Association between parental alexithymic traits and self-reported postnatal reflective functioning in a birth cohort population. Findings from the FinnBrain Birth Cohort Study.

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ABSTRACT

Parental reflective functioning (PRF) refers to a parent's effort to see his/her child as a separate individual person from early on, and to be curious of the child's own thoughts and feelings. Parenting abilities are affected by the parent's emotion regulation and emotional availability. Alexithymia as a personality construct with emotional deficits and poor imagination could potentially affect also PRF, but studies on parental alexithymia are still scarce. The aim of the present study was to examine the association between parental alexithymic traits and PRF, which to date has not been explored. As most of the parenting research concern only mothers, an additional aim was to study also fathers. The 20-item Toronto Alexithymia Scale (TAS-20) and the 14-item Parental Reflective Functioning Questionnaire (PRFQ-Fi) were filled by 1882 mothers and 994 fathers at six months postpartum as part of the FinnBrain Birth Cohort Study. A significant negative association between TAS-20 total score and PRFQ-Fi total score among both genders was found. The main alexithymia dimension responsible for this association was Externally Oriented Thinking. The results suggest that alexithymic traits indeed are related to parental reflective functioning, but more studies are needed to explore the direction of this relation.

Key words: alexithymia, parental reflective functioning, mentalization

1 Introduction

Mentalization, or it's operationalization, "reflective functioning", describes an individual's ability to imagine the mental states underlying behavior, such as experiences, feelings, wishes and intentions, in self and in others. Reflective functioning enables more accurate interpretations of behavior, better communicative skills, emotion regulation and negotiation in conflicting situations (Fonagy, Bateman and Luyten, 2012). Parental reflective functioning refers to a parent's effort to see his/her child as a separate individual person from early on, and to be curious of the child's separate own thoughts and feelings. It enables the parent to better consider alternative mental states possibly affecting the child's reactions and behavior. (Fonagy and Target, 1997, 2006; Fonagy et al., 2012; Sharp and Fonagy, 2008).

Parental reflective functioning is reported to positively associate with parental attachment pattern (Luyten, Mayes, Njissens and Fonagy, 2017), parental sensitivity in interaction (Berthelot et al., 2015; Ensink, Rousseau and Biberdzic, 2017; Katznelson, 2014), emotional availability (Luyten et al., 2017) and caregiving quality (Camoirano, 2017; Ensink, Normandin, Plamondon, Berthelot and Fonagy, 2016; Suchman et al., 2017). Higher parental reflective functioning has been linked with secure child attachment (Berthelot et al., 2015; Camoirano, 2017; Fonagy et al., 2016; Luyten et al., 2017) and child's better own reflective functioning capacity (Camoirano, 2017).

Parental reflective functioning is also positively associated with both parent and child emotion regulation (Camoirano, 2017; Ensink, Begin, Normandin and Fonagy, 2016; Heron-Delaney et al., 2016; Schultheis, Mayes and Rutherford, 2019), an important factor in the development of the maternal attachment style and caregiving responses (Jones, Brett, Erlich, Lejuez and Cassidy, 2014). Gratz and Roemer (2004) summarize that emotion regulation can be conceptualized as involving awareness, understanding and acceptance of emotions, ability to behave according to desired goals and to use situationally appropriate regulation strategies, especially when experiencing negative emotions. Emotion regulation abilities have also been associated with alexithymia (Luminet, Vermeulen, Demaret, Taylor and Bagby, 2006; Swart, Kortekaas and Aleman, 2009; Vermeulen, Luminet and Corneille, 2006), a personality construct with distinct emotional deficits of difficulty identifying and describing one's own feelings and externally oriented thinking with scarce imagination (Sifneos, 1973; Taylor, 1984). Alexithymia has been associated especially with problems in the cognitive processes of emotion

regulation such as weaker memory for emotional words and verbalizing emotions (Luminet et al., 2006), and general executive functioning (Correro, Paitel, Byers and Nielson, 2019). da Silva, Vasco and Watson (2017) suggested that mediating factors for the association between alexithymia and poorer emotion regulation would be lack of emotional awareness, emotion differentiation and recognition. Indeed, alexithymia has been associated with more suppression and less appraisal in emotion regulation, events that involve conscious processing and thus, awareness of emotions (Swart et al., 2009).

By definition, alexithymia and reflective functioning are most probably somehow linked phenomena. One possible link between them is related to the presented cognitive processes of emotion regulation and imagination. Reflective functioning is the capacity to imagine mental states and experiences underlying behaviour, and to reflect upon them using active working memory processes (Fonagy et al., 2012). Alexithymia, as said, is, in part, a poverty of imagination (Sifneos, 1973). Another link considers the ability to recognize, consider and reflect upon mental states both within self and in others. Recognition of emotions, feelings, experience and intentions is necessary for the mentalising process even to start and this ability is altered in alexithymic individuals (Sifneos, 1973; Taylor, 1984). However, only when the consideration of mental states is linked with what is observed in overt behaviour and reactions, it becomes true mentalising. Mentalising of another person's mind is even more challenging with children, i.e. in the parenting context, and the younger the child, the more challenging it is. In order to better understand the mechanisms underlying parental reflective functioning, this study aims to fill the gap in this field of research by exploring the connection between alexithymia and parental reflective functioning.

Alexithymia with a prevalence of around 10 % in the general population is relatively common trait and it is more common in men than women (Franz, Popp, Schaefer, Sitte, Schneider, Hardt, Decker and Braehler, 2007; Mattila, 2009). The development of alexithymia is known to associate with own childhood experiences of inadequate parenting and adversities (Evren, Evren, Dalbudak, Ozcelik and Oncu, 2009; Honkalampi et al., 2004) as well as childhood neglect (Aust, Härtwig, Heuser and Bajbouj, 2013). Social circumstances have been associated with both alexithymia and parental reflective functioning as low educational level has been reported to relate with greater alexithymic traits (e.g. Kokkonen et al., 2001), and higher educational level with higher parental reflective functioning (Rosenblum, McDonough, Sameroff and Muzik, 2008). In addition, mothers receiving social aid have been reported to exhibit weaker parental reflective functioning (Pajulo et al., 2018).

Considering mental health, alexithymia has repeatedly been shown to associate with anxiety (Kajanoja, Scheinin, Karlsson, Karlsson and Karukivi, 2017; Marchesi, Fonto, Balista, Cimmino and Maggini, 2005) and depression (Honkalampi, Hintikka, Tanskanen, Lehtonen and Viinamäki, 2000; Kajanoja et al., 2017). The relationship between parental reflective functioning and depression seems more complex. Cordes et al. (2017) found no association between parental reflective functioning and postpartum depression, whereas Rosenblum et al. (2008) reported that controlling for educational level diminished the already found association to a nonsignificant level. Krink, Muehlhan, Luyten, Romer and Ramsauer (2018) reported that postpartum depression would associate especially with the pre-mentalizing states.

Despite the numerous alexithymia studies in the past few decades, studies on parental alexithymia are still scarce. It has been reported that maternal alexithymia associates with offspring's insecure attachment style (Tarantino et al., 2018) and an impaired mother-infant relationship (Yürümez, Akça, Uğur, Uslu and Kılıç (2014), but these findings are considered preliminary due to correlational and cross-sectional study designs, and thus, more research is needed.

In this study we aimed to explore the association between parental alexithymia and parental reflective functioning in an early postnatal phase within a representative sample of the normal population. To our knowledge, this is the first study to explore this association. In addition, as the majority of studies regarding parental reflective functioning have studied only mothers (Cooke, Priddis, Luyten, Kendall and Cavanagh, 2017), we studied also fathers. We hypothesized that greater alexithymic traits would associate with weaker parental reflective functioning. We also expected that the alexithymia dimensions of Difficulty Identifying Feelings, Difficulty Describing Feelings and Externally Oriented Thinking would associate with parental reflective functioning differently in comparison to each other.

2 Methods

2.1 Participants

This study is a part of the FinnBrain Birth Cohort Study (www.finnbrain.fi) that is a cross-disciplinary study investigating the effects of genetic and environmental factors on child development and health. Initial recruitment of the study population (n=3808) was done at the first trimester ultrasound visits in gestational week (gwk) 12 at maternal welfare clinics in the

Turku region of South-Western Finland and Åland Islands from December 2011 till March 2015. (Karlsson et al., 2018.) The Ethics Committee of the Hospital District of Southwest Finland has approved the study protocol (14.6.2011 ETMK: 57/180/2011 § 168).

The subjects who had returned all questionnaire data relevant for this study at the child age of 6 months comprised the population for this study (n=2886; n=1882 mothers and n=994 fathers). The descriptives of the study population are presented in Table 1. Participants were to some extent from the same families, but mothers and fathers were studied separately, not as dyadic pairs. The mean ages of mothers and fathers were 30.2 and 31.9 years, respectively. The largest proportion of both mothers (37.9%) and fathers (48.9%) had low educational level, 29.1% and 26,4% middle level, and 33.0% of mothers and 24.7% of fathers had high educational level. Up to 51.5% (n= 1581) of the mothers were primiparous whereas 48.5% (n= 1489) were multiparous.

2.2 Procedure

The background information including parental age, educational level and parity were collected by self-report questionnaires in the initial recruitment to the FinnBrain Birth Cohort Study on gwk 12. Data on gestational weeks at the time of birth was drawn from hospital records and complemented with data from the Finnish Medical Birth Register administered by the National Institute of Health and Welfare (www.thl.fi). Questionnaires including parental depressive and anxiety symptoms as well as alexithymic traits and postnatal reflective functioning were all gathered at 6 months postpartum. All questionnaires were gathered separately from mothers and fathers.

2.3 Measures

2.3.1 Background information

Questionnaires included a variety of general background factors of which the following were included in this study. Maternal and paternal age at childbirth (years) and gestational weeks at the time of childbirth were collected. Maternal parity (1= primiparous and 2= multiparous) was included, but information on the number of children was not attainable for fathers. Educational level (1= Low: high school, vocational degree or lower education; 2= Middle: college degree or applied science degree; 3= High: university education) was included as a common measure

for expressing socioeconomic status. Additionally, psychiatric symptoms of depression and anxiety (see below) were included as potential confounding factors.

2.3.2 Depressive symptoms

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item self-report scale that was used for measuring postnatal parental depressive symptoms (Cox, Holden, and Sagovsky, 1987). Questions are rated on a scale of 0-3 giving a range of total score from 0 to 30 points. The EPDS is widely used and a sensitive measure for postnatal depressive symptoms both among mothers (Cox et al., 1987), and fathers (Matthey, Barnett, Kavanagh and Howie, 2001).

2.3.3 Anxiety symptoms

Anxiety was measured by using the anxiety-subscale of The Symptom Checklist 90 (SCL-90) that is a self-report questionnaire for measuring a wide variety of symptoms. (Derogatis, Lipman and Covi, 1973). Regarding the anxiety subscale, the respondent is asked to report symptoms experienced within the last month. A 5-point scale measures distress from 0 (not at all) to 4 (extremely) and the total score ranges from 0 to 40 points. (Derogatis et al., 1973; Holi, Sammallahti and Aalberg, 1998.)

2.3.4 Alexithymia

Measuring alexithymia in adult populations is most commonly done by the 20-item Toronto Alexithymia Scale (TAS-20), that is a self-report scale consisting of 20 items, which are further divided into the following three subscales: Difficulty Identifying Feelings (DIF), Difficulty Describing Feelings (DDF) and Externally Oriented Thinking (EOT) (Bagby, Parker and Taylor, 1994a; Bagby, Taylor and Parker, 1994b). Items are rated on a 5-point Likert scale of 1 (strongly disagree) to 5 (strongly agree) with a total score ranging from 20 to 100.

2.3.5 Parental reflective functioning

The original 39-item Parental Reflective Functioning Questionnaire (PRFQ) is a self-report questionnaire that was designed to assess parental reflective functioning in parents up to the child's age of five (Luyten et al., 2009 unpublished manuscript; Luyten et al., 2017). The original measure was adjusted to be feasible for the very early parenting phase (see Pajulo et

al., 2018), factor analysed and tested in the large FinnBrain Birth Cohort in order to generate a short form of the measure. As a result, the 14-item PRFQ-Fi was gained for use in the very early postnatal parenting phase (Pajulo et al., 2018) and was also used in the current study. The items are rated on a Likert-scale from 1 (strongly disagree) to 7 (strongly agree) with the total score ranging from 14 to 98. Items were recoded according to the original recoding key, with three types of items: "High-Low" scaling (7 indicating optimal PRF and 1 indicating low PRF), "Low-High" scaling (1 indicating optimal PRF and 7 low PRF) and "Middle" scaling (4 indicating optimal PRF, 1 and 7 indicating low PRF, i.e. scoring 1, 3, 5, 7, 5, 3, 1). Different item types were originally designed in order to diminish the error in responses due to "knowing" the optimal answer from how the items are phrased and scaled (Luyten et al., 2009).

The 14 items of the final version are divided into four factors: Factor 1 (F1) "Interest and curiosity in child's individual mental states", Factor 2 (F2) "Understanding the opaque nature of mental states", Factor 3 (F3) "Appropriateness of reasoning about mental states underlying child's reactions", and Factor 4 (F4) "Acknowledging the uncertainty in interpreting child's mental states". Higher factor and total scale scores indicate higher mentalization. The theoretical sum index score range for the total scale as well as the factors is 1–7. In the final 14-item questionnaire format, referred to hereafter as the PRFQ-Fi, the items are presented in random order (Pajulo et. al., 2018).

2.4 Statistical methods

All statistical analyses were conducted by using the IBM SPSS version 24.0. The means of TAS-20 total scores were compared to the reported general population prevalences by single sample t-test both for mothers and fathers. Independent samples t-test was performed to compare mothers and fathers regarding TAS-20 total score (t(2875) = -8.912, p<0.000) and PRFQ-Fi total score (t(1918) = 6.712, p<0.000). Effect sizes were evaluated with Cohen's d, which for TAS-20 (d=0.332) and for PRFQ-Fi (d=0.307) suggested small practical significance.

Further analyses were performed separately for mothers and fathers. At first, the descriptive characteristics of variables were explored, and Shapiro-Wilk test and visual evaluation were used to detect normally distributed variables (PRFQ-Fi total score, TAS-20 total score, EOT and PRFQ-Fi factors F2 and F4) and non-normally distributed variables (positively skewed DIF and DDF and negatively skewed PRFQ-Fi factors F1 and F3). Correlation analyses by Spearman`s correlation were run between TAS-20 total score, alexithymia dimensions (DIF, DDF and EOT), parental reflective functioning and its factors F1-F4, as well as continuous

background variables. Two statistical significance levels (p<0.05 and p<0.001) were considered. The reliability and internal consistencies were evaluated by calculating Cronbach's alphas for TAS-20 total score and its subscales DIF, DDF and EOT, as well as for PRFQ-Fi total score and its factors F1-F4.

Lastly, multiple linear regression analyses were performed to evaluate the associations between independent and dependent variables more closely. Assumption testing was performed and no multicollinearity detected by the variance inflation factor (VIF). Scatterplots showed a linear relationship between the outcome variable and independent variables and data showed homoscedasticity. To explore whether educational level and parity were important variables to be included in the regression analyses, independent samples t-tests were performed regarding PRFQ-Fi and effect sizes (Cohen's d) were calculated. For independent samples t-test and to be able to include educational level in the multiple linear regression analysis educational level was modified into a dichotomous variable by combining college degree or applied science degree with university education as "high educational level" thus leaving high school, vocational degree or lower education as one variable "low educational level". Significant (p<0.001) group differences were found for parity (t(1773, 371) = 5.110, d=0.243), and both maternal (t(1047,043)=-5.671, d=0.351) and paternal (t(833.728) = -4.503, d=0.312) educational level, but considering effects sizes their practical significance appeared to be small.

The multiple linear regression models were performed in two steps with PRFQ-Fi total score as the dependent variable in both steps and the independent variables being those that showed significant correlations with PRFQ-Fi (age, educational level, parity, TAS-20, DDF and EOT for mothers and EPDS, SCL-90, TAS-20, DIF, DDF and EOT for fathers). In Step 1, alexithymia was explored as TAS-20 total score whereas in Step 2, instead of TAS-20 the different alexithymia dimensions (DIF, DDF and EOT) were explored.

3 RESULTS

3.1 Description of the study population

The descriptive characteristics are reported in Table 1.

Mothers had lower level of alexithymia total scores (M=39.78, SD=9.33) than fathers (M=43.09, SD=9.73) with statistically significant group differences (t(2875) = -8.912, p<0.000) but only small effect size (Cohen's d=0.332). A significant difference in mean TAS-20 total

scores was observed between the sample and the general population (p<0.001) reported by Franz et al. (2007) and Salminen, Saarjärvi, Äärelä, Toikka and Kauhanen (1999), both for mothers and fathers. PRFQ-Fi total scores were higher among mothers (M=5.24, SD= 0.52) than fathers (M=5.10, SD 0.56) with again significant group differences (t(1918) = 6.712, p<0.000) but small effect size (d=0.307).

Internal consistencies were good for TAS-20 total score in mothers (α =0.823) and fathers (α =0.824). Regarding the TAS-20 dimensions, the internal consistencies were good for DIF in mothers (α =0.810) and fathers (α =0.820) and acceptable for DDF in mothers (α =0.759) and fathers (α =0.782). For EOT, Cronbach's alphas were questionable both in mothers (α =0.628) and fathers (α =0.617). Regarding PRFQ-Fi total score, internal consistencies were questionable in mothers (α =0.678) as well as in fathers (α =0.668). For F1, internal consistencies were acceptable in mothers (α =0.774) and fathers (α =0.776) as well as for F4 in mothers (α =0.734) and fathers (α =0.733). Internal consistencies were questionable for F2 in mothers (α =0.679) but acceptable in fathers (α =0.703), whereas for F3, the values were questionable both in mothers (α =0.505) and fathers (α =0.460).

Mothers had higher scores of depressive symptoms (M=4.52, SD=4.1) than fathers (M=3.46, SD=3.66) with statistically significant (p<0.001) group differences (EPDS, t(2262.146)=7.058, d=0.297) whereas anxiety symptoms (M=2.79, SD=3.97) did not show a significant group difference (t(2890)=1.588, p=0.112) between mothers (M=2.79, SD=3.97) and fathers (M=2.55, SD=3.76).

Those who did not return the 6-month questionnaire (and thus, were excluded from this study) were more often male, had lower age and educational level and reported more depressive symptoms in the first trimester questionnaire in comparison to those who returned the 6-month questionnaire. For more detailed descriptions, see Kajanoja et al. (2017) regarding TAS-20, and Pajulo et al. (2018) regarding PRFQ-Fi.

Insert Table 1 here

3.2 Correlations between alexithymia and parental reflective functioning

Results of correlation analyses are presented in Table 2 for mothers and in Table 3 for fathers. Significant negative correlations between TAS-20 total scores and PRFQ-Fi total scores were found both in mothers (r= -0.165, p< 0.001) as well as in fathers (r= -0.280, p< 0.001). TAS-20 total scores and all its dimensions had negative correlations with the PRFQ-Fi factors F1

and F3 among both mothers and fathers. Interestingly, F2 showed a positive correlations with alexithymia measures. The strongest correlations were found between EOT and F1, among both mothers ($r = -0.396$, $p < 0.001$) and fathers ($r = -0.400$, $p < 0.001$). Paternal depressive and anxiety symptoms were negatively correlated with PRFQ-Fi total scores.

Insert Table 2 here

Insert Table 3 here

3.3 Regression analysis of alexithymia and background factors with PRFQ-Fi

The results of multiple linear regression analyses are presented in Table 4 for mothers and in Table 5 for fathers. Higher TAS-20 total scores were associated with lower PRFQ-Fi total scores both in mothers ($\beta 1 = -0.008$, $p < 0.001$) and fathers ($\beta 1 = -0.016$, $p < 0.001$). Out of the three alexithymia dimensions, only EOT showed an association with PRFQ-Fi total score among mothers ($\beta 1 = -0.027$, $p > 0.001$) and fathers ($\beta 1 = -0.037$, $p < 0.001$). Among mothers, higher educational level was associated with higher PRFQ-Fi ($\beta 1 = 0.118$, $p < 0.001$) in Step 1 but less significantly in Step 2 ($\beta 1 = 0.088$, $p < 0.05$), whereas for fathers, the association was significant only moderately in both steps ($p < 0.05$). Parity was associated with lower PRFQ-Fi in Step 1 ($\beta 1 = -0.134$, $p < 0.001$) and Step 2 ($\beta 1 - 0.126$, $p < 0.001$) showing that primiparous women had higher PRFQ-Fi total scores than mothers not expecting their first child. Despite the association found in the correlation analyses between paternal depressive and anxiety symptoms and parental reflective functioning, no such associations were found in the regression models.

Insert Table 4 here

Insert Table 5 here

The overall explanatory value of all these models by F-test was good ($p < 0.001$.) The associations were detected more firmly when evaluating the alexithymia dimensions separately (Adj. $R^2 = 0.080$, SE Est.$= 0.501$) instead of only TAS-20 total score, presented (Adj. $R^2 = 0.054$, SE Est.$= 0.508$) in mothers. Accordingly, in fathers the association was more firmly established when evaluating alexithymia dimensions separately (Adj. $R^2 = 0.124$, SE Est.$= 0.518$) instead of TAS-20 total score alone (Adj. $R^2 = 0.093$ and SE Est.$= 0.527$).

4 DISCUSSION

In this study, the main finding was that alexithymic traits were negatively associated with postnatal parental reflective functioning (PRF), as hypothesized. Both for mothers and for fathers the main alexithymia dimension responsible for this relation was Externally Oriented Thinking (EOT). Alexithymic traits were found to have a particularly negative association with the parental reflective functioning factors "Interest and curiosity in the child´s individual mental states" and "Appropriateness of reasoning about mental states underlying the child´s reactions". This could be explained by the fact that as individuals with high alexithymia indeed do not necessarily recognise their own feelings, the ability for emotional awareness is impaired also in relation to others, and especially related to the small child.

Somewhat in line with previous studies concerning alexithymia dimensions (Conrad, Wegener, Imbierowicz, Liedtke and Geiser, 2009; Grabe, Spitzer and Freyberger, 2004), EOT was found to act differently in comparison to Difficulty Identifying Feelings (DIF) and Difficulty Describing Feelings (DDF). The differences between alexithymia dimensions have been previously stated concerning the same study population by Kajanoja et al. (2017). Cluster analysis indicated that there are two subtypes of alexithymia, one associated with high EOT scores and another one with high DIF. It was suggested that individuals with high EOT might develop a characteristic unemotional, non-introspective cognitive style. (Kajanoja et al., 2017.) This could further explain the main finding of the current study regarding the association between EOT and lower PRF, knowing that reflective functioning is highly dependent on an individual's ability to reflect upon own and others' emotional and mental states and the capacity to imagine mental states. As PRF is thought to depend on emotion regulation (Fonagy et al., 2012; Schultheis et al., 2019) and its cognitive processes associated accordingly with alexithymia (Correro et al., 2019; Luminet et al., 2006), it seems understandable that EOT with characteristic cognitive features of emotion processing is associated with lower PRF. With a concrete cognitive style, EOT could be underlined with orientation also to more concrete features of parenting and the needs of the child, such as hunger and sleep. Newborns and infants express their needs by non-verbal ways, such as cry and fussiness (Maupin, Rutherford, Landi, Potenza and Mayes, 2018). The communication could hence be more easily complicated even with parents without pronounced alexithymia.

As alexithymia and reflective functioning are both engaged with emotional abilities, their measurement and evaluation together can be somewhat challenging, However, TAS-20 as a

measure concentrates on the parent's evaluation of his/her own abilities to identify and express his/her own emotions and to what extent he/she has the tendency to concentrate on concrete things and events. In contrast, the questions in PRFQ-Fi do not concentrate on recognizing the emotional abilities in the respondent him-/herself but more in the experience of interest (e.g. 'I am often curious to find out how my baby feels.') and understanding or the effort to try to understand the child's thinking, behaviour and needs as separate from the parent's needs and thoughts (e.g. 'At times it takes several tries before I understand what my baby needs or wants.').

In the current study, the mean scores of PRFQ-Fi were higher among mothers than fathers whereas the total score of TAS-20 was higher among fathers than mothers. Both findings are in line with previous studies regarding PRF (Benbassat and Priel, 2015) and alexithymia (Salminen et al., 1999; Franz et al., 2007). An interesting further study would be to explore whether this parental gender difference will persist later when the child is older. As only a limited number of previous studies on parental reflective functioning have included also fathers (Cooke et al., 2017), this study provides new information also gender-wise. Another finding, in line with previous studies (Pajulo et al., 2015; Pajulo et al.,2018) was that first-time parents scored higher in parental reflective functioning. Accordingly, differences in parenting abilities between primi- and multiparous mothers have previously been reported in different study designs (Kim, Mayes, Feldman, Leckman and Swain, 2013; Maupin et al., 2018). Depressive and anxiety symptoms were not associated with PRFQ-Fi in the regression analysis, which could be attributable to EOT's significant role in the association with parental reflective functioning, as DIF and DDF are more commonly associated with psychopathology than EOT (Conrad et al., 2009; Grabe et al., 2004). However, DIF and DDF have shown good psychometric properties repeatedly in previous studies whereas EOT has received more criticism for lower reliability and internal consistency (Meganck, Vanheule and Desmet, 2008; Kooiman, Spinhoven and Trijsburg, 2002). Also, within this study, the internal consistencies of EOT for both mothers and fathers were questionable.

To our knowledge, this was the first study exploring the association between alexithymia and parental reflective functioning. The strengths of this study are the new investigation field with a relatively large study population with a number of controlled confounding factors and inclusion of both mothers and fathers. As the cohort is planned to be followed for decades, follow-up information is possible to be gathered regarding the importance of parental alexithymia and early phase reflective functioning for child's later development.

Some limitations of the study should be acknowledged. The prevalence of alexithymia was lower in comparison with the general population samples of previous studies (Salminen et al., 1999; Franz et al., 2007). However, the gender differences were similar to those reported in the literature. There may have been a selection bias regarding participating families as the vast majority were couples expecting their child together. Thus, they probably were in at least somewhat steady relationships, with less interpersonal difficulties and hence less alexithymic traits.

The assessments were based on self-reported questionnaires on both alexithymia and parental reflective functioning. Alexithymia in itself may influence the self-reporting of both of them. It has been questioned previously whether the 20-item Toronto Alexithymia Scale is suitable for measuring alexithymic traits because of the possibility of reporting bias. Regarding PRFQ-Fi, a question has been raised upon how much parental reflective functioning assessment is dependent on verbal abilities and educational level. However, the question has been considered especially relevant regarding interview measures based on narrative analysis (Shai and Belsky, 2011). The questionnaires for parental reflective functioning have been developed and validated to be used efficiently as screening questionnaires and in larger population studies (Luyten et al., 2017; Pajulo et al., 2018) and thus are formulated as relatively short and with clear questions instead of more complex and time-consuming interview-based methods. Since self-report measures to assess parental mentalization have only recently been developed, it will be important to explore how the measure works in different study designs and populations. The PRFQ-Fi measure used in this study is new and might include some limitations as well. For example, the Cronbach's alphas were not very high, regarding especially F3. It should be noted that F3 includes only three items and as it is known that Cronbach's alpha increases when the number of items increases, this factor should not be rejected only based on its alpha value.

In this study, the associations found were statistically quite modest, and thus more studies are needed to explore the association between alexithymia and parental reflective functioning. Additionally, the direction of this association is still unknown and thus, longitudinal study designs are needed. Lastly, even though there are many benefits for having a large sample of participants, it should be noted that statistically significant correlations could be found even when the correlations are quite small.

5 Conclusions

This study provides new evidence regarding the association between alexithymia and early parental reflective functioning and the way of connection between these two conceptually linked phenomena. We found alexithymic traits to be associated with lower parental reflective functioning and the specific alexithymia dimension responsible for the association was Externally Oriented Thinking. The correlations were found to be especially evident among fathers, which provides new understanding on the explored phenomena also gender-wise. Future studies should explore the observed phenomena longitudinally and in diverse populations in order to more firmly establish the association between alexithymia and early parental reflective functioning.

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Table 1. Descriptive statistics of the 20-item Toronto Alexithymia Scale and its dimensions and parental reflective functioning and its factors as well as continuous potential confounding factors among mothers and fathers.

	Mothers			Fathers		
	Mean	SD	Md (Q1-Q3)	Mean	SD	Md (Q1-Q3)
TAS-20 tot	39.78	9.33	39.00 (33.00-45.00)	43.09	9.73	42.00 (36.00-49.00)
DIF	11.63	4.39	11.00 (8.00-14.00)	10.96	4.24	10.00 (8.00-13.00)
DDF	9.56	3.58	9.00 (7.00-12.00)	11.02	4.08	10.00 (8.00-14.00)
EOT	18.59	4.26	19.00 (16.00-21.00)	21.12	4.45	21.00 (18.00-21.00)
PRFQ-Fi tot	5.24	0.52	5.27 (4.91-5.58)	5.10	0.56	5.12 (4.75-5.47)
F1	6.01	0.86	6.20 (5.60-6.80)	5.60	0.95	5.80 (5.00-6.40)
F2	4.62	1.28	4.67 (3.67-5.67)	4.73	1.20	4.67 (4.00-5.67)
F3	6.16	0.90	6.33(5.67- 7.00)	5.79	1.06	6.00 (5.00-6.67)
F4	4.16	1.22	4.33(3.67-5.00)	4.27	1.36	4.33 (3.67-5.00)
Age	30.23	4.71	30.00 (27.00-33.00)	31.94	5.44	32.00 (28.00-35.00)
Gwks	39.31	1.80	40.00 (39.00-40.00)	39.73	1.86	40.00 (39.00-40.86)
EPDS	4.52	4.14	4.00 (1.00-7.00)	3.46	3.66	2.00 (1.00-5.00)
SCL-90	2.79	3.97	1.00 (0.00-4.00)	2.55	3.76	1.00 (0.00-4.00)

TAS-20 = total score of the 20-item Toronto Alexithymia Scale, DIF = Difficulty Identifying Feelings, DDF = Difficulty Describing Feelings, EOT = Externally Oriented Thinking, PRFQ-Fi = Parental Reflective Functioning- Finnish version, F1 = Interest in child mental states, F2 = Opacity of child mental states, F3 = Appropriate reasoning about child mental states, F4 = Uncertainty of child mental states, Gwks= Gestational weeks at time of birth, EPDS = depressive symptoms, SCL-90 = anxiety symptoms.

Table 2. Maternal correlations between the 20-item Toronto Alexithymia Scale and its dimensions with PRFQ-Fi total scores and its factors, as well as with potential confounding factors of parental depressive and anxiety symptoms at the offsprings' age of 6 months and parental age and gestational weeks at the time of birth by Spearman's correlation.

	PRFQ-Fi	F1	F2	F3	F4
	r	r	r	r	r
TAS-20	-0.165**	-0.340**	0.104**	-0.282**	0.025
DIF	-0.035	-0.154**	0.162**	-0.226**	0.011
DDF	-0.077*	-0.213**	0.131**	-0.223**	0.018
EOT	-0.242**	-0.396**	-0.023	-0.210**	0.035
Age	0.053*	0.037	0.032	0.082**	-0.024
EPDS	-0.019	-0.076*	0.154**	-0.179**	-0.044
SCL-90	-0.003	-0.027	0.091**	-0.147**	-0.009
Gwks	0.029	0.017	0.003	0.007	0.027

** $p < 0.001$, * $p < 0.05$

TAS-20 = total score of the 20-item Toronto Alexithymia Scale, DIF = Difficulty Identifying Feelings, DDF = Difficulty Describing Feelings, EOT = Externally Oriented Thinking, PRFQ-Fi = Parental Reflective Functioning- Finnish version, F1 = Interest in child mental states, F2 = Opacity of child mental states, F3 = Appropriate reasoning about child mental states, F4 = Uncertainty of child mental states, Gwks= Gestational weeks at time of birth, EPDS = depressive symptoms, SCL-90 = anxiety symptoms.

Table 3. Paternal correlations between the 20-item Toronto Alexithymia Scale and its dimensions with PRFQ-Fi total scores and its factors, as well as with potential confounding factors of parental depressive and anxiety symptoms at the offsprings' age of 6 months and parental age and gestational weeks at the time of birth by Spearman's correlation.

	PRFQ-Fi	F1	F2	F3	F4
	r	r	r	r	r
TAS-20	-0.280**	-0.377**	0.081*	-0.351**	-0.025
DIF	-0.119**	-0.183**	0.136**	-0.285**	-0.001
DDF	-0.167**	-0.259**	0.126**	-0.251**	-0.046
EOT	-0.323**	-0.400**	-0.037	-0.289**	-0.008
Age	0.033	0.029	-0.013	0.040	0.009
EPDS	-0.114**	-0.103*	0.088*	-0.198**	-0.041
SCL-90	-0.105*	-0.037	0.046	-0.178**	-0.037
Gwks	-0.027	-0.041	-0.006	0.038	0.000

** $p<0.001$, * $p<0.05$

TAS-20 = total score of the 20-item Toronto Alexithymia Scale, DIF = Difficulty Identifying Feelings, DDF = Difficulty Describing Feelings, EOT = Externally Oriented Thinking, PRFQ-Fi = Parental Reflective Functioning- Finnish version, F1 = Interest in child mental states, F2 = Opacity of child mental states, F3 = Appropriate reasoning about child mental states, F4 = Uncertainty of child mental states, Gwks= Gestational weeks at time of birth, EPDS = depressive symptoms, SCL-90 = anxiety symptoms.

Table 4. Multiple linear regression models Steps 1 and 2 for the 20-item Toronto Alexithymia Scale and correlated co-variates associating with parental reflective functioning (dependent variable) for mothers

	Step 1				Step 2			
	β1*	β2**	t	p	β1*	β2**	t	p
Constant	5.387		50.906	<0.001	5.556		53.142	<0.001
Age	0.005	0.040	1.562	0.118	0.006	0.049	1.946	0.052
Education	0.118	0.105	4.272	<0.001	0.088	0.079	3.215	0.001
Parity	-0.134	-0.128	-5.312	<0.001	-0.126	-0.121	-5.077	<0.001
TAS-20	-0.008	-0.139	-5.934	<0.001	-	-	-	-
DDF	-	-	-	-	0.001	0.009	0.382	0.703
EOT	-	-	-	-	-0.027	-0.223	-8.951	<0.001
R^2		0.056				0.083		
Adj. R^2		0.054				0.080		
F (p)		26.269				32.125		
		(<0.001)				(<0.001)		
SE Est.		0.508				0.501		

* Unstandardized β ** Standardized coefficient β

TAS-20 = total score of the 20-item Toronto Alexithymia Scale, DDF = Difficulty Describing feelings, EOT = Externally Oriented Thinking.

Table 5. Multiple linear regression models Steps 1 and 2 for the 20-item Toronto Alexithymia Scale and correlated co-variates associating with parental reflective functioning (dependent variable) for fathers.

	Step 1				Step 2			
	β1*	β2**	t	p	β1*	β2**	t	p
Constant	5.711		64.521	<0.001	5.952		61.536	<0.001
Education	0.111	0.099	3.113	0.002	0.080	0.071	2.267	0.024
EPDS	0.004	0.025	0.553	0.580	-0.003	-0.022	-0.488	0.626
SCL-90	-0.004	-0.026	-0.618	-0.537	-0.011	-0.074	-1.702	0.089
TAS-20	-0.016	-0.278	-7.777	<0.001	-	-	-	-
DIF					-0.003	-0.025	-0.569	0.570
DDF					-0.003	-0.024	-0.589	0.556
EOT					-0.037	-0.299	-8.884	<0.001
R^2	0.097				0.129			
Adj. R^2	0.093				0.124			
F (p)	24.953				23.102			
	(<0.001)				(<0.001)			
SE Est.	0.527				0.518			

* Unstandardized β ** Standardized coefficient β

TAS-20 = total score of the 20-item Toronto Alexithymia Scale, DIF = Difficulty Identifying Feelings, DDF = Difficulty Describing feelings, EOT = Externally Oriented Thinking, EPDS = depressive symptoms, SCL-90 = anxiety symptoms.