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Research article

Factor analysis and predictive validity of the Early Risks of Physical Abuse and Neglect Scale (ERPANS): A prospective study in Dutch public youth healthcare☆

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ABSTRACT

Early detection of child abuse risk factors in families of new-born babies is an important task of the public youth health care system in the Netherlands. The Early Risks of Physical Abuse and Neglect Scale (ERPANS) was originally developed in Belgium as an observation scale for public child healthcare nurses. The present longitudinal study is an independent prospective validation of the ERPANS in a Dutch community sample (N = 1257) of families with a new-born. Results showed a commonality of underlying subsets of items belonging to the 'Disturbed parent-child relationship' and 'Psychological problems' factors, but the factor 'Communication problems' of the original ERPANS could not be replicated. We found that parental psychological problems were a significant predictor of family problems, including involvement of child protection authorities, at an average follow-up of 22 months. Parents who reported feeling unloved by their own parents were at higher risk of reports of serious concern to child protection authorities at 22 months after birth. These findings support the utility of at least a subset of the ERPANS items as a screening tool for child abuse risk in preventive public youth health care for new-born babies. Our research adds to a growing body of evidence which points to the importance of parental mental health problems and adverse childhood experiences as precursors to child abuse risk.

1. Introduction

According to the most recent strategic document of the World Health Organization on ending violence against children (WHO, 2016), "child maltreatment (including violent punishment) involves physical, sexual and psychological/emotional violence; and neglect of infants, children and adolescents by parents, caregivers and other authority figures, most often in the home but also in settings such as schools and orphanages."(p. 14). For the purpose of the present paper, only child maltreatment in the home will be considered. Child maltreatment often results in serious long-term emotional, cognitive and physical difficulties (e.g., Carrey, Butter, Persinger, & Bialik, 1995; Felitti et al., 1998; Gilbert, Bauer, Carroll, & Downs, 2013). To prevent child abuse and its negative consequences, the early detection of actual abuse and child abuse risk factors is essential.

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Many scholars rely on ecological models in understanding the risk of child maltreatment. One model which has shown both heuristic value and empirical support was developed by Belsky (1980), Belsky and Vondra (1989). Ecological perspectives such as Belsky's contend that abuse is best understood and predicted by models that include multiple risk factors simultaneously impinging upon the parent-child relationship (Belsky, 1980; Sidebotham, 2001). Ecological models organize risk factors into the domains of parent, child and context (family and social; Duffy, Hughes, Asnes, & Leventhal, 2015). Parental risk factors include characteristics such as age, marital status, mental health problems, stress level, isolation, coping skills, parental history of childhood abuse, substance abuse, personality traits, child development knowledge and parenting skills (Baartman, 1996; Black, Heyman, & Smith Slep, 2001; Casanueva, Cross, & Ringeisen, 2008; Hamilton-Giachritsis & Browne, 2005; Kahn & Schwalbe, 2010; Rinehart et al., 2005; Slack, Holl, Altenbernd, McDaniel, & Stevens, 2003; Stith et al., 2009). Child risk factors consist of aspects of physical health, behavior, temperament and developmental status (Black et al., 2001; Kahn & Schwalbe, 2010; Slack et al., 2003). Finally, contextual risk factors include lack of social support, financial stressors (such as poverty and low socioeconomic status) and neighborhood unsafety (Black et al., 2001; Kahn & Schwalbe, 2010; Milner, 1993; Scannapieco & Carrick, 2004; Slack et al., 2003; Stith et al., 2009).

During the past 15 years, along with the identification of a variety of child maltreatment risk factors, a major shift has occurred from tertiary prevention of child maltreatment to secondary and primary prevention in public health care systems (Doueck, 1995; Murry & Lewin, 2014; Taylor, Baldwin, & Spencer, 2008). In The Netherlands, public youth healthcare workers are confronted with the challenging statutory task of detecting/assessing child maltreatment risk and consequent decision-making in their day-to-day practice, as laid down in the Public Health Act (effective December 1, 2008). Children are monitored by the public youth health care system from birth until 19 years (Dunnink & Lijs-Spek, 2008). The system monitors the child's physical health, provides a vaccination program and serves as information source for young parents (Verbrugge, 1990). Public youth healthcare workers are uniquely suited for a role in the detection of child abuse and child abuse risk factors (Grietens, Geeraert, & Hellinckx, 2004). Research has shown that infants and very young children (in the 0–4 age group) experience the highest rate of child maltreatment and also have the largest risk of lethal child maltreatment as a result of their dependency, vulnerability and relative social invisibility (U.S. Department of Health & Human Services, 2013; WHO, 2006). Moreover, the possibility of successful intervention and prevention targeted at child maltreatment risk is highest in programs that focus on at-risk pregnant women and on parents in the first year after delivery (Olds, Sadler, & Kitzman, 2007).

In order to assist Dutch public health youth care nurses with the detection of child abuse risk factors during the first weeks after birth, we decided to implement the *Early Risks of Physical Abuse and Neglect Scale* (ERPANS; Grietens, Hellinckx, van Assche, Baartman, & Geeraert, 1999). We selected the ERPANS because (1) it was specifically developed for public child healthcare nurses during the first three months after birth, (2) it is nurse-rated observation scale (and not a self-report instrument), and (3) the public child healthcare monitoring systems of Flanders and the Netherlands are highly similar. Grietens et al. (1999) developed the first preliminary version of the ERPANS based on Belsky's (1980) ecological model. The first version consisted of 92 items divided into five domains: interaction between nurse and mother (9 items), parent-child interaction (35 items), dynamic parental and family characteristics (22 items), dynamic child characteristics (5 items) and static child-, parent- and contextual characteristics (21 items; Grietens et al., 1999; Hellinckx, Grietens, Geeraert, Moors, & Van Assche, 2001).

To refine the preliminary scale, Hellinckx et al. (2001) conducted a pilot study in which a random sample of 40 public child healthcare nurses collected data for three months in a sample of 373 non-abusive and 18 confirmed abusive/neglectful mothers. Of the former 92 items, only items with a prevalence rate higher than 5% that were able to discriminate between abusing and non-abusing mothers were included. This resulted in a final instrument consisting of 31 items (see Appendix A). Hellinckx et al. (2001) further examined the psychometric properties of the revised scale and found high internal consistency (Cronbach's $\alpha = .94$), high interrater reliability (across all items: $r = .97$) and good concurrent validity with socioeconomic living conditions of the families. Finally, the predictive validity of the scale was examined based on a discriminant analysis in the same sample (373 non-abusive and 18 abusive and/or neglectful mothers) resulting in a sensitivity of .70 and specificity of .58. Three factors were found to underlie the scale: Disturbed parent-child relationship, Communication problems, and Parental psychological problems. Abusive mothers scored significantly higher on all three factors compared to non-abusing mothers (Hellinckx et al., 2001).

Subsequently, Grietens et al. (2004) analysed the same dataset of 391 mothers. While using the same sample, they started with a different initial item pool (containing 71 items instead of 92). The reason for the selection of these 71 items is not offered. The authors subsequently reduced the scale to a final version of 20 items with three (different) underlying constructs: Isolation, Psychological complexity, and Communication problems. The internal consistency of the reduced 20-item scale was high (Cronbach's $\alpha = .92$), as was the interrater reliability (across all items: $r = .97$). Furthermore, two subscales of the reduced scale, 'Communication problems' and 'Isolation', were associated with the socioeconomic living conditions of the family, which significantly distinguished abusing from non-abusing mothers (Grietens et al., 2004). It should be noted that the factor structure reported by Grietens et al. shows considerable overlap with that of Hellinckx et al. (2001). The original "Parental psychological problems" factor is now composed of two subfactors, "Isolation" and "Psychological complexity" (Grietens et al., 2004), while the "Communication problems" factor of the Hellinckx study was replicated in the Grietens et al. study. The notable difference between the two studies pertains to the third factor of the Hellinckx study, labeled "Disturbed parent-child relationship". This factor could not be replicated in the Grietens study, because 11 of the 14 items pertaining to this factor were not included in the Grietens study. It is unclear to us why Grietens et al., although using the same sample and a similar analytic approach, decided to discard these items. We have consulted both Hellinckx and Grietens, but did not receive clarification.

Because of this unclarity, we decided to conduct a prospective study to examine the factor structure and the predictive validity of the 31-item ERPANS for child abuse risk in a general population sample. Child abuse risk was defined as subsequent reports by

anyone to the official child abuse reporting agency concerning the particular family. We also used referrals to and discussion of interventions directed at parenting problems as a proxy for concerns about child abuse risk. A cohort of parents (N = 1760) of new-borns from a province in The Netherlands was followed up for 22 months on average. Public child health care nurses were trained in child abuse risk screening, including the ERPANS, for use in communication with parents of a new-born baby.

2. Method

2.1. Procedure

As part of the implementation of a new method of child abuse risk screening, 15 public youth healthcare nurses attended a two-day training program (with a two-week interval). This training program focused on the provision of general information on child abuse (types, prevalence, information from studies on child abuse reporting), the rationale for the screening method, and practice in how to use it. Nurses were trained in solution-focused communication skills with parents, with the assistance of training actor. Building a collaborative partnership with parents and scaling of safety are important components in this approach (Turnell & Edwards, 1997). The new screening method was implemented as part of routine care.

In the first week after birth, parents of a new-born baby living in three municipalities in the province of Flevoland (Dronten, Zeewolde and Lelystad) were visited by a public health nurse who performed the heel prick test on the baby. During the visit, parents were informed that another nurse would come by for a home visit within the next two weeks. For the present study, parents were provided with information and consent forms about the study and after parents agreed to participate they were asked to fill out a self-report questionnaire within the coming week. In a letter attached to the self-report questionnaire, we explained that the public health service has the statutory task to monitor the well-being of new-born babies and that the questionnaire was part of a study that examined strengths and needs of families. The letter also mentioned the answers to the questionnaire would be discussed with the visiting nurse two weeks later. We also informed parents that the questionnaire included sensitive questions. Results of a study on the validity of the self-report questionnaire will be reported in a separate paper.

We did not ask parents for consent to review their files at follow-up, as it was expected that this would result in a very high attrition rate (see also Staal, Hermanns, Schrijvers, & van Stel, 2013, who used a similar approach). Obviously, parents were free to decline completing the questionnaire, which was constructed by the authors on the basis of a review of the empirical evidence on child abuse risk factors. Findings on the predictive accuracy of this self-report questionnaire will be reported in a separate paper.

During the home visit two weeks after birth, the nurse collected the questionnaire. The nurse discussed the answers given on the self-report questionnaire with the parents, stimulating a conversation about different topics related to parenthood and child rearing, needs and strengths of the parents and their family. The goal of the nurse during this visit was to create rapport with the parent(s) and to provide information on the services available to parents. Nurses also examined the baby's condition and discussed safety issues (e.g., sleeping habits). The public youth healthcare nurse completed the ERPANS after the home visit and entered a summary of the information about the family, including risk factors and strengths, into the electronic file of the child.

The Ethical Review Committee Psychology and Neuroscience of Maastricht University approved our study, including the absence of informed consent for collection of follow up data, because child abuse is a topic of great societal relevance (ECP-99 03_01_2011). We expected a substantial number of high-risk families might not give consent to obtain follow up data, compared to the low-risk families. There would be no negative consequences of using follow up data to parents. Coders of file data at follow up were blind to the information on the families at baseline.

2.2. Sample

Participants included families (N = 1760) who had a new-born baby between 15 October 2010 and 31 December 2011, living in Dronten, Zeewolde, and Lelystad. In 20 families a twin was born (rendering a total of 1780 new-born babies). For 1257 of these families (of which 14 had twins), the ERPANS was completed and could be included in the analyses (rendering a total sample of 1271 new-born babies). To examine possible selection bias, we performed a Chi-square test of independence comparing the percentage of cases with a completed ERPANS in the three different regions (Zeewolde, Dronten and Lelystad), the number of children in a family, and the parents' educational level. We conducted an independent-samples t-test to determine whether completion of the ERPANS was significantly related to parents' age. We found a significant difference (χ^2 (2) = 426.950, $p < .05$) between the regions with regard to completion of the ERPANS. In Lelystad, fewer nurses had completed the ERPANS, with 49% of lists not completed, compared to 7.7% in Zeewolde and 3.5% in Dronten. We found no significant differences in parents' age, level of education and number of children in the family with relation to completion of the ERPANS.

Of the included children, 51% (n = 642) were male and 49% (n = 629) were female. For about one third of the parents the baby was their first child (32.6%, n = 410), almost half of the families had two children in total (41.1%, n = 517), 18% (n = 226) had three children and 8.3% (n = 104) had four or more. A minority of families was combined (11.3%, n = 142), referring to families in which both the father and mother had children from another relationship. The majority of the sample lived in Dronten (40.5%, n = 509), 36.8% (n = 463) lived in Lelystad, and 22.7% (n = 285) in Zeewolde.

Mothers' age ranged from 15 to 45 (M = 30.2, SD = 5.1). Almost half of the mothers had completed higher secondary (HAVO) or pre-university (VWO) education or intermediate vocational education (MBO) (48.7%, n = 561), 32.2% (n = 371) had graduated from higher vocational education (HBO) or university and 15.4% (n = 177) finished lower secondary (MAVO) or pre-vocational education (VMBO). A very small proportion only finished primary education (3.2%, n = 37) or did not have any education (0.4%,

n = 5). Most mothers were employed at follow up (71.4%, n = 855).

Fathers' age ranged from 19 to 65 (M = 33.3, SD = 6.1). Almost half of the fathers had completed higher secondary or pre-university education or intermediate vocational education (46.4%, n = 511), 29.7% (n = 327) graduated from higher vocational education or university and 17.6% (n = 194) finished lower secondary or pre-vocational education. A very small portion only finished primary education (2.6%, n = 29) or did not have any education (0.7%, n = 8). The vast majority of the fathers was employed at the time of the follow up (92.4%, n = 1104).

2.3. Representativeness of the sample

We chose three municipalities in the Province of Flevoland for our study, because they represent a typical mix of urban and rural development, characteristic for the Netherlands. In 2011, Lelystad was the largest of the three municipalities, counting 75,211 inhabitants. Dronten counted 40,317 inhabitants and Zeewolde comprised 21,197 residents (CBS, 2012). With regard to population density, statistics over the year 2012 showed that Zeewolde and Dronten count between 21–250 inhabitants per square kilometer (i.e., little urbanization). In Lelystad, 250–500 people are housed per square kilometer (i.e., moderate urbanization; RIVM, 2013). In the included municipalities, between 22–28% of the population is highly educated. In 2009, one-third of the Dutch population between 25–64 years has a university level education. In The Netherlands, the average disposable income was 14,700 € per person for 2008. In Zeewolde, Lelystad and Dronten the average disposable income ranged from 13,700-14,700 € per inhabitant.

2.4. Measures

2.4.1. Early Risks of Physical Abuse and Neglect Scale risks of physical abuse and neglect (ERPANS)

The ERPANS (Hellinckx et al., 2001) is a 31-item nurse-rated tool. The scale assesses three domains: Disturbed parent-child relationship, Communication problems, and Psychological problems. All items are negatively formulated and have to be rated by the nurse on the basis of a home observation on a 4-point response format, ranging from 0 (never observed or reported) to 3 (very often observed or reported). Hellinckx et al. (2001) examined the psychometric properties of the scale and found high internal consistency (Cronbach's α = .94), high interrater reliability (across all items: r = .97). Furthermore they found good concurrent validity; scores on a social deprivation scale (measuring socioeconomic living conditions of the family) shared variance on all three scales; R^2 = .11 for Disturbed parent-child relationship, R^2 = .38 for Communication problems, and R^2 = .26 for Psychological problems. The predictive validity of the ERPANS was examined by discriminant function analysis, resulting in a sensitivity of 70% and specificity of 57.7%. Abusive mothers scored significantly higher on all three domains compared to non-abusive mothers (Hellinckx et al., 2001).

2.4.2. Digital child records

Child abuse reports were gathered from the children's electronic files at follow-up (on average 22 months after the ERPANS was completed). These files are updated after every contact with Public Youth Health Care (PYHC). In the first two years of the child's life, 11 contacts take place at the infant welfare center. The electronic files contain information on child abuse risk factors, demographic information, medical status information (growth curve, weight, etc.), referrals to service agencies (e.g., mental health treatment, parenting support) and calls/reports to the child protection agency. Referrals and reports include those conducted by other professionals (e.g., police, family doctor) besides those from PYHC.

Electronic files were coded by two independent raters (Master's students in Psychology). Before starting the actual data coding, both raters independently coded 30 files. Cohen's kappa was calculated to assess interrater agreement. Kappa can range from 0 to 1, with larger values indicating higher reliability. Cohen's kappa values above .70 are considered satisfactory (Field, 2009). During this training phase, the first author served as a third party in resolving disagreements by discussion; criteria for certain variables were clarified and another set of 30 files was coded independently. On the basis of the second set of 30 files, the mean kappa value for the outcome measures was .93.

2.4.3. Outcome variables

Our main outcome variable was termed 'Serious Concern', which was defined as reports of concerns (of abuse) and the involvement of child protection authorities at 22 months follow-up, as documented in the electronic files. The variable was coded dichotomously with '0' reflecting no reports and/or involvement of authorities and '1' reflecting reports of concern and/or involvement of child protection authorities, which resulted in a prevalence rate of serious concern of 5.6% (n = 70). As stated earlier, we decided not to ask parents for permission to consult official Child Protection Services registers at follow-up, because we expected a lot of refusals, which would have resulted in selection bias.

Because 'Serious Concern' had quite a low prevalence rate, we also extracted from the files whether the family had received or had been referred to care or intervention (such as mental health care, parenting guidance, debt restructuring, etc.), or whether such a referral was discussed with the parents by the public youth health care agency. Subsequently, a second outcome variable was computed termed 'Family Problems' which was defined as reports of concerns of child abuse, involvement of child protection authorities, receiving professional interventions such as mental health care, parenting guidance and debt restructuring, and also included being referred to or having discussed the need for these types of interventions. 'Family problems' was coded '0' when none of these problems were present in the family and '1' when one or more of these problems were present, which resulted in a prevalence rate of family problems of 20.1% (n = 252). This outcome variable covers a range of problems within the family, which could possibly put the child at risk of maltreatment, and thus serves as a proxy operationalization of child abuse risk.

2.5. Data analysis

2.5.1. Factor analysis

To replicate the factor structure of the ERPANS as found by Hellinckx et al. (2001) we originally intended to perform a confirmatory factor analysis (CFA). However, it is known that CFA can be problematic in analyses of multivariate data consisting of responses to questionnaire items. Such data are known to typically generate covariance between error terms, the omission of which invariably leads to poor model fit, even in cases where the factor structure has been correctly specified (Floyd & Widaman, 1995). Indeed, our initial attempt to replicate the factor structure found by Hellinckx et al. (2001) with CFA led to a contradictory outcome in that some of the measures indicated a good fit (RMSEA = 0.055), whereas other fit measures indicated a bad fit (TLI = 0.798). This contradictory outcome, coupled with a large collection of modification index values for error covariances, led us to opt for a more data driven EFA approach. To ensure generalizability of the outcome of this analysis, we performed a random split procedure on the total sample of 1263 cases, resulting in a calibration (n = 615) and a validation sample (n = 648). The first sample was used to explore the factor structure, while the second sample was used for cross-validation.

All analyses were conducted with Mplus version 5.21,[1] using the MLR estimator to correct for strong violations of the normality assumption. The MLR estimator uses maximum likelihood estimates of parameters with robust Huber-White sandwich estimates of standard errors (Huber, 1967) and a scaled correction of the model Chi Square test which is asymptotically equivalent to the Yuan-Bentler T2 statistic (Yuan & Bentler, 1998). Although this overall Chi Square test is considered to be of limited use in the case of large sample sizes, it forms the basis for the computation of more informative measures such as RMSEA and SRMR.

2.5.2. Logistic regression analyses

Logistic regression analyses were performed in SPSS 22.0 (IBM Corp., 2013). Since items that load on a common factor will be substantially correlated, we performed multiple logistic regression analyses to predict the dichotomous outcome variables 'Family Problems' and 'Serious Concern' 22-months later. To avoid possible overfitting, the 31 items could not be examined together in a single multiple logistic regression model (see Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996). Instead, we examined several logistic regression models with subsets of items (the subfactors) based on the factor analysis. To account for the fact that observations were nested in municipalities (regions) we included two dummy variables as indicators of region, with Lelystad as reference group.

3. Results

3.1. Exploratory factor analysis

After considering eigenvalues, screeplot, interpretability of obliquely rotated factors, and model fit measures, as well as a comparison of the sample eigenvalues with the average eigenvalues found in a parallel analysis of random samples, the exploratory factor analysis on the first (calibration) sample produced a six-factor solution (RMSEA = 0.05, SRMR = 0.04). This deviated from the original three-factor structure found by Hellinckx et al., although most of the six factors were dominated by items that originally loaded on one of the Hellinckx et al. factors (for instance, two factors were largely dominated by items from the original "Disturbed parent-child relationship" factor). In comparison to the original structure uncovered by Hellinckx et al., the present solution thus showed greater complexity.

Our attempt to replicate this six-factor solution in our second sample yielded good values for model fit (RMSEA = 0.037; SRMR = 0.050), although eigenvalues and screeplot suggested different solutions. A greater problem, however, was that the pattern of loadings for the present six-factor solution was markedly different from the first, so there was no configural correspondence between the solutions of the calibration and the validation samples. The divergence in the pattern of factor loadings can be explained by the relatively large standard errors (SEs) of the loading estimates of the factor solution for the first sample, with most SE values larger than 0.10 and many larger than 0.20, leading to margins of error over 0.20 and often over 0.40. This instability is related to the MLR correction of the normality violation of the data (for the EFA results for the two samples, see Appendix B).

3.2. Factor analysis on restricted item sets

Although the original factor structure of Hellinckx et al. could not be reproduced, our factor solutions in both samples consistently suggested commonality underlying subsets of items belonging to the Hellinckx et al. 'Disturbed parent-child relationship' and 'Psychological problems' factors. In an alternative attempt to get a focus on these commonalities, we decided to perform three additional EFA's on the 14 items of the original 'Disturbed parent-child relationship' factor, the 8 items of the 'Communication problems' factor and the 12 items of the 'Psychological problems' factor, respectively. In the original factor solution of Hellinckx et al. three items showed cross-loadings on factors. To prevent data dredging and to ensure generalizability, these analyses were again performed on the data of the first sample and then cross-validated on the data of the second sample. In both samples, these analyses revealed a one-factor solution for the 14 items of the 'Disturbed parent-child relationship' and a comparable three-factor structure for the 12 items of the 'Psychological problems' factor, resulting in four subfactors. The 8 items belonging to the second, 'Communication

[1] After completion of the original manuscript, reviewer comments led us to supplement the originally executed factor analysis with a parallel analysis for determining the number of factors to be extracted. For this supplementary analysis we used the more recent Mplus version 7.3.

Table 1
Item factor loadings (> .30) of ERPANS Factor 1 "Disturbed Parent-Child Relationship" as found by Hellinckx et al. (2001).

Risk item	Subfactor 1
2. Taking care of the baby is considered to be a nuisance	.835 (.706)
4. I believe the parent is giving incorrect information on the baby's behaviour and development	.483 (.431)
6. The parent expects the baby to give abundant love	.333 (.235)
7. The parent sets few limits and does not give much structure to the baby's life	.522 (.454)
8. The parent speaks often about herself and not about the baby	.473 (.553)
10. The parent is easily put out of patience when dealing with the baby	.617 (.801)
11. The parent's reaction to the baby's behavior is very unstable	.648 (.844)
13. The parent does not check the effect of his/her behavior on the baby	.686 (.695)
14. The baby is considered to be a restraint of her freedom of movement	.700 (.575)
17. There is no consideration for the baby's feelings	.569 (.777)
20. Taking care of the baby gives rise to tension and nervousness	.609 (.578)
21. The parent deals with the baby in consideration of general beliefs on how to handle babies and does not take into account that this child is special	.667 (.757)
25. The parent expects the baby to behave conveniently	.379 (.719)
27. There is not much reaction to the baby's signs for social contact (crowing, smiling)	.667 (.690)

Note. Factor loadings found in the second sample are in parentheses.

problems' factor, produced two-factor solutions with a diverging loading pattern across the two samples.

The original set of 31 items was thus divided into four stable subfactors of items, with some of the original items (all belonging to the original 'Communications problems' factor) dropping out. Subfactor1 consisted of 14 items from the original 'Disturbed Parent-Child Relationship' factor. Cronbach's α for this subfactor was .84 in the calibration sample and .89 in the validation sample. Subfactor 2 consisted of 8 items (items, 1, 8, 9, 18, 19, 28, 30 and 31) pertaining to current psychological problems of the parents such as item 1 "In a stressful situation the parent soon turns out to be helpless". Cronbach's α for this subfactor was .75 in the calibration sample and .77 in the validation sample. Subfactor 3 consisted of 3 items pertaining to a negative view of their own family of origin such as item 15 "The parent intimates that as a child (s)he did not get much love from his/her parents or family". Cronbach's α for this subfactor was .66 in the calibration sample and .77 in the validation sample. Subfactor 4 consisted of 2 items on lack of social support. Cronbach's α for this subfactor was .86 in the calibration sample and .88 in the validation sample.

The loading pattern for the first subfactor is reported in Table 1 (with the loadings in the second sample in parentheses), and the loading pattern for the three subfactors pertaining to the original 'Psychological problems' factor is reported in Table 2. The inconsistent loadings for the original 'Communication problems' factor are not reported.

3.3. Logistic regression analyses

In order to control for overlap between the items, multiple logistic regression analyses were performed to predict 'Family problems', and more specifically 'Serious concern' at follow-up. To avoid problems of overfitting, we used the subfactors based on our factor analysis. Two logistic regression models were constructed that contained the four subfactors as predictors of the dichotomous outcome variables 'Family Problems' and 'Serious concern', respectively.

Analysis showed that the four subfactors, while controlling for residential region, predicted 'Family problems' significantly better than the null model ($\chi^2 = 117.54$, $p < .001$, Nagelkerke $R^2 = .142$; see Table 3). The strongest predictor of 'Family problems' was subfactor 2, consisting of items on current psychological problems of the parent(s), followed by a negative view of family of origin

Table 2
Item factor loadings (> .30) of ERPANS Factor 3 "Psychological Problems" as found by Hellinckx et al. (2001).

Risk item	Sub factor 2	Sub factor 3	Sub factor 4
1. In a stressful situation the parent soon turns out to be helpless	.719 (.680)		
8. The parent speaks often about herself and not about the baby	.411 (.464)		
9. The parent has gloomy expectations	.597 (.566)		
15. The parent intimates that as a child (s)he did not get much love from his/her parents or family		.939 (.922)	
18. The parent has already gone through several crises and it seems that (s)he has difficulties in getting over it	.491 (.390)	.389 (.465)	
19. The parent intimates that she feels unhappy	.692 (.780)		
23. The parent is dissatisfied with contacts with family/friends		.551 (.649)	
24. There is not much support from the partner			.840 (.918)
26. The parent intimates that (s)he is alone facing the problems			.943 (.857)
28. The parent comes across as listless	.746 (.795)		
30. The parent is not able to adequately seek help or support	.314 (.497)		
31. The parent does not show much self-confidence	.689 (.640)		

Note. Factor loadings found in the second sample are in parentheses.

Table 3
Multiple logistic regression analyses of the four subfactors and region as covariate predicting 'Family Problems'.

Subfactors	B (S.E.)	Wald χ^2	Odds ratio [95% CI]
Subfactor 1: Disturbed parent-child relationship	1,24 (0.81)	2.35	3.44 [0.71–16.67]
***Subfactor 2: Current psychological problems	1.73 (0.54)	10.28	5.66 [1.96–16.34]
**Subfactor 3: Negative view of family of origin	0.87 (0.30)	8.43	2.40 [1.33–4.34]
**Subfactor 4: Lack of social support	0.92 (0.34)	7.29	2.50 [1.29–4.87]
Region Zeewolde	−0.15 (0.22)	0.48	0.86 [0.57–1.31]
Region Dronten	0.33 (0.17)	3.74	1.39 [0.99–1.94]

Note. $R^2 = 0.142$ (Nagelkerke). Model χ^2 (6) = 117.54, $p < .001$. *** $p < .001$; ** $p < .01$; * $p < .05$.

and lack of social support.

In predicting the dichotomous outcome variable 'Serious concern' at follow-up using logistic regression analysis, the four subfactors (while controlling for region as a covariate) performed significantly better than the null model ($\chi^2 = 72.56$, $p < .001$, Nagelkerke $R^2 = .162$; see Table 4). Subfactor 3 (negative view of family of origin) was the strongest predictor of 'Serious concern'. The region of residence also showed a significant association with 'Serious concern': living in the smaller and less urbanized municipalities (Zeewolde and Dronten) indicated a significantly lower chance of 'Serious concern'.

4. Discussion

Our study was the first that tested the predictive value of the ERPANS, a nurse-rated observational tool for the detection of child abuse risk in a prospective study in a community sample of parents with a newborn baby. We were unable to reproduce the original three-factor structure of the ERPANS as found by Hellinckx et al. (2001). Still, our factor solutions consistently suggested commonality underlying subsets of items belonging to the original 'Disturbed parent-child relationship' and 'Psychological problems' factors. Additional factor analyses to examine this commonality yielded four consistent subfactors: a one-factor solution for the 14 items of the original factor 'Disturbed parent-child relationship' and a configurally comparable three-factor structure for the 12 items of the original 'Psychological problems' factor. Subfactor 1 pertained to a disturbed parent-child relationship, subfactor 2 to current parental psychological problems, subfactor 3 to a negative view of family of origin and subfactor 4 included items on lack of social support. These subfactors were found in both the calibration and the validation sample. Unlike Hellinckx et al. (2001), we did not find statistical evidence for a 'Communication problems' factor. The original 'Communications problems' factor is related to social isolation of the family, which is a more distal (and thus possibly less prominent) risk factor for child maltreatment in Belsky's (1980) ecological model, in comparison to both parental psychological problems and parent-child interaction problems. In fact, a systematic review showed that proximal risk factors, such as parental mental health and substance use problems, are the strongest predictors of repeated child abuse (Hindley, Ramchandani, & Jones, 2006).

In line with our findings, most screening tools for child abuse risk such as the ERPANS contain subscales that measure problems of the parents themselves (historical and current), problems interacting with the child, and problems with social support. Examples are the Child Abuse Potential Inventory (CAPI; Milner & Gold, 1986) and the Cleveland Child Abuse Potential Scale (C-CAPS; Ezzo & Young, 2012). Recently, Murry and Lewin (2014) designed a tool quite similar to the ERPANS: the Parenting Support Needs Assessment (PSNA), developed for primary care clinicians to identify families with risk factors for child maltreatment. This tool has four subcategories: (a) demographic factors, (b) parental characteristics, (c) child characteristics, and (d) contextual factors (Murry & Lewin, 2014).

Family Problems, such as financial strain and involvement of social welfare services, which we used in our study as a proxy measure for child abuse risk, were best predicted by current parental mental health problems, but also by a negative view of the parents on their family of origin and by lack of social support. It is well established that chronic socio-economic stress is a risk factor for child maltreatment (e.g., Kim & Drake, 2017; Maguire-Jack & Font, 2017). Also, recent studies have found parental mental health problems to be an important risk factor for child maltreatment in general (Duffy et al., 2015; Jonson-Reid, Chung, Way, & Jolley,

Table 4
Multiple logistic regression analyses of the subfactors and region as covariate predicting 'Serious Concern'.

Subfactors	B (S.E.)	Wald χ^2	Odds ratio [95% CI]
Subfactor 1: Disturbed parent-child relationship	1.88 (0.97)	3.75	6.58 [0.98 – 44.26]
Subfactor 2: Current psychological problems	0.93 (0.84)	1.25	2.54 [.49 – 13.09]
***Subfactor 3: Negative view of family of origin	1.65 (0.44)	13.89	5.23 [2.19 – 12.48]
Subfactor 4: Lack of social support	0.40 (0.48)	0.69	1.50 [.58 – 3.85]
**Region Zeewolde	−1.06 (0.39)	7.48	0.35 [0.16 – 0.74]
**Region Dronten	−0.82 (0.29)	7.70	0.44 [0.25 – 0.79]

Note. $R^2 = 0.162$ (Nagelkerke). Model χ^2 (6) = 72.55, $p < .001$; *** $p < .001$; ** $p < .01$; * $p < 0.05$.

2010; Rodriguez & Tucker, 2015), and for neglect (Slack et al., 2011), physical abuse (Tucker & Rodriguez, 2014) and sexual abuse (Meinck, Cluver, Boyes, & Mhlongo, 2015), in particular. Furthermore, parental mental health problems, such as substance abuse and depression, were found to be associated with out-of-home placement of children (English, Thompson, & White, 2015). Adequate social support has been shown to significantly reduce the risk of child abuse (Li, Godinet, & Arnsberger, 2011); conversely, lack of social support predicted child maltreatment re-reports to CPS over an 8-year follow-up period in a large US sample (N = 501; Proctor et al., 2012).

Besides Family Problems, Serious Concern about child maltreatment at follow up, in the form of contact with CPS, was best predicted by a negative view by the parent(s) of their family of origin. Perhaps parents who did not feel loved by their own parents are having trouble adjusting during the first 22 months after the birth of their own child. Research has demonstrated that adults with an insecure attachment representation of the relationship to their own parents can exhibit reduced parenting capacity or maladaptive responses to their children (van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999; Verhage et al., 2016). An extensive body of research has documented that insecure attachment to one's own parents often results in insensitive responding to babies, which may lead to intergenerational transmission of insecure bonding (Verhage et al., 2016).

Although the ERPANS does not directly assess the parents' experience of childhood abuse, when parents report they did not feel loved by their parents, one could assume there likely was neglect and/or abuse. Our findings thus point at a possible link between childhood maltreatment experiences of parents and reports to CPS about their own very young children. Intergenerational transmission of child abuse has not been consistently supported by all empirical studies (Thornberry, Knight, & Lovegrove, 2012), but recent, well-designed studies provide quite strong support for the notion that a parental history of childhood maltreatment is a strong predictor of maltreatment in the next generation, including CPS involvement (Bartlett, Kotake, Fauth, & Easterbrooks, 2017; Li et al., 2011; Putnam-Hornstein, Cederbaum, King, Eastman, & Trickett, 2015). A recent study that used mother-child observations when their infants were 5 and 12 months of age found that mothers who reported a history of childhood maltreatment showed significantly less emotional availability to their infants compared to a non-maltreated comparison group (Fuchs, Möhler, Resch, & Kaess, 2015).

Living in the largest, more urbanized municipality of Lelystad predicted more serious concern, including reports to CPS. Research on the role of urbanicity in child maltreatment has provided mixed findings. Some studies found higher rates of child maltreatment in more urbanized areas (Freisthler, 2004), while others found the opposite (Sedlak et al., 2010). Disparate findings appear to be at least partly due to different operationalisations of child maltreatment (e.g., substantiated vs. unsubstantiated reports to CPS). A recent study on self-reported child maltreatment in a nationally representative US sample found that those from major urban areas reported significantly more child abuse and neglect than those from rural areas, even after adjusting for child and family risk factors (Beatriz, Salhi, Griffith, & Molnar, 2018). The middle category of minor urban areas defined in their study fell in between rural and major urban areas in terms of self-reported child maltreatment. In how far the Dutch municipality of Lelystad is comparable to a minor urban area in the US is unknown. Still, our finding points out that urbanicity, including neighborhood disadvantage and social process, impacts child maltreatment risk (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007).

Our findings, together with those from other studies mentioned, suggest that parents with a strained relationship with their own parents may lead to parenting problems and an increased risk of child maltreatment. Screening by means of an instrument such as the ERPANS could help identify parents in need of assistance during early parenthood (Madigan, Wade, Plamondon, & Jenkins, 2015). Home visiting intervention programs, such as the Nurse Family Partnership (NFP), have been shown to result in statistically significant, enduring (up to 15 years after birth) effects on child maltreatment (Geeraert, Van den Noortgate, Grietens, & Onghena, 2004; Olds et al., 1997; Prosman, Wong, van der Wouden, & Lagro-Janssen, 2015; Zielinski, Eckenrode, & Olds, 2009). The NFP started in 1977 by promoting a safe home environment, encouraging competent caregiving and improving support for families by connecting them to health and social services. This intervention has been mainly targeted at demographically high-risk target groups, such as young, low-income mothers during the first two years of their children's lives. The NFP has been integrated in the Dutch preventive youth care system in several municipalities, targeting a similar group of young, low-educated mothers, and showed a significant effect in reducing victimization and perpetration of self-reported intimate partner violence two years after birth, compared to care-as-usual (Mejdoubi et al., 2013).

Targeting high-risk parents for home visitation on the basis of demographic characteristics is obviously just one approach to assist vulnerable parents and to lower the risk of child maltreatment. We believe the ERPANS could assist preventive youth health care workers in identifying at-risk parents shortly after birth, in order to facilitate referral to appropriate services. The ERPANS could perhaps also be used as an outcome measure, to monitor whether these enlisted services have the desired effects. Whether the ERPANS is sensitive enough to measure changes in risk factors needs to be investigated in future studies. Although in our study *current psychological problems of parents* were not related to serious concerns, they were related to family problems (including risk factors for child maltreatment) at follow up. This finding could indicate that adequate help for parental psychological problems might be important in preventing child maltreatment. Obviously, our naturalistic, non-experimental design does not allow causal inferences, so we cannot be sure that the ERPANS plays a role in referral to services, but our findings at the very least show that a subset of parents with psychological problems was referred to professional care.

The Netherlands has a universal public youth health care system from birth until 19 years (Dunnink & Lijs-Spek, 2008). Although this system has traditionally focused largely on the children's physical health, in recent years awareness of children's psychological well-being and the pivotal role of their parents, has resulted in a gradual redesign. For instance, Staal, van Stel, Hermanns, and Schrijvers (2015) developed and validated a structured interview for Dutch preventive child health care professionals to facilitate early detection of parenting problems and developmental problems in children around the age of 1.5 years; the Structured Problem Analysis of Raising Kids (SPARK).

Educating prospective parents on the possible impact of their own negative experiences in their family of origin and (post-partum)

mental health problems, might help reduce stigmatization and increase help-seeking behavior (Rüsch, Evans-Lacko, Henderson, Flach, & Thornicroft, 2011; Wei, McGrath, Hayden, & Kutcher, 2015). Our findings support several of the seven evidence-based strategies for ending violence against children, as recently embraced by the World Health Organization (WHO, 2016): parent and caregiver support, and norms and values.

4.1. Limitations

A number of limitations of our study must be noted. First, for the factor analysis of the ERPANS, we had to resort to an exploratory instead of a confirmatory approach. To account for this less optimal approach, we opted to split our full sample in a calibration and a validation sample. Because this exploratory factor analysis led to inconclusive results, we finally opted for factor analyses on theoretically motivated subsets of the original total item set. Though less than ideal, we believe the chosen analytic approach guarded against data dredging and yielded interpretable as well as theoretically meaningful findings. Obviously, future research will need to examine if the factorial solution we found can be replicated in other samples. Second, we did not use actual CPS data to assess (risk of) child maltreatment. Reports to CPS were derived from digital files at the public youth health care system. We were unable to gain full access to child protection services data due to privacy issues. This may explain the low base rate of the reports of Serious Concern in our sample (5.6%). However, the previous ERPANS study by Grietens et al. (2004) reported an even lower base rate of abuse/neglect (2%) in their sample. Another limitation of our study, common to field studies, was the rather large number of missing data. During the data collection phase, we organized meetings with the nurses on a regular basis in order to optimize data inclusion. Notwithstanding, a few nurses were less convinced of the utility of the ERPANS than others, which resulted in significantly more missing data in the largest municipality of Lelystad. Thus, we cannot be sure that the nurses who employed the ERPANS in Lelystad were not selective in their choice of the cases for which they completed the instrument. This finding stresses the importance of training nurses from the beginning of their educational career in child abuse risk screening, to turn this into one of their basic professional skills that is not dependent on a specific project such as the present one. Increased knowledge on risks and consequences of child maltreatment could be helpful for public youth healthcare nurses in preparing them for their statutory task of detecting and reporting child abuse (Schols, de Ruiter, & Öry, 2013). Finally, it should be noted that even in a longitudinal study such as ours one cannot assume that inferences reflect causal relationships, because other time variant factors may still explain the demonstrated associations between risk factors and outcome variables.

4.2. Conclusion

This study provides useful insights into risk factors for child maltreatment, using the Early Risks of Physical Abuse and Neglect Scale nurse-rated observation scale. We only partially replicated Hellinckx et al.'s (2001) original study findings. Serious concern about child maltreatment at follow up, in the form of contact with CPS, was best predicted by negative views of the parents of their family of origin. Our broader proxy measure of family problems at 22 months after birth was predicted by current parental mental health problems, parents' negative view of family of origin and lack of social support. The odds ratios between 2.50 and 5.66 reveal that completion of a checklist based on a brief home observation by a public health nurse just a few weeks after birth provides important information on (precursors to) child abuse risk. Our findings suggest that training public youth healthcare nurses in screening for child abuse risk factors, such as parental mental health problems and negative experiences in their own family could be essential in preventing future child abuse. Future research could focus on the effects of using screening tools such as the ERPANS on referral of parents to appropriate interventions, to examine long term effects on future substantiated child maltreatment and child development.

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Appendix A. ERPANS items

1 In a stressful situation mother soon turns out to be helpless
2 Taking care of the baby is considered to be a nuisance
3 The parent does not wonder what may be the reason for the baby's behaviour
4 I believe the parent is giving incorrect information on the baby's behaviour and development
5 I have a feeling that the information the parent is giving on how (s)he deals with the baby, is incomplete or does not tally
6 The parent expects the baby to give abundant love
7 The parent sets few limits and does not give much structure to the baby's life
8 The parent speaks often about herself and not about the baby
9 The parent has gloomy expectations
10 The parent is easily put out of patience when dealing with the baby
11 The parent's reaction to the baby's behavior is very unstable
12 I feel uncomfortable in this family
13 The parent does not check the effect of his/her behaviour on the baby

14 The baby is considered to be a restraint of her freedom of movement
15 The parent intimates that as a child (s)he did not get much love from his/her parents or family
16 The parent does not take advice, or only in part, on how to take care of the baby
17 There is no consideration for the baby's feelings
18 The parent has already gone through several crises and it seems that (s)he has difficulties in getting over it
19 The parent intimates that she feels unhappy
20 Taking care of the baby gives rise to tension and nervousness
21 The parent deals with the baby in consideration of general beliefs on how to handle babies and does not take into account that this child is special
22 There is an atmosphere of secrecy in this family
23 The parent is dissatisfied with contacts with family/friends
24 There is not much support from the partner
25 The parent expects the baby to behave conveniently
26 The parent intimates that (s)he is alone facing the problems
27 There is not much reaction to the baby's signs for social contact (crowing, smiling)
28 The parent comes across as listless
29 The parent does not keep to the appointments regarding home visits and consultations
30 The parent is not able to adequately seek help or support
31 The parent does not show much self-confidence

Appendix B

As explained in the main text, we performed an exploratory factor analysis on all 31 items used in the Hellinckx study, in an attempt to replicate the original three-factor solution. We divided the original sample into two subsamples and used the second sample to validate the results that we found in the first sample. The EFA was carried out with MPlus version 5.21, using the default geomin rotation option to generate the best approximation of a simple structure. Instead of the original three-factor structure the analysis yielded a six-factor solution (see Table B1 below). With the exception of the second factor, all factors were dominated by

Table B1
EFA geomin rotated factor solution (calibration) sample 1.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Item 1	−0.052	**0.752 (f3)**	0.059	0.148	−0.018	−0.046
Item 2	0.190	**0.416 (f1)**	0.113	−0.090	**0.427 (f1)**	0.032
Item 3	**0.613 (f2)**	−0.124	−0.021	0.158	0.072	−0.039
Item 4	**0.569 (f1)**	0.010	**0.470 (f1)**	0.043	−0.036	−0.022
Item 5	0.024	0.131	**0.638 (f2)**	−0.027	0.207	−0.168
Item 6	**0.456 (f1)**	0.017	−0.074	0.196	0.027	−0.036
Item 7	0.230	**0.405 (f2)**	0.013	0.054	0.043	0.037
Item 8	0.271	0.088	−0.114	0.387	0.164	0.090
Item 9	0.007	0.278	0.032	0.236	0.195	0.184
Item 10	**0.487 (f1)**	**0.546 (f1)**	−0.041	−0.096	−0.121	0.030
Item 11	**0.477 (f1)**	**0.411 (f1)**	0.030	−0.027	0.033	0.013
Item 12	−0.056	−0.035	**0.630 (f2)**	0.060	−0.014	0.171
Item 13	0.117	0.154	0.041	−0.023	**0.601 (f1)**	0.011
Item 14	0.293	0.379	0.051	−0.033	0.217	0.037
Item 15	0.046	0.010	0.094	**0.672 (f3)**	−0.238	−0.043
Item 16	0.191	**0.421 (f2)**	0.389	0.004	−0.182	0.020
Item 17	**0.435 (f1)**	−0.027	0.037	0.015	0.318	0.097
Item 18	−0.045	0.275	0.039	**0.572 (f3)**	−0.046	−0.033
Item 19	−0.018	**0.422 (f3)**	−0.099	**0.416 (f3)**	0.055	0.130
Item 20	0.018	**0.749 (f1)**	0.039	0.044	0.040	−0.041
Item 21	0.297	−0.038	0.164	0.023	**0.638 (f1)**	−0.130
Item 22	−0.159	−0.015	**0.819 (f2)**	0.008	0.120	0.041
Item 23	0.017	−0.163	0.128	**0.672 (f3)**	−0.007	0.067
Item 24	0.046	−0.001	0.114	−0.015	0.026	**0.834 (f3)**
Item 25	0.313	0.067	0.003	0.014	0.150	−0.018
Item 26	−0.012	0.038	−0.016	0.049	0.009	**0.891 (f3)**
Item 27	−0.074	0.124	−0.067	0.040	**0.773 (f1)**	0.055
Item 28	0.000	0.395	−0.131	0.204	0.295	0.081
Item 29	0.150	0.131	0.236	−0.078	−0.003	0.120
Item 30	0.063	0.230	0.334	0.040	0.098	0.073
Item 31	−0.154	**0.608 (f3)**	−0.044	0.139	0.170	−0.075

Shown in bold are factor loadings of 0.40 and higher. F-number within parentheses shows to which of three factors in the original Hellinckx study the corresponding item belongs.

items that belonged to one of the original three factors found in the Hellinckx study. A forced six-factor solution for the second sample (see Table B2 below) did produce a satisfactory outcome in terms of goodness-of-fit and, with the exception of one factor, the remaining five factors were again dominated by items that pertained to one of the original Hellinckx factors. However, there was poor configural correspondence between the two samples (Tables B3 and B4). This we attributed to the large standard errors of the

Table B2
EFA geomin rotated factor solution (validation) sample 2.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Item 1	−0.008	**0.686 (f3)**	−0.196	0.054	0.209	0.005
Item 2	0.170	**0.709 (f1)**	−0.009	−0.076	0.037	−0.007
Item 3	**0.515 (f2)**	0.016	−0.017	−0.006	**0.548 (f2)**	0.008
Item 4	0.061	0.226	0.382	−0.065	0.143	−0.006
Item 5	0.048	0.029	0.313	−0.082	**0.497 (f2)**	−0.015
Item 6	−0.003	0.031	0.057	0.014	0.388	0.011
Item 7	0.049	0.320	−0.020	0.094	0.307	0.037
Item 8	0.265	0.226	0.274	0.128	−0.025	−0.024
Item 9	0.176	0.300	0.101	0.328	−0.088	0.025
Item 10	**0.532 (f1)**	0.363	−0.001	0.004	0.020	−0.021
Item 11	**0.531 (f1)**	0.338	0.054	−0.013	0.076	0.011
Item 12	−0.042	−0.021	**0.704 (f2)**	0.009	−0.004	−0.014
Item 13	**0.485 (f1)**	−0.068	0.091	0.020	**0.549 (f1)**	−0.003
Item 14	0.317	0.200	0.168	0.080	0.012	0.076
Item 15	0.033	−0.044	−0.049	**0.805 (f3)**	0.054	−0.008
Item 16	−0.172	0.352	0.301	0.050	0.066	0.034
Item 17	**0.859 (f1)**	0.009	−0.055	−0.028	0.057	0.002
Item 18	−0.053	0.221	0.034	**0.630 (f3)**	0.133	0.004
Item 19	−0.092	**0.672 (f3)**	0.002	0.284	−0.029	−0.005
Item 20	0.042	**0.784 (f1)**	−0.128	−0.100	0.018	−0.009
Item 21	**0.803 (f1)**	0.048	−0.079	0.109	−0.005	−0.002
Item 22	0.083	0.003	**0.692 (f2)**	0.067	0.037	0.033
Item 23	0.112	−0.015	0.038	**0.722 (f3)**	−0.070	0.004
Item 24	−0.005	−0.005	−0.008	−0.009	0.006	**1.969 (f3)**[a]
Item 25	**0.713 (f1)**	0.019	0.091	0.015	0.025	−0.002
Item 26	0.031	0.263	0.067	0.060	−0.047	0.334
Item 27	0.274	**0.598 (f1)**	0.098	−0.193	−0.065	0.031
Item 28	−0.004	**0.782 (f3)**	0.051	−0.019	−0.083	−0.011
Item 29	−0.221	0.053	0.013	0.018	0.287	−0.007
Item 30	0.005	0.348	0.036	0.140	0.158	−0.035
Item 31	0.037	**0.413 (f3)**	−0.155	0.204	0.235	0.001

For ease of comparison, the order of the rotated factors has been permuted so as to give maximal correspondence to the EFA solution of the calibration sample. Factor 5 does not compare to any factor found in the first sample.

[a] This solution yielded a negative variance estimate for item 24.

Table B3
Geomin factor correlations, sample 1.

	F1	F2	F3	F4	F5
F1	1.000				
F2	0.243	1.000			
F3	0.258	0.175	1.000		
F4	0.035	0.279	0.102	1.000	
F5	0.274	0.472	0.196	0.256	1.000
F6	0.193	0.384	0.141	0.253	0.366

Table B4
Geomin factor correlations, sample 2.

	F1	F2	F3	F4	F5
F1	1.000				
F2	0.530	1.000			
F3	0.335	0.306	1.000		
F4	0.189	0.208	0.187	1.000	
F5	0.394	0.286	0.158	0.218	1.000
F6	0.126	0.190	0.166	0.068	0.012

Note. Factors as displayed in Table 2 above, after permutation of the original order. See legend of Table 2 for explanation.

individual loadings, related to the MLR correction of the normality violations in the data (many items were strongly right skewed). We therefore decided to redo the EFA's on the item sets that corresponded to the original factors found in the Hellinckx study. The solution of these EFA's (calibration and validation) proved both interpretable and reliable. These tables are presented in the main article.

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