetsios, et al., 2016). The individual differences analyses reported here have not been reported elsewhere.

4. Method

4.1. Participants

One hundred and eight participants (26 men) from a large state university in Germany completed all parts of the study. A further 52 persons participated in the laboratory study, but did not return their diaries or had to be excluded due to equipment malfunction. Participants received a small gift (wellness products, chocolates, etc.) in recognition. Participant age ranged from 18 to 40 years (M = 25.87, SD = 5.04).

4.2. Measures

Participants completed a number of individual differences scales (described in Hess, Kafetsios, et al., 2016, Study 3). Analyses for the present study revolve around the following:

The **Toronto alexithymia scale** (Taylor, Ryan, & Bagby, 1985) is a widely used measure that taps three dimensions: Difficulty Identifying Feelings (DIF), Difficulty Describing Feelings (DDF), Externally-Oriented Thinking (EOT). The German translation of the 26-item scale was used (Kupfer, Brosig, & Brähler, 2001).

The **Faces section of the** Mayer, Salovey, Caruso Emotional Intelligence Test (Mayer, Salovey, Caruso, & Sitarenios, 2003) where participants report on the emotional content of each subtly emotional face by rating the degree of happiness, fear, surprise, disgust, and excitement on a 5-point scale (1 = no emotion and 5 = extreme amount

Table 1
Correlations between TAS dimensions and ACE accuracy and bias.

	1	2	3	4	5	6
1. Difficulty in Identifying Feelings (DIF)	0.83					
2. Difficulty in Describing Feelings (DDF)	0.55***	0.77				
3. Externally Oriented Thinking (EOT)	−0.02	0.15	0.54			
4. TAS Total	0.83***	0.84***	0.38***	0.83		
5. ACE Accuracy	0.04	−0.06	−0.13	−0.05	0.88	
6. ACE Bias	0.34**	0.26**	−0.05	0.30**	0.43***	0.97
M (SD)	2.16 (0.73)	2.71 (0.84)	2.36 (0.48)	2.37 (0.49)	5.11 (0.66)	2.30 (0.48)

Alphas in the diagonal.
** $p < .01$.
*** $p < .001$.

of emotion). Ratings were consensus scored using an available large culture-specific German database (α = 0.84).

4.3. Emotion perception task

The ACE-faces consists of a series of photos showing four emotional expressions (happy, sad, angry, disgust) either by a single person or by a central person surrounded by two others who show either congruent or neutral expressions. For this, groups of three same sex individuals who identified themselves as close friends were invited to a recording studio and sat in an open semi-circle. The central person in this group was instructed to remember a time when they as a group had felt *happiness, sadness, disgust, and anger* and to then recount the events as vividly as possible to the other two. The incongruent neutral expressions were obtained by cutting and pasting the central person from the emotional condition into a frame from the neutral condition. The expressions were validated in a pilot study with 26 participants (12 men, see Hess, Blaison, & Kafetsios, 2016; Hess, Kafetsios, et al., 2016 for additional information, including examples of the stimuli). A Latin square design was used to create 12 parallel orders of 48 stimuli including 6 congruent, non-congruent, and individual male and female stimuli for each emotion.

4.3.1. Emotion rating task

Participants rated the central character's emotion expressions on each of the following 7-point scales anchored with not at all and very much: calm, fear, anger, surprise, disgust, sad, happy, and other. Accuracy was defined as the rating on the scale corresponding to the focal emotion shown by the central character (i.e., anger, happiness, sadness, disgust). The mean of the ratings on all other emotion scales (representing emotions not shown by the central character) represented the level of perceived bias. Thus, 12 accuracy and bias measures respectively were computed, three for each emotion and collapsed into global accuracy and bias scores, respectively.

4.4. Social Interaction (event sampling diary) task

Participants were instructed to use a Social Interaction Record (see Nezlek, Kafetsios, & Smith, 2008) to describe for 10 days every meaningful social interaction they had that lasted 10 min or longer. In total, participants described 2695 interactions with acquaintances (23.5%), friends (16.7%), good friends (16.8%), best friends (7.6%), partners (19.3%) as well as family members (16%; $M = 1.47$, $SD = 0.72$ per day). We excluded interactions in which participants reported being in a group larger than three, basing our analyses on 2256 interactions.

For each social interaction, participants first reported the length of the interaction, the sex of the other person, and their relationship status with the interaction partner. They then described their own emotions and their perceptions of the emotions of their interactants using 7-point scales (1 = *not at all*, 7 = *very much*). Specifically, they reported their own positive affect (PA, «I felt positive (happy, cheerful, in a good mood)»), negative affect (NA, «I felt negative (sad, not well, in a bad mood)»), whether they felt accepted («During the interaction I felt accepted»), understood («During the interaction I felt understood»), whether they felt supported («During the interaction I felt supported»), and whether they were satisfied with the interaction («I was overall satisfied with the interaction»). They also described their perceptions of whether their interaction partner expressed emotion («How expressive was my interaction partner»), the degree to which the partner showed positive («Did s/he show positive emotions?») and negative emotions («Did s/she show negative emotions?») and meant well (« Did s/he mean well?»).

5. Results

Correlations between ACE Accuracy and Bias and Alexithymia dimensions as well as basic psychometric properties of those variables are presented in Table 1. Emotion perception bias was associated with Difficulty Identifying Feelings (DIF; $r(108) = 0.34$, $p < .01$) and Difficulty in Describing Feelings (DDF; $r(108) = 0.26$, $p < .01$) and Total Alexithymia scores ($r(108) = 0.30$, $p < .01$). DIF and DDF were negatively associated with accuracy as measured with the MSCEIT-faces ($r(108) = -0.49$, $p < .001$ and $r(108) = -0.26$, $p < .01$). Given the covariation between the two ACE accuracy indices, we regressed the TAS dimensions on ACE accuracy and bias. Results, presented in Table 2 clearly depict ACE bias as moderately strongly associated with DIF, DDF and total TAS scores.

The data conform to a nested data structure where social interactions are analyzed as nested within people. Hypotheses about alexithymia effects in social encounters were examined using Multilevel Random Coefficient Models (Bryk & Raudenbush, 1992) with the software HLM 6.1. Predictor variables were standardized prior to analyses. Quality indices in social interactions were examined as the outcome variable and modelled as a function of an intercept and a random error term at level 1:

$$y_{ij} = \beta_{0j} + r_i$$

The intercept was then modelled as varying randomly across

Table 2
Regressing between ACE accuracy and bias with TAS dimensions and the MSCEIT Faces.

	TAS-DIF	TAS-DDF	TAS-EOT	TAS-TOT	MSCEIT
ACE Accuracy	−0.13 (−1.28)	−0.21* (−2.08)	−0.14 (−1.29)	−0.22* (−2.18)	0.17 (1.86)
ACE Bias	0.39*** (3.87)	0.36** (3.48)	0.02 (0.14)	0.40*** (3.96)	−0.57*** (−6.11)
F (2,107)	7.57**	6.25**	0.95	7.98***	21.42***
R^2	0.13	0.11	0.02	0.13	0.25

* $p < .05$.
** $p < .01$.
*** $p < .001$.

individuals at level 2.

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

To answer the main research question we calculated two-level random coefficient models where social interaction constituted the Level 1 units and individual differences in Alexithymia the Level 2 units. Results from unconditional (null) models (see Hess, Blaison, & Kafetsios, 2016; Hess, Kafetsios, et al., 2016, study 3), that is, models without any Level 1 or Level 2 predictors, suggested there was adequate variability at both levels.

To assess the influence of alexithymia on the quality of social interactions and also test the likely mediating effect of ACE bias or accuracy, we then fitted a model that included as predictors at level 2 the DIF (step 1) and additionally (at step 2) ACE accuracy and bias.

Level 1:

$$y_{ij} = \beta_{0j} + r_{ij}$$

Level 2:

$$\beta_{01} = \gamma_{00} + \gamma_{01}(TAS - DIF) + \gamma_{02}(Accuracy) + \gamma_{03}(Bias) + \gamma_{0j}$$

As is depicted in Table 3, step 1, DIF was a consistent predictor of negative social interaction outcomes. In a second step, ACE bias and ACE accuracy were also significantly related to social interaction outcome in expected ways. In almost all cases, MSCEIT-faces did not significantly predict social interaction outcomes over and above ACE accuracy and bias. Notably, ACE bias mediated DIF relationships with social interaction level outcomes. We also performed analyses with DDF and TAS-total (see Supplementary files S1 & S2) and although the two were associated with lower social interaction quality indicators, there was little evidence of ACE accuracy or bias mediating this relationship. Further, relational intimacy was not associated with alexithymia and did not moderate alexithymia relationships with social interaction outcomes.

ACE bias significantly reduced the effect of DI on all social interaction outcomes. We formally tested for level-2 mediation of level-1 outcomes following Krull and MacKinnon (2001). We tested a mediational model where DIF (Level 2) and ACE bias (Level 2) predicted social interaction outcomes (Level 1), by: (a) calculating the unstandardized regression coefficient (B_a) and standard error (se_a) for the effect of DIF on ACE bias using standard multiple regression (controlling for ACE accuracy), and then (b) calculating the unstandardized gamma coefficient (γ_b) and standard error (se_b) for the effect of DIF on social interaction outcomes (continuing to control for all other Level 2 constructs) using multilevel analysis. The significance of the indirect effect was then assessed using Sobel's z, which was calculated using the first-order Taylor series expansion.[1] These analyses indicated that ACE bias mediated DIF effects on satisfaction with the interaction (Sobel's $z = -2.16$, $SE = 0.06$, $p < .05$), understanding (Sobel's $z = -2.09$, $SE = 0.06$, $p < .05$), openly express emotions (Sobel's $z = -2.16$, $SE = 0.06$, $p < .05$), negative affect (Sobel's $z = -2.22$, SE = 0.05, $p < .05$), feeling accepted (Sobel's $z = -2.21$, $SE = 0.06$, $p < .05$), feeling supported (Sobel's $z = -1.98$, $SE = 0.05$, $p < .05$), perception of other meaning well (Sobel's $z = -1.85$, $SE = 0.05$, $p = .06$), and partially mediated feeling positive (Sobel's $z = -1.79$, $SE = 0.04$, $p = .07$), and negative affect (Sobel's $z = 2.27$, $SE = 0.05$, $p < .05$).

6. Discussion

The present research had two main findings. First, using event sampling methodology we found that the lack of attunement in dyadic social interactions observed in people with alexithymia (e.g., Foran &

Table 3
Relationships between difficulty in identifying feelings, laboratory measured ACE accuracy & bias, and social interaction level outcomes.

	PA	PA	NA	NA	SATISF	SATISF	UNDERST	UNDERST	OPEN	OPEN	ACCEPT	ACCEPT	SUPPORT	SUPPORT	OPWELL	OPWELL
	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2
INTRCPT	4.86 (0.07)	4.86 (0.07)	2.45 (0.08)	2.49 (0.08)	5.31 (0.08)	5.30 (0.08)	5.28 (0.07)	5.28 (0.07)	5.10 (0.08)	5.10 (0.08)	5.61 (0.08)	5.61 (0.08)	5.28 (0.09)	5.28 (0.09)	5.73 (0.08)	5.73 (0.08)
TAS-DIF	−0.28** (0.10)	−0.21* (0.110)	0.50*** (0.10)	0.39** (0.11)	−0.35* (0.10)	−0.20 (0.13)	−0.33* (0.11)	−0.16 (0.14)	−0.37** (0.13)	−0.33 (0.13)*	−0.38** (0.12)	−0.22 (0.14)	−0.26** (0.11)	−0.16 (0.11)	−0.28* (0.11)	−0.19 (0.11)
ACE Accuracy		0.22^ (0.13)		−0.28* (0.13)		0.23 (0.15)		0.37* (0.15)		0.42** (0.12)		0.38** (0.13)		0.31** (0.13)		0.33** (0.13)
ACE Bias		−0.36* (0.18)		0.52** (0.18)		−0.56** (0.21)		−0.56* (0.22)		−0.56** (0.20)		−0.61** (0.22)		−0.47* (0.20)		−0.45* (0.21)

Note: Coefficients are unstandardized and represent the mean regression slope in multilevel analyses. In parentheses the corresponding standard error. * $p < .05$ ** $p < .01$ *** $p < .001$. PA = Positive Affect, NA = Negative Affect, SATISF = Satisfaction with the interaction, UNDERST = Felt Understood, OPEN = Other expressed emotion, ACCEPT = Felt accepted, SUPPORT = Perceived supported, OPWELL = Other meant well.

[1] Sobel's $z = Ba \times \gamma b / sab$, where $sab = \sqrt{(\gamma b2 \times sea2 + Ba2 \times seb2)}$

O'Leary, 2012; Vanheule et al., 2007) generalized across a variety of dyadic interactions, ranging from interactions with acquaintances to interactions with friends and relatives. This methodology provides an important complement to existing research based on either laboratory manipulations or retrospective self-reports.

Second, the present research provides insight into the perceptual processes that underlie the interpersonal consequences of alexithymic tendencies. Specifically, the present study identified biases in the perception of facial emotion expressions as a key mediating process between alexithymic tendencies and lower social interaction quality outcomes.

Existing research has identified or speculated on a number of distal causes for the relational limitations, such as lack of intimacy (Hesse & Floyd, 2011b) or being cold or distant and non-assertive (Vanheule et al., 2007). Yet, research had difficulty establishing a direct link between impairments in the ability to understand and process emotions prevalent in alexithymia and limitations in interpersonal functioning. The present study points clearly to limitations in the perception of facial emotion expressions, and particularly the erroneous attribution of additional emotions to the ones that are expressed (ACE bias), as a viable process that explains limitations in interpersonal functioning associated with higher alexithymic tendencies, especially DIF. DIF and DDF were both associated with higher bias in emotion perception of facial emotion expressions, yet ACE bias mediated only DIF relationships with social interaction quality outcomes.

This is not just another study on the connection between alexithymia and emotion perception (in)accuracy. Evidence that the tendency to mislabel emotion and perceive additional emotions to those expressed, and not merely lower accuracy, is responsible for lower quality in social interaction for persons with higher DIF adds vital pieces in the alexithymia and emotion perception literature puzzle. For one, it explains ambiguous findings on the relationship between alexithymia and limits in emotion perception (Grynberg et al., 2012). Existing emotion perception tests rarely distinguish between the correct identification of emotions that are expressed versus 'reading' emotions that are not communicated. The ACE-faces is one of the first assessments of emotion perception to test emotion perception within a social context that considers accuracy and bias as distinct processes with unique effects for interaction outcomes (Hess, Blaison, & Kafetsios, 2016; Hess, Kafetsios, et al., 2016). Moreover, and importantly, our results point to persons with higher alexithymia limitations with correctly labeling emotion and the context of emotion perception. This is in line with experimental evidence that conceptual processing is significantly involved in alexithymics' impairment in emotion perception (Nook et al., 2015). More broadly, the study supports expectations on the regulatory functions of emotion perception for interpersonal interaction and communication.

These findings have clinical implications. Alexithymia is involved in other psychological disorders such as autism and depression, and recognition abilities have a significant role there (e.g., Cook et al., 2013). Therefore, helping persons with higher alexithymia attribute the correct emotions to facial emotion stimuli can be one potent way to reduce communication boundaries associated with higher alexithymia and the comorbid disorders. The results from the present study suggest that such training should critically take account of the social context within which this mislabelling takes place.

The present study conceptualized alexithymia, predominantly, as a trait. Yet, the extent to which alexithymia involves trait and/or state components has been contested (Honkalampi et al., 2001) and future research could determine the extent to which state affect associated with HA may play a role in perceiving emotions as mixed and in the quality of HA's social interactions (e.g., Marchesi, Ossola, Tonna, & De Panfilis, 2014).

7. Conclusion

Sifneos' (1973) original observations regarding people with alexithymia was that they show patterns of distant, withdrawn, and aloof interpersonal interactions. The present study demonstrates that limitations in emotion categorization of facial emotion expressions impact on the co-ordination of interpersonal interaction, communication in general, and can impede in the properly functioning of dyadic interactions for persons higher in alexithymia.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2018.08.014.

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