Contents

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Longitudinal Associations between Symptoms of Parental Perinatal Depression, Social Support and Infant Temperament

Diāna Zande[1] & Sandra Sebre
University of Latvia

Abstract
The aim of the research was to longitudinally explore the associations between parental depression symptoms and perceived social support in the perinatal period in relation to infant temperament. Participants included women (n = 258), who were recruited during the third trimester of pregnancy, and their partners (n = 258). They completed the Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987), The Gotland Male Depression Scale (Zierau, Bille, Rutz, & Bech, 2002) and Multidimensional scale of Perceived Social Support, (Zimet, Dahlem, Zimet, & Farley, 1988) at three points in time: during the third trimester of pregnancy, 3 months and 6 months after the childbirth. Parents also completed the Infant Behavior Questionnaire – revised, very short form (Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014) at 3 and 6 months after childbirth. Bidirectional links were found between parents' depression symptoms and infant negative affect. Infant negative affect at the age of 3 months predicted depression symptoms in both mothers and fathers 6 months after childbirth; mothers' depression symptoms during the pregnancy predicted infants' negative affect at the age of 3 months. Both mothers' and fathers' depression symptoms and a low level of perceived social support 3 months after childbirth predicted infant negative affect at the age of 6 months.
Key words: *depression symptoms, infant temperament, perceived social support*

Introduction

Both scientists and the public at large are increasingly more often focusing on parents' emotionality during the perinatal period, and it is well known that depression symptoms and even clinical depression is experienced by many mothers during this period (Gaynes, Gavin, & Meltzer-Brody, 2005; O'Hara & Swain, 1996) and fathers (Paulson & Bazemore, 2010). Fathers' depression during the perinatal period has been studied much less frequently, but nevertheless has received an increasing amount of attention within the recent decades. Yet there is still much to be examined in regard to fathers' depression during the perinatal period (Wee et al., 2011) since most studies on perinatal depression still exclude or underrepresent men (Ramchandani et al., 2011). At the level of practical implications, most parents suffering from depression symptoms during the perinatal period still do not seek or receive help (Marcus, 2009).

Analysis of the scientific literature indicates that there have been many studies concerning the prevalence of perinatal depression, its risk factors and consequences. However, there is still a dearth of longitudinal studies which explore the interaction

[1] Corresponding author Diāna Zande: *dizande@inbox.lv*

between infants' temperament and parents' depression symptoms. Various studies have examined the implied reciprocity of parents' depression symptoms and their child's temperament factors within the limits of a single measurement time, while the relatively few longitudinal studies have mostly included children younger than three months of age or older than six months. Even in these studies infant temperament is often assessed at a single measurement time, and the only evaluation of the infant's temperament is by the infant's mother. Therefore, it is important to perform additional longitudinal studies of infant temperament and parents' depression symptoms with the participation of both parents and at several points of measurement.

The newly published DSM-V (APA, 2013) describes a diagnosis of "perinatal depression" as a "Depressive Disorder with Peripartum Onset", with its symptoms emerging during pregnancy or within four weeks postpartum (APA, 2013). A commonly used definition of postpartum depression is that it is a depressive illness without psychotic disorders, resembling ordinary depression in its prevalence and symptoms, and beginning within the first few months postpartum (Cox, Murray, & Chapman, 1993).

Several theoretical models have been developed for the explanation of perinatal depression. The biological approach emphasizes physiological changes during the course of pregnancy (Groer & Morgan, 2007), including metabolic imbalance, hormonal changes and serotonin imbalance. Other researchers have emphasized psychological and social factors. A biopsychosocial model of postnatal depression (Milgrom, Martin, & Negri, 1999) includes both biological factors (i.e. hereditary factors and postnatal hormonal changes), psychological factors (i.e.childhood experience, and problem-solving strategies) and social factors (i.e. social support and changes in partner relationships). Meta-analyses have shown the following risk factors for postnatal depression: antenatal depression, antenatal anxiety, negative cognitions, stressful life events, insufficient social support, a history of depression, low self-esteem and low income (Beck, 2001). Studies have also shown infant temperament to affect the development of postnatal depression (Fisher, Rowe, & Feekery, 2004; Murray, Stanley, Hooper, King, & Fiori-Cowley, 1996; Porter & Hsu, 2003).

Depression has been recognized as one of the most serious emotional complications for mothers (O'Hara, Wisner, Asher, & Asher, 2014), affecting not only the mother, but also to a significant degree her child. Studies have shown that mother's depression can affect the infant's cognitive, emotional and social development (Field, 2011; Milgrom, Westley, & Gemmill, 2004; Tronick & Reck, 2009). Mother's depression generally increases the probability of further wide-spectrum emotional complications for her children (Glover, 2014). Although in the last decades great deal of attention has been paid to male depression in the perinatal period of life, there are still many uncertainties in this area of research (Wee et al., 2011). To this day, most of the researches of the perinatal depression don't discuss male perinatal depression at all or in greater detail (Ramchandani et al., 2011). It is harder to study fathers depression than mothers, due to the fact that male depression tend to be manifested differently, for instance, through increased aggression, irritability and excessive working (Martin, 2013).

Research on the relationship between father's depression and the early development of the child has been limited, but associations between father's depression and the infant's emotional and behavioral development have been observed (Letourneau et al., 2012; Ramchandani et al., 2011).

From the first days of his/her life the infant's behavior differs in expression of early temperament traits. Over the past several decades various theoretical explanations of infant temperament have been developed, the most recent and notable of which has been the temperament theory developed by Mary Rothbart and her colleagues (Rothbart, 1981; Rothbart & Ahadi, 1994). Rothbart defines temperament as individual differences in reactivity and self-regulation which, through time, are influenced by genes, maturation and experience (Rothbart & Derriberry, 1981). Rothbart's theory is grounded in the assumption that both the behavioral reactions of children and the processes regulating these reactions are based upon neurobiological factors (Rothbart, 2011).

Rothbart's model places emphasis on the infant's reactivity and self-regulation, focusing on the interaction between the infant's reactive impulse and his/her attempts at regulation. Rothbart proposes that reactivity and self-regulation are universal and elastic dimensions of temperament, which can be observed on the level of the vegetative nervous system, the endocrine system, behavior and emotionality (Rothbart, 2011). Rothbart has developed a framework of temperament which consists of three broad factors – surgency, negative affect and effortful control (at ages post-infancy) or regulatory capacity (during the infancy period) (Rothbart, Chew, & Gartstein, 2001; Rothbart, 2011). The theoretical insights of Rothbart and the results of her studies have significantly broadened our understanding of temperament. The questionnaires for parents developed by Rothbart, Putnam and colleagues, have become the most widely used questionnaires in recent studies of infant and child temperament (Putnam & Stifter, 2008).

The question of the extent to which a child's temperament is determined by genes or the environment is still open to debate, and further research in this field is important. Studies from previous decades have shown that mothers' depression symptoms postpartum correlate with higher negative affect in infants (Edhborg, Seymur, Lundh, & Winström, 2000; Muzik, 2010) as well as "difficult temperament" (Kerstis et al., 2013; McGrath, Records, & Rice, 2008; Porter & Hsu, 2003). Although there have been far fewer studies on father's depression symptoms in relation to infant temperament during the perinatal period, the observation has been made that father's depression and low mood after the birth of his child is associated with negative infant temperament (Dave, Nazareth, Sherr, & Senior, 2005; Schoppe-Sullivan & Mangelsdorf, 2013). Another research results show that depressed men perceive their infants to be more distressed than do fathers without depression (Ramchandani et al., 2011). A recent study showed that the internalizing problems of fathers (elevated depression and anxiety indicators) during the first four months of their child's life predicted the child's negative affect at the age of six months (Potapova, Gartstein, & Bridgett, 2014). Other research has concluded that it is the mother's, not the father's, depression at six weeks after the birth of the child which predicts the assessment of the infant's irritability (Atella, DiPietro, Smith, & St. James-Roberts, 2003).

Although parenting is undeniably an essential aspect of the development of the child from their birth onwards children also affect the lives of their parents (Cole, LeDonne, & Tan, 2013). Recent research and recent theoretical approaches emphasize the reciprocal nature of the child-parent relationship (Tronick, 2007). Parental depression symptoms can promote a negative perception of the child, but a higher level of negative affect of infants can promote the development of depression in parents, since it may be more difficult to develop a positive relationship with an infant who expresses negative temperament and is difficult to placate (Austin et al., 2005).

The conclusion of one of the first major studies on the relationship between the infant's temperament and his/her mother's depression was that mothers of infants who are irritable, prone to cry often, intensely and are difficult to placate, experience more anxiety and depression than women whose babies are calm and cry less often (Cutrona & Troutman, 1986). Several recent studies have confirmed these findings (Fisher, Rowe & Feekery, 2004; Porter & Hsu, 2003). Research has shown that a high level of irritability of infants during their first weeks of life has predicted depression in mothers who were in the high risk-group for developing depression, but not for mothers in the low-risk group (Murray et al., 1996). Yet not all studies have confirmed this possible bidirectional interaction between parents' depression and their child's temperament, for example, Hanington and colleagues (Hanington, Ramchandani, & Stein, 2010) found that the influence of children's temperament on parents' depression was insignificant. Therefore, the possibility of the reciprocity of the relationship between parents' depression symptoms and the temperament of children in their infancy is a question still open for debate.

Many studies have indicated that social support is important for the prevention of depression and its alleviation, and that insufficient or unavailable social support during the perinatal period poses a risk for the development of depression for pregnant women and new mothers (Ford & Ayers, 2009; O'Hara, 1986). The results of the study by Cutrona and Troutman (Cutrona & Troutman, 1986) showed that infant "difficult temperament" is associated with the postpartum depression levels of their mothers, but that social support can act as a preventive factor, particularly when mediated by the mother's self-efficacy. In another study (Gelfand, Teti, & Fox, 1992) the mothers who regarded their children's temperament as "difficult" indicated a lower level of perceived social support. Nevertheless, the results of these studies have made no suggestions pertaining to the reciprocity of mothers' depression symptoms and the temperament of their infants. And some studies have shown that mothers with depression regarded their babies as more "difficult" both two and six months postpartum, regardless of social support (i.e. McGrath et al., 2008).

Very few studies have included fathers upon the examination of the relationship of depression symptoms, social support and infant temperament, and especially lacking are studies which would include both parents and in a longitudinal research design. Of the few studies of fathers' perinatal depression, one study (Zelkowitz & Milet, 1997) included men whose partners had been diagnosed with postpartum depression, and men whose partners were not thus diagnosed. Fathers, whose partners were depressed, reported a lower level of received social support and a higher level of stress. Even

though the men who indicated less received social support reported a higher level of depression, the level of social support was not related to the perception of their child as "difficult".

To date there has been an insufficient amount of research on the interrelatedness of parents' depression symptoms, perceived social support and the infant's temperament in the perinatal period, and most studies of perinatal depression have not included fathers. The following is a study including both mother and fathers, conducted longitudinally at three points of measurement, initially involving women in the third trimester of pregnancy and their partners, and further examining the interaction of parents' depression symptoms, perceived social support and infant temperament from the third trimester of mothers' pregnancy through the infant's age of six months. This is the first known longitudinal study in Latvia regarding perinatal depression and infant temperament, and the first study involving also men in perinatal depression symptom research. In addition, since this study both parents assessed the temperament of their infant, it was possible to calculate a composite infant temperament rating, including the evaluations from both parents.

The aim of the present study was to conduct a longitudinal investigation of the interrelation of mothers' and fathers' perinatal depression and perceived social support in relation to their infant's temperament. The following research hypothesis were posed:

1. Infant temperament at the age of three months predicts changes in depression symptoms of their mothers/fathers at six months postpartum, controlling for perceived social support.
2. Mothers' depression symptoms during the third trimester of pregnancy predict changes in infant temperament at three months of age.
3. Mothers'/fathers' depression symptoms three months after childbirth predict changes in infant temperament at six months of age.

Method

Participants

Participating in the study were women (n = 258), who were recruited during the third trimester of pregnancy, and their partners (n = 258). At the time of recruitment the women were in the 30th to 40th week of pregnancy (M = 33; SD = 1.38) with no complications. The women were 20 to 41 years old (M = 28.26; SD = 3.99), their male partners were 21 to 46 years old (M = 30.31; SD = 4.86). A majority of the participants had completed university education: 216 (83.72%) of the women and 160 (62.02%) of the men. The family status was as follows: 180 (69.77%) of the women and 182 (70.82%) of the men were married; the remaining were living together, but not married. The vast majority (94.19%) of the couples lived in an urban environment. Almost all of the participants reported that the per-capita monthly family income was equal to or above the average monthly income in Latvia.

Planned pregnancy was reported by 211 (82.10%) of the women and 213 (82.88%) of the men. Most (80.93%) of the families were expecting their first child, and born to

the participants were 127 (49.61%) girls and 129 (50.39%) boys. None of the women reported any serious postnatal health issues for themselves or their child. Participation in the study was voluntary. The participants can generally be described as a low-risk group, and this has been taken into consideration upon the interpretation of the results.

Measures

A sociodemographic information form was developed so that parents could report on their age, education, income level, expected date of the child's birth, and after delivery the postnatal health of the mother and the child.

Prenatal and postnatal depression. To measure the prevalence of depression symptoms during and after pregnancy, two self-report depression inventories were used, completed by both mothers and fathers. One of the questionnaires was the Latvian translation of the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987). The EPDS was initially translated to Latvian by Maija Kulinska (Kulinska, 2006), and the translation was improved upon (Zande & Sebre, 2012) during the course of this research. The EPDS is a self-report inventory, widely used in research studies and clinical practice, consisting of 10 items concerning possible symptoms of depression during the preceding seven days. Each item is rated from 0 to 3, with a maximum of 30 points. The EPDS was developed as a means to determine postnatal depression symptoms and has been validated with women at six weeks postpartum (Cox et al., 1987). It has been shown to be effective for the assessment of postpartum depression risk within the first few days after childbirth (Jardri et al., 2006); has been validated for use during pregnancy (Cox & Holden, 2003) and has been validated for use with mothers and fathers (Edmonson et al., 2010; Matthey, Barnett, Howie, & Kavanagh, 2001). The original Cronbach's alpha of the questionnaire was .87. The Cronbach's alpha in this study varied from .78 to .88 in the female group, and from .70 to .78 in the male group, upon various times of measurement.

The other questionnaire used for assessing depression was the Gotland Male Depression Scale (GMDS; Zierau, Bille, Rutz, & Bech, 2002), which has been developed specifically for the detection of depression episodes in men. In addition to items on the common symptoms of depression, such as lack of energy and moodiness, it also includes items on irritability, anger and aggressive behavior. It has been previously used in studies for measuring postnatal depression for fathers (Madsen & Juhl, 2007) and mothers (Möller-Leimkühler, Bottlender, Strauss, & Rutz, 2004).

The GMDS consists of 13 items concerning how the respondent has been feeling lately, assessed on a Likert-type scale from 0 ("not present") to 4 ("present to a high degree"). The questionnaire was translated from English to Latvian by forward – backward translation as a part of the doctoral thesis (Zande & Sebre, 2012). During the translation process, the ninth item of the GMDS, which includes abuse of drugs and alcohol, excessive physical activity and overeating, was divided into three separate items, and a version of the questionnaire with 15 items was derived. The Cronbach's alpha of the original version was .86; the Cronbach's alpha of the Latvian translation varied at different times of measurement, from .81 to .84 in the male group and from .79 to .87

in the female group. The convergent validity was calculated by correlating the results of the EPDS and GMDS. The results of the correlations of the scores from both depression questionnaires indicate high convergent validity at all three times of measurement for both mothers (r_s = .65–.67, p < .01) and fathers (r_s = .48–.61, p < .01). Due to the strong correlation between the results from both depression questionnaires, it was decided to calculate a unified index of depression symptom level, derived from the summed z values of the results from the two questionnaires. The summary index of the two depression questionnaires will be referred to as "mothers' depression symptoms" and "fathers' depression symptoms".

Infant temperament. To measure the temperament of infants, the revised, very short form version of Infant Behavioral Questionnaire (IBQ-RVSF; Gartstein & Rothbart, 2003; Putnam, Helbig, Gartstein, & Rothbart, 2012, Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014; Latvian adaptation by Zande & Sebre, 2011) was used. This is the most recent widely-recognized questionnaire concerning infant temperament, developed by leading temperament researcher Mary Rothbart and her colleagues. The questionnaire consists of 37 items regarding the infant's behavior in various everyday situations in the course of the preceding week. The items are rated on a scale of 1 ("never") to 7 ("always"), with a possible response of "NA" ("not applicable") if, during the preceding week, the infant has not encountered the situation described in the item, or the respondent has not witnessed such an encounter. The questionnaire consists of three subscales – Positive Affectivity/Surgency (12 items), Negative Affect (12 items) and Effortful Control or Orienting/Regulatory Capacity (13 items). The Surgency dimension addresses the intensity with which the child reacts to changes in the environment, and is related to positive affect and activity. Negative Affect dimension is a measure of the infant's negative mood and difficulties calming down. Effortful Control dimension is a measure of the infant's early regulatory capacity.

The Cronbach's alphas of the original questionnaire were .68 for the Surgency scale, .74 for Negative Affect and .74 for Regulatory Capacity. The Cronbach's alpha for the Latvian translation in this study were .68 and .63 for Surgency; .72 and .78 for Negative Affect; and .75 and .72 for Regulatory Capacity in the mothers' group (three and six months after childbirth). The alphas were .81 and .68 for the Surgency; .81 and .84 for Negative Affect; and .78 and .75 for Regulatory Capacity in the fathers' group (three and six months after childbirth).

The possible influence of mother's depression on the assessment of her child's temperament as "problematic" (Atella et al., 2003; Bayly & Gartstein, 2013) has been discussed above, and, therefore, to decrease the effect of "observer bias", a combination of several observers were employed. In this study infant temperament was assessed by both mothers and fathers, and the combined averaged score was used in the data analysis. Initial correlation analysis showed that mother's and father's assessment of their three months old infant's temperament were correlated: Surgency (r = .41, p < .01), Negative Affect (r = .39, p < .01), Regulatory capacity (r = .28, p < .01). The Cronbach's alpha of the combined temperament ratings were as follows: Negative Affect scale .78; Surgency scale .72 at three months and .70 at six months; Regulatory Capacity .78 at three and at six months.

Social support. Social support was measured with the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988; Kazarian & McCabe, 1991; Latvian translation by Voitkāne, Miezīte, & Raščevska, 2004). This self-report questionnaire consists of 12 items concerning support received from family, friends and significant others, rated on a scale from 1 – "very strongly disagree" to 7 – "very strongly agree". The questionnaire consists of three subscales – Family, Friends and Significant Other – and a total perceived support score can be calculated. The Cronbach's alpha of the original version was .91 for Significant Other subscale, .87 for Family subscale and .85 for Friends subscale. The reliability of the total scale was .88. The Cronbach's alpha of the Latvian translation varied at different times of measurement, from .81 to .84 in the male group and from .79 to .87 in the female group. In this study only the total perceived social support was used; Cronbach's alpha at the three times of measurement in both male and female groups varied from .84 to .93.

Procedure

The data for the longitudinal study were gathered from June 2011 through January 2014. Expectant parents in the third trimester (weeks 30 through 40) of pregnancy without complications were invited to participate in a study concerning who parents are feeling during pregnancy and after childbirth, and the baby's behavior. The invitations were disseminated at classes for expecting parents, through sites on the internet and at the private practices of midwives and gynecologists. Participation was voluntary, informed and confidential.

The study procedure, expected duration, participants' obligations and confidentiality issues were explained. Since some of the questionnaires were distributed and returned via the internet, complete anonymity could not be secured, but each participant could receive and send their questionnaires independently from their partner, using separate mailboxes, indicating their couple's code. Over 600 couples of parents were initially sent the questionnaires and a letter explaining the study. The questionnaires of the first measurement time included the short questionnaire regarding sociodemographic data, EPDS, GMDS and MSPSS. Three hundred seventeen eight couples returned completed questionnaires, but 50 of them were invalid (filled out inappropriately or omitting answers to many of the questions). In the second stage of the study 293 couples agreed to participate. They were instructed to submit the date of birth of their child so that the further questionnaires could be sent to them at the appropriate measurement time: 280 couples provided the date of their children's birth.

At the second measurement time parents completed the EPDS, GMDS and MSPSS once again, in mixed order, and the IBQ-RVSF. Those who did not respond within a week were sent a reminder. Questionnaires at the second measurement time were sent to 280 couples, 271 of these responded by returning fully completed questionnaires.

Upon their child reaching the age of six months, 271 couples were sent the third set of questionnaires including the EPDS, GMDS, MSPSS and IBQ-RVSF. The EPDS and GMDS were provided in a mixed order to decrease the possibility of trained responses. Fully completed questionnaires were received from 257 couples, and these were the couples from whom information was included in the further data analysis.

Data processing and analysis. For the processing and analysis of the data SPSS software v.20.0 was used. The main statistical methods applied were correlation and regression analysis.

Results

Before the development of the regression models, the associations between depression symptoms, perceived social support and infant temperament ratings were calculated for the mothers' and fathers' groups, separately. These initial correlations showed that parents' depression symptoms were associated with infant temperament ratings only in regard to infants' Negative Affect (in both fathers' and mothers' groups), and therefore only this aspect of infant temperament was included in further analysis. Initial calculations also included correlation analysis between parents' depression symptoms and the sociodemographic indicators. As no relation between these variables was found, sociodemographic indicators were excluded from further analysis.

To examine the first research hypothesis – *infant temperament (negative affect) at the age of three months predicts changes in depression symptoms in their mothers/fathers six months postpartum, controlling for perceived social support.* – a series of hierarchical regression analyses were performed. The results are presented in Table 1.

Table 1. **Mothers' depression symptoms, perceived social support and infants' negative affect predicting mothers' depression symptoms six months postpartum (*N* = 257)**

Model	*Independent variables*	*B*	*SE*	*β*	R^2
1.	Mothers' depression symptoms at the 3rd trimester of pregnancy	.23	.05	.22***	.56
	Mothers' depression symptoms 3 months postpartum	.53	.05	.57***	
	Mothers' perceived social support 3 months postpartum	– .02	.01	– .09*	
2.	Mothers' depression symptoms at the 3rd trimester of pregnancy	.22	.05	.21***	.59
	Mothers' depression symptoms 3 months postpartum	.51	.05	.53***	
	Mothers' perceived social support 3 months postpartum	– .01	.01	– .08	
	Infant's negative affect at the age of 3 months	.37	.10	.16***	

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

In the first step mothers' depression symptoms at the third trimester of their pregnancy, depression symptoms three months postpartum and perceived social support three months postpartum were entered. These independent variables accounted for 56% of the variation in mothers' depression symptoms six months postpartum ($R^2 = .56$, F (3.254) = 108.40, $p < .001$). Upon the introduction of infants' negative affect at three months, the prediction increased by 3% ($R^2 = .59$, F (4.253) = 89.01, $p < .001$), while the perceived social support was no longer a statistically significant predictor.

In the fathers' group similar hierarchical regression analysis models were developed. In the first step of hierarchical regression analysis, fathers' depression symptoms during

their partners' pregnancy and three months after childbirth were entered, as was the perceived social support three months after childbirth (see Table 2).

Table 2. **Fathers' depression symptoms, perceived social support and infants' negative affect predicting fathers' depression symptoms six months postpartum (*N* = 255)**

Model	*Independent variables*	*B*	*SE*	*β*	R^2
1.	Fathers' depression symptoms at the 3rd trimester of their partners' pregnancy	.33	.05	.32***	.51
	Fathers' depression symptoms 3 months after childbirth	.51	.06	.44***	
	Fathers' perceived social support 3 months after childbirth	– .02	.01	– .14**	
2.	Fathers' depression symptoms at the 3rd trimester of their partners' pregnancy	.33	.05	.32***	.53
	Fathers' depression symptoms 3 months after childbirth	.49	.06	.43***	
	Fathers' perceived social support 3 months after childbirth	– .02	.01	– .14**	
	Infants' negative affect at the age of 3 months	.23	.08	.12**	

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

Fathers' depression symptoms at the third trimester of their partners' pregnancy and three months after childbirth and a low level of perceived social support three months after childbirth predicted depression symptoms at six months after childbirth, and the model accounted for 51% of variation in fathers' depression symptoms ($R^2 = .51$, F (3.254) = 89.73, $p < .001$). Upon including infants' negative affect at the age of three months, the prediction increased by 2% ($R^2 = .53$, F (4.253) = 70.88, $p < .001$).

Next, the influence of mothers' and fathers' depression symptoms on their infants' negative affect was examined. To examine the second research hypothesis – *mothers' depression symptoms during the third trimester of pregnancy predict changes in infant temperament at three months* – another hierarchical regression model was developed with mothers' depression symptoms and perceived social support at the third trimester of pregnancy as independent variables (see Table 3).

Table 3. **Mothers' depression symptoms and perceived social support predicting infants' negative affect at the age of three months (*N* = 257)**

Model	*Independent variables*	*B*	*SE*	*β*	R^2
1.	Mothers' perceived social support at the 3rd trimester of pregnancy	– .05	.01	– .05	.03
	Mothers' depression symptoms at the 3rd trimester of pregnancy	.08	.03	.18**	

** $p < .01$.

This model accounted for 3% of variation in infants' negative affect ratings at their age of three months ($R^2 = .03$, F (2.255) = 3.80, $p < .01$). In this model, only mothers' depression symptoms were significant predictors of the negative affect of their infants at the age of three months.

Finally, calculations were performed to determine whether mothers' and fathers' depression symptoms predict their infant children's negative affect at the age of six months. Another series of hierarchical regression models were developed, controlling for the infants' negative affect at three months (see Table 4).

Table 4. **Mothers' depression symptoms and perceived social support predicting infants' negative affect at the age of six months (*N* = 257)**

Model	*Independent variable*	*B*	*SE*	*β*	*R2*
1.	Infants' negative affect at the age of 3 months	.56	.05	.57***	.32
2.	Infants' negative affect at the age of 3 months	.54	.05	.54***	.36
	Mothers' perceived social support 3 months postpartum	– .01	.00	– .13*	
	Mothers' depression symptoms at the 3rd trimester of pregnancy	.04	.03	.09	
	Mothers' depression symptoms 3 months postpartum	.06	.02	.14*	

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

In the first step infants' negative affect at the age of three months was entered and shown to predict the infants' negative affect at the age of six months ($R^2 = .32$) (F (1.256) = 123.16, $p < .001$). In the next step, mothers' depression symptoms at the third trimester of pregnancy and three months postpartum and their perceived social support three months postpartum were introduced into the model. This model accounted for 36% of variation in infants' negative affect at the age of six months ($R^2 = .36$) (F (4.253) = 36.07, $p < .001$). In this model, infants' negative affect at six months was best predicted by their negative affect at the age of three months, and this level of prediction was increased by mothers' depression symptoms three months postpartum and by a lower level of perceived social support.

To examine whether fathers' depression symptoms predict changes in infants' negative affect at the age of six months, similar hierarchical regression analysis models were developed, controlling for infants' negative affect at three months of age, and including fathers' depression symptoms and the perceived social support three months after childbirth (see Table 5).

Table 5. **Fathers' depression symptoms and perceived social support predicting infants' negative affect at the age of six months (*N* = 253)**

Model	*Independent variables*	*B*	*SE*	*β*	*R²*
1.	Infants' negative affect at the age of 3 months	.56	.05	.57***	.33
2.	Infants' negative affect at the age of 3 months	.55	.05	.56***	.35
	Fathers' perceived social support 3 months after child-birth	– .01	.00	– .12*	
	Fathers' depression symptoms 3 months after childbirth	.07	.03	.12*	

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

As seen in Table 5, infants' negative affect at the age of three months accounted for 33% of the variation in infants' negative affect at the age of six months (R^2 = .33) F (1.256) = 123.16, p < .001). Upon the introduction of fathers' depression symptoms three months after the birth of their child the prediction increased by 2% (R^2 = .35, F (3.254) = 45.28, p < .001).

Discussion

To examine the possibilities of a reciprocal relationship between infants' temperament and parents' depression symptoms, a longitudinal study was conducted and several hierarchical regression models were developed. The results showed that infants' negative affect at the age of three months predicted changes in depression symptoms in both mothers and fathers six months after childbirth, and that mothers and fathers depression symptoms at three months predicted changes in infants' negative affectivity at six months after childbirth.

The results from the mothers' group correspond with the conclusions of previous studies, suggesting that mothers whose infants are irritable, cry often and intensely and have difficulties calming down, experience greater anxiety and depression than those women whose infants are calm and cry less often (Porter & Hsu, 2003; Fisher, Rowe, & Feekery, 2004); and that mothers of children with a "difficult" temperament have a greater risk of depression (Murray et al., 1996). In the study by Cutrona and Troutman (Cutrona & Troutman, 1986), infants' temperament at the age of three months predicted mothers' depression symptoms, although the prediction of the influence of infants' temperament on mothers' depression symptoms was determined upon the basis of a cross-sectional study with measurements within a single point in time.

It is generally recognized that the healthy development of a child depends on its caretakers, but the results of this study broaden the understanding of the effect an infant has on the emotional well-being of his/her parents during the infant's first months of life. If the infant cries a lot, is restless and demanding, then his/her parents can become exhausted and less joyful in their interaction with the child and even experience symptoms of depression. And this affects not only the mother as most often the main caretaker of the child, but also the father. Since increasing a greater number of fathers are taking part in caring for their child and its upbringing, and therefore need to be emotionally available to their children, it is important to explain to parents how a child's weeping and demandingness can lower their mood and possibly lead to the experiencing of depression symptoms.

Nevertheless, the strongest predictor of depression for both mothers and fathers at six months was the level of depression symptoms three months after childbirth, which corresponds to both the results of previous studies, and theoretical models of previous depression as a predictor of parents' depression during the perinatal period (Beck, 1996; Beck, 2001; Goodman, 2004; O'Hara & Swain, 1996; Rahman, Iqbal, & Harrington, 2003), making note of the significant role of genetic factors in the development of depression. In this study the degree of depression was increased by an insufficient level of perceived social support. These results correspond with the insights of other studies,

indicating social support as a risk factor for the development of depression during the perinatal period (Milgrom et al., 2008).

The results of the first regression model aimed at determining the effect of mothers' depression symptoms on infants' negative affect, showed that infants' negative affect at the age of three months was predicted by mothers' depression symptoms during pregnancy. This confirms the conclusion of previous studies that infants of mothers who have experienced depression symptoms during pregnancy can suffer from various complications, including a heightened negative affect (Field et al., 2006). The results of this study suggest that the emotional state of a mother during pregnancy exerts an influence on the negative affect of her child, and, therefore, mothers who suffer from low mood or depression during pregnancy should be provided with the necessary assistance to improve their emotional state, thus decreasing the potential for the facilitation of infant negative affect. By providing psychological assistance, for expectant mothers with depression symptoms, already during the pregnancy period, there is less probability of the development of a coercive cycle, whereby mother's depression affects mother-child interaction and thereby facilitates infant negative affect, which, in turn, further facilitates mother's depressive symptoms (Leigh & Milgrom, 2008).

The analysis of the predictive model of infants' negative affect at the age of six months showed that the increase in the negative affect is predicted by mothers' depression symptoms and a low level of their perceived social support at the previous measurement times. These results are in agreement with the results of previous studies which show that insufficient social support can promote depressed mothers' perception of their children's temperament as "difficult" (Cutrona & Troutman, 1986; Gelfand, Teti, & Fox, 1992). This can be explained by theoretical models which emphasize the interrelation between the development of infants' temperament and the social environment (Rothbart, 2011; Thomass & Chess, 1977). This also implicates a bidirectional effect: if the infant is demanding and cries a great deal, then the mother may have a greater need for both physical and emotional support; but if the mother does not receive sufficient help or feels as if it is insufficient, then it may be more difficult for her to care for the baby, which may promote further restlessness of the child.

The results of this study showed that father's depression symptoms at three months predicted infant's negative affect at the infant's age of six months. Likewise, a low level of father-perceived social support predicted a higher negative affect in the infant at the age of six months. These results might be explained by a lesser degree of positive emotionality expressed by depressed fathers in their communication with their infants, thereby promoting heightened negative affect in the child.

These results expand the understanding of the interaction of parents' depression symptoms and their infant children's temperament from the third trimester of pregnancy through the infants' age of six months, thus suggesting a reciprocal, bidirectional interaction between the variables.

The study is subject to some limitations. The use of self-report questionnaires for the measurement of depression symptoms at all the stages of measurement, instead of clinical interviews, can be considered one of the main limitation of the study. Likewise, for the assessment of the infants' temperament parent-completed questionnaires were

used and no controlled observations or laboratory measurements of infant temperament were employed. The study is significantly limited by the respondents' use of the internet for the submission of completed questionnaires, which precluded any control over the couples' discussion or ability to assure sufficient comprehension of the questions. In similar future studies, collecting information face-to-face would be preferable. An additional limitation of the study is the homogeneity of this sample as a low-risk group. In future studies larger samples, including respondents from different risk groups, would be preferable so that the sample would be representative of Latvian society at large, and there would be the possibility of comparing the interactive effects in a high-risk and low-risk group. Of course it would be important to conduct similar research in other sociocultural contexts, perhaps also enabling cross-cultural comparison.

To study the dynamics of parents' depression symptoms and their interaction with infants' temperament within a broader time-frame, similar future studies should perform measurements from the beginning of pregnancy through the infant's age of a full year or longer.

The results of this study can provide the basis for the preparation of educational materials for professionals and parents concerning depression symptoms during the post-natal period and the effect of mothers' emotional state during pregnancy on the development of her infant's temperament during the first months after childbirth. Parents in Latvia are still insufficiently acquainted with the concept of infant temperament, as research in this field is at its beginning stage in the country. The results of this study can expand the understanding of the early expressions of infant temperament and the interaction with the parents' emotional state during the first months after the infant's birth. It would also be advisable to inform parents about the effect that the infant's negative affect can have upon parents' feelings, and to teach parents to recognize their children's temperament expressions. Familiarity with differences in infant temperaments right after birth can help parents accept their child's temperament traits to a greater degree, and thereby to develop a more effective interaction with them.

The results of this study can be used in the professional work of psychologists, midwives, pediatricians and general practitioners, when working with new parents or parents to-be. The adaptation of the questionnaires in Latvian is a contribution to the approbation of the questionnaire in different cultures. These questionnaires can be employed in future studies and after development of norms and training of professionals used as an assessment measure in psychologists' individual work with clients . One of the strong points of this study is also the relatively large sample size, relative to the demographics of Latvia with its low birthrate.

In summary, the results of this study can be seen as a contribution within the context of previous studies and expands the understanding of the interaction and bidirectional effect of parents' depression symptoms and infant temperament. The main conclusions of the study are that mothers' depression symptoms predict changes in infants' negative affect at both three and six months of age, and fathers' depression symptoms predict changes in infants' negative affect at the age of six months. And in the other direction – infants' negative affect at the age of three months predicts changes in depression symptoms in mothers and fathers six months after childbirth.

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Mothers' Emotion Regulation Strategies, Depressive Symptoms and Children's Behaviour Problems

Kristīne Vende[1] & Sandra Sebre
University of Latvia

Abstract
The aim of this research was to evaluate the association between mother's emotion regulation strategies, depression symptoms and child's behaviour problems. Participants in this study were 218 mothers with children from 7 to 11 years old. Mothers completed the Child Behaviour Checklist (Achenbach & Rescorla, 2001), Beck Depression Inventory – II (Beck, Steer, & Brown, 1996) and Emotion Regulation Questionnaire (Gross & John, 2003). Results showed positive associations between mother's depression symptoms and mother-reported child's externalizing and internalizing behaviour. Mother's emotion regulation strategy Cognitive Reappraisal ratings were negatively associated with mother's depression symptoms, and negatively associated with child's internalizing and externalizing behaviour. Mother's emotion regulation strategy Expressive Suppression ratings were negatively associated with child's internalizing behaviour. Regression analysis showed maternal depression ratings to be the strongest predictors of child internalizing and externalizing behaviour problems.
Key words: *maternal emotion regulation strategies, maternal depression symptoms, child behaviour problems*

Child behaviour problems are among the more often researched topics in psychology, since behaviour problems early in the child's life can have multiple and serious consequences during adolescence and later in life. Child behaviour problems have been shown to be associated with lower social competence, lower achievement in school, more problematic peer relationships and with greater degrees of self-destructive behaviour (Henricsson & Rydel, 2006). Commonly child behaviour problems are described in terms of internalizing and externalizing behaviour (Achenbach, 1978; Achenbach & Edelbrock, 1979). The child's externalizing behaviour is described as deviant, impulsive and aggressive behaviour with antisocial actions and excessive activity. Externalizing behaviour is an outward expression of emotional experiences which the child is unable to deal with in socially acceptable way (Achenbach, 1978; Achenbach, Craig, & Edelbrock, 1978; Achenbach & Edelbrock, 1979). Internalizing behaviour is described as the child's inner tension directed inward towards him or herself, and is characterized by anxiety/ depression, withdrawal and somatic complains (Achenbach & Rescorla, 2001).

Child externalizing and internalizing problems are influenced by biological and genetically-based factors such as the child's temperament (Phillips et al., 2012) as

[1] Corresponding author Kristīne Vende: *kristine.vende@googlemail.com*

well as by social factors which can facilitate the development of behaviour problems. Social factors which may facilitate the development of behaviour problems include marital conflict, maternal depression, maternal low level of education, parental stress, complicated socioeconomical conditions in the family, and the child being raised by one parent (Papatheodorou, 2005). Another factor which increases the possibility of developing behaviour problems is the experience of violence or abuse, including the parents' use of physical punishment as a disciplining method during the child's early age (Deater-Deckard, Ivy & Petrill, 2006). Parents' physical and sexual abuse of their child leads to the child's violence toward peers (Shields & Cicchetti, 2001). On the other hand, if families receive adequate social support, this can mitigate parental stress and can be protective factor against the development of the child's behaviour problems (Eiden, Edwards, & Leonard, 2007; Stormont, 2002).

Maternal depression has been shown to be associated with the child's general social and emotional development, including the child's behaviour problems (Tarabulsy et al., 2005). Research has shown that maternal depression, in turn, is influenced by various factors, including daily stress, low socioeconomical status, marital problems, employment problems and loss of one' own mother in early childhood or problematic relationships with one's own mother (Elliot, 2007; Gelfand, 1990). Another factor which can influence maternal depression is the mother's ability to regulate her emotions (Gross & John, 2003).

Emotion regulation is defined as the ability to modulate one's emotions in order to successfully adjust to a situation (Gross & John, 2003; Shields & Cicchetti, 1997). The ability to regulate one's emotions has been related to a person's psychological health, physiological health and social relationships (Gross & John, 2003, Gross, 2011). In recent studies of emotion regulation by Gross and colleagues, primary attention has been given to two emotion regulation strategies: cognitive reappraisal and expressive suppression (Gross & John, 2003). Research results have shown that people who use the emotion regulation strategy of cognitive reappraisal in stressful situations assume a more optimistic perspective by interpreting stressful situations in a more positive light and by exerting conscious effort in order to change a bad mood to one more positive, even before negative emotions have escalated. People who use cognitive reappraisal as an emotion regulation strategy more often experience positive emotions and more often express positive emotions. In social relationships they are more able to express their emotions, and therefore they are able to develop more emotionally close relationships with others. In addition, they generally have higher self-esteem and less depressive symptoms (Gross & John, 2003).

On the other hand, particularly in studies with Caucasian American participants, people who more often use expressive suppression as an emotion regulation strategy, also indicate that they experience themselves as less authentic. In stressful situations people who choose this strategy repress their emotions and do not express them outwardly. It is characteristic for people using this emotion regulation strategy to be confused about how they feel. People using expression suppression strategies report that they feel less positive emotions, but feel more negative emotions. This has an impact on their social relationships in that their relationships with other people are less emotionally close. In relation to well – being it is characteristic that they have decreased self-esteem, less

satisfaction with life and more depressive symptoms (Gross & John, 2003). People who used expressive suppression are less able to accept their emotions, less able to improve their mood and are more predisposed to ruminate, to rethink again and again those situations in which they feel uncomfortable. This rumination, in turn, is related to the development of depression and can also facilitate other forms of psychopathology (Aldao, Nolen-Hoeksema & Schweizer, 2010).

However, research shows that the consequences of expression suppression may hold different meanings and have different consequences in relation to emotional well-being within different cultures. For example, bicultural research participants who hold strong Asian-cultural values report that their use of expression suppression is associated with lesser degrees of negative emotion. The authors of this study suggest that cultures differentially encourage emotional responding, and that in Asian cultures emotion-expression suppression is encouraged in order to preserve social relationships (Butler, Lee, & Gross, 2007).

Although there are is much research on factors which facilitate the development of child behaviour problems, to date research about mother's emotion regulation strategies in association with the child's behaviour problems is missing. Previous research indicates that the mother's emotional state is related to child behaviour problems (Tarabulsy et al., 2005), and mother's ability to regulate her emotions is a factor which may influence the development of maternal depression (Gross & John, 2003). However, the association between mother's emotion regulation strategies and the child's behaviour problem, especially in regard to primary school children, has not yet been explored. Moreover, there is scant research about adult emotion regulation strategies as such in Latvia, and there is a need to explore factors association with specific emotion regulation strategies within the Latvian sociocultural context.

The aim of the present study is to examine the associations between mother's emotion regulation strategies, depression symptoms and mother-reported child behaviour problems within the Latvian sociocultural context. The research questions were as follows:

1. What are the relationships between mother's emotion regulation strategies, mother's depression symptoms and mother-reported child's externalizing and internalizing behaviour ratings?
2. To what extent do mother's mother's emotion regulation strategies and mother's depression symptom ratings predict mother-reported child's externalizing and internalizing behaviour ratings?

Method

Participants

Altogether 191 mothers with children from 7 to 11 years old (M = 8.69, SD = 1.37; 44.5 percent boys, 55.5 percent girls) took part in this research. These children did not have any reported developmental difficulties. Within this research participant group 73.4 percent of the children lived together with both parents, 9.6 percent lived with mother and stepfather, 16.5 percent lived with only one of the parent, .5 percent of the

children had another family situation. Regarding employment status, in 72.5 percent cases both of parents were working, in 13.8 percent cases only one parent was working, and in .5 percent cases both parents were unemployed, 11 percent of mothers were raising their children alone and were working at the moment, .5 percent of mothers were raising the child alone and were not working at the moment 1.4 percent had a different employment situation. None of the mothers who participated in the research had only primary education, 3.1 percent of mothers had a secondary school education, 65.6 percent higher education, 18.8 percent unfinished higher education. Children's fathers' education level was 6.3 percent primary education, 6.3 percent secondary school education, 53.1 percent vocational education, 31.1 percent higher education, 3.1 percent unfinished higher education.

Measures

Child Behaviour Checklist (Achenbach & Rescorla, 2001) for the age group of 6 to 18 years was used by mothers to evaluate and report on their child's behavioural difficulties. There are 112 statements which mothers rate 0 ("not true"), 1 ("sometimes true") or 2 ("often true"). The subscales for Aggressive Behaviour (α = .82) and Rule – Breaking Behaviour (α = .61) were used to assess Externalizing Behaviour. The subscales for Anxious/Depressed (α = .77), Withdrawn/Depressed (α = .64) and Somatic Complaints (α = .69) were used to assess Internalizing Behaviour. The Checklist has been adapted in Latvia by S. Sebre and I. Laizāne (Sebre, & Laizāne, 2006), and standardized by a research team at the University of Latvia (Skreitule-Pikše, Raščevska, Sebre, Koļesovs, & Bite, 2013).

Beck Depression Inventory (BDI-II, Beck, Steer, & Brown, 1996) was used for mothers to report on their depression symptoms. The Inventory consists of two subscales: Cognitive- Affective (α= .86) and Somatic- Productive (α= .82). There are 21 statements altogether by which person's emotional and physical states during the past two weeks are measured. The Beck Depression Inventory has been adapted in Latvia by S. Voitkāne and S. Miezīte (Voitkāne & Miezīte, 2001).

*Emotion Regulation Questionnaire (*ERQ, Gross & John, 2003) consists of 10 items and was used in this research for mothers to report on their emotion regulation strategies: cognitive reappraisal, for example, "When I was to feel less negative emotion (such as sadness or anger) I change what I'm thinking about" (α = .79); and expressive suppression, for example, "I control my emotions by not expressing them" (α = .66), was also used in this research. The initial adaptation of this instrument was carried out by Marija Morozova (Morozova, 2011).

Participants of the study also completed a demographic questionnaire, including questions about the child's age, family living arrangements (child lives together with both parents, child lives together with one of parent and stepmother/father; child lives together with one parent, and other family situations), parents' employment (both parents are working; one of the parents is working; none of parents are working; mother is raising the child alone and is working at the moment; mother is raising child alone and is not working at the moment) and their educational level of each parent (primary school; secondary school; vocational school; higher education; unfinished higher education; other).

Procedure

The data were collected in cooperation with Riga primary schools. Teachers handed out the questionnaires in an unsealed envelopes to those mothers whose have children within the age group were 7–11 years old. Participation was voluntary and confidential. Mothers who agreed to participate in the study completed the questionnaires, sealed them in the envelope and returned them to their child's teacher. The sealed envelopes was then collected by the researcher.

Results

Initial correlation coefficients were calculated in order to see if the children's externalizing and internalizing behaviour was correlated with demographic data. The results showed that only the child' externalizing behaviour correlated negatively with child's gender (boys were coded as 0, girls as 1; $r = -.16$; $p < .01$) (see Table 1). In order to specify these differences the Mann -Whitney test was used and it was confirmed that boys had higher mother-reported externalizing behaviour rates than girls ($U = 4817$, $p = .023$).

Table 1. **Descriptive statistics and correlations for child externalizing behaviour problems and demographic data**

	M	*SD*	*Child's age*	*Child's gender*	*Mother's education level*	*Father's education level*
Child's externalizing behaviour	7.48	5.66	–.10	–.16*	.01	.06
Child's internalizing behaviour	7.57	6.48	.03	.09	–.09	–.00

*$p < 0.05$

Correlations were calculated to examine if the child' s externalizing and internalizing behaviour correlated with mother's emotion regulation strategies and depression symptom ratings (see Table 2). The results show that child's externalizing behaviour was positively correlated with mother's depression ratings ($r = .32$; $p < .01$). The results show a tendency for the child's externalizing behaviour to be negatively correlated to the emotion regulation strategy of cognitive reappraisal ($r = -.13$; $p = 0.062$), but in analysing the associations with externalizing behaviour subscales, it is seen that the emotion regulation strategy of cognitive reappraisal correlated negatively with the child's aggressive behaviour ($r = -.15$; $p < .05$). There was a negative correlation between mother's depression ratings and her emotion regulation strategy cognitive reappraisal ($r = -.24$; $p < .01$). The child's internalizing behaviour ratings were also positively correlated with mother's depression symptoms ($r = .49$, $p < .001$). Child's internalizing behaviour was negatively correlated with expressive suppression ($r = -.20$, $p < .01$) and cognitive reappraisal ($r = -.16$, $p < .5$).

Correlation coefficients were also calculated to examine the relationship, if any, between externalizing behaviour subscales aggressive behaviour and rule-braking behaviour and mother's depression ratings. As it was expected, both of the externalizing

behaviour subscales, aggressive behaviour ($r = .29$; $p < .01$) and rule-breaking behaviour ($r = .29$; $p < .05$), correlated positively with mother's depression ratings.

Table 2. **Descriptive statistics and correlations for child behaviour problems, mother's emotion regulation strategies and mother's depression symptoms ($n = 218$)**

	M	*SD*	*Mother's depression symptoms*	*Mother's cognitive reappraisal*	*Mother's expressive suppression*
Child externalizing behaviour	7.48	5.66	.32**	–.13[t]	–.11
Child rule-breaking behaviour	1.90	1.99	.29**	–.07	–.11
Child aggressive behaviour	5.57	4.07	.29**	–.15*	–.10
Child internalizing behaviour	7.57	6.46	.49***	–.16*	–.20**
Child anxious/depressed	3.38	3.21	.43**	–.11*	–.18**
Child withdrawn/ depressed	1.06	1.42	.31**	–.06	–.02
Child somatic complaints	1.69	2.13	.32**	–.19**	–.17**
Mother's depression symptom ratings	7.22	6.97	–	–.24**	–.07
Mother's cognitive reappraisal	5.05	1.07	–.24**	–	.20**
Mother's expressive suppression	3.72	1.19	–.07	.20**	–

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, $t = 0.062$

Results shows that the internalizing behaviour subscales anxiety/depressed behaviour correlated statistically significantly to mother's depression ratings ($r = .43$; $p < .01$) and mother's expressive suppression ($r = –.18$ $p < .01$), but no to mother's cognitive reappraisal.

The internalizing behaviour subscale child's withdrawn/depressed also correlates statistically significantly to mother's depression ratings ($r = .31$; $p < .01$), but not to mother's emotion regulation strategies: cognitive reappraisal and expressive suppression. Finally, the subscale child's somatic complaints also correlated with mother's depression ratings ($r = .32$; $p < .01$) and to mother's emotion regulation strategy cognitive reappraisal ($r = .19$; $p < .05$), but not to mother's emotion regulation strategies: cognitive reappraisal and expressive suppression.

In order to examine which variables predict child externalizing behaviour, all of the demographic variables (child's gender and age, mother's and father's education level), mother depression ratings and mother's emotion regulation strategy ratings were included in a hierarchical multiple regression model. As seen in Table 3, among the demographic variables only child's gender statistically significantly predicted child's externalizing behaviour, explaining 5 percent of child' externalizing behaviour ($F = 2.63$, $p < .01$, $R^2 = .05$). In the second step of the hierarchical multiple regression model mothers' depression ratings and emotion regulation strategies were also included. This regression model explains 12 percent of child's externalizing behaviour ($F = 3.61$,

$p < .01$, $R^2 = .12$). These results indicate that if the child is a boy and the mother has depression symptoms, then the child has a greater likelihood of higher externalizing behaviour ratings.

Table 3. **Hierarchical multiple regression analysis predicting child externalizing behaviour**

	B	*SEB*	*β*
Step 1			
Child's gender	–2.35	.81	–.21**
Child's age	–0.30	.30	–.07
Mother's education level	–0.02	.57	.00
Father's education level	0.50	.40	.09
Step 2			
Child's gender	–2.34	.79	–.20**
Child's age	–0.22	.28	–.05
Mother's education level	0.11	.56	.02
Father's education level	0.44	.40	.08
Mother's depression ratings	0.17	.06	.21**
Cognitive reappraisal	–0.09	.07	–.10
Expressive suppression	–0.06	.08	–.05

**$p < 0.01$

Finally, a hierarchical multiple regression model was used to examine which variables predict the child's internalizing behaviour. As seen in Table 4, the various demographic variables do not create a statistically significant regression model. In the second step of the hierarchical multiple regression model were also included the ratings of mother's emotion regulation strategies and mother depression ratings. This regression model was statistically significant and explained 22 percent of child's internalizing behaviour ($F = 7.34$, $p < .01$, $R^2 = .22$). This implies that if the mother has higher depression ratings and she uses less of the emotion regulation strategy expressive suppression, then there is a greater likelihood of higher internalizing behavior scores for her child.

Table 4. **Hierarchical multiple regression analysis predicting child internalizing behaviour**

	B	*SEB*	*β*
Step 1			
Child's gender	.29	.34	.06
Child's age	.63	.94	.05
Mother's education level	–1.00	.66	–.12
Father's education level	.49	.47	.08
Step 2			
Child's gender	.43	.31	.09
Child's age	.73	.84	.06
Mother's education level	–.81	.60	–.09
Father's education level	.39	.42	.06
Mother's depression ratings	.33	.06	.36**
Cognitive reappraisal	–.09	.07	–.09
Expressive suppression	–.25	.09	–.19**

$p < 0.05$; ** $p < 0.001$

Discussion

In this study externalizing behaviour problems were reported by mothers to be more common for boys than girls, similar to results as shown in other research here in Latvia and other countries (Eiden, Edwards, & Leonard, 2007; Laizāne, 2011; Ļubenko, 2011; Skreitule-Pikše, 2010). In contrast to previous research, the child' externalizing and internalizing behaviour was not found to be correlated with child's age, mother's or father's educational level (Papatheodorou, 2005; Skreitule-Pikše, 2010). The lack of association between behaviour problems and demographic variables may be related to the fact that most of the research participants in this study were living in relatively well-adapted situations, 73.4 percent of the children were living in families with both parents, and in most of these cases both parents had were working (72.5 percent).

Results also showed that the child's externalizing and internalizing behaviour correlated positively with mother's depression ratings. The more detailed data analysis shows that both externalizing behaviour subscales, aggressive behaviour and rule-breaking behaviour, correlate positively with mother's depression ratings. The internalizing behaviour subscales of the child's withdrawn/depressed, anxious/depressed and somatic complains also correlated with mother's depression symptom ratings. This correlation between mother's depression and child behaviour problems has been shown in previous research as well (Jaffe & Poulton, 2006). These results can be explained by understanding that depression impacts negatively not only the mother's ability to be responsive to her child, but it also negatively impacts the child' social and emotional development in general, which then leads to the development of behaviour problems (Tarabulsy et al., 2005). The more that the parent is emotionally responsive to the child and involved with the child emotionally and behaviorally, the less is the possibility that the child will develop externalizing and/or internalizing behaviour problems (Bradley & Corwyn, 2005; Walton & Flouri, 2010). Another explanation of these results could be at least partially due to the so called 'child effect' (which includes child's temperament, development, intellect and social skills), which might, in turn, affect mother's emotional state. The mother-child relationship and parenting in association with child behaviour problems is a bidirectional, two-way process (Jaffe & Poulton, 2006.)

Mother's emotion regulation strategy cognitive reappraisal negatively correlated with the child's internalizing and almost statistically significant to externalizing behaviour problems. The more detailed analysis showed that cognitive reappraisal correlated negatively with the child's aggressive behaviour ratings and with the child's somatic complaints symptoms. This indicates that if the mother uses more cognitive reappraisal there will be less aggressive child behaviour and less child somatic complained behaviour. These results support the theoretical understanding regarding mother's emotion regulation strategy cognitive reappraisal as to how it might relate to greater or lesser degrees of child behaviour problems, since mothers who use cognitive appraisal are in general experiencing more positive emotions and higher levels of psychological well-being, therefore more able to interact positively with their child (Gross & John, 2003). Also, results of this study showed that mothers who use cognitive reappraisal are also less likely to be suffering from symptoms of depression, and therefore are more able to positively interact with their child.

Mother's emotion regulation strategy expressive suppression was negatively predictive of the child's internalizing behaviour ratings. In other words, children model suppression of distress from their mothers and show a minimum of observable anxious and depressive symptoms. Moreover, mothers who deal suppressively with their own discomfort have a higher threshold for perceiving symptom manifestations in their children. These results could possibly be explained by positing that a mother who is unable to control her emotions, one who is unable to "not express" her emotions, may become more volatile and expressive of very negative emotions, which could then create emotional problems for the child. And a more extreme expression of negative emotions could at times result in emotional and/or physical abuse, which has been shown in many previous studies to be associated with child behaviour problems (Deater-Deckard, Ivy, & Petrill, 2006; Papatheodorou, 2005; Shields & Cicchetti, 2001).

Another explanation for the negative association between mother's expressive suppression and her child's internalizing behaviours could be due to sociocultural differences. As previous research has shown, specifically the emotion regulation strategy of expression suppression is differently associated with emotional well-being for individuals holding Western European values in contrast to individuals holding Asian values (Butler, Lee, & Gross, 2007). These authors suggest that in different cultures emotion expression suppression can hold different meanings – and that some cultures may encourage expression suppression, whereas other cultures may consider such suppression as undesirable. Therefore, the issue of the relation between Latvian sociocultural values in relation to emotion-expression and emotion-suppression needs to be addressed in future studies, and it may be that additional items need to be created and added to the *Emotion Regulation Questionnaire* to be more appropriate for the specifics of the Latvian sociocultural context (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross & John, 2003; Ehring, Schnulle, Fisher, Tuschen-Caffier, & Gross, 2010).

The main limitation of this research is that it is cross-sectional and based only upon mother's report. It would be valuable in the future to examine the relationships between mother's emotion regulation strategies, mother's depression and child behaviour problems in a longitudinal study and with the use of reports from multiple sources, such as teacher's reports of child behaviour. Also, it would be valuable to look at mother's emotion regulation strategies in relation to her child's emotion regulation strategies.

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Behavioral Characteristics of Speech Emotional Prosody Perception and Emotional Intelligence Measures in Listeners of Different Ages

Elena Dmitrieva[1]
Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St-Petersburg, Russia

Victor Gelman
North-West State Medical University, St-Petersburg, Russia

Abstract
The present study is a combined psychoacoustic and psychometric investigation of emotional intelligence observed in adult listeners of different ages (20–79 years old). This study examined the relationships of the data on the assessment of emotional intelligence as obtained by self-report (EmIn questionnaire) with parameters of speech emotional prosody perception obtained by a behavioral (psychoacoustic) technique. The results of correlation analysis showed an average and moderate relationship between behavioral parameters of perception of speech emotional intonation and ratings of the emotional intelligence components. The strongest direct correlations were observed between the behavioral parameters of emotional intonation recognition and the scale "Emotion Perception" from the questionnaire. Results of the experimental study provide some evidence for the validity of the self-report EmIn questionnaire.

***Key words*:** *emotional intelligence, speech emotional prosody perception, behavioral parameters, self-report test*

Introduction

Research contributions of the last century interpret environment not only as physical space but a behavioral medium as well. Acoustic conditions such as noise background and speech communication are significant for a person's adjustment to the environment in this behavioral medium. It is also very important to note that cerebral mechanisms involved in speech production and perception in the process of speech communication deal with the processing of two interacting levels of information – emotional and semantic. No one argues today that when studying mechanisms of a working brain one should consider the emotional intelligence (EI) of the person in question. Emotional intelligence is a relatively new area of psychological research although Vygotsky already many years ago, in 1930-ties, underlined the necessity of the complex study of intellect and affect (Vygotsky, 1934/1960). The research literature on emotional intelligence is now quite manifold and includes various theoretical models and ways of measurement

[1] Corresponding author Elena Dmitrieva: *dmit49@mail.ru*

of emotional intelligence. The founders of the ability model have included in their EI model "…the abilities to accurately perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth" (Mayer & Salovey, 1997). Emotional intelligence has been assessed by objective tests consisting of tasks similar to traditional intelligence tests (Mayer, Caruso, & Salovey, 1999). On the other hand, the abilities which provide perception, understanding and the expression of emotions are among the topics of the intensively developing neuroscience research.

Human emotion may be communicated by verbal and nonverbal cues. Among the nonverbal cues are facial expressions, body language, speech affective prosody (or speech emotional intonation). There are well-developed methods which measure the physiological and behavioral characteristics of recognition of emotions of various stimuli (Bachorowski & Owren, 2003; Ekman, 1982; Ethofer, et al., 2006; Izard, 1977; Juslin & Scherer, 2005; Morozov, 1977; Pittam & Scherer, 1993). Researchers have extensively examined the visual recognition of emotions; less frequently they have used auditory stimuli (voices, musical passages) in experimental research of emotion perception in humans. The fact that the emotional intonation of a communication turn may disregard, cancel or even invert its linguistic content underlines the importance of investigation of mechanisms of speech emotional intonation perception. The identification of emotional intonation of speech by listeners corresponds to the "perception branch" of the ability model of emotional intelligence (Mayer, Salovey, & Caruso, 2002).

The other EI models – mixed models (Bar-On, 1999; Goleman, 1995) – include also self-awareness, motivation, social skills and empathy (Goleman, 1995), a combination of cognitive and non-cognitive factors: adaptation, stress management and general mood (Bar-On, 1999). The surveys and questionnaires which rely on self-report are among the tools of EI measurement in these models.

An analysis of the studies of procedures which represent approaches to EI measurement in both of these models does not provide unequivocal data on the correlation between EI indicators obtained in these studies (Roberts, Matthews, Zeidner, & Lyusin, 2004). It seems justified to investigate the relationship between the results of self-report tests and behavioral measures of emotional intonation perception that corresponds to the "perception branch" of an ability test.

The most representative of the self-report tests used in Russia for EI measurement is the EmIn questionnaire (Lyusin, 2009). Interpretation of EI as the ability to understand and manage one's own and others' emotions served as the basis for developing this questionnaire (Lyusin, 2009).

We assumed that the relationships between the accuracy and time of emotional prosody recognition and EI components of the test's "perception branch" would be the strongest ones. In addition, earlier we have shown that the cerebral mechanisms of emotional intonation perception with background noise have some peculiarities as compared to the perception under noiseless conditions (Dmitrieva, 1997; Dmitrieva & Gelman, 2011; Dmitrieva, Gelman, Zaitseva, & Orlov, 2013; Dmitrieva, Zaĭtseva, & Gel'man, 1999; Zaĭtseva, Dmitrieva, & Miroshnikov, 1995). We thought it

would be interesting to look into the relationship of the emotional intelligence measures and characteristics of emotional intonation recognition under these two conditions, thus testing the general nature of the EI measures.

Methods

Participants

The population under investigation included 44 adults, ranging from 20- to 79-years old. The sample consisted of four age groups: 20- to 35-year-olds (11 listeners, mean age = 27.54, *SE* = .97), 36- to 50-year-olds (11 listeners, mean age = 44.2, *SE* = 1.39), 51- to 65-year-olds (12 listeners, mean age = 55.5, *SE* = .59) and older than 65 (10 listeners, mean age = 71.7, *SE* = 1.35). The numbers of men and women in the groups were similar. The participants were native Russian speakers; they had either completed higher education or were university students; they were mostly of middle socio-economic status, living in an urban context. The participants were screened for normal hearing and handedness. The selection criteria for listeners were the following: (1) they had normal hearing in both ears; and (2) they were right-handed according to the brief Oldfield Handedness Inventory (Oldfield, 1971). The participants volunteered to take part in the experiment, and all of them completed the study battery in full.

Procedures

To conduct the study a procedure was developed which provides a comparison of the cognitive components of emotional intelligence with data on the behavioral measures of the emotional prosody perception of speech signals of different emotional intonations (positive, negative, neutral). Psychometric data on emotional intelligence components were obtained by the EmIn test – the questionnaire assessing "intrapersonal" and "interpersonal" emotional intelligence (Lyusin, 2009).

Psychophysical procedures

Psychophysical procedures (Morozov, 1977; Scherer, 1991; Simonov, 1967) which study the ability to recognize emotional prosody in speech signals were applied to assess the behavioral parameters of emotional intonation perception. A test program evaluating the response of the subject to the stimuli with different emotional valences was used (Dmitrieva, Gel'man, & Zaĭtseva, 2000; Gelman, Dmitrieva, & Nemirovskaia, 1998).

Speech material

The test is based on a specially created corpus of speech signals, differing in their emotional prosody (Dmitrieva, Gelman, Zaĭtseva & Orlov, 2009). We applied the method of simulated emotional intonations in the same speech utterance in order to prepare this corpus (Juslin & Scherer, 2005; Morozov, 1977; Scherer, Banse, Wallbott, & Goldbeck, 1991; Sidorova, 1978).

Twelve adult speakers aged 20–70 years old (six men, six women) took part in composing this speech corpus. The group included both professional dramatic actors from St. Petersburg theaters and non-actors. We did not find significant differences

between the main acoustic parameters of vocal expressions of emotions simulated by actors and non-actors (Dmitrieva et al., 2009). Russian was the native language of all speakers; they had either completed higher education or were university students.

The spoken material consisted of three simple declarative sentences which contained common words consisting of eight syllables on average. They had neutral emotional content, and the speakers articulated them with three different emotional intonations (joy, anger, unemotionally). Each speaker pronounced the utterances three times. Utterances were recorded on a computer disk using a Sennheiser HMD 280 PRO headset microphone (Sennheiser electronic GmbH & CO KG, Germany) and the WaveSurfer 1.8.5 program (Centre for Speech Technology, Royal Institute of Technology, Sweden). Recordings were stored as ".wav" files with a sampling frequency of 32 kHz and resolution of 16 bits.

We selected the best speakers, phrases, and performances with the best display of the required emotional intonation during a special study. A panel of 10 judges (listeners) performed control experiments recognizing the target emotions in the collection. The judges were presented with utterances from the collection at random, and their task was to evaluate (on a five-point scale) the presence of each of the three intonations (anger, neutral, joy). We used statistical analysis of points assessments (weighted means) to determine the level of correspondence of the perceived emotion to the spoken emotion. This led to the selection of two phrases, four best speakers (two men and two women), and the best trial of each speaker for each emotion. The selected phrases provided the best displays of the required emotional intonation on the basis of the experts' evaluation.

Test program and procedure for emotional intonation recognition

The selected performances of the phrases were used to develop a test computer program to assess subjects' responses to the selected speech signals. Test stimuli were prepared by using the sound file processing programs Cool and WaveSurfer. Utterances were equalized on power and mixed with white noise, providing the signal / noise ratio 12dB. All the test stimuli were presented using an experimental setup (notebook Toshiba Sat.P300-20B T6400, headphones of the Sennheiser HMD 280 PRO headset, response console) and software developed for previous studies (Gelman et al., 1998) which controlled the stimulus presentation and recorded responses and response time (see Figure 1). Test stimuli were presented at random through the headphones binaurally. We conducted the comparison of emotional intonation recognition at different acoustic background conditions (noiseless and noisy). Each listener was presented at random with 48 test stimuli (4 speakers × 2 phrases × 3 emotional tones × 2 signal / noise ratios). Subjects pressed one of the three keys on the console of the experimental setup (see Figure 1).

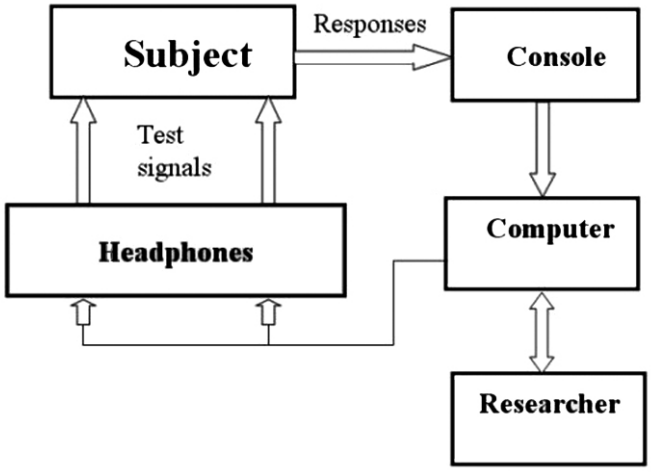


Figure 1. **Flow block diagram of the set-up for the emotional prosody perception task**

The behavioral features of the emotional prosody perception were assessed by comparing: the accuracy of recognition (AR) and time of reaction (RT).

Self-report procedure

The same listeners completed the questionnaire (EmIn test) assessing "intrapersonal" and "interpersonal" emotional intelligence (Lyusin, 2009). This questionnaire has been the most representative of the techniques used in Russia. Interpretation of EI as the ability to understand and manage their own and others' emotions was the basis for the development of this questionnaire (Lyusin, 2009). The ability to understand and manage emotions applies to both their own emotions as well as the emotions of other people. For this reason the authors consider both intrapersonal and interpersonal EI. These two options involve actualization of the various cognitive processes and skills which presumably must be connected to each other. Thus, the intersection of a priori "dimensions" of the structure of EI results in four components of EI (see Table 1).

Table 1. **Structure of emotional intelligence constructs which served as a basis for development of the EmIn questionnaire (Lyusin, 2009)**

General EI Score	*Interpersonal EI*	*Intrapersonal EI*
Emotion Perception	Perception of Others' Emotions	Perception of One's Own Emotions
Emotion Management	Management of Others' Emotions	Management of One's Own Emotions

The final EmIn questionnaire version consists of 46 statements which the subject has to evaluate and rate on a 4-point scale ("I disagree", "I tend not to agree", "I tend to agree", "I agree"). These statements are grouped into five subscales in addition to the four general scales (intrapersonal and interpersonal emotional intelligence, the ability to perceive and to manage emotions) (see Table 2).

Table 2. **Scales and subscales of emotional intelligence of the EmIn questionnaire (Lyusin, 2009)**

Scale, subscale	*Abbreviation*	*Scale's structure*
Interpersonal Emotional Intelligence	IrEI	POE + MOE
Intrapersonal Emotional Intelligence	IaEI	POOE + MOOE + CEEO
Emotion Perception	EP	POE + POOE
Emotion Management	EM	MOE + MOOE + CEEO
Perception of Others' Emotions	POE	
Management of Others' Emotions	MOE	
Perception of One's Own Emotions	POOE	
Management of One's Own Emotions	MOOE	
Control of One's Own Emotional Expression	CEEO	

The subscales are as follows:

- Perception of Others' Emotions Subscale (POE). The ability to understand the emotional state of a person on the basis of external manifestations of emotions (facial expressions, gestures, voice sound) and / or intuitively; sensitivity to the internal states of others.
- Management of Others' Emotions Subscale (MOE). The ability to cause other people to feel one or another emotion, and to reduce the intensity of unwanted emotions. Perhaps the tendency to manipulate others.
- Perception of One' Own Emotions Subscale (POOE). The ability to perceive one's own emotions: their identification, understanding the causes, the ability to describe them verbally.
- Management of One' Own Emotions Subscale (MOOE). The ability and the need to manage the emotions of oneself, to induce and maintain the desired emotions and to control the unwanted emotions.
- Control of One's Own Emotional Expression Subscale (CEEO). The ability to control the external manifestations of the emotions of oneself.

The internal reliability of the main scales ranged from Cronbach's α = .75 to α = .79, for the subscales – Cronbach's α at about .70 (Lyusin, 2009).

Some examples of the entries of the EmIn questionnaire:

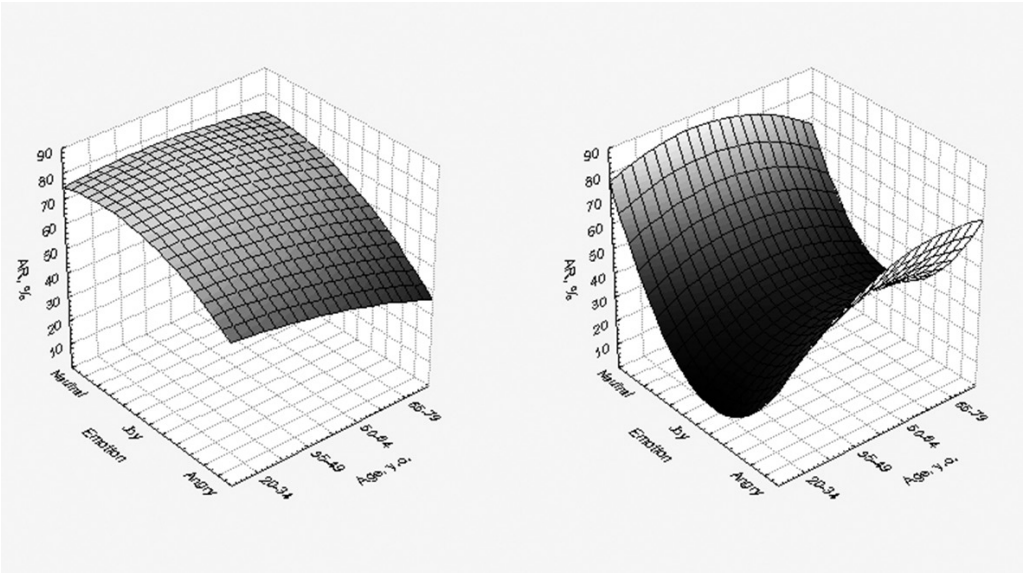
3. Мне легко догадаться о чувствах человека по выражению его лица (I can easily imagine the feelings of a man by the expression on his face).
6. Когда я раздражаюсь, то не могу сдержаться, и говорю все, что думаю (When I get irritated, I can not hold back, and I say what I think)
9. Я умею улучшить настроение окружающих (I know how to improve the mood of the people around me)
14. Когда я злюсь, я знаю, почему (When I am angry, I know why)
39. По интонациям моего голоса легко догадаться о том, что я чувствую (It is easy to guess what I feel by the tone of my voice).

Data analysis

Data analysis was conducted using the statistical package SPSS. Analysis assessed the main statistical properties of the study parameters. The effect of various experimental factors on the accuracy and time of recognition of emotions was determined by analysis of variance (RM ANOVA), and the significance of pairwise differences was verified by t-test. Correlation analysis was carried out to reveal the relationships between emotional intelligence components and behavioral characteristics of speech emotional prosody perception.

Results and Discussion

The ANOVA exploring the effect of various experimental factors on the accuracy and response time for recognition of emotions allowed us to compare the behavioral measures of emotional intonation perception obtained in the present study and the results of our previous studies. The current results indicate that the factors "type of emotion", "gender" and "age" and the interactions of factors "signal to noise ratio (S/N)"*"type of emotion", "S/N"*"age" influence significantly ($p < .01$) the values of AR and RT. The results are congruent with those obtained in the previous papers (Dmitrieva & Gelman, 2011; Dmitrieva et al., 2000, 2013).



Figures 2A and 2B. **Changes in the accuracy of recognition of different emotional intonations: (2A) – at noiseless conditions, (2B) – at noise background.**

Perception of the emotional intonation of the stimulus depended on the conditions of the acoustic environment. In the noiseless background condition the accuracy of response (AR) of the emotion perception remained approximately at the same level for participants in all age groups except for the participants in the eldest group; for listeners in the 65–79 year old age group the AR was lower than for the other age groups (see

Figure 2A). The findings indicate (see Figure 2A and 2B) that regardless of the signal's neutral semantic content the accuracy of recognition of positive emotional intonation ("joy") decreased the most strongly in the noise condition in comparison to the other emotional intonations for listeners of all ages. The recognition accuracy of the emotional intonation "anger" did not change for the eldest listeners (65–79 years old) in the noise condition.

Emotion recognition response time (RT) was dependent upon the age and gender of the listeners (see Figure 3) regardless of the positive or negative emotional intonation, and the acoustic background (noiseless/noise) did not significantly affect the value of RT ($p > .05$). The response time was generally lower for females than for males. Figure 3 shows that males in the age group of 35–49 years old have the lowest RT, while the RT of females younger than 65 years is practically the same. In the eldest age group (age > 65 years) the lowest RT was observed. We obtained similar results in our previous study, but for a different sample (Dmitrieva et al., 2013).

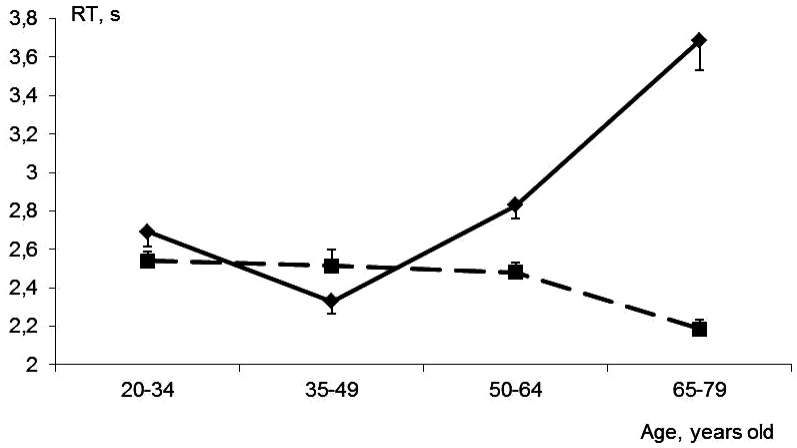


Figure 3. **Differences in the response time (RT) for recognition of emotional intonations by listeners of different genders (solid line – males, dotted line – females) and from different age groups**

The results of the EmIn self-report questionnaire show that the mean values for males were higher on almost all scales (except the scale "Interpersonal emotional intelligence" and the subscale "Management of Others' Emotions") (see Table 3). These results coincide closely with the values obtained by Lyusin (Lyusin, 2009) for experimental material substantially more extensive than the material of this study. Due to the smaller sample size of this study there are some discrepancies (the difference between emotional intelligence scores between males and females in the present study is significant only for the scale of "Emotion Perception").

Table 3. **Listeners' results according EmIn questionnaire**

Scale, subscale	*Male*		*Female*	
	Mean	*SE*	*Mean*	*SE*
Interpersonal EI	37.71	2.63	39.18	1.73
Intrapersonal EI	46.29	2.87	39.27	3.48
Emotion Perception	44.01	2.23	38.91	2.50
Emotion Management	40.03	4.54	39.55	2.46
Perception of Others' Emotions	22.29	1.58	21.82	1.10
Management of Others' Emotions	15.43	1.81	17.36	.70
Perception of One's Own Emotions	21.71	1.06	17.09	1.55
Management of One's Own Emotions	13.29	2.20	12.09	1.10
Control of One's Own Emotional Expression	11.29	.99	10.09	1.21

To test the supposition that there are relationships between accuracy and time of emotional prosody recognition and EI components of EmIn questionnaire the correlation analysis was carried out. We used Pearson's correlation coefficients to examine the relationships between AR, RT, age of the listeners and EI measures obtained according to self-report on the EmIn questionnaire (see Table 4). Significant relationships were found between age and the EmIn questionnaire scale and subscale ratings: "Management of One's Own Emotions" ($r = -.42$, $p < .05$), "Emotion Management" ($r = -.39$, $p < .05$), and "Intrapersonal EI" ($r = -.36$, $p < .05$). The relationships found were negative, i.e., the older the respondents, the lower were the self-reported ratings on the EI.

Table 4. **Correlation coefficients between self-reported ratings on the EmIn questionnaire and emotional recognition parameters on the emotional prosody perception task**

	IrEI	*IaEI*	*EP*	*EM*	*POE*	*MOE*	*POOE*	*MOOE*	*CEEO*
AR, %	.15	.15	.34	–.01	.34	–.10	.28	–.15	.27
RT, s	.14	.15	.47*	–.12	.40*	–.19	.43*	–.11	.00
AR noiseless conditions, %	.30	.35*	.52*	.16	.46*	.04	.48*	.05	.31
RT noiseless conditions, s	.07	.11	.39*	–.15	.32	–.23	.37*	–.11	–.04
AR under noise, %	–.06	–.11	.04	–.19	.12	–.23	–.02	–.35*	.15
RT under noise, s	.20	.17	.52*	–.10	.46*	–.15	.46*	–.11	.03
Age	–.14	–.36*	–.12	–.39*	–.01	–.23	–.18	–.42*	–.28

Notes. * $p < .05$; AR – accuracy of response; RT – response time; IrEI – Interpersonal Emotional Intelligence; IaEI – Intrapersonal Emotional Intelligence; EP – Emotion Perception; EM – Emotion Management; POE- – Perception of Others' Emotions; MOE – Management of Others' Emotions; POOE – Perception of One's Own Emotions; MOOE – Management of One's Own Emotions; CEEO – Control of One's Own Emotional Expression

The strongest correlation was between accuracy of recognition (AR) in the noiseless condition for the psychoacoustic test and ratings on the "Emotion Perception" scale of the EI questionnaire ($r = .52$, $p < .05$), which indicates that the greater the accuracy of emotion recognition in the psychoacoustic test the higher is the self-reported emotion perception according to the EmIn questionnaire. A significant associations ($r = .48$, $p < .05$) were observed between AR and "Perception of One's Own Emotions", as well as between AR and "Perception of Others' Emotions" ($r = .46$, $p < .05$). These values are significantly higher than the correlations previously found between the results of performance-based testing (MEIS, MSCEIT) and the EI self-report of "Emotion Perception" ($r = .20$) (MacCann, Matthews, Zeidner, & Roberts, 2003).

The values of accuracy of recognition obtained under the noise condition showed significant correlations between AR and "Management of One's Own Emotions" ($r = -.35$, $p < .05$). The relationship is inverse, that is, the better the listener detects acoustically expressed emotion in the noise condition, the lower he reports the management of others' emotions, and vice versa.

Correlations between RT and ratings of the scales and subscales of the EmIn questionnaire were found as well. Significant associations in the noiseless conditions were found between RT and "Emotion Perception" and "Perception of One's Own Emotions" ($r = .39$, $p < .05$; and $r = .37$, $p < .05$, respectively), which are similar to the correlations obtained for the accuracy of recognition. The strongest relationships of response time of emotions' recognition with the noise background with EI test measures are similar to those under noiseless conditions: between RT and "Emotion Perception", "Perception of One's Own Emotions", "Perception of Others' Emotions" ($r = .52$, $p < .05$, $r = .46$, $p < .05$, $r = .46$, $p < .05$, respectively). The relationships are positive that is, the better understanding of emotions that the listeners self-report on the EmIn questionnaire, the more time they spend for the recognition of emotional intonations in the noise condition.

In conclusion, the present study examined the relationship between the self-reported ratings of the components of emotional intelligence and behavioral parameters of speech emotional prosody perception in a combined psychoacoustic and psychometric research study. We found individual changes in emotional speech prosody perception in association with the valence of emotional intonation regardless of the stimuli neutral semantic content, thereby confirming the results of our previous studies. The comparison of the behavioral parameters of perception of speech emotional intonation under different conditions of acoustic (noise) environment with components of emotional intelligence, as measured by EmIn questionnaire, revealed certain, though moderate relationship between them. The results obtained in the present study confirmed the hypothesis that the relationships between accuracy and response time of emotional prosody recognition and EI components of questionnaire's "perception branch" would be the strongest ones. On the other hand, we have found the correlation between the EI components and only the one of the behavioral characteristics – time of reaction- to be independent of the noise background. Though the study has its limitations (the age-restricted and small sample size), its results provide some evidence for the validity of the self-report EmIn questionnaire. In future research we intend

to overcome these limitations and to study in more detail the relationship between cognitive and behavioral aspects of emotional intelligence.

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Assessing Originality with the Test for Creative Thinking–Drawing Production

Emīls Kālis[1], **Aleksejs Vorobjovs**
Daugavpils University

Līga Roķe
University of Latvia

Abstract
Assessment of originality using individuals' responses to visual stimuli is a component of many tests of creativity. Most often these tests employ a certain cut-off value in order to distinguish stereotypical responses from original ones. Although in the literature there are some indications of the recommended cut-off value for the Torrance Tests of Creative Thinking, no information is provided for the Test for Creative Thinking–Drawing Production (TCT-DP). This study used various criteria and employed different approaches to solve this and other problems related to the assessment of originality with visual stimuli. The analysis was done using four different age samples: pre-school (n = 463), fifth grade (n = 308), ninth grade (n = 381) and students (n = 684). The results show that stereotypic responses to visual stimuli differ across cultures: the list of stereotypical responses in the Latvian sample illustrates some deviation from the list in the TCT-DP manual. Therefore, selection of culture-specific stereotypic responses is recommended whenever the test is being adapted in other cultures. The results from this study indicated that the cut-off value of 2% could be applied in the selection of stereotypic responses using the TCT-DP. It was also found that any abstract drawing made from the stimuli should be treated as stereotypical. Based on these findings we proposed an alternative measurement model of originality which shows good model fit and measurement invariance across gender and age groups, hence, being useful for studies particularly interested in specific aspects of originality. Within this model no gender differences were found in regard to originality, while a statistically significant increase in originality scores was observed up until the ninth grade. In this paper we discuss theoretical and practical issues about the measurement of originality using the TCT-DP.
Keywords: *psychometrics, originality, unconventionality, measurement model, gender differences, age differences.*

Introduction

Originality is an essential aspect of creativity (Runco, 2009) and it usually refers to statistical rarity (Kaufman, Plucker & Baer, 2008). Sometimes creativity is associated solely with originality although a scientific perspective highlights at least two important aspects of creativity – originality and appropriateness (Plucker, Beghetto, & Dow, 2004; Sternberg & Lubart, 1999). Moreover, originality without appropriateness is difficult

[1] Corresponding author Emīls Kālis: *emils.kalis@gmail.com*

to attribute to creativity (Runco, 2004). However, in research there is a necessity to measure these aspects of creativity separately as it is the way in which theories can be verified. In the field of creativity research there have been many attempts to measure originality. One frequent approach used to assess originality is to present the test taker with visual stimuli (usually basic or curved lines) and to ask him or her to make an original drawing from it. Such an approach derives from principles stated by Guilford (Guilford, 1956) and is still encountered in popular instruments which are used for the assessment of creative potential (Torrance, 2007; Goff & Torrance, 2002; Williams, 1980; Urban & Jellen, 2010). The measurement of originality refers to a creative product based upon the "4P's" perspective as identified by Rhodes (1961): Person, Process, Press and Product. Usually the test taker is invited to create mini products which can be afterwards assessed regarding originality. If a person creates many original products in following the instructions of the test, we can say that he or she has high creative potential (for detailed explanation of this term see Lubart, Zenasni, & Barbot (2013) and Runco (2007)), and it is very likely that in a real-life situation the same person will also be capable of creating something original.

Many practical and theoretical issues about the assessment of originality arise from the scoring and administration instructions of the specific test. Instruments including divergent thinking tasks often are criticized for the measure of originality being confounded with fluency (Hocevar, 1979; Silvia et al., 2008) or that minor variations in the administration instruction may influence task performance (Kaufman, Plucker, & Baer, 2008; Runco & Okuda, 1991). Analogous problems can be found in regard to any instrument. When a researcher tries to investigate the relationships between various constructs which are supposed to measure creative potential within a particular test, he or she is confronted with the frame of the test whose borders are determined by theoretical assumptions and practical convenience. For example, if a researcher is interested in examining the relationship between originality and fluency, he or she should first deal with the problem of inter-dependence of these variables, then with reliability and finally with validity. It means that in most cases we cannot use constructs (i.e., subscales) measured by such a test in a straight-forward manner to justify the scoring and actual relationships of these constructs. To do so we must go beyond the frame of the test and improve the measure of the specific construct by enhancing its psychometric properties. When we have precise and detailed information about the measure of the specific construct, then it is easier to justify its position and role within the test.

Similarly, the Test for Creative Thinking–Drawing Production (TCT-DP; Urban & Jellen, 2010) also incorporates a criterion (Unconventionality D) associated with originality which according to the scoring instructions is confounded with other criteria of the test (Kālis, Roķe, & Krūmiņa, 2014). In order to use this criterion as a measure of originality or reveal its relatedness to other criteria, it should be scored in a more sophisticated manner. However, before we apply some alternative scoring approaches there are some questions which should be answered. For example, the TCT-DP is defined as being culture fair (Urban, 2004) and empirical evidence for this has been found (Togrol, 2012; Kālis, Roķe, & Krūmiņa, 2014). Nevertheless, the question, "Are stereotypical responses similar among all cultures?" still needs to be clarified. There are a

number of studies pointing to differences in the perception and interpretation of stimuli in different cultures (Bruner, 1957; Segall, Campbell, & Herskovits, 1963; Kastanakis & Voyer, 2014). Thus we propose that when the test is adapted to other cultures, the list of stereotypical responses should be reassessed as well (Kim, 2009). If stereotypical responses differ from the original list, then the researcher should make corresponding adjustments to the list.

Another issue is related to the scoring of originality. Often originality is defined as statistical rarity (Runco, 1999), and therefore it is necessary to use the most appropriate cut-off value to identify stereotypical responses. In most creativity tests responses are considered stereotypical if are encountered in 5 to 10 percent of the cases (Kaufman, Plucker, & Baer, 2008; Milgram & Milgram, 1976; Plucker, Runco, & Lim, 2006;), but to our knowledge no empirical studies are available which provide evidence about the most appropriate cut-off value. In the TCT-DP manual no information is included about the cut-off value for stereotypical responses in situations when the test is adapted within other cultures. In addition, the TCT-DP manual does not provide any information about how to evaluate stereotypic responses if a drawing is made in an abstract way. A further issue is about penalty points which are given if the stimulus is used but is not elaborated (completed). The above mentioned problems served to define the following research questions which were aimed to improve and reveal important aspects of the scoring of the criteria, but also to find a way in which to obtain a reliable and valid measure of originality in using this test:

(1) What is the most appropriate cut-off value for identification of stereotypical responses? (2) Should selection of stereotypical responses be done based on responses of a specific age group? (3) Is it reasonable to give a penalty point for responses regardless of originality if the drawing is not completed (in sense of elaboration)? (4) Should abstract or obscure responses such as abstract line/figure or geometric shapes be considered as original? (5) Should we control for meaningfulness if we give a penalty point for an abstract response? (6) Do stereotypic responses differ across cultures? (7) Has the categorical variable approach better psychometric properties than a dichotomous variable approach using stimuli of the TCT-DP for assessing originality?

Method

Participants

The study used data obtained from four different age samples: a preschool sample (n = 463, females = 217), a fifth grade sample (n = 308, females = 156), a ninth grade sample (n = 381, females = 207) and an undergraduate student sample (n = 684, females = 491).

Measures

Test for Creative Thinking–Drawing Production (TCT-DP)

The TCT-DP was developed by Urban & Jellen (2010) as an integrative measure of creative potential. It has good psychometric properties and its popularity is growing

across many countries (Urban, 2004). The test consists of two forms, each having a sheet with 6 visual stimuli (semicircle, dot, corner, curve, dashed line and a square with one side open) within a frame, and upon the basis of stimuli the test taker is asked to make a drawing. Each drawing is rated by the researchers according to 14 criteria which address various creative behaviours made by the test taker while making the drawing: continuations (*1Cn*), completion (*2Cm*), new Elements (*3Ne*), connections made with a line (*4Cl*), connections made to produce a theme (*5Cth*), boundary breaking that is fragment dependent (*6Bfd*), boundary breaking that is fragment independent (*7Bfi*), perspective (*8Pe*), humour and affectivity (*9Hu*), speed (*14Sp*), and four criteria of unconventionality (Unconventionality A (*10Uca*) – Unconventionality D (*13Ucd*). The total score of the TCT-DP is obtained by summing the ratings of the 14 criteria. Recently, an adaptation study of the TCT-DP was made in Latvia evaluating the psychometric properties of the test and providing evidence about its culture fairness (Kālis, Roķe & Krūmiņa, 2014). In the current study the total score of the TCT-DP was obtained by summing the ratings on all of the criteria except the criterion of originality (Unconventionality D), and criteria which are confounded with the criterion of originality (Continuations and Completions).

Factor of originality/ unconventionality

Although there are no convincing findings on the structure of the TCT-DP as of yet (Kālis, Roķe & Krūmiņa, 2014; 2013), the structure of the TCT-DP could at the very least be described as having two factors – adaptiveness and originality (Lubart, Pacteau, Jacquet & Caroff, 2010). The Originality factor includes the following criteria: *1Cn*, *2Cm*, *6Bfd*, *7Bfi* and the sum of the criteria of unconventionality. In the present study the two factors from the two-factor solution hold the same general meaning as the factors in the study by Lubart and colleagues, but the factors differ in content because the interdependencies between the indicators have been controlled (Kālis, Roķe & Krūmiņa, 2014). Based on the results of a factor analysis (Kālis, Vorobjovs, Roķe & Krūmiņa, 2015), one of the measures of validity for the current study was defined as the sum of all criteria belonging to the factor of originality / unconventionality (*6Bfd*, *7Bfi*, *10Uca*, *11Ucb*, *12Ucc*, *13Ucd*) except for the criterion Unconventionality D (*13Ucd*), because it is being explored as a separate variable in this study.

Scoring of Unconventionality D (13Ucd)

Although the test taker is presented with six stimuli, the analysis of original responses, in contrast to stereotypical responses, is made upon the basis of five of the six stimuli (the semicircle, dot, corner, curve, dashed line and a square with one side open). The sixth stimlulus has a different functional meaning – it is placed out of the frame and serves to assess the individual's mental risk taking. The manual provides a list of stereotypical responses for each stimulus. For example, if the test taker draws a sun from the stimulus shaped as semicircle, then he or she receives one penalty point because the sun is on the list of stereotypical responses for this stimulus. According to the scoring guidelines, the test taker receives one minus point which is subtracted from 3 if his or her response to the stimulus is on the list. If three or more of the five stimuli are used in a stereotypical way then the test taker receives 0 points for the criterion Unconventionality

D. A penalty point is given also for each stimulus which was not used and also for a stimulus which was used but the drawing was not completed (elaborated). In the current study the scoring of originality refers to the scoring of this criterion but in a modified way in order to answer the research questions (see section *Strategy for analysis*).

Scale of Unconventionality

A Scale of Unconventionality from a recently developed questionnaire was used (Kālis & Vorobjovs, 2013). The scale contains 10 items which are assessed on a 5-point Likert scale. The questionnaire and the particular scale have shown good evidence of convergent validity – they have approximately .50 correlations with the Biographical Inventory of Creative Behaviours (Batey, 2007) and all of the dimensions of the Kaufman Domains of Creativity Scale (Kaufman, 2012). The Scale of Unconventionality has shown a positive and significant correlation (r = .30) with the factor of originality of the TCT-DP and significant but lower correlation (r = .15) with the factor of adaptiveness.

Creative Perception Test

The Creative Perception Test (CPT) is being developed to measure the cognitive component of creative potential, namely, flexibility in perception (Kālis & Vorobjovs, 2015). The basis of the test is a drawing consisting of many chaotic lines containing contours of schematic objects such as a fork, butterfly, envelope etc. The test taker is asked to find as many hidden objects in the given drawing as possible within 5 minutes and to write them down. The main idea of the CPT is that individuals who are more flexible in their perception will be more successful in finding objects because they are able to view one and the same line as a part of multiple objects. Although the test is still in the process of construction, the results of a preliminary study show good convergent validity. The CPT has medium correlation (r = .57) with the Remote Association Test (Mednick, 1968; Kālis & Perepjolkina, 2013) and a somewhat higher correlation (r = .63) with the Test for Creative Thinking–Drawing Production (Kālis, Vorobjovs, Roķe, & Krūmiņa, 2015). At the same time it is important to note that the correlation between the Remote Association Test and TCT-DP total score was not significant in the Latvian sample (Kālis & Perepjolkina, 2013).

Procedure

Collection of data

For all of the research participants the Test for Creative Thinking–Drawing Production was administrated as the first instrument. The Scale of Unconventionality was administrated to the undergraduate students (n = 195), while the Creative Perception Test was administrated to the fifth grade pupils (n = 101) after they completed TCT-DP.

The preschool children, fifth and ninth grade pupils received both forms of the TCT-DP while the undergraduate students received only form A. In the fifth and ninth grades the second form was administrated immediately after the first form was finished, following the instructions recommended in the manual (Urban & Jellen, 2010). For the preschool children the administration of both forms was adapted to the specific bio-psychological characteristics of that age – after the administration of the first form the

researchers offered the children to play a short game in order to provide them with physical activity and emotional support. After the playing of the game the test form B was administered.

All of the completed test forms from all of the samples except for the fifth grade sample were evaluated by three judges who were experts in the evaluation of the TCT-DP responses. The 5th grade sample was evaluated only by one of the judges. As these judges have shown very high interrater reliability for the total score and also for separate criteria (Kālis, Roķe, & Krūmiņa, 2014), we assumed that using the evaluation of responses by only one judge was reliable in regard to the previously found high interrater reliability. In order to retain the same metric across all of the samples in this study, evaluation ratings were used only from one judge who had participated in the rating of all of the samples.

Recording of responses to the visual stimuli in TCT-DP

The judge recorded every response to each of the five stimuli in accordance with two principles: on the one hand, to provide a precise description of how the stimulus actually was used; on the other hand – not to make the description too detailed. For example, if a corner (one of the stimuli) was used as the body of a house, it was recorded as "a house", but if the same stimulus was used to make a roof of a house, it was recorded as "a roof" because these are functionally different uses of the stimulus. Besides the listing of the responses, the judge also noted which of the responses were complete responses (see the criterion *2Cm* in the manual.). After all of the responses to all of the stimuli were recorded, we made a table containing the frequencies of the responses. If a response was recorded at least twice (in the entire sample), a code was assigned for it. When all of the codes where assigned, we repeated the procedure of counting the number of responses corresponding to each code, and looked for responses which were identical in meaning but had been listed differently. This procedure was repeated until there were no similar yet differently coded responses which could be found. Finally, a list of approximately 90 codes for each stimulus was developed and these lists were used for further analysis.

After all of the responses to the stimuli were coded, we were able to process them quantitatively. A script was created using the R program (R Core Team, 2014) in order to do subsequent analysis and to illustrate the results. Analysis using structural equation modelling was done with Mplus Version 7 (Muthén & Muthén, 2012).

Strategy for analyses

At first, a baseline model was set up for the assessment of original responses to the stimuli. The baseline model is an approach used in the scoring of original responses, and it differs from the instructions in the TCT-DP manual. According to the manual, a test taker is able to receive no more than 3 points for originality (in total), even if all of the responses to all five stimuli are original. The baseline model for assessment of original responses included the following principles: (a) a test taker initially has 5 credit points for originality; 1 point is subtracted for each stereotypic response to the stimuli – so if all of the responses are stereotypic then the test taker has 0 points for originality; (b) in contrast to the instruction for coding provided in the manual (Urban & Jellen,

2010), the baseline model treats an original response as original even if the drawing is not completed (i.e., elaborated); (c) 1 point is subtracted for each stimulus which is not used; (d) 1 point is subtracted for each stimulus if it is used in an abstract way – as an abstract line/ shape, some abstract decorative element or as a geometric figure, in other words, for drawings without particular meaning.

After setting up the baseline model, analysis was done to determine the best cut-off value for original responses to the stimuli and to test different approaches in order to address the research questions. Analysis of the frequencies of the original responses was made, and the following steps were taken to determine the best cut-off value and to compare the approaches. First was an analysis of the reliability of the forms as measured by making correlations between the originality scores (this score is obtained using the baseline or alternative model) using both forms of the TCT-DP. Next were taken steps to ensure convergent validity, and correlations were calculated between the originality scores and the following: (1) the total score of the TCT-DP, excluding the criteria *1Cn*, *2Cm* and *13Ucd*; (2) the sum of the criteria belonging to the factor of originality/ unconventionality (except criterion *13Ucd*); (3) the Creative Perception Test score; (4) the Scale of Unconventionality score. We predicted that the original responses to the stimuli would be determined by creative perception, on the one hand, and by unconventionality on the other hand.

The second block of analysis was done to refine the measurement of originality by replacing and comparing the dichotomous variable approach with a categorical variable approach. This model has only one difference from the baseline model – three, four or five credit points are given depending on how many categories are used for each stimulus (e.g., if we use three credit points, then the minimal score is 0 but maximal is 3 * 5 (for each stimuli) = 15) and points are subtracted according to whether a response is stereotypic.

The third part of the study reflects a more sophisticated analysis and results of the performance of the selected model for assessment of original responses.

Results

Figure 1 illustrates the correlations between assessment of originality and five criteria across various cut-off values that were used for the identification of stereotypic responses. The results show that the reliability between forms increases if the cut-off value of the original responses increases. The correlation between the originality score and the total score of the TCT-DP gradually increases until it reaches the 5% cut-off value and then decreases minimally. The correlation between the originality score and the factor of originality / unconventionality reaches maximum at 2% cut-off value and then decreases and starts to increase again after the 5% cut-off value. Investigation of the correlation between the originality score and the Creative Perception Test score shows that the best result is achieved at a 4% cut-off value. The most obvious decrease of correlation while increasing the cut-off value is observable for the correlation with the scale of unconventionality. Moreover, this is the only criterion showing the highest correlation at a 1% cut-off value and constant decrease after the 4% cut-off value.

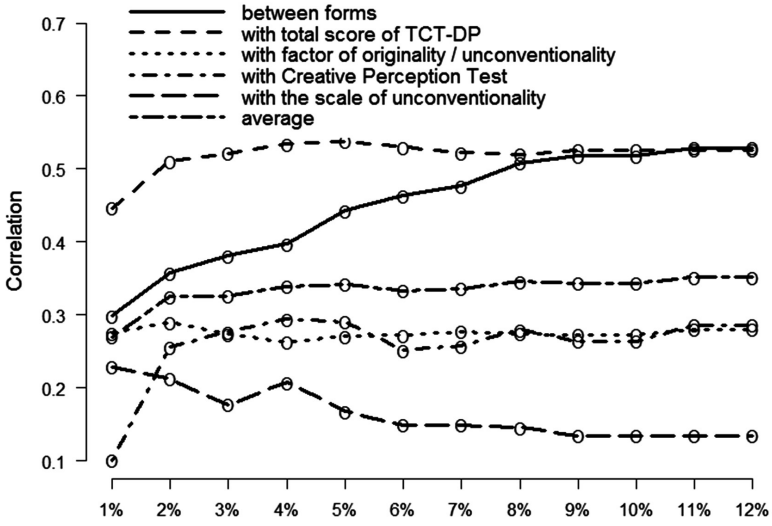


Figure 1. **Correlation values between various measures of creativity and the measure of originality at various cut-off values.**

In order to decide which cut-off value is the most appropriate, additional information should be taken into account. It should be emphasized that the assessment of originality in our case cannot be completely separated from the context, i.e. from the specific aspects of the test. The number of stimuli used should correlate with the total score of the TCT-DP regardless of originality, even though the influence of the number of stimuli used was diminished in our study (i.e., we excluded criterion *1Cn* from analysis). The problem emerges from the fact that the stimuli are the most important component of the test and thus almost any criterion will have some sort of dependence on the use of these stimuli, and that is why the assigned values for the responses of the particular test should correlate with the number of stimuli used. In the case of the originality assessment, every stimulus which is not used is treated as a stereotypic reaction. This explains why reliability grows and the criteria related to the TCT-DP (i.e., factor of originality / unconventionality and total score of the TCT-DP) do not change their course dramatically in regard to the strength of correlation as the cut-off value increases (see Figure 1) – possibly a decrease in the proportion of variance

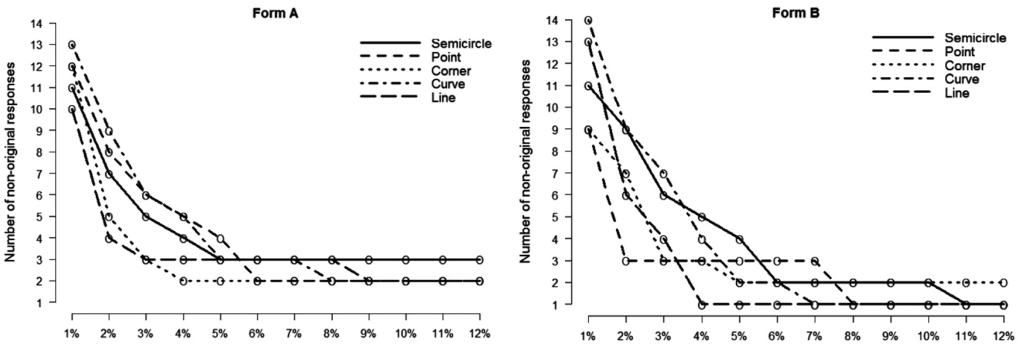


Figure 2. **Number of stereotypic responses at various cut-off values.**

related to originality boosts the role of variance accounting just for number of responses used. This interpretation is supported by the results of the analyses of the number of stereotypic responses at increasing levels of cut-off value (Figure 2 and Table 1).

When the cut-off value is 4% and 5% most of the stimuli have only one or two responses which are regarded as stereotypic, and roughly for most of the stimuli this number of responses does not change until the cut-off value of 10% (detailed information is provided in Table 1).

Table 1. **Percentage of stereotypic responses to stimuli of TCT-DP in Latvian sample**

Semicircle			*Dot*			*Corner*			*Curved line*			*Dashed line*		
	A	*B*		*A*	*B*		*A*	*B*		*A*	*B*		*A*	*B*
Se1	26.0	5.8	Do1	2.1	7.4	Co1	23.6	16.8	Cu1	4.5	6.7	Li1	15.1	3.5
Se2	12.6	10.3	Do3	5.1	–	Co2	2.8	2.2	Cu2	15.7	3.8	Li2	28.4	35.8
Se5	–	4.1	Do5	21.0	25.2	Co3	–	2.2	Cu3	7.3	4.8	Li5	8.0	–
Se6	–	5.0	Do6	13.0	–	Co5	30.1	36.6	Cu4	2.7	4.4	Li8	2.9	2.3
Se7	3.4	–	Do7	5.6	7.5	Co8	2.5	2.5	Cu5	3.3	3.2	Li35	–	3.6
Se8	22.8	30.4	Do9	4.9	–	Co9	–	2.5	Cu8	–	2.7	Li39	–	2.8
Se9	4.4	2.2	Do10	2.3	–	Co10	3.1	4.2	Cu9	2.6	2.1	Li40	–	3.1
Se13	2.4	–	Do11	3.8	–	–	–	–	Cu10	25.4	33.8	–	–	–
Se14	–	2.4	–	–	–	–	–	–	Cu12	2.4	–	–	–	–
Se15	2.2	–	–	–	–	–	–	–	Cu15	4.1	–	–	–	–
Se26	–	3.3	–	–	–	–	–	–	Cu36	–	3.3	–	–	–
Se43	–	2.2	–	–	–	–	–	–	–	–	–	–	–	–
NU	3.2	5.2	–	14.8	25.0	–	4.2	6.1	–	5.1	8.0	–	9.4	13.1
OR	23	29.1	–	27.4	34.9	–	33.7	26.9	–	26.9	27.2	–	36.2	35.8

Note. NU – not used; OR – original responses; A – form A; B – form B;

Se – Semicircle; Se1: sun; Se2: a face (also for animals); Se5: a ball; Se6: a wheel; Se7: an eye; Se8: an abstract figure, a line, geometric figure and similar, Se9: a mouth; Se13: centre of flower; Se14: mushroom; Se15: sickle moon; Se26: arch of a door/a door/an entrance of cave or tunnel and similar; Se43: a stone;

Do – Dot; Do1: snow/rain/hail/a flake/a drop; Do3: a bird or contour of a bird; Do5: an abstract figure, a line, geometric figure and similar; Do6: an eye (also for animals) Do7: centre of a flower; Do9: cloud/sky; Do10: sun/a planet; Do11: a star/ contour of a star;

Co – Corner; Co1: a house/castle/hut/cage and other house-like buildings; Co2: a box/a gift in the form of a box; Co3: stairs/ ladder; Co5: an abstract figure, line, geometric figure and similar; Co8: vehicle with wheels (also tractor and others); Co9: face/head (also for animals); Co10: a window (also for vehicles);

Cu – Curve; Cu1: a snake/a worm; Cu2: stem of flower/ stem of plant/haulm and similar; Cu3: a tree; Cu4: a thread/a rope/a fishing line and similar; Cu5: a vase; Cu8: a cloud; Cu9: a road/a street/a path; Cu10: an abstract figure, a line, geometric figure and similar; Cu12: a leg for a being (also for a human); Cu15: body of a person or a contour of human; Cu36: smoke/steam/vapour

Li – Dashed line; Li1: a road/a street/a path; Li2: an abstract figure, line, geometric figure and similar; Li5: a surface/ ground/floor/baseline for an object; Li8: a house/a hut and similar buildings; Li35: a cloud/sky; Li39: a roof of a house; Li40: a picture/a frame for a picture/photo/ a poster;

It is very unlikely that of the identification stereotypic responses by using a cut-off value from 5% to 10% will differentiate original responses from unoriginal ones. Thus in order to decide what is the greatest appropriate cut-off value we decided to put more emphasis on examining other criteria whose outcome is not related to the number of stimuli used. Examination of the correlations between the originality score and scores

on the Creative Perception Test and the Scale of Unconventionality indicated that there are two possible appropriate cut-off values – 2% and 4%. As the correlation between the originality score and the factor of originality / unconventionality has its maximum at 2%, and the same cut-off value provides more stereotypic responses than in comparison to the cut-off value of 4% (Table 1), it was more reasonable to prefer the 2% cut-off value.

Thus for further analysis the baseline model employs a 2% cut-off value. Figure 3 provides information about the performance of various scoring models of originality as indicated by the research questions. The model B1 is the previously described baseline model while models B2–B5 are slightly modified. Model B2 does not include a penalty point for the stimulus which is used as an abstract object unless the number of responses in that particular category of object (i.e., a rectangle is made from the corner) is greater than the cut-off value. Model B3 gives a penalty point whenever the stimulus is not completed (i.e., elaborated) as mentioned in the manual. Model B4 selects original responses based on drawings of a specific age group (stereotypic responses could be different in specific age groups). Model B5 gives a penalty point for using the stimulus to create an abstract object only if the result of the criterion "Connections made that contribute to a Theme" (5Cth) is less than 3 points. Comparing the correlations made according to models B1, B2 and B5 we can conclude that model B1 shows the best results which means that all abstract responses (see the note in Table 1 for precise definition) should be treated as stereotypic regardless of their type and meaningfulness. Model B3 outperforms other models in regard to all criteria except for the scale of unconventionality. Model B4 which incorporates the age-group-specific approach seems to have the worst evidence of validity as all of the correlations with all of the criteria reach a minimum value.

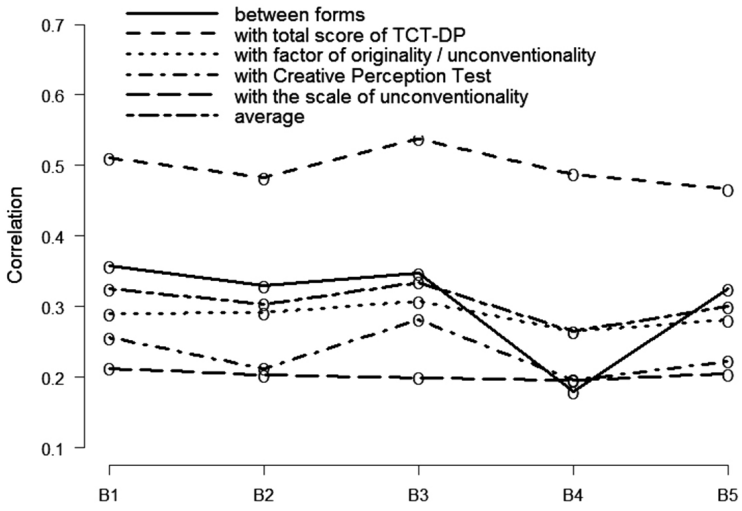


Figure 3. **Correlation values between various measures of creativity and the measure of originality using different approaches.**

An additional analysis was made to refine the model for the assessment of originality. The previous analysis contained issues related to the scoring of originality according to the principles stated by the TCT-DP manual, while in this section we propose a different

approach to assessing originality with the TCT-DP. Instead of a dichotomous approach regarding original responses to stimuli, we decided to use a categorical approach similar to the one used by Lubart et al. (2010). In order to determine the number of possible categories and the distance between them, we used information about the average number of stereotypic responses at various cut-off values (see Figure 4).

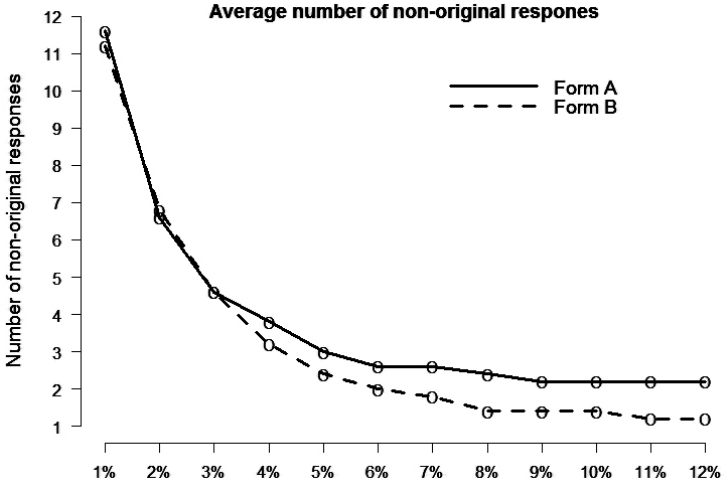


Figure 4. **Average number of stereotypic responses at various cut-off values.**

Seven models for the assessment of originality were defined using three, four and five categories where categories represent the corresponding cut-off values: (a) 2, 3, 4; (b) 2, 3, 5; (c) 2, 3, 8; (d) 2, 3, 4, 5, (e) 2, 3, 4, 8, (f) 2, 3, 4, 5, 8 and (g) 2, 3, 4, 5, 11 (see Figure 5). Comparison of the results showed that these models did not vary substantially. In order to select two models for further analysis, we also took into account the distance between categories relying on a similar decline of the average number of non-original responses (see Figure 4).

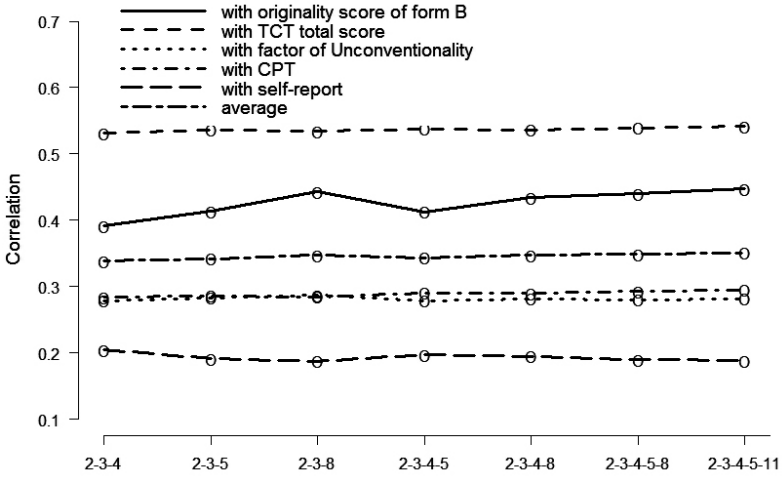


Figure 5. **Correlation values between various measures of creativity and the measure of originality using various categories.**

The next section of results provides information about the performance of three selected models using structural equation modelling (SEM). The first model (A1) is defined exactly as the baseline model (B1) from the analysis identifying the best cut-off value. Models A2 and A3 represent the approach using three and five categories and are defined the same as the models from the previous section with 2, 3, 4 and 2, 3, 4, 5, 11 cut-off values. All three models were specified in SEM as measurement models consisting of two latent variables – originality measured by the test forms A and B. Each latent variable has five indicators corresponding to the stimuli of the TCT-DP and the test taker's responses to those stimuli determine a category according to this approach. The calculation of parameters was done using the WLSMV estimator. The model fit for all three models was evaluated by CFI, TLI, RMSEA and WRMR indices using the following cut-off values: for CFI, TLI > .95, for RMSEA < .05 (Hu and Bentler, 1999) and for WRMR <= 1 (Yu, 2002). Following these guidelines, all three models had good fit. Reliability of originality for each form was calculated using factor loadings (Raykov & Marcoulides, 2011; Stone, Otten, Ringlever, & Hiemstra, 2013) of the corresponding indicators (see Table 2). In order to estimate to what degree the assessment of originality under various conditions is associated with the general factor of TCT-DP and the factor of originality / conventionality, criterion *13Ucd* was replaced with a corresponding measure of originality using measurement models (see Table 2). The correlation between the assessed originality and the Creative Perception Test was estimated as follows: responses to stimuli from both forms of the TCT-DP were used to create two latent variables, but these latent variables loaded equally on the higher order factor. The correlation between this factor and the latent variable measuring creative perception with four continuous variables was estimated. The correlation with the Scale of Unconventionality was estimated using one latent variable measuring originality with stimuli from form A and the other latent variable measuring unconventionality with self-report items.

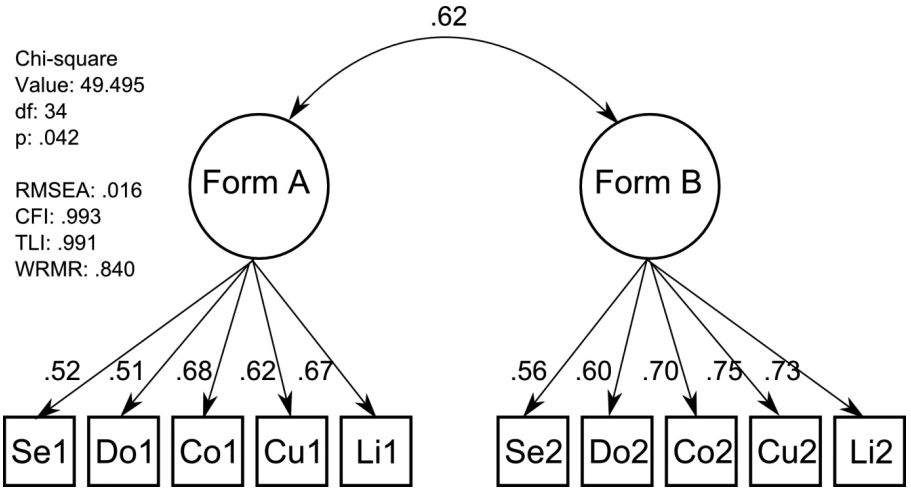
Table 2. **Comparison of three approaches assessing originality**

	Reliability			*Factor loadings*		*Correlations*	
	Form A	*Form B*	*Correlation between forms*	*General factor*	*Factor of originality*	*CPT*	*Unc.*
A1	.74 (.01)	.80 (.01)	.62 (.05)	.51 (.02)	.64 (.03)	.64 (.25)	.39 (.11)
A2	.76 (.01)	.83 (.01)	.62 (.04)	.49 (02)	.60 (.02)	.78 (.29)	.32 (.10)
A3	.76 (.01)	.87 (.01)	.70 (.03)	.52 (.02)	.63 (.02)	.64 (.22)	.28 (.10)

Note. Standard error of each parameter is shown in parenthesis at the right side. CPT – Creative Perception Test; Unc. – The scale of unconventionality. A1 – measurement model with dichotomous outcome; A2 – measurement model with three categories using 2, 3, 4 cut-off values; A3 – measurement model with five categories using 2, 3, 4, 5, 11 cut-off values. Model fit for all models except for models estimating factor loadings were good. For general factor model of TCT-DP and two factor model of TCT-DP RMSEA was in range of .11 but CFI and TLI was is in range of .95 and .94 correspondingly.

The results show that reliability tends to be higher in all aspects when more categories are used in evaluation of the degree of originality, but at the same time

association with unconventionality decreases. It seems that all models are good enough, nevertheless evaluating all pros and cons of these three models and taking into consideration the complexity of application, model A1 seems to be the most useful (see Figure 6).



Note. Form A and Form B represent latent variables of originality assessed by both forms of TCT-DP; Se – Semicirle, Do – Dot, Co – Corner, Cu – Curve, Li – Dashed line; Abbreviations from model fit evaluation: df – degree fo freedom, p – p value, RMSEA – Root mean square error approximation, CFI – Comparative fit index, TLI – Tucker-Lewis index, WRMR – Weighted root mean square residual.

Figure 6. **Measurement model with dichotomous outcome (model A1) using both forms.**

The last part of this study focuses on the testing of gender and age differences regarding originality as measured by the proposed procedure (model A1) using form A. The measurement model was specified according to multiple group design (MIMIC) holding equal loadings and intercepts of the indicators between the groups. All specified models for testing gender and age differences had good model fit – in all cases they did not exceed the following cut-off values CFI, TLI > .95, RMSEA < .05. The estimated means of originality for both genders did not show significant difference (z = –1.05). Significant differences were found when age groups were compared: (1) preschool sample; (2) fifth grade sample; (3) ninth grade sample; (4) undergraduate student sample. When the preschool sample was a reference group, all other groups showed statistically significant higher results (z = 3.46, z = 5.88, z = 6.36). When 5th grade sample was the reference group, only student sample showed statistically significant higher results (z = 1.76, z = 2.35). No significant differences were found between the 9th grade sample and the student sample (z = .68).

Discussion

We employed several principles to determine the most appropriate cut-off value. All of the TCT-DP criteria except for the Scale of Unconventionality had the lowest correlations with the measure of originality when the cut-off value was set at 1%

(Figure 1). In contrast to the other criteria, the Scale of Unconventionality showed the highest correlation (with the measure of originality) at this cut-off value and a marked decrease in correlation values when the cut-off value was greater than 4%. Other independent criteria also showed higher correlations (with the measure of originality) when the cut-off value was set at 1%. These findings confirm the position that originality in the context of creativity is a compromise between marginality and usefulness (Stokes, 1999; Dacey & Lennon, 1998). If we go too far to either side we have the risk of dealing solely with extremity or conventionality. Our study showed that the most appropriate cut-off value for identification of original responses with the TCT-DP is 2%. Using this cut-off value one can obtain good reliability and good evidence of validity.

The study also found better evidence of validity for the approach identifying stereotypic responses using data from all age groups simultaneously in contrast to an age-group specific approach (see Figure 3 for model B4 in contrast to others).

The comparison of the baseline model and the model allowing an abstract response to be original (B1 vs B2, see Figure 3) suggests that all responses regarded as abstract should be treated as stereotypic otherwise the psychometric properties of the measure become less adequate. This suggestion may seem too strict and it promotes a situation where test takers who are creative have no chance to receive any points of originality if they make an abstract but personally meaningful drawing. Indeed, when we tried to control for meaningfulness of the drawing (model B5 in Figure 3) all psychometric properties improved, but nevertheless the model which assigned one penalty point for each abstract use of the stimulus performed better. In addition to this empirical evidence, it is rational to treat any abstract response as inappropriate for an assessment of originality because it is difficult to categorize abstract responses and even more difficult to relate them to functional fixedness. Thus, whenever one is interested in using the test with a particular purpose to assess originality, we recommend considering the inclusion of an additional sentence in the instructions which encourages a test taker to avoid abstract drawings.

In answer to one of the research questions, we tested how reasonable it is to give a penalty point for responses regardless of their originality if a drawing is not completed. In contrast to our expectations, the model which assigned a penalty point for uncompleted (not elaborated) responses showed the highest association with all other criteria, except with the Scale of Unconventionality (Figure 3). These results would be hard to explain in the context of the assessment of originality without the presence of the Scale of Unconventionality. As this scale is the only criterion which shows lower correlations in comparison to the baseline model, we can hypothesize that additional control over completion of the drawing makes this measure more related to an overall assessment of creative potential and thus giving the penalty point for uncompleted stimulus in sense of criterion *2Cm* is not recommended when originality is the focus of the investigation.

Our results give some evidence supporting the view that stereotypic responses to visual stimuli differ across cultures (Kim, 2009) and hence a list of stereotypic responses should be provided whenever the test is adapted to other cultures. It should be noted

that this conclusion would be the same if we had chosen another cut-off value (compare Table 1 and the list of stereotypic responses in TCT-DP manual).

We expected that the measure of originality will show better psychometric properties if a dichotomous approach (stereotypic / original) will be replaced by an approach employing several categories corresponding to the degree of originality (e.g., if we use three categories and follow cut-off values of 2, 3 and 4, then an individual whose response to the particular stimulus is observed less frequently than in 2% of all cases will have 3 points, but an individual whose response is observed less frequently than 3% but more than 2% will have 2 points and so forth). The results showed that better estimates of reliability could be obtained using the categorical approach while indicators of convergent validity were similar or even worse in comparison to the dichotomous approach. Since the approach using the categorical outcome is more complex and its superiority associates mainly with minor improvement of reliability, we recommend the dichotomous approach as it was defined in the baseline model with the 2% cut-off value.

The results of gender differences in originality were somewhat surprising to us because in a recent study on the factor structure of the TCT-DP significant gender differences in favour of males were found for the factor of unconventionality (Kālis, Vorobjovs, Roķe, & Krūmiņa, 2015) and in corresponding subscales in another study (He, Wong, Li, & Xu, 2013). It seems that in general males tend to show higher unconventionality but not originality. We also found significant age differences in originality. Significant increase was observed till the age of 9th grade pupils, while difference between 9th grade sample and undergraduate student sample was not significant. These results illustrate that individuals till the age of 5th and 9th grade tend to react to visual stimuli in more stereotypic way. Perhaps such finding is related to the process of maturation of personality, i.e., the qualities influencing individual's disposition to react originally are in the process of formation from biopsychosocial perspective (Dacey & Lennon, 1998).

The study provides detailed information about the performance of the model for the assessment of original responses to visual stimuli and also illustrates the way in which this model could be employed as a measurement model using SEM. The proposed measurement model has important characteristics for the use in further studies that focuses particularly on originality – it has shown evidence of validity, high reliability and also structural and metric invariance across gender and age groups.

We showed that originality is related to creative perception and unconventionality, but the data did not allow testing how much variance could be explained by these two constructs simultaneously. This is one of the issues that future studies could address. Another question that requires a serious study to be answered is about how the results of this assessment are related to original solutions in real-life activities.

Readers who are interested to use this approach, should bear in mind that in assessing originality with the TCT-DP originality cannot be regarded as an ability but rather as one of the components of creative potential which could be described as a readiness to respond originally to the requirements of a situation. Such a definition emerges from the test instructions since these instructions do not specifically invite the test taker to draw something creative or original. Instead the test taker is introduced

to the situation and invited to complete an uncompleted drawing thus providing more freedom for manifestation of his or her personality. This is one of the strengths of the test and perhaps the key why it has shown such good evidence of validity both with other measures of creativity, including self-reports (Kālis, Vorobjovs, Roķe, & Krūmiņa, 2015). We also recommend to use both forms of the TCT-DP during the same assessment session because the value of correlation between the two latent variables (r = .62) measuring the same construct could indicate that much of the variance is dependent on the situation (e.g. due to warm-up).

One of the limitations of this study is related to the accuracy of the method used for comparison of approaches. The differences between correlations were small and no statistical testing was done in order to determine the significance of change. Nevertheless, we believe that the conclusions drawn from this study are reliable because many units of information and arguments were used to support the results. The results obtained with precise statistical testing in the last part of the study confirmed the correctness of the conclusions made in the first part of the study.

Another limitation of this study relates to the possibility of comparing the results with those of other studies. First, to our knowledge, no study has used the same or a similar measurement model for the assessment of originality. Second, and of importance, is that originality as measured by the TCT-DP is hardly comparable with originality measured by the Torrance Tests of Creative Thinking (TTCT) and those which are similar to it. The TTCT measures originality as a certain dimension of divergent thinking which is defined as an ability to produce original ideas (Guilford, 1959), whereas the TCT-DP measures originality as a disposition to react originally to demands of the situation. In the case of the TCT-DP no time limit for completion of the task is stressed and no direct instructions to be creative or original are given. Thus if one is interested to understand an individual's readiness to respond originally to real-life situations, the approach suggested in this study seems more suitable.

Summing up all the results, the study highlights four important issues about scoring of original responses to visual stimuli that perhaps could be generalized also to other similar instruments: (a) stereotypic responses to visual stimuli differ across cultures; (b) selection of stereotypic responses should be made using various age-groups simultaneously; (c) an abstract response to stimuli should be treated as stereotypic (therefore we suggest to include an additional instruction which says to avoid abstract drawings if originality is under investigation); (d) selection of the most appropriate cut-off value is an important issue for identification of stereotypic responses as it may influence validity and applicability of the measure (our results show that the selection of an appropriate cut-off value is important to analyse not only for purposes of validity but also to specify the difficulty of the task in a psychometric sense). In addition there are some issues particularly related to the TCT-DP: (a) giving a penalty point regardless of originality for uncompleted (unelaborated) drawings make this criterion (*13Ucd*) confounded with other aspects of creative potential (this is not a problem in the case when the overall assessment of creative potential is used by summing all criteria according to the manual); (b) the most appropriate cut-off value for selection of stereotypic responses is 2%; (c) the list of stereotypic responses to stimuli of TCT-DP

in the Latvian culture differs from the original (see Table 1). Taking into account these issues we developed a measure of originality that uses TCT-DP as the base and we found: (a) preference for the dichotomous approach versus an approach using more categories for level of originality; (b) no significant gender differences; (c) significant age differences; (d) applicability of the purposed measure for profound studies as it has evidence of validity, good reliability and properties of measurement invariance.

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Reliability and Validity of Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) Latvian Version

Līga Kroniņa[1]
Department of Paediatric Dentistry, Institute of Stomatology,
Riga Stradins University, Latvia

Malgožata Raščevska
Faculty of Education, Psychology and Arts, Latvian University

Rūta Care
Riga Stradins University

Abstract
The Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) is a frequently used method to evaluate children's dental anxiety/fear (CDA). The aim of this study is to examine the reliability and validity of the CFSS-DS Latvian version. Internal consistency, test-retest reliability, convergent and factorial validity, CDA correlation with age and gender differences were tested. CFSS-DS was translated from the original language (English) to Latvian and backwards by two bilingual experts. Two hundred and twelve children (mean age M = 7.87, *SD* = 2.59, range from 4 to 12 years, 48% boys, 52% girls) took part in the study. Their parents were asked to evaluate on a Likert scale the degree to which their child is afraid of specific aspects concerning a visit to the dentist. The child's behavior at the dentist was rated by a doctor according to the Frankl scale.

The CFSS-DS Latvian version showed high internal consistency, test-retest reliability and convergent validity. Factor analysis of the CFSS-DS Latvian version confirmed a one-factor structure.

Keywords: *dental anxiety, dental fear, CFSS-DS, reliability, validity.*

Introduction

Dental anxiety is a worldwide problem in dentistry, especially in the field of paediatrics. A metaanalysis by Klingberg and Broberg (2007) showed that the rate of children's dental anxiety (CDA) varies in different countries, from 5.7% in Denmark and 6% in the Netherlands to 19% in Norway and 19.5% in the USA (Klingberg & Broberg, 2007). Although the presence of dental anxiety has been established with different methods, for children of different ages and with different cut-off points, up to one fifth of children are afraid to attend the dentist, and this increases the possibility that it may lead to more severe problems of dental health. To date there have been no studies about children's dental anxiety in Latvia.

[1] Corresponding author Līga Kroniņa: *L.kronina@gmail.com*

Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) is a frequently used method to evaluate children's dental anxiety/fear. This survey was created by the American authors Cuthbert and Melamed (1982), and the items were derived from a larger list of different possible children's fears made by Scherer and Nakamura (1968). Their survey was based on the Wolpe-Lang fear theory about mental imagery processes and the affective reaction to different fear arousing stimuli. Wolpe and Lang created the Fear Survey Schedule (FSS) with more than 100 stimuli, including, for instance, snakes, sharp objects, etc., and asked respondents to evaluate their reaction on a Likert scale from 0 (no fear) to 4 (very much afraid), and they later analysed the number and intensity of the reported fears (Wolpe & Lang, 1964). Scherer and Nakamura in1968 derived a version of the FSS for children (FSS-FC) which was one of the first instruments to identify a specific source of children's fear arousal, to measure the effect of anxiety reduction therapy (before and after the therapy course), to establish individual differences in the degree of fear arousal, and to screen subjects for desensitization therapy (Scherer & Nakamura, 1968).

More than a decade later Cuthbert and Melamed improved the Scherer and Nakamura scale of medical fears, and created a screening device in order to evaluate the average level of dental fear of children in public schools, and to identify children at risk for particularly high levels of dental fear and subsequent behaviour management problems (Cuthbert & Melamed, 1982). The authors sent a letter with a list of 15 items to parents of 603 children and asked them to evaluate each item on a scale from 1 (not afraid) to 5 (very afraid). After receiving the parents' responses, they divided the children (whose fears the parents had reported) by age groups and compared the sum of the items and the average score for each item, as well as gender differences.

There were variations developed regarding child and parents versions of test in later studies. Ten Berge, Hoogstraten, Veerkamp, and Prins (1998), Klingberg (1994) and Wogelius, Poulsen and Sorensen (2003) used parental version of the test, similar to the original version of Cuthbert and Melamed (ten Berge et al., 1998; Klingberg, 1994; Wogelius et al., 2003; Cuthbert & Melamed, 1982). In other studies the test was administered directly to children (Chellapah, Vignehsa, Milgrom, & Lo, 1990; Alvesalo et al., 1993; Milgrom, Jie, Yang, & Tay, 1995). Arapostathis, Coolidge, Emmanouil and Kotsanos (2008) used a mixed groups of respondents – if younger children were not sure of their answer then their parents assisted them (Arapostathis et al., 2008). A parental version of the CFSS-DS was used to establish reliability and validity of the Latvian version.

The CFSS-DS has shown high internal consistency rates in all of the studies with adaptated versions in different countries – Singapore, Finnland, Sweden, China, the Netherlands, Denmark, Croatia, Greece (Chellapah et al., 1990; Alvesalo et al., 1993; Klingberg, 1994; Milgrom et al., 1994; ten Berge et al., 1998; ten Berge et al., 2002; Wogelius et al., 2003; Majstorovic, Veerkamp, & Skrinjaric, 2003; Arapostathis et al., 2008). Cronbach's alpha has varied from .83 to .93 in all of the studies mentioned above. Test-retest reliability was not tested within the original study by Cuthbert and Melamed, but it was demonstrated in two later studies of CFSS-DS – Klingberg (1994) found

r = .97 (p < .001), Arapostathis et al. (2008) showed r = .74 (p < .001) (Cuthbert & Melamed, 1982; Klingberg, 1994; Arapostathis et al., 2008).

Cuthbert and Melamed (1982) compared the results of the Dental Subscale (DS) to another available test – the Dental Fear Survey by Kleinknecht and Bernstein (1978), and they found that the CFSS-DS showed the highest ratings on the same items (drilling and injections) as in using Kleinknecht's method (Cuthbert & Melamed, 1982; Kleinknecht & Bernstein, 1978). The results of the Dental Subscale correlated well with the full CFSS scores; with the Behaviour Profile Rating Scale (higher DS scores were associated with higher anxiety and lower cooperation measures); and the Behaviour Problem Check List (a correlation with acting-out and withdrawal was established) (Cuthbert & Melamed, 1982). Klingberg, Berggren and Noren (1994) found a positive correlation between dental anxiety (measured by CFSS-DS) and general anxiety (an "extract" of the different fears of children) (Klingberg et al., 1994).

Majstorovic et al. (2003) analysed various questionnaires to evaluate dental anxiety, medical fear and even children's aggression (CFSS-DS, Dental Anxiety Inventory – short form, Child Medical Fear Questionnaire, Overt Aggression Scale) and found a positive correlation with the results from all three of these measures (Majstorovic et al., 2003). Arapostathis et al. (2008) tested the validity of the CFSS-DS by dividing children according to the Frankl scale ratings (negative or positive behaviour in the dental clinic) and found that children with negative or somewhat negative behaviour had higher CFSS-DS average scores than children with somewhat positive and definitely positive behaviour (Arapostathis et al., 2008).

As it was mentioned before, the CFSS-DS was constructed as a one-factor test (Cuthbert & Melamed, 1982). However, Alvesalo et al. (1993), Milgrom et al. (1994) and ten Berge et al. (1998) performed more detailed studies to examine the factor structure, validity and reliability of the CFSS-DS. Varimax rotation factor analysis was performed and showed a three-factor structure in all three studies (explaining 54, 64.5 and 65% of the variance, respectively), but in each study the items were distributed to the factors differently. Ten Berge et al. (2002) performed factor analysis on the results from a study on a patient group with high dental anxiety and found four factors (ten Berge et al., 2002). However, the authors indicated that almost all of the items load on more than one factor, which means that the CFSS-DS has a weak factor structure and actually is a one-dimensional concept (ten Berge et al., 1998, ten Berge et al., 2002). Lee, Chang and Huang (2009) used the Promax rotation method of factor analysis and the Schmid-Leiman solution for a second-order factor analysis (Lee et el., 2009). They also found three first order factors, but the results of the higher order factor analysis showed a single second-order factor. The authors noticed that item 6 ("having a stranger touch to you") and item 7 ("having somebody look at you") could be deleted because they loaded more strongly on the first-order factor than on the second-order factor, and this resulted in a different factor structure (Lee et al., 2009). Hence, although factor analysis has shown a three- or four-factor structure, the most stable might be the original one-factor structure, and it is possible that some items could be deleted.

The first publication of the CFSS-DS showed results for the dental anxiety of children 5 to 13 years old, but in subsequent studies there has been a lot of variation

in regard to the participants' age, whether the respondents were parents of children, the means of administration, and adaptation of the measure in different languages (Cuthbert & Melamed, 1982; Klingberg & Broberg, 2007). For instance, Klingberg (1994) tested children in from the age range of 4–14 years old, ten Berge et al. (1998) and Arapostatis et al. (2008) tested children from 4–12 years old, Majstorovic et al. (2003) studied children and adolescents from 5 to 15 years with a series of different tests. Chellappah et al. (1990) studied primary school children from 5–8 years old, Alvesalo et al. (1993) did not specify the age of the tested children, but only reported that the average age was approximately 13 years old. The original Dental Subscale showed the highest level of dental fear for children six and seven years old (but not for 5-years-olds) and lower average scores for older children (Cuthbert & Melamed,1982). However, some studies were contradictory and showed a negative correlation between children's age and their dental anxiety (Klingberg et al., 1994, Milgrom et al.,1994; Wogelius et al., 2003), whereas in other studies no age differences were found (Alvesalo et al., 1993; ten Berge et al., 2002; Arapostathis et al., 2008). Various studies have not shown clear gender differences in dental anxiety (Klingberg&Broberg, 2007), but some studies found girls more anxious than boys (Chellapah et al., 1990; Alvesalo et al., 1993; Milgrom et al., 1994; ten Berge et al., 2002). In other studies no gender differences were found (Klingberg, 1994; Wogelius et al., 2003; Arapostathis et al., 2008).

The aim of our study was to examine the reliability and validity of the Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) Latvian version. Internal consistency and test-retest reliability as well as convergent validity and factorial validity, the correlation of dental anxiety with age, and gender differences were also tested.

Method

Participants

In total, 207 children (mean age $M = 7.84$, $SD = 2.60$, age ranging from 4 to 12 years old, 99 boys (48%) and 108 girls (52%)) and their parents took part in this study which included the evaluation of the child's dental fear. Internal consistency as well as factorial validity, the correlation of dental anxiety with age, and gender differences were tested on the full respondent set. Convergent validity with the behavioural evaluation according to the Frankl scale was established with 191 children (mean age of the subsample was $M = 7.88$, $SD = 2.62$, ranging from 4 to 12 years old, 93 boys (49%) and 98 girls (51%)). The subsample for test-retest reliability consisted of 10 respondents (mean age $M = 9.3$, $SD = 2.26$, range from 5 to 13 years, 50% boys and 50% girls).

Instruments

Fifteen items of the Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) were translated from the original language (English) to Latvian and backwards by two different linguistic experts (Cuthbert & Melamed, 1982). A pilot study including 30 respondents was performed (Kronina, Care, & Rascevska, 2009). Upon the basis of the results of the pilot study, the original formulation of item 15 ("having the nurse clean

his/her teeth") was replaced by "having the doctor or dental hygienist clean his/her teeth" which was more appropriate to the actual situation in contemporary dentistry.

Parents were instructed that the following questionnaire contains 15 aspects of dental and medical situations which are often associated with children's dental anxiety. They were asked to evaluate how much their child is afraid of each of following 15 items on a Likert scale (1 – not afraid, 5 – very much afraid). Parents were encouraged to consult with their children about their feelings before, during or after the completion of the questionnaire. The sum of the item scores as well as the average score of each item was calculated. An additional question ("Does your child get upset easily?") was added in order to establish the convergent validity. Available answers were from 1 (mostly yes) to 4 (not at all) on the Likert scale.

The Frankl scale is a one item scale which was invented in 1962 to evaluate the child's behaviour within the dental setting (Frankl, Schiere, & Fogels, 1962). The authors proposed four categories of behaviour ratings: 1 – definitely negative (crying forcefully, refusal of treatment); 2 – rather negative (reluctant to accept treatment, uncooperative, some evidence of negative attitude); 3 – rather positive (acceptance of treatment, at times cautious or with reservation); 4 – definitely positive (good rapport with the dentist, interested in the dental procedures).

Procedure

The data was collected from December 2011 to June 2013 by one dentist. Ethical permission was provided by Riga Stradins University Ethical committee; parental permission was acquired before the commencement of the study. Parents were recruited in the waiting area of the Paediatric Department of the Institute of Stomatology, Riga Stradins University before their children's treatment. However, their participation in the research was voluntary and refusal neither affected access to the dentist nor the therapy. One hundred and ninety one questionnaires were administered to an accompanying parent before or during the child's dental visit. The behavioural evaluation was performed by a doctor according to the Frankl scale.

Sixteen of the questionnaire packets were completed by parents outside of the dental setting, including by electronic means, thus, evaluation of the child's behavior during the dental visit was not possible. The test-retest study was performed between April and November 2013 when participants returned to the next dental visit. The time span between the test and retest completion was $M = 2.17$ months, $SD = 1.65$, range from two weeks to 4 months. Statistical analysis was performed by SPSS Statistics 19.0.

Data analysis

Internal consistency was tested by calculating Cronbach alpha. Test-retest reliability was calculated with Pearson's correlation. Convergent validity was established in two ways: by correlating CFSS-DS scores with the ratings of how easy a child gets upset and by correlating them with behavioural ratings according to the Frankl scale (using Spearmen's correlation). Pearson's correlation was used to establish the relationship between age and dental fear/anxiety. T-test was used for CFSS-DS scores to compare groups by gender.

Principal Component Analysis was performed to confirm the one-factor structure of the CFSS-DS.

Results

Internal consistency (reliability) of the CFSS-DS Latvian version was high (Cronbach's alpha = .91). Test-retest reliability was .70, p = .03. The mean score of the CFSS-DS was M = 31.79 (SD = 10,85, range 15 to 70), which indicates that the average level of children's dental anxiety may be qualified as "a little bit afraid". The highest scores were for item 3 ("injections"), item 8 ("dentist drilling") and item 13 ("going to the hospital"); the lowest scores were for item 14 ("people in white uniforms"), item 5 ("having to open his/her mouth") and item15 ("having a doctor or dental hygienist clean his/her teeth") (see Table 1). All items showed a discrimination index of higher than .20, with mean index of .61, except for item 7 (.16).

Table 1. **Descriptive statistics and discrimination indices of 15 items of the CFSS-DS Latvian version**

Item (how much is your child afraid of…)	*Mean*	*Std. Deviation*	*Corrected Item-Total Correlation*
1. dentists	2.38	1.30	.71
2. doctors	1.85	.86	.63
3. injections	3.06	1.30	.61
4. having someone examine his/her mouth	1.74	.93	.74
5. having to open his/her mouth	1.60	.93	.76
6. having a stranger touch him/her	2.01	.91	.42
7. having somebody look at him/her	1.85	.88	.16
8. the dentist drilling	2.76	1.31	.77
9. the sight of dentist drilling	1.99	1.13	.65
10. the noise of dentist drilling	2.11	1.18	.71
11. having somebody put instruments in his/her mouth	2.22	1.13	.78
12. choking	2.47	1.25	.44
13. having to go to the hospital	2.64	1.28	.45
14. people in white uniforms	1.44	.79	.61
15. having the doctor or dental hygienist clean his/her teeth	1.68	.97	.71
Total (average)	2.12		.61

Factor analysis. After the Principal Component Analysis almost all items strongly loaded on one factor, except item 7 (.154) (see Table 2), although it only explained 47.29% of the variance.

Table 2. **One-factor matrix of the CFSS-DS Latvian version with Promax rotation**

Item (how much is your child afraid of…)	*One component*
5. having to open his/her mouth	.830
11. having somebody put instruments in his/her mouth	.829
8. the dentist drilling	.818
4. having someone examine his/her mouth	.815
1. dentists	.797
15. having the doctor or dental hygienist clean his/her teeth	.787
10. the noise of dentist drilling	.763
9. the sight of dentist drilling	.722
2. doctors	.691
3. injections	.668
14. people in white uniforms	.659
13. having to go to the hospital	.484
12. choking	.465
6. having a stranger touch him/her	.442
7. having somebody look at him/her	.154
Eigenvalue	7.09
% of variance	47.29

Dental anxiety's correlation with age and gender differences. Dental anxiety (CFSS-DS scores) showed negative correlation with age (Pearson's correlation $r = -.21$, $p = .003$), which indicates that the older was the child, the lower was his/her dental anxiety. T-test analysis showed no statistically significant differences between boys ($M = 31.87$, $SD = 12.06$, range from 15 to 70) and girls ($M = 31.72$, $SD = 9.67$, range from 16 to 55), $t = 0.1$, $p = .92$.

Convergent validity. The correlation between CFSS-DS scores and the ratings of how easy the child gets upset was Spearman's $r = -.53$, ($p < .0001$). We can therefore conclude that the easier a child gets upset, the higher is his/her dental anxiety. Correlation between the child's dental anxiety's scores and behaviour ratings in the dental setting (Frankl scale) was Spearman's $r = -.68$ ($p < .0001$), which indicates that the higher was the child's dental anxiety, the more difficult was the children's behaviour.

Discussion

The Latvian version of the CFSS-DS showed high convergent validity confirming that it is an appropriate method to evaluate dental anxiety in Latvia. There was also high internal consistency (Cronbach alpha) which corresponds with previous publications (Alvesalo et al., 1993; Klingberg, 1994; ten Berge et al., 1998; Majstorovic et al., 2003, Arapostathis et al., 2008). Similarly, the high test-retest reliability of our study is concordant with the study of Arapostathis et al. (2008).

The negative correlation of the child's dental anxiety with the child's age is concordant with the publications of Klingberg, Milgrom and Wogelius (Klingberg et al., 1994; Milgrom et al., 1994; Wogelius et al., 2003). Although these results differs from the study of the original version of this measure (Cuthbert & Melamed, 1982), it seems obvious that younger children would be more afraid of dentists than older

ones, especially if no specific treatment method (for example, general anaestesia) is being used. No gender differences were found and this corresponds to several previous publications (Klingberg et al., 1994, Wogelius et al., 2005, Arapostathis et al., 2008). It was impossible to compare the mean scores of CFSS-DS in our study with those from other studies because of variations in the participants' age, whether the parent or child completed the questionnaire, and the means of administration, as mentioned above.

The CFSS-DS Latvian version showed a one-factor structure, indicating that all of the items created a unified construct within the Latvian culture and Latvian language environment. Although all 15 items together showed high internal consistency, the validity of item 7 proved to be questionable, because its factor score was low. Lee et al. (2009) met with the same problem, finding that the validity of both items 6 and 7 needs to be reconsidered (Lee et al., 2009). Ten Berge et al. (2002) mentioned in their study that actually the CFSS-DS is a one-factor method and that as such it must be used. However, there could be discussion as to whether the reason for the low item 7 validity is an issue of translation, Latvian cultural and linguistic context differences, or is it a weaker item than the others (as evidenced by the low factor score, mentioned above). It is possible that parents do not associate this question with their child's dental anxiety. Subsequently, the formulation of item 7 should be improved or the item should be excluded from the survey in its Latvian version.

The study has its limitations, for example, the amount of respondents for test-retest reliability was too small, and the gap between the time of the test and retest was rather large. The authors also admit that a limitation of the study is that all of the children attended only one dentist in one clinic, and therefore this was not a random case selection (of children, doctors or clinics). A future study should be performed outside the dental clinic (for instance, in schools and/or kindergartens) with a randomized respondent selection, in order to establish normative data of children's dental anxiety in the Latvian population.

Conclusions

The CFSS-DS Latvian version showed high internal consistency, test-retest reliability and high convergent validity. The older was the child, the lower was his/her dental anxiety. No gender differences in dental anxiety were found. The one-factor structure was confirmed for the Latvian version of the CFSS-DS.

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Social Problems of Children with Language Impairment: Associations with Other Behavioral Problems, Adaptive Behavior, and Intellect

Inga Skreitule-Pikše[1], Ieva Bite, Malgožata Raščevska, Sandra Sebre, Aleksandrs Koļesovs, Ilze Damberga, & Baiba Martinsone

University of Latvia

Abstract

The goal of this research was to examine the associations between social problems, other behavioral problems, adaptive behavior and intelligence for children with language impairment in both the home and school situation. Thirty-two children with language impairment between the ages of 8 to 13 years participated in the study, as well as one parent and one teacher of each child. The social problems and other behavior problems were reported by parents using the Child Behavior Checklist and teachers with the Teacher Report Form. Children's adaptive functioning was evaluated using the Adaptive Behavior Assessment System-II, parent and teacher forms. Children were administered the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV). The results showed that in comparison to the ratings from parents, the teachers reported higher levels of anxiety/depressed and attention problem ratings, as well as lower ratings on adaptive behaviour. Both parent and teacher reports of social problems were negatively associated with various adaptive behaviour skills, and positively associated with various behaviour problems and with processing speed scores.

***Keywords*:** *language impairment, social problems, behavior problems, adaptive behavior, intellect*

Language plays an integral role in many aspects of child development, including academic learning, the forming of social relationships and overall functioning, however, research shows that 7 to 15% of school-aged children have marked speech and language problems (Lindsay & Dockrell, 2000; Lundervold, Posserud, Sorensen, & Gillberg, 2008; Noterdaeme & Amorosa, 1999). Language impairment has been found to be associated with both emotional, cognitive and behavioral difficulties, including problems of self-regulation, anxiety, withdrawal, somatic complaints, atypical thinking, aggression and rule-breaking behavior; difficulty in maintaining attention, impulsivity and lower intelligence scores (Lundervold, Posserud, Sorensen, & Gillberg, 2008; Noterdaeme & Amorosa, 1999; van Daal, Verhoeven, & van Balkom, 2007; Willinger, Brunner, Diendorfen-Radner, Sams, Sirsch, & Eisenwort, 2003); difficulty in forming peer relationships, and general problems with social skills (Mccabe & Meller, 2004; Ripley & Yuill, 2005), which can futher facilitate behavior problems (Wiener, 2004).

[1] Corresponding author Inga Skreitule-Pikše: *inga.skreitule@lu.lv*

If the child's communication diffulties hinder his/her social interaction, there is a greater risk that these children will be excluded from peer groups, which can further minimize opportunities to practice and develop language skills (Rice, 1993). Essential for the maintaining of social relationships is the child's ability to regulate his/her emotions and behavior, which for children with language impairment is often less well developed, and therefore increases the risk of problem behavior (Conti-Ramsden & Botting, 2008; Ford & Milosky, 2003; Fujiki, Brinton, & Clarke, 2002; Mccabe & Meller, 2004; Ripley & Yuill, 2005). Research to date shows that about 50% of children with language impairment have significant behavior and emotional problems, at the level of clinical diagnosis (Lundervold et al., 2008).

Boys more often than girls are found to have speech and language difficulties (Biederman, Mick, & Faraone, 2002), and this may one of the facilitating factors of the higher ratings of aggression and rule-breaking behavior for boys (Cohen, 2001; Messer, Goodman, Rowe, Meltzer & Maugham, 2006; Moffit, Caspi, Harrington & Milne, 2002). Children with language impairment more often isolate themselves from others, and less often engage in socially-desirable behavior. Socially undesirable behavior is positively associated with less developed language skills, but there is no significant association between degree of social isolation and level of language difficulty (Hart, Fujiki, Brinton, & Hart, 2004). In comparing the behavioral problems of children with various types of speech and language difficulties, for children with speech difficulties there is a greater possibility of developing social relationship problems (Lindsay & Dockrell, 2000; van Daal, Verhoeven, & van Balkom, 2007).

In considering the associations between language impairment and the child's behavior, it is essential to also consider the context in which the child is being observed. The behavior of children at home can be different from that at school, different competencies may be more relevant at home than at school, and there can also be differences in the criteria by which parents and teachers rate the child (Redmond & Rice, 1998). In evaluating the social competence of children with language impairment, parents have noted that these children have less well developed self-control, but teachers have noted that they have less skill in assertively expressing their opinions in comparison to children without language problems (Mccabe & Meller, 2004).

The social problems associated with language impairment may be related to the known interaction of language and cognitive development. Research has shown that language problems are often associated with lower intelligence test scores (Lundervold et al., 2008). The results of one study showed that 62.3% of the children with language impairment had low or very low intelligence test scores (Lundervold et al., 2008). Lowered intelligence, in turn, significantly affects social adaptation and may lead to other difficulties such as relationship problems (Emerson, Robertson & Wood, 2005). Children with language impairment have lowered abilities of working memory and information processing, which then further hinders the processing of linguistic and social information (Bishop, 1997). Higher levels of language ability are negatively associated with problems in reading, cognitive processe and social adaptation (Cohen, Farnia, Im-Bolter, 2013), and figurative language (i.e understanding of metaphors) skills

are negatively associated with social cognition and social problem solving difficulties (Im-Bolter, Cohen, & Farnia, 2013).

In summary of the findings from previous research, it can be seen that the social problems of children with language impairment are associated not only with their specific language problems, but also with ability to regulate their emotions and behavior, social skill development and intelligence scores. In order to help these children resolve their social relationship problems, it is important to more thoroughly understand the association with other emotional and behavioral problems, social skills and cognitive functioning. The goal of this research was to examine the associations between social problems, other behavioral problems, adaptive behavior and intelligence for children with language impairment in both the home and school situation. The following *research questions* were posed: For children with language impairment are there differences in parent and teacher ratings of behavior problems and adaptive behavior? What are the associations between the child's social problems, other emotional and behavioral problems, adaptive behavior and intelligence ratings?

Method

Participants

Study participants were 32 children with a diagnosis of speech and language developmental disorder, selected from special schools for children with language impairment, as well as one parent and one teacher of each child. Of children 43.8 % were girls and 56.2% were boys, children's age was from 8 to 13 years old (M = 10.34, SD = 1.60). All children had Full Scale IQ scores of 70 or above. Other possibly co-existing psychiatric disorders (e.g., ADHD, ASD, etc.) were not controlled in this study.

Measures

Social problems and another behavioral problems. The children's social problems and another behavioral problems were measured by the Child Behavior Checklist for ages 6 to 18 years old (CBCL/6-18, Achenbach & Rescorla, 2001) and the Teacher Report Form (TRF, Achenbach & Rescorla, 2001), Latvian translation (Skreitule-Pikše, Raščevska, Sebre, Koļesovs, & Bite, 2013). These questionnaires each include 112 items that describe the child's emotional and behavioral problems. Parents and teachers are asked to rate each item on a scale from 0 ("not true") to 2 ("very true" or "often true"). In this study eight subscales were analyzed: Anxious/ Depressed, Withdrawn/ Depressed, Somatic Complaints, Social Problems, Thought Problems, Attention Problems (in the teacher report form there are two subscales – Inattention and Hyperactivity-Impulsivity), Aggressive Behavior, and Delinquent Behavior. The Latvian version Cronbach's alphas are from .57 to .85 for the parent form and from .70 to .95 for the teacher form (Skreitule-Pikše, Raščevska, Sebre, Koļesovs, & Bite, 2013).

Adaptive behavior. Children's adaptive behavior was evaluated with the Adaptive Behavior Assessment System-II, ABAS-II (Harrison & Oakland, 2003) parent and teacher report forms (for children from 5 to 21 years). Latvian language version translation and standardization in Latvia was carried out by project director

M. Rascevska with colleagues (Harrison & Oakland, 2013). The ABAS-II allows for the evaluation of adaptive skills in three domains – Conceptual domain, Social domain and Practical domain. It also allows for the evaluation of the child's total adaptive abilities with the General Adaptive Composite Scale. The Conceptual domain includes three skill areas: Communication, Functional Academics and Self-Direction skills. The Social domain includes two skill areas: Leisure and Social skills. The Practical domain includes four skill areas: Self-Care, School Living (for teacher report) or Home Living (for parents), Community use, and Health and Safety skills. The data analysis included all of the domain scales and general adaptation. The Cronbach's alphas for the Latvia sample are from .90. to .97 for the parent form and from .94 to .99 for the teacher form (Harrison & Oakland, 2013).

Intelligence. The children's intelligence scores were obtained from adminsitration of the Wechsler Intelligence Scale for Children, Latvian version (WISC-IV^{LV}) (Wechsler, 2003; 2013) four indexes – Verbal Comprehension, Perceptual Reasoning, Working Memory, Processing Speed – as well as the Full Scale IQ. The Latvian version Cronbach's alphas are from .88 to .94 (Wechsler, 2013).

Procedure

The researchers received permission from the school administration to invite teachers and parents to participate in the study. The parents received the questionnaire packet in an unsealed envelope from the teachers. The parents completed the questionnaires, sealed the envelope and returned it to the teacher. The intelligence testing took place at the school. All of the children were individually administered the WISC-IV by trained and experienced psychologists. Included in the study were only those children whose parents granted informed consent, and whose parents and teachers had completed the necessary questionnaires. For purposes of data analysis standardized T-values were used.

Results

Parent and teacher reports of child behavior problems and adaptive behavior

Initial analysis included a comparison of the parent and teacher reported child behavior problems and adaptive behavior (see Table 1).

Results show that the teachers reported higher ratings of anxiety/ depressed behavior and attention problems, as well as lower ratings in all of the adaptive behavior domains and General Adaptive Composite than did the parents of these children.

Social problems in association with other behavioral problems, adaptive behavior and intelligence ratings

Further analysis involved calculation of the intelligence test mean scale scores (see Table 2) and Pearson correlation analysis to examine the associations between social problems, other behavioral problems, adaptive behavior and intelligence, as reported by their parents and teachers (see Table 3).

Table 1. **Comparison of parent and teacher reported ratings (shown as T-scores) of children's behavior problems and adaptive behavior**

Measure	*Parent report (n = 32)*		*Teacher report (n = 32)*		*[a]Z or [b]t*
	M	*SD*	*M*	*SD*	
Child behavior problems					
Anxious/ Depressed	55.06	6.87	58.66	7.82	–2.41*
Withdrawn/ Depressed	55.41	7.91	57.00	6.78	–1.44
Somatic Complaints	55.03	8.15	56.75	7.85	–1.51
Social Problems	56.75	6.32	58.75	7.75	–1.47
Thought Problems	56.34	9.65	57.09	6.74	–.77
Attention Problems	56.06	6.81	59.91	6.93	–2.74**
Inattention	–	–	59.58	7.15	–
Hyperactivity-Impulsivity	–	–	58.97	7.13	–
Rule-Breaking Behavior	56.91	9.43	57.97	6.01	–1.64
Aggressive Behavior	57.13	7.62	57.19	6.87	–.42
Child adaptive behavior					
Conceptual domain	95.66	15.14	88.69	12.19	2.68*
Social domain	96.97	14.70	91.31	13.15	2.19*
Practical domain	102.56	12.85	93.69	12.50	3.36**
General Adaptive Composite	99.03	14.68	90.63	12.43	3.28**

[a] Children's behavior problem ratings were compared with the Wilcoxon Signed Ranks Test.

[b] Adaptive behavior ratings were compared with the Paired Samples T-Test.

*$p < .05$; **$p < .01$

Table 2. **WISC-IV Latvian version intelligence test scale scores for this sample of language impaired children**

Measure	*M*	*SD*
Verbal Comprehension	87.22	15.56
Perceptual Reasoning	95.91	15.23
Working Memory	93.28	13.82
Processing Speed	99.06	13.27
Full Scale IQ	90.94	14.17

$n = 32$; *$p < .05$; ***$p \leq .001$

Table 3. **Pearson correlations between social problems, other behavioral problems, adaptive behavior, and intelligence ratings of children with language impairment**

Measure	*Social problems*	
	Parent report (n = 32)	*Teacher report (n = 32)*
Child behavior problems		
Anxious/Depressed	.72***	.76***
Withdrawn/Depressed	.63***	.45**
Somatic Complaints	.54***	.04
Thought Problems	.52*	.40*
Attention Problems	.27	.44**
Inattention	–	.40*
Hyperactivity-Impulsivity	–	.39*
Rule-Breaking Behavior	.26	.48**
Aggressive Behavior	.41*	.33
Child adaptive behavior		
Conceptual domain	–.31	–.27
Social domain	–.28	–.40*
Practical domain	–.48**	–.29
General Adaptive Composite	–.40*	–.34
Intellect		
Verbal Comprehension	–.04	–.001
Perceptual Reasoning	.16	.01
Working Memory	.15	.17
Processing Speed	.51**	.39*
Full Scale IQ	.20	.15

Note. Parent reported ratings of the child's social problems were correlated with their ratings of other behavior problems and adaptive behavior, and teacher reported ratings of the child's social problems were correlated with their ratings of other behavior problems and adaptive behavior.

*$p < .05$; **$p < .01$; ***$p \leq .001$

Parent reported ratings of the social problems showed positive correlations with all of the other parent-reported behavioral problems, except for attention problems and rule-breaking behavior. Teacher reported social problems showed positive correlation with all other behavioral problems, except for somatic problems and aggressive behavior.

In examining the associations between the child's social problems and adaptive behavior, it can been seen that parent-reported social problems were negatively correlated with the child's adaptive behavior in the Practical domain, and also with the General Adaptive Composite ratings. Teacher-reported social problems were negatively correlated with the child's adaptive behavior in the Social domain.

In examining the parent and teacher reported social problems in association with the child's intelligence ratings, there were positive correlations with the Processing Speed index, but not with any other of the index scores.

Intelligence test scores in association with other behavioral problems and adaptive behavior

In order to gain greater understanding of the positive association between Processing Speed index scores and social problem ratings, a series of Pearson correlation analysis was conducted between all of the intelligence test index scores and ratings of other behavioral problems and adaptive behavior (see Tables 4 and 5).

Table 4. **Pearson correlations between intelligence scores and parent-reported child behavior problems and adaptive behavior**

Measure	*Verbal Comprehension*	*Perceptual Reasoning*	*Working Memory*	*Processing Speed*	*IQ*
Child behavior problems					
Anxious/Depressed	–.07	.36*	.11	.39*	.23
Withdrawn/Depressed	–.14	–.15	–.04	.14	–.11
Somatic Complaints	–.01	.23	–.15	.20	.09
Social Problems	–.04	.16	.15	.51**	.20
Thought Problems	.13	.16	.22	.25	.23
Attention Problems	–.24	.06	–.02	.10	–.07
Rule-Breaking Behavior	–.13	–.04	–.08	.08	–.09
Aggressive Behavior	–.29	.16	–.09	.19	–.06
Adaptive behavior					
Conceptual domain	.30	.11	.13	–.16	.18
Social domain	.18	.20	.16	–.09	.19
Practical domain	.14	.03	–.02	–.19	.01
General Adaptive Composite	.22	.10	.11	–.14	.14

Note. IQ – Full Scale IQ.
$n = 32$; $^{*}p < .05$; $^{**}p < .01$

Results of the correlational analyses showed that Processing Speed index scores were positively correlated not only with parent-reported ratings of social problems, but also with anxious/depressed behavior. In turn, anxious/depressed ratings were positively correlated with the Perceptual Reasoning index scores. Parent-reported ratings of the child's anxious/depressed behavior were positively correlated also with the child's social problems (see Table 3).

Table 5. **Pearson correlations between intelligence scores and teacher-reported child behavior problems and adaptive behavior**

Measure	*Verbal Comprehension*	*Perceptual Reasoning*	*Working Memory*	*Processing Speed*	*IQ*
Child behavior problems					
Anxious/ Depressed	–.05	.19	.06	.35*	.15
Withdrawn/ Depressed	–.06	.09	.10	.08	.06
Somatic Complaints	.12	.32	–.22	.27	.19
Social Problems	–.001	.01	.17	.39*	.15
Thought Problems	.02	.22	.10	.15	.18
Attention Problems	.00	.03	.01	.22	.06
Inattention	–.05	–.11	–.02	–.01	–.08
Hyperactivity-Impulsivity	.09	.19	.04	.42*	.23
Rule-Breaking Behavior	.13	–.002	.06	.27	.15
Aggressive Behavior	.10	.10	–.11	.38*	.16
Adaptive behavior					
Conceptual domain	.05	.18	.16	.01	.14
Social domain	.03	.25	.08	–.08	.11
Practical domain	–.16	.18	.11	.05	.04
General Adaptive Composite	–.03	.21	.12	.004	.10

Note. IQ – Full Scale IQ. n=32

*$p < .05$

Teacher-reported ratings of anxious/depressed behavior were positively correlated with Processing Speed index ratings, which were positively correlated also with social problems, hyperactivity-impulsivity and aggressive behavior ratings.

Teacher-reported social problems were also positively correlated with anxious/depressed behavior and with hyperactivity-impulsivity ratings. Even though there was not a significant correlation between teacher-reported social problems and aggressive behavior, there was a positive correlation with hyperactivity-impulsivity ratings (see Table 3).

Regression analysis

A more detailed analysis was conducted to further explore the found correlations between parent-reported anxious/depressed ratings, processing speed scores and social problem ratings; as well as between teacher-reported anxious/depressed ratings, hyperactivity-impulsivity ratings, processing speed scores and social problem ratings. Several stepwise regression analyses were carried out with social problem ratings as the dependent variable. Separate regressions were carried out for parent ratings and teacher ratings (see Tables 6 and 7).

Table **6. Summary of regression analysis with parent-reported child social problems as dependent variable**

Variable	*B*	*SE B*	*β*
Anxious/Depressed	.57	.12	.62***
Processing Speed	.13	.06	.27

Note. R^2 = .52, Adjusted R^2 = .50, F = 32.19, p < .001

***p < .001

As seen in Table 6, results of the regression analysis with parent-reported child social problems as the dependent variable and processing speed scores and anxious/depressed ratings as independent variables (included in the model due to the previously found correlations between these variables) show that only anxious/depressed ratings are significant predictors of child social problems, and that processing speed ratings are excluded from the final regression model.

Table 7. **Summary of regression analysis with teacher-reported child social problems as dependent variable**

Variable	*B*	*SE B*	*β*
Anxious/Depressed	.68	.13	.68***
Hyperactivity-Impulsivity	.13	.15	.12
Processing Speed	.06	.08	.10

Note. R^2 = .57, Adjusted R^2 = .56, F = 40.43, p < .001

***p < .001

As seen in Table 7, results of the regression analysis with teacher-reported child social problems as the dependent variable and hyperactivity-impulsivity ratings and processing speed scores and anxious/depressed ratings as independent variables (included in the model due to the previously found correlations between these variables) showed that only anxious/depressed ratings are significant predictors of child social problems, but processing speed and hyperactivity/impulsivity is excluded form the final model.

Discussion

In answer to the first research question about differences in the child behavior ratings of parents and teachers, the results show that such differences are apparent. Teachers, in comprison to parents, reported higher levels of anxious/depressed behavior and attention problems, as well as lower ratings of child adaptive behavior skills. It may be that in the school situation these problems become more apparent than in the home situation, and/or that teachers and parents hold different criteria for appropriate behavior.

Petersen and colleagues (Petersen et al., 2013) have pointed out that language impairment may exacerbate difficulties in maintaining attention, particularly in the school situation, where the children are obliged to deal with more difficult tasks than at home. In order to concentrate on more difficult academic tasks, language can serve as a tool which helps to maintain focus, and good language skills can thereby facilitate concentration.

Previous research also shows that a child with language impairment may have difficulty with the processing not only of linguistic information, but also social information (Bishop, 1997). The language impaired child may have greater difficulty in understanding the teacher's instructions, and this may increase his/her level of anxiety in the school situation and decrease the ability to maintain focus. In Latvian schools the majority of instructions are given verbally, and there is not enough use of visual aids, which may then heighten the level of anxiety and difficulty in maintaining focus for those children who have language impairment.

Explanations for the differences in the ratings of the parents and teachers include the possibility that the child's behavior can differ in different settings, and that in the school setting the child with language impairment actually has greater difficult in adapting to the situational demands. However, it is also possible that parents and teachers make use of different standards for evaluating the observed child behavior. The teachers have greater opportunity than parents to observe the behavior of other children who are of the same age, and therefore they have a broader base upon which to evaluate deviations from the norm.

The second research question was concerning the associations between social problems, other behavior problems, adaptive behavior and intelligence scores for children with language impairment. In examining the associations between the parent and teacher reported social problems and other emotional and behavioral problems, parent-reported social problems were associated with internalizing problems (anxious/depressed, withdrawn/depressed, somatic problems) and aggressive behavior, reflecting the child's difficulties in controlling negative emotions. The teacher-reported social problems were associated with all of the remaining behavior problems, except for somatic problems and aggressive behavior. It appears that parents reported more social problems for those children with other difficulties related to emotion regulation, but the teacher report more social problems for children with emotion regulation and/or behavior regulation difficulties.

It is also important to note that the parent-reported social problems were associated with somatic problems and thought problems. This could be explained in that child with language disorders have greater difficulty in resolving social problems and regulating negative emotions, and that these difficulties may result in somatization (Wangby, 2000), or in various forms of atypical behavior such as difficulties in dealing with negative thoughts, the hoarding of unnecessary items, etc. It may be that these associations were found only for the parent-reported problems because somatic problems and atypical behavior can be best observed and identified when one is in closer contact with the child.

In examining the associations between social problems and adaptive behavior, the parent-reported social problems were negatively associated with general adaptive composite scores and with adaptive behavior skills in the practical domains (self-care, home living, health and safety). Skills in the practical domain are necessary so that the child is able to care for him/herself, and to be independent in an age-appropriate manner. It is possible that providing additional training for children in these skill areas could help to minimize the development of social problems in the home situation.

In the school situation more frequent social problems were associated with lower teacher-reported skills in the social domain, including how the child spends his/her free time (for example, during recess and after school hours), and how the child interacts with others in various types of social situations. This indicates that for children with language impairment additional training of basic social skills could help to lessen the development of more serious social problems.

In examining the parent and teacher reported social problems in association with intelligence, the results are surprising, because a positive correlation was found between parent and teacher reported social problems and processing speed ratings. Results from previous research (Emerson et al., 2005) show that most often there are negative associations between behavioral problems and intelligence scores.

In order to further understand the positive association between social problems and processing speed, a more detailed analysis was made of associations among the other behavioral problems, and a positive association was found between processing speed and both parent and teacher-reported anxious/depressed behavior. In previous research Calhoun and Dickerson Mayes (2005) found that in certain clinical groups anxiety can serve as a positive motivating factors for children to complete test items more quickly, therefore resulting in higher processing speed ratings. In the present research the results from the regression analysis showed that precisely the anxious-depressed ratings predicted the child's social problems rather than the processing speed abilities per se.

Social problems can also be related to fear of evaluation or criticism from others, as in the case of social anxiety (Clark & Wells, 1995). Although most research shows that anxiety most often negatively affects performance on tasks which require greater concentration and working memory skills (Eysenck & Calvy, 1992), in some studies it has been shown that anxiety affects performance on different types of tasks to different degrees, and also differs with the specifics of the anxiety. For example, higher levels of anxiety were associated with faster performance on a Stroop test task with negative emotional stimuli (Fisher et al., 2010), and test performance was differentiated according to whether the respondents evidenced trait anxiety or situational state anxiety related to test taking (Hopko, Hunt, & Armento, 2005).

In light of the positive correlations between processing speed, teacher-reported ratings of anxious/ depressed, hyperactivity-impulsivity and social problems, we further examined these associations and found that specifically anxious/depressed problem ratings were those which significantly predicted the child's social problems. Previoius research has shown that in clinical groups of children with ADHD, processing speed scores are lowered for children in the inattentive group, not for children in the hyperactivity-impulsivity group (Goth-Owens et al., 2010). The results from this research show that higher rates of teacher-reported hyperactivity-impulsivity are associated with higher scores on processing speed, and higher ratings of social problems. In this research we did not separately measure the so-called cognitive and motoric processing speed, and, therefore, it may be that hyperactivity increases the level of motoric processing speed, which then negatively affects the child's ability to form relationships with peers. At present there is still discussion about processing speed as a

construct (Shanahan et al., 2006), and there is a necessity for additional research of this construct in clinical groups.

Practical Implications

The results of this research showed that the context of evaluating a child's behavior is important, and that difficulties which are not apparent in the home situation may become apparent at school. Children with language impairment are in need of additional assistance in regard to emotion regulation (especially in regard to anxiety reduction), but also in regard to concentration and the maintaining of focus on academic tasks. In order for these children to be able to better perceive and concentrate upon orally presented material, teachers should make greater use of visual stimuli. By decreasing the amount of information which is presented orally, this may help the child with language impairment to be better able to concentrate on the academic material and this, in turn, may help to reduce the level of anxiety which may in part be related to the difficulties in understanding the verbally presented information. In the home situation the child may need additional opportunities to become more independent and skilled within the practical domain, and this may enhance the quality of social relationships with other members of the family. In the school situation it is essential to facilitate the improvement of social skills so that the child can develop more positive relationships with peers and adults.

Limitations of the study and implications for further studies

One of the research limitations is the exclusive use of parent and teacher report forms for the evaluation of child behavior. Another limitation of the study is that there was no control for the type of language impairment (i.e. speech impairment, expressive or receptive language impairment) or the degree of impairment, nor the possibility of comorbidity (i.e. learning disability, ADHD, etc.), which should be controlled for in future studies. Also the relatively small sample size could have influenced the results, because there were various correlations which were at the level of tendency approaching significance. Another limitation is that parents and teachers were handed the questionnaires to be completed on their own, but were not individually instructed on the questionnaire completion, as has been advised by the adaptive behavior questionnaire authors.

In the future it would be meaningful to conduct a more in-depth analysis of the interactions between anxiety, social problems and processing speed in children with different forms of developmental disability, including observational measures, as well as to conduct longitudinal studies to look at the causal relationships within a broader developmental context.

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Adaptive Behavior in Children with Specific Learning Disabilities and Language and Intellectual Impairments

Ilze Damberga[1], Malgožata Raščevska, Aleksandrs Koļesovs, Sandra Sebre, Ilona Laizāne, Inga Skreitule-Pikše, & Baiba Martinsone

University of Latvia

Abstract

Adaptive behavior includes conceptual, social, and practical skills which an individual attains in order to function in daily life. The aim of this study was to examine differences in adaptive behavior for children with language impairment, specific learning disabilities and intellectual impairment, and find out what are the differences between parent and teacher ratings of the adaptive behavior for the various groups of children. This study included 76 children (49 boys and 27 girls) from ages 8 to 13 years old. Adaptive behavior was assessed with the Adaptive Behavior Assessment System-II (ABAS-II; Harrison & Oakland, 2003), parent and teacher forms, ages 5–21. Results showed significant differences in the adaptive behavior ratings of parents and teachers between groups and within each group.

Key words: *adaptive behavior, intellectual impairment, specific learning disabilities, language impairment*

A very important aspect of life is an individual's ability and skill in caring for one's self, being independent and being able to take on responsibility for one's actions. Restrictions in this regard affect one's daily living and also one's ability to react adaptively to changes in the environment and to societal expectations (American Association on Mental Retardation, AAMR, 2002). The evaluation of a child's or adolescent's adaptive behavior is an essential aspect of psychological assessment, and it enables the specialist to more precisely understand and to diagnose various forms of developmental disorder. Information about the pupil's behavior and adaptive skill level is necessary in order for the psychologist to prepare a more comprehensive psychological assessment report. The more complete and thorough information the psychologist has in regard to the adaptive behavior of the child, the more completely will the psychologist be able to identify the child's problem areas and to provide suggestions for problem alleviation. An identification of the child's adaptive behavioral limitations can be very useful in helping the parent to understand the child's difficulties and in developing specific recommendations for parents and teachers to follow.

Even though among researchers there are differences of opinion regarding the structure of adaptive behavior (Arias, Verdugo, Navas, & Gomes, 2013). The majority of studies (Harrison & Oakland, 2003; Harrison & Rainieri, 2008; Widaman et al., 1991;

[1] Corresponding author Ilze Damberga: *ilze.damberga@lu.lv*

Widaman & McGrew, 1996) support the presupposition that adaptive behavior is multi-factorial and consists of three main skill domains – conceptual, social, and practical. Sometimes a fourth skill domain – motor skills – is also mentioned, but generally it is considered that this domain is directly related to the individual's physical development and that this should be assessed separately from adaptive behavior (Luckasson et al., 2002; Schalock et al., 2010).

In contemporary scientific literature adaptive behavior has been defined as "a collection of conceptual, social, and practical skills that have been learned and are performed by people in their everyday lives" (Schalock et al., 2010, p. 15). Conceptual skills consist of language and literacy; money, time, and number concepts; and self-direction. Social skills include interpersonal skills, social responsibility, self-esteem, gullibility, naïveté (i.e., wariness), social problem solving, and the ability to follow rules/obey laws and to avoid being victimized. Practical skills – activities of daily living (personal care), occupational skills, healthcare, travel/transportation, schedules/routines, safety, use of money, use of the telephone (AAMR, 2002).

Age, cultural expectations, and environmental demands will all influence the individual's adaptive behavior. As the child develops his or her adaptive behavior will improve and become more complex (Sparrow, Balla, & Cicchetti, 2005; Tasse, 2013). Adaptive behavior is directly tied to specific situations. If the child has well-developed adaptive behavior skills, then he/she will be able to use those skills which are necessary for each specific situation, and will be able to differentially adapt to different situational demands (AAMR, 1992; Harrison, 1990). Adaptive behavior is to a large degree influenced by cultural expectations, and the societal standards of the sociocultural context in which the individual lives, studies, relaxes and works (Tasse, 2013). Finally – adaptive behavior is defined by the activities in which the individual engages on a daily basis, rather than by the skills which are not being used. For example, if the individual knows how to dress him/herself, but does not do this on a daily basis, then this is not appropriate adaptive behavior.

To date there have been developed approximately 200 different questionnaires for the reporting of adaptive behavior (Schalock, 1999), but it has been recognized (Schalock et al., 2010; Tasse et al., 2012) that sufficient criteria is met by only the following four: (1) The Vineland Adaptive Behavior Scales-2nd edition, VABS-II (Sparrow, Cicchetti, & Balla, 2005); (2) the Adaptive Behavior Assessment System-II, ABAS-II (Harrison & Oakland, 2003); (3) the Scales of Independent Behavior-Revised, SIB-R (Bruininks, Woodcock, Weatherman, & Hill, 1996) and (4) the Adaptive Behavior Scale-School Version, ABS-S (Lambert, Nihira, & Leland, 1993). These four scales meet the following criteria: adequate evidence of reliability and validity; they assess adaptive behavior upon the basis of a 3-factor structure (conceptual, social, and practical skills); and they have been standardized on individuals with and without intellectual impairment. However, two of these scales (SIB-R and ABS-S) have not been re-normed since the initial standardization (Balboni et al., 2014).

In this study we have used the ABAS-II Parent and Teacher forms, ages 5–21 (Harrison & Oakland, 2003), which has been adapted and standardized in Latvia. This adaptive behavior assessment system was chosen because it is based upon the

following: (1) a concept of adaptive skills as promoted by the American Association on Mental Retardation (AAMR, 1992; AAMR, 2002; Grossman, 1983; Heber, 1959); (2) legal and professional standards applicable to various special education and disorder classifications (e.g., Individuals with Disabilities Education Act, 1997; the American PsychiatricAssociation's

Diagnostic and Statistical Manual of Mental Disorders–Fourth Edition (DSM–IV), 1994; 2000); and (3) research investigating diagnoses and interventions for persons with various types of disorder. It is possible to use results from the ABAS-II in order to provide additional information to educational and medical commissions responsible for special education placement and clinical disorder diagnosis, especially in regard to intellectual impairment diagnosis.

The ABAS-II has been developed by Patti Harrison and Thomas Oakland (Harrison & Oakland, 2003) with a set of questionnaire statements which have been designed to evaluate the adaptive skills of persons across a wide age range, from birth to 89 years old, and which includes the provision of standardized norms. The ABAS-II includes separate forms for parents and teachers (Oakland & Harrison, 2008). This approach allows the specialist to more fully understand the individual's area of difficulty by comparing the parents' evaluations of adaptive behavior at home, and the teachers' evaluations of behavior at school. It is possible to use these forms separately or congruently.

In this study we included the evaluations from both parents and teachers. The majority of previous studies have used only parent or only teacher report. As the authors of the ABAS-II have noted (Oakland & Harrison, 2008), the evaluations from multiple respondents provide a broader and more reliable picture of the child's adaptive skills, which may differ in various settings.

Originally the assessment of adaptive behavior was directly associated with the necessity to correctly identify and diagnose intellectual impairment (Harrison & Oakland, 2003). However, over the course of time it has been shown that the evaluation of adaptive behavior is important also in regard to the assessment of other psychological and physical disorders, for example, autism spectrum disorder (Bölte & Poustka, 2002; Fisch, Simensen, & Schroer, 2002; Harrison & Oakland, 2003), developmental delay (Harrison & Oakland, 2003), specific learning disabilities (Ditterline, Banner, Oakland, & Becton, 2008; Oakland & Harrison, 2008; Harrison & Oakland, 2003), attention-deficit/hyperactivity disorder symptoms (Sikora, Vora, Coury, & Rosenberg, 2012), hearing and visual impairments (Harrison & Oakland, 2003; Metsiou, Papadopoulos, & Agaliotis, 2011). The most often studied disorder groups are with children with intellectual impairment and/or autism spectrum disorder.

The majority of studies regarding adaptive behavior have been focused upon a specific disorder group, for example, autism spectrum disorder, but there are relatively few studies which provide a comparison between the various disorder groups. One of the few studies which have compared the adaptive behavior profile of children with specific learning disabilities, emotional disturbance, specific learning disabilities in combination with emotional disturbance, and autism spectrum disorder has been conducted by Ditterline and colleagues (Ditterline, Banner, Oakland, & Becton, 2008).

More often there have been studies comparing the results from children with disorder to a group of children without disorder (i.e. Arias, Verdugo, Navas, & Gomes, 2013). Therefore, in this study we made a comparison of the adaptive behavior for three groups of children with different forms of disorder – intellectual impairment, specific learning disabilities and language impairment.

Results of previous studies (Harrison & Oakland, 2003) have shown that children who have a diagnosis of intellectual impairment scored at least 2 standard deviations below the mean on one or more of the adaptive domains on the ABAS-II. For children with specific learning disabilities the ABAS-II General Adaptive Composite score has shown to be in the low average range (Ditterline, Banner, Oakland, & Becton, 2008; Harrison & Oakland, 2003; Leigh, 1987). The Social and Practical Domain skills have been average, but those skills which are included in the Conceptual domain (communication, functional academics and self-direction) were shown to be below average (Ditterline, Banner, Oakland, & Becton, 2008). Children with specific learning disabilities more often have lower ratings on adaptive behavior skills such as functional academics and communication. In some studies it has also been shown that these children have lower scores on the ABAS-II subdomain of school living skills (Ditterline, Banner, Oakland, & Becton, 2008) and social skills (Sparrow, Balla, & Cicchetti, 2005; Leigh, 1987). Age differences have been found, and results of studies have shown (Harrison & Oakland, 2003) that for children with specific learning disabilities social skills are below the norm only for the children in the 10 to 12 year age group, but not for the children in the 5 to 9 year age group.

Children's adequate language skill development is often an important prerequisite for the child to engage in successful social interaction (Hazen & Black, 1989). Children with language impairment more often have demonstrated aggressive behavior, difficulty in sustaining attention, heightened level of anxiety, somatic complaints, social withdrawal and excessive shyness, as well as lower intelligence test scores than children without language impairment (Lindsay & Dockrell, 2000; Lundervold, Posserud, Sorensen, & Gillberg, 2008; Noterdaeme & Amorosa, 1999; van Daal, Verhoeven, & van Balkom, 2007). Research has shown that language impairment is associated with various forms of psychological and social problems (Brinton, Fujiki, & Higbee, 1998; Clegg, Hollis, Mahwood, & Rutter, 2005), therefore, it is essential to understand the adaptive behavior of these children and how it compares to the behavior in other groups of children. Although we have not seen any previous studies of the adaptive behavior of children with language impairment, it is possible to expect that these children may have lowered ratings on adaptive behavior in subdomains such as communication, functional academics and social skills.

Based upon the results from previous studies two research questions were posed: How does the adaptive behavior differ for children with language impairment, specific learning disabilities and intellectual impairment? What are the differences between parent and teacher ratings of the adaptive behavior of children with language impairment, specific learning disabilities and intellectual impairment?

Method

Participants

The research participants included children who, in accordance with the International Classification of Diseases, Tenth Revision (ICD-10; The World Health Organization, 2010), the diagnostic system used in Latvia, have been diagnosed with one of the following forms of disorder: intellectual impairment (F70, F71), specific learning disabilities (F81) or language impairment (F80)[1]. In this study were included 76 children (49 boys and 27 girls) ages from 8 to 13 years old (see Table 1), who were chosen from a larger sample of 165 pupils ages 7 to 13 years old. Included in this study were only those children for whom ABAS-II Parent form or Teacher form ratings were available. Excluded from the study were those children whose adaptive behavior ratings were disproportionally high (for example, the parent having reported the maximum rating for a child in the ID group). The intellectual impairment group included only those children whose Full Scale IQ score on the WISC-IV intelligence test for children was below 69.

Table 1. **Demographic Characteristics of Children with Different Disorders**

	Intellectual impairment (n = 23)	*Specific learning disabilities (n = 20)*	*Language impairment (n = 33)*	*F*	*p*
Age				.48	.62
M	10.65	10.15	10.36		
SD	1.85	1.66	1.62		
Girls	8 (35%)	5 (25%)	14 (42%)		
Boys	15 (65%)	15 (75%)	19 (58%)		

Measures

The ABAS-II (Harrison & Oakland, 2003) Latvian language translation and adaptation by M. Raščevska and colleagues (Raščevska, Sebre & Legzdiņš, 2007) was used for evaluating the child's adaptive behavior, including both Parent form and Teacher form, ages 5–21. The parent form is meant to be completed either by a parent or a caregiver, for example, grandparent, who lives with the children and is familiar with the child's daily activities. The parent form includes 232 items. The teacher form is meant to be completed by a teacher, teacher's assistant or other school personnel who are familiar with the child's daily activities in the school setting. The teacher form included 193 items. Both parent and teacher forms provide evaluation of 9 specific adaptive skill areas (communication, community use, functional academics, home/school living, health and safety, leisure, self-care, self-direction and social skills) which

[1] According to the ICD-10 classification F70 is referred to as "mild mental retardation" and F71 as "moderate mental retardation", but for purposes of this article we are using the term "intellectual impairment". In ICD-10 classification F80 is referred to as "Specific developmental disorders of speech and language", but in this article we are using the term "language impairment". In ICD-10 classification F81 is referred to as "Specific developmental disorders of scholastic skills", but in this article we are using the term "specific learning disability".

are combined to form 3 domains: Conceptual, Social and Practical (see Table 2). Based upon the ratings from the 9 skills areas the General Adaptive Composite is calculated.

Table 2. **ABAS-II Adaptive Domain–Skill Area Classifications (Harrison & Oakland, 2003; Oakland & Harrison, 2008)**

Domain	*Skill Areas*
Conceptual	Communication Functional Academics Self-Direction
Social	Leisure Social
Practical	Self-Care Home/School Living Community use Health and Safety

Raters score each item using a 4-point Likert-type scale. The choices are: is not able, never or almost never when needed, sometimes when needed, and always or almost always when needed. Each item includes an opportunity to check a box if the respondent guessed. Respondents may comment about the items in space provided. All scores are based on age-related norms. The General Adaptive Composite and domain composite scores have a mean of 100 and a standard deviation of 15. Skill area standard scores have a mean of 10 and a standard deviation of 3.

The Cronbach's alpha of the ABAS-II, Latvian language version, in the Latvia clinical validization study are very good (see Table 3). The General Adaptive Composite scale alpha is .98, which provides excellent basis for interpretation (Raščevska & Koļesovs, 2013).

Table 3. **ABAS-II parent and teacher domain and subdomain Cronbach alpha coefficients for the Latvia clinical group validization study (Raščevska, Koļesovs, 2013)**

Measure	*Parent report*			*Teacher report*		
	LI	*SLD*	*II*	*LI*	*SLD*	*II*
General Adaptive Composite	.97	.97	.99	.98	.98	.98
Conceptual domain	.96	.95	.97	.97	.97	.97
Social domains	.86	.90	.96	.96	.95	.94
Practical domains	.96	.96	.98	.95	.95	.97
Communication skills	.89	.88	.96	.94	.93	.94
Community use skills	.89	.92	.97	.85	.80	.91
Functional Academics skills	.94	.95	.97	.96	.96	.97
Home Living skills	.92	.92	.97	.92	.92	.91
Health and Safety skills	.90	.88	.95	.92	.99	.92
Leisure skills	.86	.85	.92	.92	.90	.89
Self-Care skills	.85	.86	.96	.84	.84	.90
Self-Direction skills	.92	.89	.92	.91	.93	.90
Social skills	.77	.83	.95	.94	.93	.91

Note. LI – language impairment, SLD – specific learning disabilities, II – intellectual impairment.

Procedure

Initially contact was made with special education schools and regular schools which have special programs for children with special needs. A clinical sample was formed with children from various regions of Latvia, and who had been identified with specific disorders by the medical-pedagogical commission. The assessment (intelligence testing, behavior and ABAS-II data collection from parents and teachers) was conducted by psychologists with master's or doctoral degrees. Study participants received the ABAS-II forms from the psychologist. They were placed in an envelope, and after the parents completed the questionnaires they were asked to seal the envelope and return it to the psychologist. In some cases the psychologist provided verbal instructions to the parents, and in some cases, answered if the parent had questions about specific items. Informed consent was received from all parents whose child was included in the study. Both parents and teachers completed the appropriate ABAS-II forms and returned them to the psychologist who was completing the study.

Results

In order to answer to the research question about the differences in adaptive behavior skills for children with different forms of developmental disorder, analysis of variance (ANOVA) calculation was made. In order to compare the results from different groups, the mean values were compared with *Bonferroni Post-hoc* test.

Table 4. **Comparison of adaptive behavior skills (Parent report) among groups of children language impairment, specific learning disabilities and intellectual impairment (*n* = 76)**

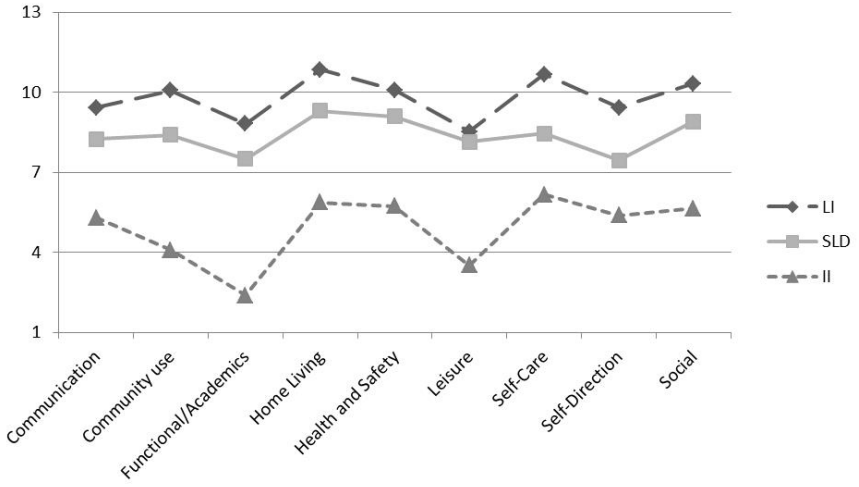
Measure	*LI (n = 33) M (SD)*	*SLD (n = 20) M (SD)*	*II (n = 23) M (SD)*	*F*
General Adaptive Composite	97.48 (14.84)[a]	89.40 (17.63)[a]	66.91 (14.82)[b]	26.61***
Conceptual domain	94.12 (15.43)[a]	85.35 (15.56)[a]	65.74 (13.38)[b]	24.94***
Social domains	95.82 (14.70)[a]	91.30 (17.63)[a]	70.30 (11.82)[b]	21.46***
Practical domains	101.33 (12.84)[a]	92.10 (19.42)[a]	70.26 (19.19)[b]	23.58***
Communication skills	9.42 (3.27)[a]	8.25 (2.75)[a]	5.30 (3.42)[b]	11.50***
Community use skills	10.06 (3.18)[a]	8.40 (4.06)[a]	4.09 (3.25)[b]	20.72***
Functional Academics skills	8.82 (3.14)[a]	7.50 (3.72)[a]	2.39 (1.85)[b]	32.71***
Home Living skills	10.85 (2.85)[a]	9.30 (3.44)[a]	5.87 (3.24)[b]	17.34***
Health and Safety skills	10.09 (2.98)[a]	9.10 (3.68)[a]	5.74 (2.63)[b]	13.97***
Leisure skills	8.52 (2.86)[a]	8.15 (2.85)[a]	3.52 (2.23)[b]	26.33***
Self-Care skills	10.67 (2.67)[a]	8.45 (2.80)[b]	6.17 (4.09)[b]	13.53***
Self-Direction skills	9.42 (3.19)[a]	7.45 (3.56)[ab]	5.39 (3.20)[b]	10.22***
Social skills	10.33 (3.39)[a]	8.90 (3.58)[a]	5.65 (2.66)[b]	14.31***

Note. In each row, those mean values with the same subscript letter indicate significant Bonferroni post-hoc comparison differences ($p < .05$).

LI – language impairment, SLD – specific learning disabilities, II – intellectual impairment.

***$p < .001$

As seen in Table 4, parent report of child adaptive behavior skills differs for children with different forms of developmental disorder. The skill level of children with intellectual impairment is lower for General Adaptive Composite, as well as for conceptual, social and practical domain skills than for children in the other two groups. On the other hand, the language impairment group ratings do not differ from the ratings of children in the learning disabilities group in regard to the General Adaptive Composite score, nor conceptual, social and practical domain skills.



Note. LI – language impairment, SLD – specific learning disabilities, II – intellectual impairment.

Figure 1. Adaptive Behavior Scaled Scores of Children with Different Disorders (Parent report)

Analyzing more specifically the group differences, it can be seen that the children with intellectual impairment have lower skill level than the children in the other two groups in regard to skills such as communication, community use, functional academics, home living, health and safety, leisure and social skills (see Table 4 and Figure 1). However, the self-care skills for children with intellectual impairment and for children with specific learning disabilities are lower than for children with language impairment. Self-direction skill level differences are significantly higher for the language impairment group in comparison to the intellectual impairment group.

As seen in Table 5, analysis of variance comparison of the teacher-reported ratings shows a similar, yet somewhat varying degree of differences. In comparison of the teacher-reported ratings, the intellectual impairment group has lower scores on the General Adaptive Composite as well as on the Social and Practical domains. The teacher-reported Conceptual domain ratings evidence highest scores for the language impairment group and lowest scores for the children with intellectual impairment.

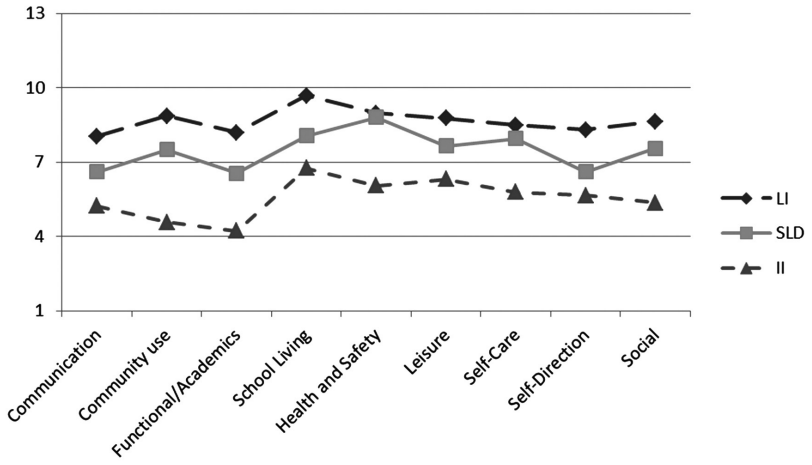
As seen in Table 5 and Figure 2, for the teacher-reported ratings the children with intellectual impairment have lower scores on skills such as community use, functional academics, health and safety, self-care and social skills in comparison with children from the other two groups. The school living and leisure skill scores for children

with intellectual impairment are significantly lower than for children with language impairment, but do not differ than the mean scores for children in the learning disabilities group. Communication and self-direction skill levels do not differ for children with intellectual impairment or specific learning disabilities, but the mean scores of these children are lower than for children with language impairment.

Table 5. **Comparison of adaptive behavior skills (Teacher report) among groups of children language impairment, specific learning disabilities and intellectual impairment (*N* = 76)**

Measure	*LI (n = 33) M (SD)*	*SLD (n = 20) M (SD)*	*II (n = 23) M (SD)*	*F*
General Adaptive Composite	91.03 (12.61)[a]	83.85 (9.28)[a]	70.87 (9.75)[b]	22.88***
Conceptual domain	89.30 (12.42)[a]	80.40 (7.37)[b]	71.57 (8.42)[c]	20.87***
Social domains	91.85 (13.02)[a]	85.25 (10.17)[a]	75.83 (8.34)[b]	14.23***
Practical domains	93.79 (12.81)[a]	88.30 (12.01)[a]	73.35 (9.68)[b]	21.01***
Communication skills	8.03 (2.34)[a]	6.60 (1.35)[b]	5.22 (2.00)[b]	13.29***
Community use skills	8.85 (2.92)[a]	7.50 (1.85)[a]	4.57 (2.13)[b]	20.98***
Functional Academics skills	8.18 (2.88)[a]	6.55 (1.93)[a]	4.22 (1.86)[b]	18.88***
Home Living skills	9.67 (2.77)[a]	8.05 (2.61)[ab]	6.57 (2.34)[b]	10.53***
Health and Safety skills	8.97 (2.63)[a]	8.80 (2.73)[a]	6.04 (1.87)[b]	10.95***
Leisure skills	8.76 (2.50)[a]	7.65 (1.73)[ab]	6.30 (1.85)[b]	9.00***
Self-Care skills	8.48 (2.03)[a]	7.95 (1.70)[a]	5.78 (1.54)[b]	15.85***
Self-Direction skills	8.30 (2.38)[a]	6.60 (1.54)[b]	5.65 (1.67)[b]	12.82***
Social skills	8.64 (2.70)[a]	7.55 (2.33)[a]	5.35 (1.50)[b]	13.96***

Note. In each row, those mean values with the same subscript letter indicate significant Bonferroni post-hoc comparison differences ($p < .05$).
LI – language impairment, SLD – specific learning disabilities, II – intellectual impairment.
***$p < .001$



Note. LI – language impairment, SLD – specific learning disabilities, II – intellectual impairment.

Figure 2. **Adaptive Behavior Scaled Scores of Children with Different Disorders (Teacher report)**

In order to answer the second research question what are the differences between parent and teacher ratings of the adaptive behavior of children with language impairment, specific learning disabilities and intellectual impairment, the ratings of teachers and parents were compared (see Table 6).

Table 6. **Paired t-test values of comparison of parent and teacher reported adaptive behvavior skill levels for children with language impairment, specific learning disabilities and intellectual impairment**

Measure	*t-test values for paired samples (parent and teacher report)*		
	LI (n = 33)	*SLD (n = 20)*	*II (n = 23)*
General Adaptive Composite	2.47*	1.63	–1.66
Conceptual domain	1.76	1.42	–2.65*
Social domains	1.54	1.90	–2.60*
Practical domains	2.91**	0.94	–0.98
Communication skills	2.09*	2.52*	0.13
Community use skills	1.78	0.99	–0.82
Functional Academics skills	1.01	1.01	–4.87***
Home Living skills	1.91	1.70	–1.27
Health and Safety skills	1.82	0.38	–0.52
Leisure skills	–0.46	0.81	–5.87***
Self-Care skills	4.17***	0.67	0.52
Self-Direction skills	2.13*	1.29	–0.52
Social skills	2.89**	1.91	0.58

Note. LI – language impairment, SLD – specific learning disabilities, II – intellectual impairment.
*$p < .05$. **$p < .01$. ***$p < .001$

The comparison of parent and teachers ratings within each group shows that there are significant differences between the ratings of parents and teachers. Within the language impairment group the parent-reported ratings are significantly higher than the teacher-reported ratings in regard to General Adaptive Composite and the Practical domain as well as communication, self-care, self-direction and social skills (see Table 6).

Within the specific learning disabilities group the ratings reported by parents and teachers are similar in almost all aspects, except for the evaluation of communication skills (see Table 6). Parents rate these skills higher than do the teachers.

Within the group of children with intellectual impairment the opposite trend is seen. The evaluations of the teachers are higher than those of the parents for functional academics, as well as for the leisure subdomain and for the Conceptual and Social domains (see Table 6).

Discussion

The aim of this research was to examine the differences in adaptive behavior skills for children with language impairment, specific learning disabilities or intellectual impairment, and to explore if there are differences between parent and teacher ratings

of the adaptive behavior for children with language impairment, specific learning disabilities or intellectual impairment.

The results of the research show that both parents and teachers report that children with intellectual impairment have lower skill level on General Adaptive Composite and lower conceptual, social and practical skills than children from the other two disorder groups. Adaptive behavior skills level of children from the language impairment and specific learning disabilities groups does not differ in regard to General Adaptive Composite, nor conceptual, social and practical skills. Previous research (Harrison & Oakland, 2003) also has shown that the General Adaptive Composite mean scores of children with intellectual impairment are at least 2 standard deviations below the norm.

In analyzing the skill areas ratings, it was found that for children with intellectual impairment they were lower than for children in the other two developmental disorder groups in regard to the communication, community use, functional academics, home living, health and safety, leisure and social skills. On the other hand, the self-care skills for children with intellectual impairment and specific learning disabilities are significantly lower than for children with language impairment, but the self-direction skills differ only for the language impairment group and intellectual impairment group.

Even though there are some similar trends among the evaluations of teachers and parents, there are also meaningful differences. The social and practical skill areas evaluations, as well as the General Adaptive Composite from the teacher-reported information differed with lower ratings for the children from the intellectual impairment group. However, in the Conceptual skill area the teacher ratings were significantly different among all of the clinical groups, with higher ratings for the language impairment group and lower ratings for children intellectual impairment.

The children with intellectual impairment had significantly lower ratings on skills such as community use, functional academics, health and safety, self-care and social skills, in comparison with children from the other two groups. The school living and leisure-time skills ratings for children with intellectual impairment were significantly lower than for children with language impairment, but the specific learning disabilities group did not differ from the other two groups. Communication and self-direction skill ratings for children with intellectual impairment did not differ from those of children with specific learning disabilities, but both groups had significantly lower ratings than the children with language impairment.

In order to answer the second research question about differences between parent and teacher ratings of adaptive behavior for children with language impairment, specific learning disabilities and intellectual impairment, the ratings of parents and teachers were compared. The results showed that there are significant differences between the parent and teacher ratings within each group of clinical disorders.

The use of multiple informants is based upon the presumption that each informant is able to provide unique information (Lane, Paynter, & Sharman, 2013), and it can be expected that between the informant ratings there will be both differences as well as similarities (Kalyva, 2010; Kanne, Abbacchi, & Constantino, 2009). Differences between the ratings of informants can be explained by differences in the child's behavior in different situations of different environments (Kanne, Abbacchi, & Constantino, 2009).

For example, the school setting offer differs from the home setting in aspects such as the level of behavioral expectations, degree of structure, and amount of goal-oriented activities (Lane, Paynter, & Sharman, 2013). Also, the subjective perspective and varying levels of criteria for acceptable behavior can differ between parents and teachers.

Within the language impairment group the ratings of the parents were significantly higher than the ratings of teachers in regard to General Adaptive Composite, the Practical skills area, as well as in regard to communication, social, self-care and self-direction skills. These differences in parent and teacher ratings in the communication and social skills areas can be explained at least partially by the demands of each situation. In the home situation language competence is merely one of several aspects of forming relationships, but in the school setting language competence is more essential for developing and maintaining social relationships among peers (Marton, Abramoff, & Rosenzweig, 2005). Fujiki and colleagues have found that children with language impairment rated themselves in the school setting as more lonely than their typically developing classmates, and as having significantly fewer peer relationships (Fujiki, Brinton, & Todd, 1996). Furthermore, teacher reports have indicated that children with language impairment demonstrate more withdrawn behaviors, particularly within the classroom environment (Fujiki, Brinton, Hart, et al., 1999; Fujiki, Brinton, Morgan, et al., 1999). Research to date has shown that children with language impairments are less preferred playmates as compared to typically developing peers and are often the subject of peer rejection (Fujiki, Brinton, Hart, & Fitzgerald, 1999). Children with language impairment are more likely to initiate conversations with adults than with their peers (Rice, Sell, & Hadley, 1991).

Researchers agree that there is a strong association between social skills and language competence, but there is a difference of opinion in regard to the precursor of this association (Marton, Abramoff, & Rosenzweig, 2005). Some maintain that language impairment is one of the reasons why these children have difficulty in forming successful relationships with their peers (Craig, 1993; Jerome, Fujiki, Brinton, & James, 2002). Others (i.e. Locke, 1997) argue that socio-cognitive abilities are at the basis of language development, and that socio-cognitive abilities level influences the alacrity of language development. Similarly one could explain the differences in the parent and teacher ratings of self-direction and self-care skills. In the school setting, to a much greater extent than in the home setting, the environment is structured and goal-oriented, and therefore precisely in the school setting difficulties in self-direction and self-care skills would be most conspicuous and cumbersome. Several studies have shown an association between language ability and self-regulation (Vallotton & Ayoub, 2011), attention regulation and delay of gratification, especially among impulsive children (Rodriguez, Mischel, & Shoda, 1989). It may be that the explanation for the association between language and self-direction is that the use of language in the form of private (self-directed) speech may help to guide behavior and to facilitate problem solving, as suggested by Vygotsky and Luria (Luria, 1961; Vygotsky, 1962). In support of language as a facilitator of self-regulation, studies have shown that private speech is associated with performance on problem-solving tasks (Berk, 1999). In addition, interventions that increase the use of private speech result in improved behavioral regulation (Barnett et al., 2008; Diamond, Barnett, Thomas, & Munro, 2007; Winsler, Manfra, & Diaz, 2007).

Within the specific learning disabilities group the evaluations of parents and teachers are similar in almost all aspects, except for the ratings of communication skills, which is higher for the parents than for the teachers. Specific learning disabilities often are comorbid with language impairment (Wong, 1991), and therefore it is apprehensible that communication skills may be less well developed. As already mentioned, within the school setting language competence is at the basis of forming and maintaining relationships with peers (Marton, Abramoff, & Rosenzweig, 2005), and this may explain why teachers place greater emphasis on communication skills and are more stringent in their criteria of evaluation.

Within the intellectual impairment group an opposite tendency was observed. The teachers' ratings were higher than those of the parents in regard to functional academic skills and recreation subdomain, as well as for the Conceptual and Social domains. Partially, this finding is similar to that of previous research, for example, Szatmari and colleagues (Szatmari et al., 1994) found that for children with pervasive developmental disorders, the parents consistently rated lower the child's adaptive behavior than did the teachers. Voelker and colleagues (Voelker et al., 2000) found similar results in studying a group of children with low intelligence test scores. However, Hundert, Morrison, Mahoney, & Vernon (1997) found that parent ratings were more severe than teacher ratings only for children with severe developmental delays, but not for those with moderate or no delays.

Another potential source of rating differences may be attributed to characteristics of the informant (Lane, Paynter, & Sharman, 2013). For example, parent educational level and age influences their perceptions of autism symptoms (Hattier, Matson, Belva, & Adams, 2013). Other studies have shown an association between parental stress level or depression level and higher levels of externalizing and internalizing behavior problems than did teachers' evaluations (Loeber, & Stouthamer-Loeber, 2000) and reporting more autistic behaviors and less adaptive skills than teachers (Szatmari, Archer, Fisman, & Streiner, 1994).

Future research is necessary to further explore why the teachers of children with intellectual impairment reported higher levels of adaptive behavior than did the parents of these children. One of the explanations could be that the teachers evaluated the adaptive behavior of the said pupil in relation to other children in his or her class, all of whom were in a special education placement for children with intellectual impairment, whereas the parents of the said child were more apt to compare his/her behavior with that of other children in the general population. Therefore, in future studies special efforts should be made so that the teachers would be additionally informed to compare the said pupil with other children from the general population.

Limitations and implications for future research

One of the limitations of this study is the relatively small size of the clinical sample. Initially the clinical sample was designed to be larger in order to be more representative of the children with special needs in Latvia, but in many cases it was not possible to obtain completed questionnaire forms from parents and teachers. Also excluded were those children whose parents had completed the adaptive behavior items as completely

incongruous with the diagnosis of the child. Therefore, the relatively small sample size limits the generalization of the results. The small number of participants in each disorder group also affects the statistical power to detect other differences between the groups. Also, since these disorders are asymmetrical by gender, then also the clinical groups of this study were not balanced by gender. Another limitation is related to the way in which data were collected. Most of the parents and teachers were handed the questionnaires to be completed on their own, but the authors of ABAS-II emphasize that psychologists are encouraged to meet with parents and teachers, explain the assessment process and the manner in which the ABAS-II should be completed, as well as answer to questions. The third limitation is the exclusive use of parent and teacher report forms for the evaluation of child adaptive behavior.

Practical Implications

The benefits of this study include the use of multiple informants. As noted by Lane and colleagues (Lane, Paynter, & Sharman, 2013), it is important for assessments to maximize the unique information gained about each child. In this way the information is most useful for professionals in order to identify the specifics of the problem, and to provide recommendations for further treatment and intervention. Our research results show that children with different disorders have different adaptive behavior problems and the ABAS-II provides essential information in addition to the results from intelligence testing and child behavior problem evaluations.

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Inattention and Anxiety in Relation to Working Memory and Processing Speed in the Latvian WISC-IV Version

Sandra Sebre[1], Baiba Martinsone, Malgožata Raščevska, Aleksandrs Koļesovs, Inga Skreitule-Pikše

University of Latvia

Abstract

The aim of this study was to explore the associations between inattention and anxiety in relation to the working memory (WM) and processing speed (PS) scores of the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV) Latvian version in a group of children who were participants in a clinical validation study. Included in the study were 267 participants: 89 children, one parent of each child, and the child's teacher. The children were administered the WISC-IV Latvian version, their parent completed the Child Behavior Checklist and their teacher completed the Teacher Report Form. Results showed that teacher but not parent ratings of inattention were associated with WM and PS scores . Teacher ratings of inattention were found to negatively correlate with Coding (from the PS scale) and Digit Span Backwards (from the WM scale). Teacher ratings of child anxiety were predictive of inattention. Cluster analysis indicated that inattention in combination with high anxiety resulted in the lowest Digit Span Backwards scores. Results are discussed in regard to practical implications for psychologists who will be using these assessment instruments to identify pupils' difficulties and to provide recommendations.

Key words: *inattention, anxiety, WISC-IV, working memory, processing speed*

Introduction

Parents and teachers often turn to psychologists in order to seek help in understanding why their child or pupil is encountering difficulties in relation to academic work, with the hope that the understanding which the psychologist provides will be the basis for recommendations which can serve to help alleviate the noted academic problems.

Among the precipitating aspects which psychologists seek to identify include inattention, especially in relation to processes of working memory and processing speed, previously shown to be associated with essential academic skills such as reading and math (Jacobson et al., 2011; Rogers, Hwang, Toplak, Weiss, & Tannock, 2011). Recent research has shown that in addition to the strong neurobiological basis of inattention (Cheung, Fazier-Wood, Asherson, Rijsdijk, & Kuntsi, 2014), emotions and emotion-based cognitive factors such as anxiety and negative interpretations may interfere with a child's attention (Weissman, Chu, Reddy, & Mohlman, 2012). As will be briefly discussed in this introduction, to date there have been numerous studies addressing the

[1] Corresponding author Sandra Sebre: *sebre@lu.lv*

association between inattention, working memory and processing speed, but there has been a marked dearth of research concerning the interrelationship of these cognitive processes in relation to anxiety.

The associations between inattention, working memory and academic progress have been addressed in various studies. Working memory, the system which temporarily holds multiple pieces of information in the mind and includes the mental manipulation of this information (Baddley & Hitch, 1974) has been shown to play an important role in the development and enhancement of academic skills (Gathercole, Pickering, Knight, & Stegmann, 2004). Rogers and colleagues (Rogers et al., 2011) have provided support for a mediational model, whereby inattention predicts working memory performance, which in turn, is strongly associated with achievement in reading and mathematics. Within this model it is shown that the path from inattention symptoms to reading skill is partially mediated by the working memory variables. Others, such as Mulder (Mulder et al., 2011) and Tillman (Tillman, Eninger, Forssman, & Bohlin, 2011) have considered working memory abilities to be predictors of inattention.

Processsing speed is typically defined as speed of completion of a task with reasonable accuracy (Jacobson et al., 2011), and has been identified as underlying many academic (e.g., decoding, mathematical computation) and cognitive skills (e.g., working memory, verbal ability) (Fry and Hale,1996). Processing speed and working memory scores have been shown to be powerful predictors of learning disability (Mayes and Calhoun, 2007). Jacobson and colleagues (Jacobson et al., 2011) have shown that both processing speed and working memory are significant predictors of oral reading fluency. The authors of this study have differentiated the assessment of the "cognitive" (executive) components of PS (WISC-IV Coding) from the graphomotor output components (Coding Copy task), and have shown that specifically the "cognitive" components of PS were predictive of reading fluency.

Inattentive behavior has been shown to be associated with both poor working memory and slow processing speed (Mulder, Pitchford, & Marlow, 2011). Studies with children with ADHD have shown reduced processing speed and lower working memory scores, compared to controls (Jacobson et al., 2011; McConaughy, Ivanova, Antshel, & Eiraldi, 2009). Studies have also shown differences in ratings of the child's behavior by parents and teachers, and differences in the degree of association between parent and teacher ratings with working memory and processing speed scores. For example, teacher but not parent rated inattention has been linked to poorer working memory performance (Mulder et al., 2011; Nadeau, Boivin, Tessier, Lefebvre, & Robaey, 2001).

Working memory performance has also been associated with anxiety (Eysenck, Derakshan, Santos, & Calvo, 2007), although most of the theoretical and empirical work concerned with the relationship between cognitive processes and anxiety has been with adults. Eysenck and colleagues have developed the Attentional Control Theory which predicts that anxiety affects cognitive performance via its adverse effects on attentional control. In particular, the authors suggest that anxiety specifically one aspect of the attentional system – the goal-driven attentional system which in centered in the prefrontal cortex. Recent research with adults exploring the interrelationships of affective and cognitive components from a neuroscience perspective has shown

that anxiety is linked to impoverished recruitment of prefrontal attentional control mechanisms (Bishop, 2009). This research supports previous suggestions by child behavior specialists that there might be an overload on prefrontal cortex functioning in situations of both anxiety and the need to engage attentional control mechanisms for cognitive tasks, since the prefrontal cortex serves both cognitive and emotional control functions (Barkley, 1998).

From a clinical standpoint it is known that there is high rate of comorbidity between ADHD and anxiety, and that approximately 30–40% of children with ADHD meet criteria for a comorbid anxiety disorder in clinical samples (Tannock, 2009). The proposed etiology for the comorbidity includes both genetic and family environmental influences (Jarrett, 2013). Nevetheless, there has been a dearth of research specifically with children examining symptoms of ADHD (inattention and hyperactivity-impulsivity) together with anxiety in association with the critical cognitive processes of working memory and processing speed. Within the professional literature for psychologists (Sattler & Dumont, 2004) there is mention of the possibility that anxiety may affect working memory and processing speed subtest scores, but these implications have not been supported by research to date.

Two specific research aims were formulated: 1.) to examine the associations between measures of inattention, hyperactivity-impulsivity, anxiety, working memory and processing speed; 2.) to examine if meaningful clusters including these variables can be identified. A cluster analysis approach has been used in previous research in order to identify various patterns of the child's cognitive functioning in relation to difficulties with inattention and hyperactivity-impulsivity (Bonafina, Newcorn, McKay, Koda, & Halperin, 2000).

Method

Participants and procedure

Included in the study were 89 children, and for each child one of their parents and one of their teachers. The children's mean age was 10.22 (SD = 1.56), ranging from 8 to 13 years old, 29 (31% were girls) and 65 (69%) were boys. Children included in this study were chosen from a larger study sample which had been developed in order to examine the validity of the WISC-IV Latvian version in a clinical sample. All of the children included in this sample had been identified by psychologists and teachers as having difficulties with learning, language development and/or ADHD symptoms. Only those children with IQ 70 or greater (as measured by the WISC-IV Latvian version) were included in this sample. The mean IQ was 87.53 (SD = 12.85), ranging from 71 to 123.

Participating in the study was also one of the child's parents, most often the mother, who agreed to complete the questionnaire form, as well as one of the child's teachers, who similarly agreed to complete the provided questionnaire. As a result the total number of study participants was 267. The majority of the parents were with high school or occupation school education.

Children were chosen for participation in the validation study based upon psychologists' identification of children as having learning problems, language impairment or inattention/hyperactivity behaviors. Children's parents were contacted and informed consent was attained. Parents and teachers were informed by the researchers about the purpose of the study and were assured of confidentiality, as well as voluntary participation and ability to withdraw from participation at any time. Only children of parents who provided written consent for their child's participation were included in the study.

Children were administered the intelligence test by psychologists trained in the administration of the WISC-IV Latvian version. The testing took place in the child's school, most often in the school psychologists' office. Parents and teachers were asked to complete the questionnaire forms at school or at home, and to return them in a sealed envelope to the researchers.

Measures

All measures had been previously forward and back-translated from English to Latvian by several independent translators and consensus was agreed upon. The translated measures were pilot-tested and after initial psychometric analysis, some items were made more precise in order so that the items would be conceptually equivalent to the original.

Working memory and processing speed. Children participating in the study were administered the WISC-IV Latvian version (Wechsler, 2014), which is a translation from English to Latvian language of the WISC-IV (Wechsler, 2004). The present study includes with measures of scaled scores on subtests comprising the Processing Speed Index (Coding and Symbol Search), as well as the Working Memory Index (Digit Span-forwards and backwards, and Letter-Number Squencing). On the Digit Span test children are asked to repeat strings of digits, both forward and backward. Although both forwards and backwards repetitions are components of the Working Memory Index, various researchers have noted the backward repetition to be a more specific measure of working memory (Jacobson et al., 2011; Mulder et al., 2011).

Attention, hyperactivity-impulsivity and anxiety. The children's anxiety, inattention and hyperactivity-impulsivity behaviors were assessed with subscales of the Latvian versions of the Child Behavior Checklist (CBCL/6-18, Achenbach & Rescorla, 2001), and the Teacher Report Form (TRF, Achenbach & Rescorla, 2001). Both parent and teacher checklists include 112 items which describe the child's possible emotional and behavioral problems. Parents are asked to rate each item on a scale from 0 ("not true") to 2 ("very true "or "often true"). In this study the two subscales – Inattention (I) and Hyperactivity-Impulsivity (H-I) – were used from the TRF. The Attention Problems scale was used from the CBCL. The DSM-Oriented scales of Anxiety Problems were used as measures of anxiety. Cronbach's alphas for the Anxiety scales ranged from .63 to .69; Cronbach's alphas for the Attention Problems, Inattention and Hyperactivity-Impulsivity scales ranged from .74 to .90.

Data analyses

All statistical analyses were conducted in SPSS Statistics 22. First, we studied associations between measures of inattention, hyperactivity, anxiety, working memory and processing speed with correlational analysis. Second, those variables which were shown to be significantly interrelated were entered into a hierarchical regression analysis. Third, based upon the results of the regression analysis, the significantly associated variables were entered into a K-Means Cluster analysis.

Results

Intercorrelations among parent/teacher ratings and child subtest scores

The pattern of association between inattention, hyperactivity-impulsivity and anxiety ratings in relation to child working memory and processing speed subtest standardized scores were examined with correlation analysis. Results are presented in Table 1. Teacher-rated inattention and Parent-rated attentional problems were positively correlated ($r = .50$, $p < .01$). Teacher-rated inattention scores were significantly negatively correlated with Digit Span Backwards standardized scores ($r = –.28$, $p < .01$); and with Coding standardized scores ($r = –.27$, $p < .01$). Teacher-rated hyperactivity-impulsivity ratings were not associated with any of the working memory or processing speed scores. Parent-rated attention problems were not associated with working memory or processing speed. Anxiety rating were not associated with the working memory or processing speed scores, but teacher-rated anxiety was significantly associated with teacher-rated inattention ($r = .45$, $p < .01$).

Table 1. *Intercorrelations between Parent/Teacher Ratings and WM / PS subtests*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Teacher-Inattention									
2. Teacher-Hyperactivity-Impulsivity	.56**	–							
3. Parent-Attention Problems	.50**	.42**	–						
4. Teacher-Anxiety	.45**	.32**	.17	–					
5. Parent-Anxiety	.14	.13	.36**	.38**	–				
6. Digit Span	–.12	.03	.07	–.02	–.03	–			
7. Digit Span-Backwards	–.28**	.01	.05	.01	.11	.76**	–		
8. Coding	–.26**	–.11	–.15	–.02	.13	.31**	.32**	–	
9. Letter-Number	–.11	.09	–.12	–.02	.09	.38**	.39**	.23*	–
10. Symbol Search	–.09	.12	–.10	.04	.08	.28**	.36**	.39**	.31**

* $p < .05$; ** $p < .01$.

Explained variance

In the next statistical analysis with linear regression we examined the amount of variance explained by Digit Span Backwards, Coding and anxiety scores in predicting teacher-rated inattention. As seen in Table 2, teacher ratings of inattention were

significantly predicted by Digit Span Backwards scores and teacher-rated anxiety scores F (4, 86) = 10.037, $p < .001$, and explaining 33% of the variance.

Table 2. **Hierarchical Regression Analysis Predicting Teacher-Rated Inattention**

	β	*p*	*F*	R^2
			10.037***	.33
Gender	.21	.053		
Gender	.16	.092		
Digit Span Backward	–.21*	.028		
Coding	–.16	.092		
Teacher-Rated Anxiety	.43***	.000		

*$p < 0.05$; ***$p < 0.001$

Table 3. **Comparison of Teacher-Rated Inattention and Anxiety, and child Digit Span Backwards Standard Scores by Cluster**

	Cluster 1 (n = 25)		*Cluster 2 (n = 37)*		*Cluster 3 (n = 27)*		*F-value*
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	
T-Inattention	19.64	(2.67)	13.16	(2.14)	4.96	(2.99)	213.17***
T-Anxiety	3.84_a	(2.53)	3.30_a	(1.82)	1.33	(1.62)	11.85***
Digit Span Backwards	7.04	(2.39)	8.40_b	(2.55)	9.33_b	(2.53)	5.51**

*** $p < 0.001$; ** $p < 0.01$. Note: values marked with subscript *a* or *b* denote those pairs of means which do not significantly differ at the value of $p < .05$.

Cluster analysis

In light of the findings that there were significant associations between teacher-rated inattention, teacher-rated anxiety and Digit Span Backwards scores, a K-Means cluster analysis of these three variables was performed. The results yielded a three-factor solution with 25 children in Cluster 1, 37 children in Cluster 2 and 27 children in Cluster 3. The mean scores from each cluster were compared with analysis of variance (ANOVA) and post-hoc analysis, as seen in Table 3. The results showed significant differences between the scores in all three groups. Cluster 1 included children with the highest mean scores of teacher-rated inattention, teacher-rated anxiety scores significantly higher than for Cluster 3, and Digit Span Backwards scores which were significantly lower than for Cluster 2.

Discussion

The present study was aimed at investigating the interrelationships among teacher and parent perceptions of child inattention, hyperactivity-impulsivity and anxiety in relation to measures of the the child's working memory and processing speed abilities.

First, certain subtests of working memory and processing speed were shown to be associated with teacher-rated inattention, specifically the Coding subtest from the Processing Speed Scale, and Digit Span Backwards from the Working Memory Scale.

The found associations between the Coding subtest and inattention are similar to those Jacobson and colleagues (Jacobson et al., 2011), who found that children with ADHD showed lower scores on Coding than did children from the non-ADHD control group.

It was not surprising that specifically the Digit Span Backwards scores, rather than the combined Digit Span score (including results from both forwards and backwards repetitions), were associated with the teacher-reported inattention scores. Several previous researchers (Jacobson et al., 2011; Mulder et al., 2011) have also emphasized the distinction between the cognitive processes which are involved in repeating spans of digits forwards as opposed to repeating them backwards. These researchers have specifically identified Digit Span Backwards to be a measure of working memory, in contrast to Digit Span Forwards which they have considered to be a measure of short-term memory. It seems logical, in accordance with the results from the present study, that a greater degree of concentrated attention would be necessary to carry out the mental manipulations which are required in order to repeat a string of digits backwards, rather than forwards.

A question arises as to the lack of association in the present study between scores from the Letter-Number Sequencing subtest and ratings of inattention. The Letter-Number subtest does require a degree of mental manipulation, in that the child must listen to a series of numbers and letters which are presented in incorrect order, and must place them in correct sequential order. One possible explanation for the lack of association with inattention ratings is that placing digits or letters in the traditional order is a more automatic process due to the principles of classic Hebbian learning theory. It may be that since throughout early childhood children generally receive much practice and experience in repeating numbers in order, as well as some experience in repeating letters in order, that these previously well-rehearsed sequences are neurologically ingrained as "well-worn pathways" (Kupfermann, 1991). Therefore, following along these "pathways" requires less focused attention than, for example, repeating a string of digits backwards. Such a possible explanation, of course, requires exploration in future studies.

With practical implication is also the finding that it was specifically the teacher-reported ratings of inattention, rather than the parent-reported ratings, which were associated with the working memory and processing speed subtest scores. As noted also by authors of the report forms (Achenbach & Rescorla, 2001), parent-reported and teacher-reported ratings of child behavior may differ for various reasons, including differences in how the adult perceives the child, differences in criteria for evaluation, and actual differences in the child's behavior in the home and school situation. Mulder (Mulder et al., 2011) proposes that in regard to a similar association found in their study between teacher-reported inattention and working memory tasks, it may be that this is due to the different situational expectations, i.e. that the classroom situation is cognitively more demanding and that there is a greater need to apply working memory skills. Another explanation may be that within the classroom situation there generally is a greater demand for concentrated focus, hence, more opportunity for the teacher to observe if the child has difficulty in maintaining attention.

The relationship between inattention and working memory has previously been conceptualized and examined to be causally related in either direction. For example, Rogers (Rogers et al., 2011) has shown inattention to be a predictor of working memory abilities, whereas others, such as Mulder (Mulder et al., 2011) and Tillman (Tillman et al., 2011) have considered working memory abilities to be predictors of inattention. In this study, based upon the initial finding of correlations between teacher-reported Inattention, Digit Span Backwards, Coding and teacher-rated Anxiety, a hierarchical regression analysis was performed and shown to indicate

Digit Span Backwards and teacher-rated Anxiety to be predictive of teacher-rated Inattention, with Coding scores being excluded from the regression model. This implies that Digit Span Backwards (DSB) seems to be a more potent indicator of attentional difficulties in comparison to other WISC-IV subtest scores, and that it would be useful for psychologists to make particular note of these DSB scores in relation to attentional difficulties when attempting to sort out and identify the specifics of the child's problems.

Results from the cluster analysis, which showed that the combination of inattention and anxiety is associated with lower working memory scores, highlight the necessity for future studies to further explore in greater depth the interactive effects of anxiety and inattention in relation to cognitive processes. As mentioned previously there have been some studies with adults exploring the associations between anxiety and cognitive functioning (Bishop, 2009; Eysenck, Derakshan, Santos, & Calvo, 2007), but to date lacking are explorations of inattention and anxiety interactions in relation to children's intelligence test scores. Optimally future studies would need to examine the known neurological components of both inattention and anxiety in relation to the known environmental/societal/familial factors which can facilitate both attentional difficulties and anxiety. For psychologists it seems especially imperative to examine and identify situations in which the child's anxiety is being perpetuated by traumatic experience (Chaffin, Silovsky, & Vaughn, 2005; Flynn, Cicchetti, & Rogosch, 2014), so that the perpetuating factors of the trauma can be addressed.

The findings from this study imply that teachers and parents may benefit from psychoeducational training in order to increase awareness and understanding of how both problems of inattention and anxiety can contribute to the child's cognitive functioning which, in turn, contributes to the child's academic progress. It is often useful for teachers and the parents of children with these difficulties to understand both the neurological underpinnings as well as environmental factors which can facilitate or minimize these problems, so that appropriate changes in the environment can be enacted when possible. Furthermore, there is reason to agree with previous researchers that early identification of problems with working memory, processing speed, inattention and anxiety is important so that appropriate interventions can be implemented. Such early intervention can help to overcome a "negative developmental cascade" of academic and emotional/behavioral difficulties (Mulder et al, 2011).

Limitations of the present study include the relatively small sample size. It would be important to conduct future studies with larger samples and, if possible, more specifically deliniated clinical groups. Of course, it would be important to explore more fully the interrelationships of inattention, anxiety and WISC-IV subtest scores

in other sociocultural contexts, not only in Latvia. Future analysis would also benefit from additional computerized measures of attention, and assessment of graphomotor abilities, particularly if the child evidences low scores on the Coding subtest, in order to differentiate and identify the specifics of the problem which requires additional remediation.

Strengths of the present study include the identification of the Digit Span Backwards and Coding subtests of the WISC-IV Latvian version, as significantly associated with teacher-reported ratings of child inattention. In addition, of practical importance is the finding that the teacher but not the parent ratings of inattention, are significant in association with the child's working memory and processing speed difficulties. This implies that psychologists should pay particular attention to teacher reports of the child's behavior in analyzing the child's performance on cognitive tasks. Further, the results from this study confirm that the child's anxiety may be a contributing factor to the child's attentional difficulties, which may in turn contribute to the child's cognitive functioning and subsequent academic difficulties. If this is the case, then specific means and measures should be taken to identify and address the precipitating factors of the anxiety.

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Notes on Authors

Ieva Bite is a clinical psychologist and an associated professor in the University of Latvia. Her professional experience includes work in Riga Psychiatry and Narcology centre and Crisis intervention centre "Skalbes". Her researh interests are children, adolescent behavior and emotional problems and treatment possibilities, parent-child relationships, abuse and violence towards children, domestic violence, psychoemotional disorders in adulthood, cognitive behavioral therapy.

Rūta Care, Ph.D., is a profesor in the Department of Conservative dentistry, Riga Stradiņš University. She has been teaching operative and paediatric dentistry since 1971, has been a head of the Department from 1992 to 2011. Areas of her research interest are paediatric dentistry, cariology and dental prophylaxis, where she has multiple publications.

Ilze Damberga, Dr. Psych., is a clinical psychologist and assistant professor in the University of Latvia. Her professional experience includes work in Riga Psychiatry and Narcology centre, Riga Teika Secondary School and Jelgava Secondary School No. 4. Her research interests in clinical and educational psychology are children and adolescent behavior and emotional problems, parent involvement, social emotional learning and bullying.

Elena Dmitrieva, Ph.D. – works as senior researcher at the Institute of Evolutionary Physiology and Biochemistry, Russian Academy of Sciences. She was a head of several Russian Humanitarian Research Foundation projects carried out in last decade. The studies concerned psychophysiological mechanisms of speech emotional prosody perception and their relationship with school progress (in ordinary and gifted pupils), ontogenetic features of echoic and working memory, voice cues for valence of the speech emotional prosody. Main research interests: developmental psychophysiology of perception of emotional speech prosody and its links to Emotional Intelligence.

Victor Gelman, Doctor of Technical Sciences – works as a professor of the department of medical informatics and physics of the North-Western State Medical University named after I. I. Mechnikov where he gives courses on statistical research methods and ICT. As a researcher he has been involved in a number of Russian Humanitarian Research Foundation projects. . Main research interests: psychophysiology, pedagogics, application of math methods in psychophysiology.

Emīls Kālis has obtained a master's degree in social psychology in 2010 and at the moment is continuing studies at the Daugavpils University working on his dissertation about the assessment of creative potential. He is also a researcher at the State Probation Service in Latvia. His research interests are related to psychological assessment, methodology, creativity, intellect, personality and probation.

Aleksandrs Koļesovs, Dr. Psych., is an associate professor of General Psychology at University of Latvia. His research interests include future orientation, time perspective, individual-context interaction, and test development.

Līga Kroniņa, is a graduated dentist since 1999 and certified in paediatric dentistry in 2006. She has a bachelor degree in social sciences (psychology), but also underwent magister studies in psychology in University of Latvia and doctoral studies in medicine/dentistry in Riga Stradiņš University. The theme of her doctoral work is "Dental anxiety and its correlation to oral health and different psychosocial factors for 4–12 years old children in Latvia".

Ilona Laizāne is a senior lecturer at Riga Teacher Training and Educational Management Academy. She has Dr. psych. degree obtained at the University of Latvia. Her professional and practical experience was obtained through parents and children consultations while working as school psychologyst and the chief of Pieriga Pedagogical Medical Commission. Her research interests include parent–child relationship related problems treatment and development psychology.

Baiba Martinsone, Dr. psych. is a clinical psychologist, family therapist and docent at the University of Latvia. She delivers courses such as Psychological Counseling, Professional Ethics and supervised internships. She is also a co-author of "Social emotional learning" and "Support to positive behavior" programs for schools. Significant part of her professional work deals with psychological assessment and she is one of authors of WISC-IV Latvian edition interpretive manual.

Malgožata Raščevska, Ph.D., a professor in the Department of Psychology, University of Latvia. For the past 25 years she has been teaching at the University of Latvia courses in cognitive psychology, theory of intelligence, and research methodology. She has published several books and articles in these areas. Her current research deals with intelligence, test construction and adaptation.

Līga Roķe has obtained a master's degree in clinical psychology at the University of Latvia in 2003. She is continuing my studies in the doctoral program in Developmental Psychology, focusing her research on the interaction of emotions and creativity in children. She works in the Creativity Research Centre at the Riga Teacher Training and Educational Management Academy. The scope of her interests includes creativity,

emotional development and pscyhological assessment. She also works in the nongovernmental sector in the field of rehabilitation of addicted persons.

Sandra Sebre, PhD., is a professor at University of Latvia, Department of Psychology. She teaches developmental and clinical psychology courses. Sandra Sebre has participated in various research projects which examine trauma symptoms of children and adults, especially as sequelae to child abuse and harsh parenting. Her research interests also include multi-method use in psychological assessment, autobiographical narration within the developmental process, and nested contexts which foster resilience.

Inga Skreitule-Pikše, Dr. Psych., is a clinical psychologist and an associate professor at University of Latvia, Department of Psychology. Her research interests include child behavior problems and family psychology, especially, parent-child interaction. Her clinical experience includes working with parents and children and leading parent training groups about preschool children's emotional development.

Kristīne Vende, Dr. Psych., lecturer in the Department of Health Psychology and Pedagogy, Rīga Stradiņš University. Research interests include clinical and developmental psychology (behaviour problems in children, emotion regulation, nonverbal attunement). Also interested in qualitative research methodology.

Aleksejs Vorobjovs, is a professor in Daugavpils University and his main scientific interests are related to the questions about modelling personality and its selective activities, transformational leadership and other many topics in personality psychology and social psychology. He is author of more than 90 publications including 10 monographs and many textbooks for students. In his assistance more than 15 dissertation, 100 master and 200 bachelor theses are defended in psychology and pedagogy.

Diāna Zande is a Doctoral Candidate in Clinical Psychology at the University of Latvia and Cognitive Behavioral psychotherapist. Her research interest and clinical experience include Perinatal depression, Infant temperament, Parenting, Cognitive Behavioral Psychotherapy.