

National Origin and Behavioural Problems of Toddlers: The Role of Family Risk Factors and Maternal Immigration Characteristics

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Abstract In many societies the prevalence of behavioural problems in school-aged children varies by national origin. We examined the association between national origin and behavioural problems in 1½-year-old children. Data on maternal national origin and the Child Behavior Checklist for toddlers ($n=4943$) from a population-based cohort in the Netherlands were used. Children from various non-Dutch backgrounds all had a significantly higher mean behavioural problem score. After adjustment for family risk factors, like family income and maternal psychopathology, the differences attenuated, but remained statistically significant. Non-Dutch mothers with immigration risk factors, such as older age at immigration or no good Dutch

language skills, reported significantly more behavioural problems in their offspring. In conclusion, the present study indicated more behavioural problems in immigrant toddlers from various backgrounds. Researchers and policymakers aiming to tackle disparities in behavioural problems should take into account that risks associated with national origin are intertwined with unfavourable family and immigration characteristics.

Keywords Child behaviour · Behavioural problems · National origin · Ethnicity · Immigrant health

During the past decades, the number of non-Western individuals moving to Western countries has increased rapidly due to economical factors and political conflicts in other parts of the world. Whereas a large group came as immigrants, other groups entered European countries as migrant workers of whom many later decided to stay and thereby became immigrants. Immigrants of diverse ethnic backgrounds living in Europe are reported to be at high risk for mental health problems, such as depression, anxiety disorders, and schizophrenia (Carta et al. 2005). The risk is seen among immigrants originating from non-Western countries, and to a lesser extent in those migrating within Europe. Research on this topic in school-aged children and adolescents, however, provides mixed results. Studies indicate that immigrant children of diverse national backgrounds tend to exhibit more behavioural problems than non-immigrants as measured with behaviour checklists completed by parents (Bengi-Arslan et al. 1997; Gross et al. 2006; Reijneveld et al. 2005; Stevens et al. 2003; Vollebergh et al. 2005). Conversely, other studies in Western countries show similar levels of problem behaviour in immigrant and native children (Alati et al. 2003; Kolaitis

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et al. 2003), or even point out that immigrants report lower rates of behavioural problems in their offspring than parents of native children (Beiser et al. 2002; Hackett et al. 1991). In general, many of the studies of behavioural problems among immigrant children are hampered by small sample sizes (Gross et al. 2006; Hackett et al. 1991; Kolaitis et al. 2003; Vollebergh et al. 2005). Moreover, the restriction to immigrants originating from one country only and the study of immigrants of different backgrounds as one group limits generalizability (Beiser et al. 2002; Bengi-Arslan et al. 1997; Hackett et al. 1991; Kolaitis et al. 2003; Reijneveld et al. 2005; Vollebergh et al. 2005). Finally, previous studies often controlled marginally for confounders (Beiser et al. 2002; Bengi-Arslan et al. 1997; Gross et al. 2006; Stevens et al. 2003; Vollebergh et al. 2005), while these factors possibly elucidate the association between immigrant status and mental health.

Well known risk factors of child behavioural problems (Campbell 1995; Rutter et al. 1975a, b), such as low socioeconomic position, single parenthood, and parental psychopathology, possibly explain the elevated levels of behavioural problems among immigrant children. For instance, many immigrants end up in the lower socioeconomic strata of a host country and experience financial problems, largely due to language difficulties or lack of adequate education (Bhugra 2004). Generally, studies on parent reported behavioural problems among immigrant children control for socioeconomic status, but other family risk factors are rarely taken into account. Hence, their role in the association between national origin and behavioural problems remains unknown. Alternatively, the increased risk of mental health problems among first-generation adult and adolescent immigrants has been ascribed to characteristics of the immigration process. Immigration causes stress due to loss of the familiar environment and adaptation to a new situation (Bhugra 2004; Lerner et al. 2005). Moreover, immigrants may find it hard to identify with the host culture and may experience rejection by the mainstream society. For instance, a study among Moroccan adolescents in the Netherlands indicates that perceived discrimination predicted externalizing behavioural problems (Stevens et al. 2005). However, it is largely unknown how characteristics of the immigration process as experienced by immigrant parents affect behaviour in the offspring. Intergenerational effects of parental immigration characteristics may be involved; a study among Asian immigrants, for instance, indicates that the refugee process of parents was strongly related to violent behaviour in their children (Spencer and Le 2006). So, both immigration characteristics and family risk factors should be taken into account to disentangle the underlying mechanisms in the association between national origin and behavioural problems in children. Furthermore, it is important to study immigrants originating from

different countries. Finally, the association between national origin and behavioural problems has, to our knowledge, not been examined in preschool children, while growing evidence suggests that behavioural problems early in life tend to persist into later ages and predict adverse outcomes during childhood (Carter et al. 2004).

We examined the association between maternal national origin and behavioural problems in toddlers aged 1½ years in a large, multi-ethnic cohort study. While the importance of ethnic minority as a risk factor for problem behaviour in children is well-recognized, research that may elucidate the mechanisms underlying the poor mental health among immigrant children is needed. Without insight into these mechanisms prevention is hardly possible and treatment may be less effective. Therefore, we also investigated whether family risk factors can explain the relation between national origin and behavioural problems. Moreover, we explored the association of maternal immigration characteristics, e.g. generational status, Dutch language skills, and feelings of acceptance by Dutch natives, with child behaviour. We hypothesized (a) that toddlers of non-Western origin would have higher behaviour problem scores than Dutch children and children of non-Dutch European descent, and that the latter two groups would not differ in problem scores; (b) that family risk factors would partly explain the higher levels of behavioural problems among non-Western toddlers; and (c) that immigration risk factors would also explain part of the tendency of non-Western immigrants to report high level of child behavioural problems.

Method

Design

This study was embedded in Generation R, a population-based cohort from fetal life onwards (Jaddoe et al. 2008). Briefly, all pregnant women living in Rotterdam, the Netherlands, with an expected delivery date between April 2002 and January 2006 were invited to participate. The participation rate was estimated at 61% (based on cohort years 2003 and 2004: of the 8494 live births in the study area, 5189 participated). Written informed consent was obtained from all participants. The Medical Ethical Committee of the Erasmus Medical Centre, Rotterdam approved the study.

Questionnaires were available in three languages, e.g. the behaviour checklist was filled out in Dutch ($n=4813$), in English ($n=14$), and in Turkish ($n=116$). For those participants not able to read these languages, research assistants helped filling out the questionnaires. We contracted English, French, Arabic or Berber (Moroccan), Portuguese (Cape Verdian), and Turkish speaking research assistants to communicate with the participants.

Participants

Full consent for the postnatal phase of the Generation R Study was obtained from 7295 children and their mothers. Those without information on maternal national origin ($n=603$) and child behaviour at 18 months ($n=1719$) were excluded. The response rate for the behaviour questionnaire was 74% (4973 / 6692). Due to small numbers, 30 mothers of different national origins were additionally excluded (i.e. USA $n=11$, Australia $n=3$, Japan $n=3$, and other $n=13$), yielding a sample size of 4943 mother-child dyads for the present study. The analyses of immigration characteristics were restricted to the non-Dutch groups ($n=1753$). In these analyses the study population varies slightly due to missing data on the individual items.

Measures

National Origin Maternal national origin was based on country of birth of the mothers' parents, which was assessed by questionnaire during pregnancy. In accordance with Statistics Netherlands (2004b), we classified a mother as non-Dutch if one of her parents was born abroad. If both parents were born abroad, the country of birth of the mothers' mother decided maternal national origin. Among non-Dutch mothers in this study, we identified persons of European ($n=406$) and non-Western ($n=1347$) origins. The non-Western group consisted of: Cape Verdian ($n=110$), Dutch Antillean ($n=84$), Indonesian ($n=190$), Moroccan ($n=164$), Surinamese ($n=278$), Turkish ($n=301$), and Other non-Western ($n=220$). A large number of immigrants are from former Dutch colonies, i.e. Dutch Antilles, Indonesia, and Suriname. Others, from Cape Verdian, Morocco, and Turkey have an immigration history starting in the 1960s when 'guest workers' came to the Netherlands. More recently, immigration occurred mostly for marital reasons.

Behavioural Problems At the age of 1½ year, child behaviour was assessed using the Dutch version of the Child Behavior Checklist for toddlers (CBCL/1½ -5) (Achenbach and Rescorla 2001). The CBCL/1½ -5 is a 99-item questionnaire designed to obtain ratings of behaviour and emotional problems by parents of 1½- to 5-year-old children. Parents are asked to rate the occurrence of their child's behaviour within the past two months on a scale from 0 (not true) to 2 (often true). For 95% of the children, the CBCL/1½ -5 was filled out by the mother. The CBCL/1½ -5 includes a Total problems score, which is the sum of all items, and two broadband scales. The Internalizing scale (36 items) comprises problems such as anxiety, sadness and withdrawn behaviour. The Externalizing scale (24 items) involves attention problems and aggressive behaviour. Higher scores on the CBCL scales indicate more behavioural problems. In

this study, mean scores and differences in mean scores are presented. To give an indication of clinical relevance, we also present the percentage of children with a score in the borderline / clinical range in Table 2. The cut off point for this score is based on the 83rd percentile of a Dutch norm group (Tick et al. 2007). Good reliability and validity are reported for the English and Dutch CBCL/1½ -5 (Achenbach and Rescorla 2001; Tick et al. 2007). More specifically, the construct validity of the CBCL/1½ -5 problem scales is supported by concurrent and predictive associations with a variety of other measures, such as other parental reports for toddlers' behaviour, referral to mental health facilities, later behavioural problems, and psychiatric diagnoses using the Diagnostic and Statistical Manual (Achenbach and Rescorla 2001; Carter et al. 2004). The cross-cultural validation of the CBCL/1½ -5 has not yet been ascertained, but CBCL versions for other age ranges show high cross-cultural validity (Achenbach et al. 2008). To check the validity of the factor structure within the different national origins of our study population, we calculated Cronbach's alpha's for the Internalizing and Externalizing CBCL/1½ -5 scales. The alpha's are presented in Table 1 and range between 0.75 (Dutch, Externalizing problems) and 0.89 (other non-Western, Internalizing problems), indicating acceptable to high internal consistencies.

Immigration Characteristics The immigration characteristics were assessed during pregnancy. Generational status of mothers with a non-Dutch national origin was based on their own country of birth: foreign-born mothers were classified as 'first generation', and mothers born in the Netherlands, while having non-native parents, were classified as 'second generation'. Of the first generation mothers, age at immigration to the Netherlands was dichotomized into '0–15 years old' (42%) and '≥16 years old' (58%). For those in the first category it is mandatory to attend school in the Netherlands, whereas those immigrating at age 16 or older are not obliged to attend school anymore. Mothers were asked to rate their Dutch speaking, reading and writing skills on three separate 5-point scales ranging from 'not at all' (1) to 'good' (5). This information was summed into general 'Dutch language skills' (1–9, not good; 10–14, reasonable; 15, good). Cultural identity was assessed with the item "Feels part of..." (Dutch culture; own national culture; both cultures; neither of the cultures) and feelings of acceptance were assessed with the item "Feels accepted by Dutch natives" (agree; neither agree, nor disagree; disagree). Items were based on questions in an international study on acculturating youth (ICSEY) (Vedder and Van de Vijver 2004).

Family Risk Factors and Confounders Family risk factors were regarded as possible explanatory variables in the association between national origin and child behavioural

Table 1 Internal Consistencies of CBCL Broadband Scales per National Origin

Maternal national origin	<i>n</i>	Cronbach's alphas	
		Internalizing Problems	Externalizing Problems
Dutch	3190	0.763	0.751
European	406	0.778	0.787
All non-Western	1347	0.856	0.818
Non-Western subgroups:			
Antillean	84	0.856	0.771
Cape Verdian	110	0.858	0.756
Indonesian	190	0.862	0.770
Moroccan	164	0.841	0.850
Surinamese	278	0.833	0.817
Turkish	301	0.807	0.816
Other non-Western	220	0.894	0.845

problems. Family risk factors were assessed by questionnaire during pregnancy. The family risk factors included maternal age, marital status (married/cohabiting, single) and smoking habits during pregnancy (yes, no). Maternal psychopathology was assessed using the Brief Symptom Inventory (BSI) (Derogatis 1993), a validated self-report questionnaire which consists of 53 positive and negative self-appraisal statements. The internal consistency for the Global Severity Index, the overall score of the BSI, in this sample was $\alpha=0.96$, which indicates high reliability. Furthermore, maternal educational level was defined by the highest attained educational level and classified into 3 categories according to the definition of Statistics Netherlands (2004a): low (primary school, lower vocational training, intermediate general school, 3 years general secondary school), mediate (>3 years general secondary school; intermediate vocational training; 1st year higher vocational training), and high (higher vocational training, Bachelor's degree, higher academic education and PhD). Family income, defined by the total net month income of the household, was categorized as '<1200 €' (below social security level), '1200–2000 €' and '>2000 €' (more than modal income). We defined parity as the number of live births the mothers delivered before the birth of the participating child (0, ≥ 1).

We also adjusted the analyses for gender, birth weight, gestational age at birth and age of the children. Although these variables are probably not on the causal pathway between national origin and child behaviour, they might confound the associations. Information on these covariates was obtained from the medical records completed by community midwives and obstetricians.

Statistical Analyses

All statistical analyses were performed using the Statistical Package of Social Sciences version 11.0 for Windows (SPSS Inc, Chicago, IL, USA). We studied the association between

national origin (Dutch, European and non-Western) and child and maternal characteristics with 3x2 χ^2 -tests and 3-group oneway ANOVAs (Table 2). Three-group oneway ANOVAs were also used to study the relation between national origin and behavioural problems scores (Table 3). If the overall χ^2 -tests or ANOVAs indicated a significant difference, post hoc pairwise comparisons followed (2x2 χ^2 -tests or Bonferroni's post hoc test). Next, correlations between confounders, family risk factors and maternal immigration characteristics, and CBCL Total Problems were calculated (Table 4). Then, hierarchical multivariate regression analyses were performed that predicted CBCL Problems from national origin with sociodemographic confounders and maternal psychopathology entered into the regression in sequential steps (Table 5). For each step, the R^2 and R^2 changed are displayed to indicate the proportion of variability of the behavioural problem score that is accounted for by the model and by the variables added to the model. Next, we examined the association between maternal immigration characteristics and behavioural problems in the non-Dutch population (Table 6). Due to relatively small numbers in some strata of national origin, we combined all mother-child dyads of non-Western origin. In both the European and non-Western groups, we performed oneway ANOVAs to calculate the mean behavioural problem scores per category of the immigration characteristics. We also report the R^2 of all immigration characteristics. Based on these univariate associations, a risk index was calculated by summing the amount of risk immigration characteristics per participant, which generated an index ranging from 0 (no risk) to 5 (highest risk on immigration characteristics). Finally, using ANOVA, mean Total problems scores were calculated for the Dutch toddlers and for the European and non-Western groups each split up by amount of immigration risk factors. Bonferroni tests for pairwise comparisons followed to compare the differences in mean scores with Dutch as the reference group (Figs. 1 and 2). These analyses were

Table 2 Characteristics of Mothers and their Children by Maternal National Origin

	<i>n</i>	Dutch (<i>n</i> =3190)	Other European (<i>n</i> =406)	Non-Western ^c (<i>n</i> =1347)
Child characteristics				
Gender (% boys)	4892	49.9	47.4	49.6
Age (months)	4936	18.4 (1.1)	18.4 (1.1)	18.6 (1.2) ^{a,b}
Gestational age at birth (weeks)	4942	40.0 (1.7)	40.0 (1.7)	39.7 (1.7) ^{a,b}
Birth weight (grams)	4888	3511 (551)	3474 (537)	3336 (545) ^{a,b}
Children with CBCL borderline/clinical score:				
Total Problems (%)	4943	4.5	11.8 ^a	18.9 ^{a,b}
Internalizing Problems (%)	4943	11.1	20.9 ^a	31.9 ^{a,b}
Externalizing Problems (%)	4943	5.3	8.6 ^a	10.4 ^a
Maternal characteristics				
Educational level: high (%)	2747	65.8	67.0	33.6 ^{a,b}
mediate (%)	1350	24.3	24.6	35.3 ^{a,b}
low (%)	769	9.9	8.4	31.0 ^{a,b}
Family income: >2000 € (%)	3249	86.3	78.1 ^a	54.1 ^{a,b}
1200–2000 € (%)	660	10.3	14.8 ^a	20.1 ^{a,b}
<1200 € (%)	483	3.4	7.1 ^a	25.8 ^{a,b}
Marital status (% single)	4846	5.4	6.0	18.1 ^{a,b}
Age (years)	4943	32.1 (4.0)	31.6 (4.4)	29.4 (5.6) ^{a,b}
Parity (% nulli)	4783	60.3	61.0	54.8 ^{a,b}
Psychopathology symptoms (score)	3965	0.18 (0.22)	0.28 (0.35) ^a	0.39 (0.44) ^{a,b}
Smoking in pregnancy (% yes)	4160	22.4	23.5	24.7
Immigration characteristics of mothers				
Generational status				
Second generation (%)	650		38.3	36.8
First generation (%)	1100		61.7	63.2
Age at immigration of first generation immigrants ^d				
0–15 years old (%)	573		49.7	31.3 ^b
≥16 years old (%)				
Dutch language skills				
Good (%)	814		49.7	51.2
Reasonable (%)	478		30.0	29.8
Not good (%)	309		20.3	19.0
Cultural identity				
“Feels part of ...”				
Dutch culture (%)	306		26.5	21.2 ^b
Dutch and own national culture (%)	582		44.9	42.2 ^b
Own national culture (%)	415		26.5	31.9 ^b
Neither Dutch nor own national culture (%)	55		2.1	4.7 ^b
Feelings of acceptance				
“Feels accepted by Dutch natives”				
Agree (%)	740		74.4	54.2 ^b
Neither agree, nor disagree (%)	354		18.9	31.1 ^b
Disagree (%)	160		6.7	14.6 ^b

Values are percentages for categorical variables and means (standard deviation) for continuous variables

^{a, b} Refers to significant 2x2 χ^2 -test (categorical variables) and Bonferroni post hoc tests (continuous variables) ($p < 0.05$): ^a vs. Dutch; ^b vs. Other European. Additional comparisons for variables with more than two categories were performed with 2x2 χ^2 -tests using the category mentioned first in the table (e.g. high educational level) as the reference for all other categories in order to obtain specific p -values per category

^c Included: Cape Verdian ($n=110$), Dutch Antillean ($n=84$), Indonesian ($n=190$), Moroccan ($n=164$), Surinamese ($n=278$), Turkish ($n=301$), and Other non-Western ($n=220$)

^d Only first generation immigrants included, as second generation immigrants were born in The Netherlands

Table 3 Mean Scores on CBCL Total Problems and CBCL Broadband Scales by Maternal National Origin ($n=4943$)

Maternal national origin	<i>n</i>	Mean scores (standard deviations)		
		Total Problems	Internalizing Problems	Externalizing Problems
Dutch	3190	20.7 (13.1)	4.2 (3.5)	10.0 (6.4)
European	406	25.3 (16.4) ^a	5.6 (4.7) ^a	11.3 (7.1) ^a
Non-Western	1347	30.0 (19.4) ^{a,b}	7.1 (6.5) ^{a,b}	11.9 (7.3) ^a
<i>Non-Western subgroups^c</i>				
Antillean	84	31.8 (21.9) ^a	7.0 (6.9) ^a	13.2 (8.4) ^a
Cape Verdian	110	35.4 (18.9) ^a	7.9 (5.7) ^a	14.7 (7.6) ^a
Indonesian	190	24.0 (14.2)	4.6 (3.8)	11.2 (6.6)
Moroccan	164	28.7 (22.8) ^a	7.6 (8.0) ^a	9.9 (7.4)
Surinamese	278	26.5 (16.6) ^a	5.5 (4.7) ^a	11.6 (7.1) ^a
Turkish	301	34.2 (19.6) ^a	9.2 (7.0) ^a	12.3 (7.0) ^a
Other non-Western	220	31.8 (20.7) ^a	7.8 (7.4) ^a	12.1 (7.2) ^a

^{a, b} Refers to significant Bonferroni post hoc tests ($p<0.05$): ^a vs. Dutch; ^b vs. Other European (only tested in the total Non-Western group ($n=1347$))

^c Analyses on national origin and CBCL scores repeated by including Antillean, Cape Verdian, Indonesian, Moroccan, Surinamese, Turkish, and Other non-Western as separate groups instead of one total non-Western group

performed with and without adjusting for confounders and family risk factors. In all multivariate analyses, missing values of confounders and family risk factors were replaced by the median (categorical variables) or mean (continuous variables).

Non-response Analyses Within the Dutch subgroup, mothers with missing data on their children's behaviour at 18 months

($n=629$) were compared with mothers who filled out the CBCL/1½-5 ($n=3190$). Data on behaviour was more often missing in mothers who were lower educated, $\chi^2(2, 3800) = 187, p<0.001$, single parent, $\chi^2(1, 3721) = 38, p<0.001$, and younger, $F(1, 3819) = 94, p<0.001$, as compared to mothers who filled out the behaviour questionnaire. The non-response analyses were repeated in all other national origins separately and indicated the same pattern: non-responders

Table 4 Correlations Between Maternal and Child Characteristics, and CBCL Total Problems

	Correlation coefficient ^a	<i>p</i> -value
Child characteristics (confounders)		
Gender	-0.047	0.001
Age	0.059	<0.001
Gestational age at birth	-0.044	0.002
Birth weight	-0.087	<0.001
Maternal characteristics (family risk factors)		
Educational level	0.154	<0.001
Family income	0.155	<0.001
Marital status	-0.121	<0.001
Age	-0.167	<0.001
Parity	-0.052	<0.001
Psychopathology symptoms	0.295	<0.001
Smoking in pregnancy	0.057	<0.001
Immigration characteristics of mothers		
Generational status	-0.079	0.001
Age at immigration of first generation immigrants	0.107	<0.001
Dutch language skills	-0.150	<0.001
Cultural identity	0.144	<0.001
Feelings of acceptance	0.130	<0.001

^a Pearson correlation coefficient or Spearman's rho depending on scale level of the variable

Table 5 Maternal National Origin and CBCL Total Problems Adjusted for Family Risk Factors and Confounders (*n*=4943)

Variables in model	Model 1	Model 2	Model 3	Model 4
Maternal national origin:				
Dutch	0 (reference)	0 (reference)	0 (reference)	0 (reference)
European	4.6 (3.1, 6.2)	4.6 (3.1, 6.2)	4.4 (2.9, 6.0)	3.8 (2.2, 5.3)
Antillean	11.1 (7.8, 14.4)	10.7 (7.4, 14.0)	6.5 (3.2, 9.9)	6.1 (2.8, 9.4)
Cape Verdian	14.7 (11.8, 17.6)	14.4 (11.5, 17.3)	10.2 (7.2, 13.2)	8.7 (5.7, 11.6)
Indonesian	3.3 (1.1, 5.5)	3.1 (0.9, 5.3)	3.1 (0.9, 5.3)	2.7 (0.6, 4.9)
Moroccan	8.0 (5.6, 10.4)	7.9 (5.5, 10.3)	5.7 (3.2, 8.2)	3.9 (1.5, 6.4)
Surinamese	5.8 (4.0, 7.7)	5.4 (3.5, 7.2)	2.5 (0.6, 4.5)	1.9 (−0.1, 3.8)
Turkish	13.4 (11.6, 15.2)	13.2 (11.4, 15.0)	10.8 (8.9, 12.7)	9.2 (7.3, 11.1)
Other non-Western	11.0 (9.0, 13.2)	10.8 (8.7, 12.9)	9.4 (7.3, 11.5)	8.8 (6.8, 10.9)
Gender: boy		1.5 (0.6, 2.3)	1.5 (0.6, 2.3)	1.4 (0.5, 2.2)
Age child (per year)		0.5 (0.1, 0.9)	0.5 (0.1, 0.9)	0.4 (0.1, 0.8)
Gestational age (per week)		−0.2 (−0.5, 0.01)	−0.2 (−0.4, 0.1)	−0.2 (−0.4, 0.1)
Birth weight (per gram)		−0.1 (−0.1, 0.01)	0.0 (−0.01, 0.000)	0.0 (−0.01, 0.00)
Parity: nulliparity			1.4 (0.5, 2.3)	1.3 (0.4, 2.2)
Maternal age (per year)			−0.2 (−0.3, −0.1)	−0.2 (−0.3, −0.1)
Marital status: single			3.8 (2.1, 5.5)	3.4 (1.7, 5.1)
Education mother:				
high			0 (reference)	0 (reference)
mediate			1.0 (−0.02, 2.1)	0.8 (−0.2, 1.8)
low			2.5 (1.1, 3.9)	2.4 (1.0, 3.7)
Family income:				
>2000			0 (reference)	0 (reference)
1200–2000			0.08 (−1.2, 1.4)	−0.5 (−1.8, 0.8)
<1200			3.0 (1.3, 4.7)	1.8 (0.07, 3.4)
Smoking in pregnancy:				
yes			0.3 (−0.7, 1.4)	−0.4 (−1.4, 0.7)
Maternal psychopathology (per score point)				
<i>R</i> ²	0.085	0.092	0.115	9.7 (8.2, 11.2)
<i>R</i> ² changed	0.085	0.007	0.024	0.028
<i>F</i> change	56.7*	8.8*	16.3*	158.1*

Values are raw beta's (95% CI) derived from the regression analyses. **p*<0.001

Model 1 unadjusted; Model 2 adjusted for confounders; Model 3: model 2 adjusted for family risk factors (except maternal psychopathology); Model 4: model 3 adjusted for maternal psychopathology

were more often lower educated, single parent, and younger than mothers who filled out the behavioural questionnaires.

Results

Characteristics of the mother-child dyads are presented in Table 2. Both children of European, $\chi^2(1, 3596) = 39, p < 0.001$, and of non-Western descent, $\chi^2(1, 4537) = 249, p < 0.001$ were more likely to have a borderline/clinical Total Problems score than children with a Dutch background.

Non-Western toddlers were also more likely to have a borderline/clinical Total Problems score than non-Dutch European toddlers, $\chi^2(1, 1753) = 11, p = 0.001$. Non-Western mothers were more often low educated than their Dutch, $\chi^2(1, 3287) = 448, p < 0.001$, and European counterparts, $\chi^2(1, 1177) = 130, p < 0.001$. In contrast, Dutch and European mothers did not differ in distribution of educational level, $\chi^2(2, 3596) = 0.99, p = 0.607$. European and non-Western mothers did not differ with regard to generational status, $\chi^2(1, 1750) = 0.30, p = 0.592$, or Dutch language skills, $\chi^2(2, 1601) = 0.36, p = 0.834$. Mothers with a European background felt more often accepted by

Table 6 Mean Scores on CBCL Total Problems by Maternal Immigration Characteristics

Maternal immigration characteristics	Mean Total Problems score (standard deviation)			
	European (n=406)	R ²	Non-Western (n=1347)	R ²
Generational status: Second	24.0 (16.3)	0.005	27.8 (17.2)	0.008
First	26.2 (16.5)		31.4 (20.5)**	
Age at immigration ^a : 0–15 years old	22.2 (15.7)	0.016	28.4 (19.0)	0.017
≥ 16 years old	27.7 (16.8)		33.2 (19.5)**	
Dutch language skills: Good	23.7 (16.1)	0.012	26.6 (16.7)	0.032
Reasonable	27.0 (16.7)		31.9 (19.7)***	
Not good	27.5 (17.3)		34.9 (21.8)***	
Cultural identity:				
“Feels part of ...”		0.045		0.033
Dutch culture	22.1 (15.2)		28.6 (18.3)	
Dutch and own national culture	25.5 (16.0)		26.5 (16.0)	
Own national culture	27.3 (16.8)		33.9 (21.2)**	
Neither Dutch nor own national culture	44.9 (17.5)*		35.4 (20.4)*	
Feelings of acceptance:				
“Feels accepted by Dutch natives”		0.018		0.017
Agree	24.6 (15.6)		27.5 (17.7)	
Neither agree, nor disagree	27.5 (16.2)		32.7 (19.0)***	
Disagree	32.6 (20.5)		31.6 (20.3)*	

p*<0.05, ** <0.01, * <0.001 for difference in mean score between a certain category and the reference category. Reference categories for the separate immigration characteristics are: second generation, age at immigration 0–15 years, good Dutch language skills, feeling part of Dutch culture, or agreeing with ‘feeling accepted by Dutch natives’
^a Only first generation immigrants included, as second generation immigrants were born in The Netherlands

native Dutch people than the non-Western mothers, $\chi^2(1, 1254) = 38, p < 0.001$.

The mean scores on the CBCL scales per national origin are presented in Table 3. Compared to children of Dutch

mothers, children of mothers from various non-Dutch backgrounds all had higher mean scores on Total Problems, indicating more behavioural problems. Particularly high behavioural problem scores were found in children of Cape

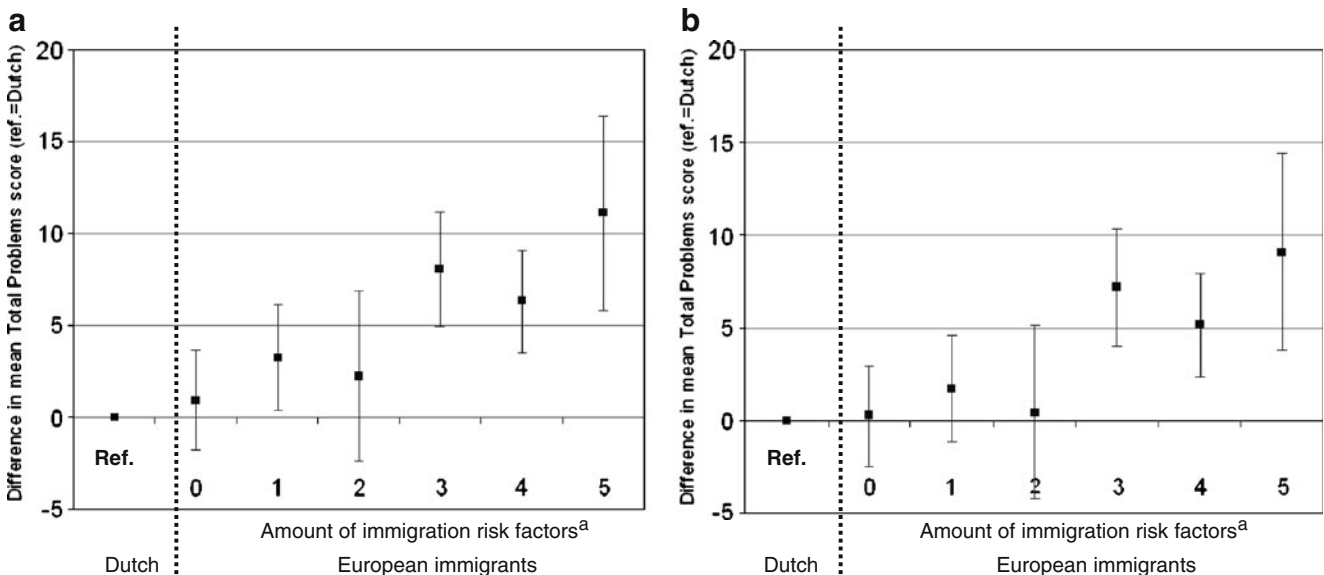


Fig. 1 **a** Unadjusted association between immigration risk index^a in Europeans and CBCL Total Problems, **b** Adjusted association^b between immigration risk index^a in Europeans and CBCL Total Problems. Values indicate differences in mean Total problems score between Dutch toddlers (reference) and toddlers of European or non-Western origin divided by their amount of immigration risks (0 and 5).
^aBased on table 5, the following categories of immigration character-

istics were labelled as ‘risk’: 1st generation, ≥16 years at immigration, no good Dutch language skills, feeling part of only own or of neither Dutch nor own national culture, and not agreeing with statement ‘feels accepted by Dutch natives’. ^bAdjusted for gender, age child, gestational age, birth weight, parity, marital status, family income, smoking during pregnancy, and maternal age, education, and psychopathology

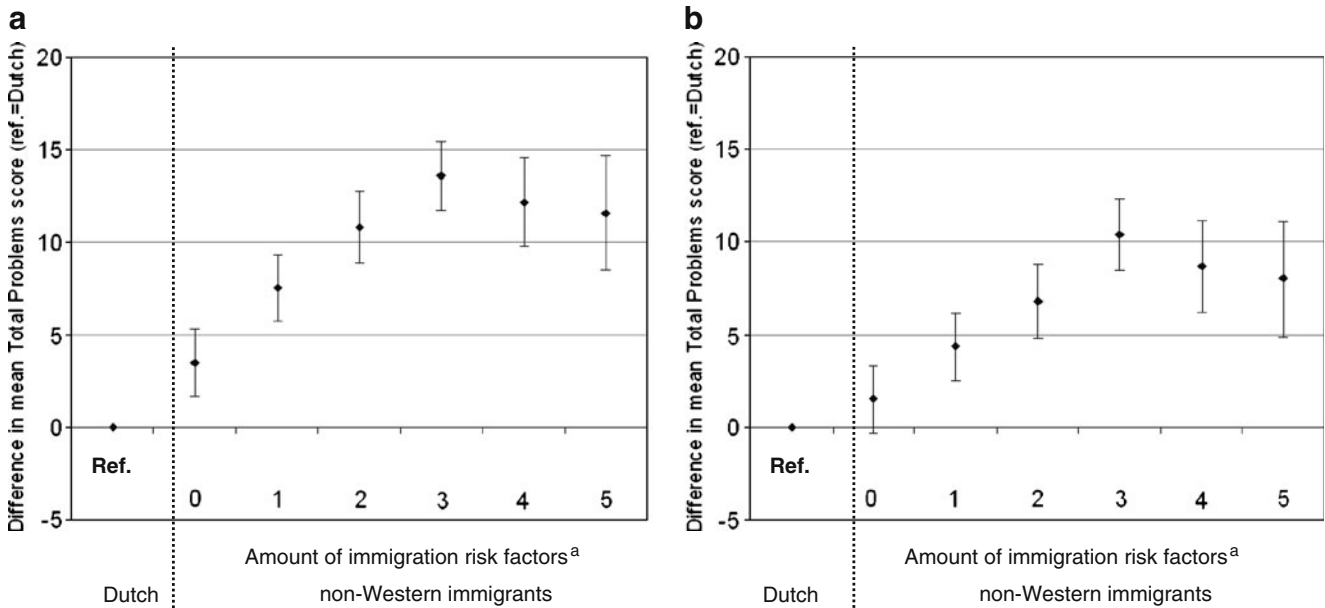


Fig. 2 **a** Unadjusted association between immigration risk index^a in non-Westerns and CBCL Total problems, **b** Adjusted^b association between immigration risk index^a in non-Westerns and CBCL Total problems. Values indicate differences in mean Total problems score between Dutch toddlers (reference) and toddlers of European or non-Western origin divided by their amount of immigration risks (0 and 5). ^aBased on table 5, the following categories of immigration character-

istics were labelled as ‘risk’: 1st generation, ≥16 years at immigration, no good Dutch language skills, feeling part of only own or of neither Dutch nor own national culture, and not agreeing with statement ‘feels accepted by Dutch natives’. ^bAdjusted for gender, age child, gestational age, birth weight, parity, marital status, family income, smoking during pregnancy, and maternal age, education, and psychopathology

Verdian and Turkish background (mean = 35.4, 95% CI: 31.8, 38.9; mean = 34.2, 95% CI: 31.9, 36.4, respectively). The effect sizes for the association between national origin (including only Dutch, European and non-Western) and behavioural problems were moderate for Total Problems ($\eta^2=0.067$) and Internalizing Problems ($\eta^2=0.072$), and small for Externalizing Problems ($\eta^2=0.017$).

Table 4 shows that positive correlations of confounders, family risk factors and maternal immigration characteristics with Total Problems scores ranged from 0.06 (smoking during pregnancy) to 0.30 (maternal psychopathology), whereas negative correlations ranged from -0.04 (gestational age) to -0.17 (maternal age). All correlation coefficients represented small effect sizes except for maternal psychopathology, which was moderate in size. Given the significant correlations with behavioural problems, all a priori confounders and family risk factors were included in the multivariate analyses.

Table 5 shows the series of hierarchical multiple regression analyses indicating the association between maternal national origin and CBCL scores adjusted for confounders and family risk factors. In model 1, the unadjusted differences between the Dutch reference group and the other national origins are shown. These differences correspond to the differences in mean Total Problems score, which are presented in Table 3 (e.g. mean behavioural score Dutch=20.7, Antillian=31.8, difference=11.1). National origin explained 8.5% of the

variance in Total Problems score (Model 1). When the confounders (child characteristics) were entered in the model (model 2), there was a 0.7% increase in explained variance, resulting in an overall R^2 of 9.2%. As can be seen in the second column of Table 5, the effect estimates in Model 2 were similar to those in Model 1. Entering the sociodemographic family risk factors resulted in a further 2.4% increase in explained variance of the Total Problems score (overall $R^2=11.5\%$). The attenuation of differences in CBCL score between Dutch and non-Dutch toddlers (model 2 to model 3) was especially evident in Antillean, Cape Verdian, Moroccan, Surinamese, Turkish, and Other Non-Western toddlers. Finally, when maternal psychopathology was entered in the model (model 4), there was a 2.8% increase in explained variance, resulting in an overall R^2 of 14.3%. As can be seen by comparing models 3 and 4, adjustment for maternal psychopathology resulted in substantial attenuation of the differences in mean behavioural problems scores between Dutch and non-Dutch toddlers. However, the confounders and family risk factors did not explain all differences in behavioural problems scores between Dutch and non-Dutch toddlers. For instance, the difference in mean CBCL Total problem score between Dutch and Cape Verdian origin decreased from a mean score of 14.7 to 8.7. This difference was still highly significant, $p<0.001$.

Table 6 shows the association between immigration characteristics of non-Dutch mothers and mean Total

Problems score in the offspring. First generation mothers had children with higher behavioural problem scores than mothers who were born in the Netherlands. This difference was only significant in mothers of non-Western descent (difference in European: 2.2, $p=0.180$; in non-Western: 3.6, $p=0.001$). Poor Dutch language skills of non-Western mothers were also associated with higher behavioural problem scores in toddlers, as was lack of feelings of acceptance by Dutch natives (see Table 5). Among children of European origin we observed the same tendencies as in the non-Western group, although these associations did not reach statistical significance due to a small sample size.

The correlations between immigration characteristics ranged from 0.19 (feelings of acceptance and age at immigration, $p<0.001$) to 0.91 (generational status and age at immigration, $p<0.001$). To summarize the effect of correlated maternal immigration characteristics, a risk index (range 0–5) was calculated based on the maternal immigration characteristics that were associated with child behavioural problems. Figures 1 and 2 present the association between an accumulation of adverse immigration characteristics and child behavioural problems. European toddlers with 3–5 five immigration risks have significantly higher Total Problems scores than Dutch toddlers (Fig. 1a); after adjustment for family risk factors, these differences between European and Dutch toddlers attenuate, but remain statistically significant (Fig. 1b). European children with a few immigration risks (0–2) do not have higher Total Problems scores than toddlers of Dutch origin, this is especially apparent after adjustment for the family risk factors (Fig. 1b). Figure 2a points out that, independently of the amount of immigration risks, toddlers of non-Western origin have a higher mean Total Problems score than Dutch toddlers. The higher problem score among non-Western toddlers without any maternal immigration risk is explained by the family risk factors (adjusted difference=1.53, 95% CI: -0.28, 3.35) (Fig. 2b). The difference in Total Problems scores between Dutch children and non-Western children with 1 or more immigration risks becomes smaller after adjustment, but remains statistically significant (Fig. 2b). Visual inspection of Figs. 1 and 2 suggests non-linear associations between the risk index and Total Problems scores in both the European and non-Western groups, the statistical analyses demonstrated significant linear associations only.

Discussion

This large population-based study in the Netherlands showed that mothers of non-Dutch origin report more behavioural problems in their toddlers as compared to Dutch parents. In contrast with our hypothesis, the higher

scores were observed not only in children of non-Western origin but also in toddlers with a non-Dutch European background. The behavioural problems among non-Dutch toddlers were partially explained by family risk factors. In addition, the parent reported behavioural problems of non-Dutch children were more pronounced among those with several unfavourable maternal immigration characteristics.

Strengths and Limitations

Before we discuss these findings, some methodological comments have to be made. The strengths of the present study are the large number of participating mother-child dyads from diverse national origins, its population based design, and the use of the age-appropriate and validated CBCL/1½ -5 to obtain information on child behaviour. However, our research also has some limitations. The non-response analyses indicated that data on the CBCL/1½ -5 were more complete in children of higher educated and non-single mothers, a trend that was found in Dutch and non-Dutch toddlers. This selective attrition resulted in an under-representation of both Dutch and non-Dutch children of the most disadvantaged groups, who are at increased risk for behavioural problems. Secondly, our research assistants helped a few participants (all illiterate, mostly Berber Moroccan mothers) filling out the questionnaires. This may have resulted in socially desirable answers.

A third limitation is that around 20% of the second generation immigrant women were classified as immigrant, because one of their parents had been born abroad, while the women themselves and their other parent were born in the Netherlands. Although this decision was based on the official classification system used in the Netherlands (Statistics Netherlands 2004b), it can seem questionable to consider these women as immigrants. We thus repeated the analyses after excluding these women. The respective results were similar, remained significant, and lead to the same conclusions as the presented results, with one exception: offspring of Indonesian women no longer displayed more behavioural problems than Dutch toddlers. This was due to the very small sample size of Indonesian women in this more stringent analysis ($n=14$). Another limitation is that we had to rely on a parent report of children's behavioural problems, as it was not feasible to obtain clinical diagnoses in such a large number of children and the toddlers are too young to be assessed by teachers or other informants. Furthermore, although data was available, it was not possible to adjust the analyses for factors related to religion and beliefs, as the Dutch reference group was nearly exclusively Christian or atheist. Finally, another limitation of our research is the use of several single item measures to assess the association between immigration characteristics and child behavioural problems. Single item

measures have psychometric restrictions, such as the tendency to be less reliable than multiple item scales. Although some of the studied immigration characteristics can be measured using multidimensional scales, we used single items for practical reasons. Furthermore, if the construct being measured is sufficiently narrow or is unambiguous to the respondent -which is certainly the case for some of the immigration characteristics-, a single item measure may be adequate (Sackett and Larson 1990).

Parent Reported Behavioural Problems in Immigrant Children

The principle finding of the present study, namely more behavioural problems in toddlers of immigrant mothers, compares well with several large studies in school-aged children conducted in the Netherlands and the United States. In these studies, parents of children of different national origins also reported higher levels of child behavioural problems as compared to native parents (Bengi-Arslan et al. 1997; Gross et al. 2006; Reijneveld et al. 2005; Stevens et al. 2003; Vollebergh et al. 2005).

Our results are less congruent with other, mostly smaller, studies on parent reported behavioural problems in school-aged immigrant children, that found no association (Alati et al. 2003; Kolaitis et al. 2003) or reported that immigrant children displayed less behavioural problems than native children (Beiser et al. 2002; Hackett et al. 1991). An explanation that may underlie this discrepancy is the small sample size that leads to reduced power in some of the above studies—e.g. data was available in 106 Greek native and Soviet immigrant children (Kolaitis et al. 2003) or 200 Gujarati and English native children only (Hackett et al. 1991). The divergence in results may also be related to immigration policies of host countries. For instance, Beiser et al. (2002) argue that selection mechanisms may explain their study finding: immigrant children had lower levels of behavioural problems than their Canadian-born counterparts due to Canadian immigration policy. Many immigrant households in Canada consist of well-educated, occupationally skilled, healthy people, a selection that does not apply to the Netherlands.

Explaining the Association Between National Origin and Child Behavioural Problems

The present study demonstrated that among European and non-Western mothers adverse circumstances such as low socioeconomic status, single motherhood, and psychopathological symptoms, are more prevalent than among Dutch mothers. In line with research indicating that such family characteristics are risk factors of behavioural problems in the offspring (Campbell 1995; Rutter et al. 1975a, b), we showed that these factors together explained part of the

behavioural problems in toddlers of non-Dutch origin. In some of the immigrant groups the effect of family risk factors was particularly marked. Surinamese toddlers, for instance, displayed hardly more behavioural problems than Dutch children after adjustment for several adverse family circumstances. Maternal education and family income explained a small part of behavioural problems of toddlers of various non-Dutch backgrounds, which is consistent with results of previous studies (Bengi-Arslan et al. 1997; Stevens et al. 2003; Vollebergh et al. 2005). Maternal psychopathology during pregnancy turned out to be an important explanatory variable. This may be due to several mechanisms. First, maternal psychological well being during pregnancy may affect growth and brain development of the foetus. For example, Teixeira et al. (1999) reported that maternal anxiety during pregnancy was associated with reduced blood flow through the uterine arteries, which affects foetal development. Second, genetic factors may be involved, since twin and adoptee studies indicate a substantial genetic influence on behavioural problems (Van der Valk et al. 1998). Third, since maternal mental health during and after pregnancy are highly associated (Milgrom et al. 2008), maternal psychopathology as measured during pregnancy in our study might also affect child behaviour due to the interaction between the mother and her child. Finally, reporter bias is a possible explanation, because a parent report of child behaviour may reflect the well being of the child as well as the well being of the parent.

Maternal psychopathology and other family risk factors play an important role in the behaviour development of toddlers of non-Dutch origin, but these factors did not fully explain the behavioural problems of most immigrant children. Our results also stress the significance of the immigration process, as mothers with several immigration risks reported more behavioural problems in their toddlers than mothers without immigration risks. Whereas several studies among adult and adolescent immigrants indicated that immigration characteristics affect immigrant's mental health (Bhugra 2004; Lerner et al. 2005), little research has examined the effect of parental immigration characteristics on offspring's behavioural problems (Spencer and Le 2006). Our finding that maternal immigration risks affect offspring's health might be explained in light of the presumptions about acculturation. Acculturation is generally described as the process by which individuals adopt the attitudes, customs, and behaviours of another culture (LaFromboise et al. 1993). Often used indexes of acculturation are generational status, length of residence and language use, which are similar to the immigration characteristics we examined (Abraido-Lanza et al. 2006). The process of acculturation presents several challenges and life changes that might affect health of immigrants,

both beneficially and adversely. Despite growing evidence of an association between acculturation and health, little is known about underlying mechanisms. It has been posited that acculturation is a proxy for other variables, such as prolonged exposure to stressful events or adverse circumstances associated with immigration (e.g. loss of social networks), settlement in a host country (e.g. discrimination), and disadvantaged social status (Abraido-Lanza et al. 2006). In line with this theory, we reason that maternal immigration characteristics as reported during pregnancy influence toddler's behaviour through stress that results from adjustment to a new culture, language difficulties, feelings of rejection, and not feeling at home in a country. Chronic maternal stress in pregnancy may expose the foetus to increased levels of stress hormones (Gitau et al. 1998). Adaptation of the foetus to this 'stressful' foetal environment possibly influences its development of stress systems. It is also possible that maternal stress associated with the acculturation process affects child behaviour due to the interaction between mother and her child.

There are several potential explanations for the elevated behavioural problem scores that cannot be ascribed to the family risk factors and immigration characteristics in toddlers of non-Dutch origin (i.e. the unexplained variance). Possibly, cultural differences in parent reported behavioural problems are involved. Dissimilar expectancies and beliefs with respect to appropriate child behaviour (Hackett and Hackett 1993) and differences in threshold to report problems (Rescorla et al. 2007) across cultures may lead to perceptual differences between parents of various national origins. In this respect, it should also be considered that the lower scores of Dutch as compared to non-Dutch toddlers might reflect a tendency of Dutch parents to underreport child behavioural problems. This is, however, unlikely, as research comparing the CBCL Total Problems scores of 31 societies indicated that the mean score of Dutch children was rather average instead of exceptionally low in comparison with other countries (Rescorla et al. 2007). Second, we cannot rule out that genetic factors underlie differences in behaviour problem scores between Dutch and non-Western toddlers. This would imply that the genetic vulnerability for behavioural problems also predisposes to immigration (Van der Valk et al. 1998). An alternative interpretation that the genetic background of indigenous Dutch children is particularly protective against behavioural problems as compared to the genetic make-up of other national groups is not very plausible. A third possible explanation for the remaining difference in behavioural problem score between native and non-Western children may be residual effects of immigration characteristics that were not captured by our measures. For instance, we did not consider the effects of racism and discrimination, while this causes high levels of stress and

may have far-reaching consequences for immigrants. It has even been reported that discrimination perceived by immigrants seems to contribute to their elevated risk of schizophrenia (Veling et al. 2007). Furthermore, we lacked information on traumatic events, whereas research on adolescents indicated that parental experience of traumatic events before and during immigration has a strong effect on mental well-being of the offspring (Scharf 2007). Moreover, we only studied the effects of immigration characteristics of the mothers, while paternal immigration characteristics might explain an additional part of the behavioural problems of toddlers of non-Western origin.

Implications

Firstly, our research has scientific implications. Future research using other informants is needed to replicate and complement our findings. Since it is known that levels of problem behaviour in adolescents vary with the informant questioned (Stevens and Vollebergh 2008), the validity of our results would improve if multiple informants were included. However, information provided by other informants should also be evaluated cautiously. It has, for instance, been reported that teachers scored Asian immigrant children higher on hyperactivity symptoms than native British children, whereas more objective measures of hyperactivity indicated similar prevalence in both groups (Sonuga-Barke et al. 1993). Secondly, the differences in behaviour scores between native and immigrant children living in The Netherlands have societal implications, as behavioural problems early in life tend to persist over time and may represent early symptoms of later psychopathology (Carter et al. 2004). Our results imply that both researchers and policy makers aiming to tackle ethnic disparities in behavioural problems should take into account the intertwined nature of national origin and family risk factors. Programs should be developed in order to improve family circumstances within the immigrant families. Furthermore, the effect of maternal immigration characteristics on child behavioural problems underlines the importance of acquiring language skills and of feeling accepted by the host culture. This implies that immigrants should, to some extent, adjust to the host country, but it also implies that a host country must give immigrants the *opportunity* to integrate within the society.

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