Do risk factors for problem behaviour act in a cumulative manner? An examination of ethnic minority and majority children through an ecological perspective

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Background: Extensive research has identified risk factors for problem behaviour in childhood. However, most of this research has focused on isolated variables, ignoring possible additive influences. The purpose of this study was to examine whether risk factors for problem behaviour act in a cumulative manner, and to investigate whether cumulative risk stemming from distinct ecological levels (Bronfenbrenner, 1979) differentially influences the manifestation of problem behaviours in middle childhood. In addition, ethnic differences between minority (i.e., Indian) and majority (i.e., English) families were examined.

Methods: The sample consisted of 125 children (59 English and 66 of Indian origin) between the ages of 7 and 9.6 (M = 8.51, SD = .62) and their parents. Both mothers and fathers completed questionnaires regarding the children’s problem behaviour and provided reports of the children’s characteristics and environment. Children were also assessed and provided reports about themselves and their relationships. Finally, parent–child mutuality and parenting behaviour were coded from a videotaped parent–child interaction task.

Results: Risk factors acted in a cumulative manner – the more risk children experienced, the more problem behaviour they exhibited. Total problem behaviour was predicted by all three levels: individual, microsystem and exosystem. However, externalising problems were mainly predicted by microsystem-level cumulative risk, whereas internalising problems were predicted by both individual-level cumulative risk and exosystem-level cumulative risk. These results were similar for both ethnic groups.

Conclusions: The support for the cumulative hypothesis highlights the importance of having a broad picture of children's characteristics and environmental components when analysing children’s adjustment. The distinct influence of risk stemming from the different ecological levels suggests that the trajectories of internalising, externalising and total problem behaviour may be different.

Keywords: Adjustment, cumulative model, ecological model, problem behaviour, risk factors.

School children’s emotional and behavioural problems have a substantial adverse impact on families, schools, and children’s own long-term well-being (Hwang & St James-Robert, 1998). In order to intervene and/or prevent children’s problem behaviours, it is necessary to identify those factors that put children at risk. The aim of this study was to examine whether risk factors for problem behaviour in middle childhood act in a cumulative manner, and to uncover whether different clusters of problem behaviour (i.e., externalising, internalising and total problem behaviour) are related to distinct types of risk factors. In addition, we investigated whether risk patterns were similar for ethnic minority and majority children.

Bronfenbrenner’s ecological model

The theoretical framework used in this study was Bronfenbrenner’s ecological model (Bronfenbrenner, 1979). According to this model, the child is not only affected by his or her own characteristics (the individual level) but also by his or her immediate social and physical environment (the microsystem level), and by the interrelationship among the various settings of his or her immediate environment (the mesosystem level). The child is further influenced by the broader social setting, such as economic processes (the exosystem level), which, in turn, are influenced by cultural attitudes and ideologies (the macrosystem level) (Bronfenbrenner, 1979). In other words, an ecological perspective considers how the individual develops in interaction with the immediate environment, as well as how aspects of the larger context influence the individual and his or her immediate setting. In the present study, risk factors for problem behaviour were examined within this ecological framework to ensure a more inclusive examination of the factors that may put children at risk.

Risk factors for problem behaviour

Research reveals several factors influencing children’s behaviour both directly and indirectly (Garmezy & Rutter, 1983). Using Bronfenbrenner’s (1979) ecological model as a theoretical framework, a review of some of the known risk factors for problem
behaviour is presented. At the individual level, temperament (e.g., Caspi, Henry, McGee, Moffitt, & Silva, 1995), gender (e.g., Achenbach, 1991), IQ (e.g., Williams, Anderson, McGee, & Silva, 1990) and self-worth (e.g., Harter, 1985) have been related to problem behaviour in childhood. Secondly, at the microsystem level, friendship (e.g., Hartup, 1996), the sibling relationship (e.g., Dunn, Slomkowski, Beardsall, & Rende, 1994), parenting style and use of harsh discipline (e.g., Deater-Deckard, Dodge, Bates, & Pettit, 1996), the parent–child relationship (e.g., Shaw, Owens, Vondra, Keenan, & Winslow, 1996), and family style (e.g., Smets & Hartup, 1988) have all been associated with problem behaviour. Thirdly, at the exosystem level, there is evidence that the parental marital relationship (e.g., Webster-Stratton, 1989), social support (e.g., Campbell, 1990), socio-economic status (e.g., Dodge, Pettit, & Bates, 1994), and parental work experience (e.g., Crouter, Bumpus, Maguire, & McHale, 1999) all have an influence on children’s problem behaviour. Finally, at the wider level of the macrosystem, findings from research on ethnic minority children show inconsistent results indicating both higher (e.g., Bradley & Sloman, 1975; Rutter, Yule, Berger, Yule, & Bagley, 1974) and lower (e.g., Fuligni, 1998; Munroe-Blum, Boyle, Offord, & Kates, 1989) rates of problem behaviour in children from ethnic minority groups.

Furthermore, Deater-Deckard, Dodge, Bates, and Pettit (1998) examined in a European- and African-American sample whether ethnicity moderated the prediction of externalising problems from cumulative risks. Using teachers’ and peer reports, positive and moderate associations between the number of risk factors and externalising problems were found for the European-American children, but modest, non-significant associations were found for the African-American children. This moderation effect suggests that the developmental processes involving risk factors and externalising problems may differ for the two ethnic groups (Deater-Deckard et al., 1998). This finding stresses the need to examine ethnic differences not only in the manifestation of single variables but also in the processes and mechanisms that influence behaviour.

The cumulative model

Research indicates that risk factors do not act in isolation, but that there are multiple and sometimes complex relations between risk factors. One of the ways in which multiple factors may influence children’s problem behaviour is through a cumulative or additive process. The cumulative model proposes that it is the accumulation of risk factors across a variety of domains rather than a single factor that is important in determining risk of adverse outcome (e.g., Rutter, Tizard, & Whitmore, 1970). That is, the more risk children experience or are exposed to, the more problem behaviour they will exhibit, regardless of which factors constitute the risk. They showed that the presence of only one risk factor did not increase the risk for later problems. However, the presence of more than one factor did increase the incidence of problems. More recent investigations of Rutter’s cumulative stressor hypothesis have confirmed that the likelihood of child problem behaviour increases with the number of family stressors. This finding has been replicated across cultures and over time (e.g., Blanz, Schmidt, & Esser, 1991; Shaw & Emery, 1988). Finally, in a more differentiated analysis, Deater-Deckard et al. (1998) investigated whether cumulative risk indices stemming from four different domains (child characteristics, sociocultural, parenting and peer experiences) predicted externalising behaviours in middle childhood. It was found that all four domains of risk made a unique contribution in the prediction of externalising problems.

Present study

Risk factors for problem behaviour have been extensively investigated. The importance of identifying the antecedents for problem behaviour is particularly salient since externalising and internalising problems have been found to be relatively stable (e.g., Campbell, 1990), and predictive of more serious behaviours in adolescence and beyond (Tremblay, Pihl, Vitaro, & Dobkin, 1994). The vast majority of research concerning the risk factors for problem behaviour is bivariate studies in which the links between isolated variables and children’s adjustment are examined. Although in recent years there has been a better understanding of the importance of examining comprehensive influences of risk factors rather than isolated variables, few studies have used multivariate approaches. Furthermore, little is known about ethnic group similarities and differences in the manner by which risk factors are related to children’s problem behaviour – most research has been based on White samples (cf. Deater-Deckard et al., 1998). In addition, although researchers have become concerned with the child in a broader social context, as a member of a family, peer group, wider social network, community, and culture (Bronfenbrenner & Crouter, 1983; Campbell, 1990), not many studies have examined the cumulative effect of risk factors on children’s problem behaviour.

Directed by Bronfenbrenner’s ecological model (1979), we examined the cumulative influence of risk factors on children’s problem behaviour utilising an ethnically diverse sample. In addition, the cumulative influences stemming from the different ecological levels on children’s problem behaviour were investigated. Adopting the cumulative hypothesis, we asserted that not only the type of risk, but also...
the quantity of risk, would be related to children’s problem behaviour. That is, the more risk children experience or are exposed to, the more problem behaviour they will exhibit, regardless of which factors constitute the risk. The statistical approach utilised to examine cumulative risk was dimensional. According to this approach, cumulative influences are inferred when higher levels of overall risk predict negative outcomes.

Specifically, three questions were proposed:

1. Do risk factors operate in a cumulative manner, such that higher levels of risk are associated with higher levels of problem behaviour?
2. Will cumulative risk variables (CRVs) at the different ecological levels (i.e., individual, microsystem and exosystem) provide differential prediction of externalising, internalising and total problem behaviour?
3. Do cumulative risks influence ethnic minority and majority children in the same manner?

**Method**

**Sample**

The sample consisted of 125 families who were participating in the Family and Child Behavior Study (Atzaba-Poria, 2002). Fifty-nine children were English (28 boys and 31 girls) and 66 were of Indian origin and Hindu religion (36 boys and 30 girls). All children were living in West London and were resident with both biological parents, or with a stepfather who had been in the father role for the target child prior to the child’s second birthday. In almost all cases, data were collected from both parents as well as the target child. Children’s ages ranged from 7 to 9.6 years ($M = 8.51$, $SD = .62$).

The sample was diverse in terms of parental education: 10% of the mothers and 15% of the fathers did not have any educational qualification; most of the mothers (71%) and fathers (56%) finished school with either the equivalent of a high school diploma or higher national diploma; and 19% of the mothers and 29% of the fathers were university graduates. Most of the mothers had skilled occupations and fewer but still many mothers had managerial and technical occupations or partly skilled occupations. However, the picture was different for fathers; many fathers had managerial and technical occupations or partly skilled and unskilled occupations. An SES composite was created combining information regarding parental education, occupational status and crowding (see Measures section). No significant differences were found for SES between English and Indian families. Finally, family size varied between 3 and 16 people ($M = 4.94$, $SD = 1.52$). Most families had two (57%) or three (28%) children living at home, and the target children were primarily eldest (42%) or second born (41%).

**Procedure**

In order to protect families’ confidentiality, letters were sent via schools to the children’s homes. Schools were asked to target those children from two-parent families of either English or Indian origin. However, we are unsure how accurate this procedure was, and not all schools agreed to target specific children. In addition, letters were sent home via the children, but there was no guarantee that parents received our letters. Because of this opt-in procedure it was not possible to estimate refusal rates accurately. Certainly, however, this volunteer sample represents a minority of eligible families. It is reassuring, however, that this sample included a wide range of SES families, and indeed wide variability on most measures, including child IQ (see below).

Interested families were visited at home for approximately an hour and a half. Two researchers conducted the home visits, during which structured parent–child interactions were videotaped, children were tested, and parents were interviewed as well as asked to complete questionnaires. The structured parent–child interaction was an Etch-A-Sketch game-task in which each parent and child were asked to copy a picture of a house for 10 minutes using an Etch-A-Sketch. The Etch-A-Sketch is a drawing toy, with two dials, one drawing horizontal lines and the other vertical lines. The parent and child were told that they could use one dial each, and were not to touch the other’s dial, necessitating cooperation in order to complete the task (see Deater-Deckard, 2000 for further details). Following the home visit, children were visited at school for further assessment that lasted approximately 30 minutes. The children’s assessment at home included measures of friendship, self-worth and IQ, whereas the assessment in the school environment included the children’s perceptions of their mother, father and the sibling relationship.

**Measures**

In order to obtain a more representative Indian sample, all parental questionnaires were translated into Gujarati. Gujarati is one of the languages spoken in India, in the area of Gujarat (i.e., West India). This language was chosen as it is the principal language used among most of the Hindu families in Britain (Modood, 1997). Assessment was made across the four levels of the ecological model (i.e., the individual, microsystem, exosystem and macrosystem), and via five informants (mothers, fathers, children, in-home testers and coded videotaped interactions). This multiple measurement across informants allows for the attenuation of rater-bias in analysis, and for context-specificity to be assessed.

**Measures at the individual level**

**Child problem behaviour.** The Child Behaviour Checklist (CBCL; Achenbach, 1991) is a parental report of problem behaviour for children 4–18 years of age. Parents were asked to indicate how true different statements of behaviours were about their child within the past 6 months. The 113 items forming this questionnaire cover eight scales. These scales form two second-order scales: Externalising behaviour problems (items from the Delinquency and Aggression scales) and Internalising behaviour problems (items from the...
Withdrawn, Somatic complaints and Anxious/Depressed scales). Finally, summing all the problem items yields a Total problem score. Internal reliability coefficients were .90 and .91 for Externalising behaviours, .88 and .85 for Internalising behaviours and .93 and .95 for Total problem behaviour for mothers’ and fathers’ reports, respectively.

Correlations between mothers’ and fathers’ reports were calculated for each of the clusters as well as the total problems index. Mother–father agreement was substantial for Externalising ($r = .64$), Internalising ($r = .55$) and Total problems ($r = .58$). On the basis of these inter-reporter correlations, reports from both parents were averaged to form externalising, internalising and total problems composites. This strategy was used in order to increase the reliability and validity of these indices (Rushton, Brainerd, & Pressley, 1983).

**Child temperament.** Parents completed the EAS (Buss & Plomin, 1984). This 20-item questionnaire examines multiple aspects of temperament: Emotionality, Activity, Shyness and Sociability. Internal consistencies for mothers’ and fathers’ reports were acceptable for Emotionality ($\alpha = .77$, $\alpha = .73$, respectively), Activity ($\alpha = .57$, $\alpha = .66$, respectively), Shyness ($\alpha = .70$, $\alpha = .63$, respectively) and Sociability ($\alpha = .60$, $\alpha = .54$, respectively).

**Child IQ.** The Kaufman Brief Intellgent Test (K-BIT; Kaufman & Kaufman, 1990) is a short, individually administered measure of verbal and nonverbal intelligence, covering the ages of 4 to 90 years. The test consists of two sub-tests: Vocabulary and Matrices. In this sample the IQ scores ranged from 70 to 120 ($M = 98.16$, $SD = 10.91$). Sixty-six percent of the children showed average performance (90–109), 19% showed lower performance (70–89), and 22% showed greater performance than average (110–120).

**Child self-worth.** The self-worth scale is one of 6 scales forming the Self-Perception Profile for Children (Harter, 1985). Children are asked to describe what kind of person they are, by indicating which of two described children is more like them. They then indicate whether this was ‘Really true for them’ or only ‘Sort of true for them’. The global self-worth scale consists of six items ($\alpha = .71$).

**Measures at the microsystem level**

**Sibling relationship.** Children’s perceptions of their sibling relationship were assessed via the Sibling Relationship Inventory (SRI; Stocker & McHale, 1992). This 20-item questionnaire indexes rivalry, affection, and hostility. Cronbach’s alphas for these scales were reasonable, .78 for sibling affection, .71 for sibling rivalry, and .62 for sibling hostility.

**Friendship.** Children completed the Friendship Quality Questionnaire (FQQ; Parker & Asher, 1993) in which they indicated the veracity of 40 statements referring to their relationship with their best friend. This questionnaire assesses one negative aspect of friendship: conflict and betrayal ($\alpha = .57$), and five positive aspects of friendship: help and guidance, validation and caring, conflict resolution, companionship and recreation, and intimate exchange. Owing to the moderate to high correlations among the positive sub-scales, a positive friendship composite was calculated. Cronbach’s alpha for this index was substantial ($\alpha = .90$).

**Family style.** Mothers and fathers both completed the FACES II (Olson, Portner, & Bell 1982). The FACES II is a 30-item questionnaire that measures family balance using items related to family cohesion (e.g., emotional bonding, coalitions, decision making, and recreation), and family adaptability (e.g., discipline, negotiations, roles and rules). Cronbach’s alpha coefficients were good for both mothers’ reports ($\alpha = .77$) and fathers’ reports ($\alpha = .78$) of family style.

**Parental style.** Parents completed the Parent Report, a 48-item questionnaire regarding their parental behaviour and their feelings about their relationship with the target child (PR; Dibble & Cohen, 1974). The PR consists of eight positive aspects and eight negative aspects. Internal reliability coefficients for parental positive behaviour was high both for mothers’ ($\alpha = .84$) and fathers’ ($\alpha = .91$) reports. Cronbach’s alpha coefficients for parental negative behaviour were .87 and .83, for mothers and fathers, respectively.

**Children’s reports** of parental style were also obtained, via the Parenting Style Questionnaire (PSQ; Smith, Padley, Bowers, & Binney, 1993). Thirty cards were used with children to examine five parenting style scales: Warmth, Punitiveness, Overprotection, Accurate Monitoring and Neglect. Children were presented with 3 boxes labelled ‘A lot like my mum/dad’, ‘A bit like my mum/dad’, and ‘Not at all like my mum/dad’ on the front, with scores of 3, 2, and 1 respectively. Each item was printed on an individual card, and the child was asked to post the card into the box best suited for his or her mother/father. Cronbach’s alphas were good for Warmth ($\alpha = .65$, $\alpha = .75$ about mothers and fathers, respectively) and for Punitiveness ($\alpha = .70$, $\alpha = .76$ about mothers and fathers, respectively). Owing to the low internal reliability of the Neglect, Accurate Monitoring, and Overprotection scales, these were not used in further analyses.

**Testers’ ratings** of parental style were obtained using the Post Visit Inventory (Deater-Deckard, 2000). Based on what was observed and heard during the home visit, the two testers discussed each question until a consensus was reached. Four items were averaged to form a Warmth composite for both mothers and fathers (Deater-Deckard, 2000). Cronbach’s alphas for mothers and fathers were high ($\alpha = .84$, $\alpha = .76$, respectively) indicating good internal consistency.

Finally, parenting positivity and negativity were coded from the videotaped Etch-A-Sketch task. Observers completed seven-point Likert-type scales (ranging from low to high in frequency) from the Parent–Child Interaction System (PARCHISY; Deater-Deckard, Pylas, & Petrill, 1997) regarding four aspects: Parental positive content/control; Parental positive affect; Parental negative content/control; Parents negative affect. A single composite for maternal and paternal positivity was created by summing the two positive items ($r = .50$, $\alpha = .66$; $r = .45$, $\alpha = .62$, for mothers and fathers,
respectively), and parental negativity composites were computed by summing the two negative items for mothers and fathers \((r = .70; \ z = .82; \ r = .68; \ z = .80, \text{ for mother and fathers, respectively})\). The tapes were coded in the laboratory in which the coding system was designed (Eugene, Oregon, USA) and has been utilised for over five years. The PARCHISY was designed to be intuitive and facilitate reliability (Deater-Deckard, 2000; Deater-Deckard & O’Connor, 2000). Inter-rater agreement of \(z > .75\) was reached before coding began.

**Parent–child relationship.** The parent–child relationship system was examined via the Etch-A-Sketch task. Observers completed global rating of four components of dyadic mutuality, using the PARCHISY (Deater-Deckard et al., 1997). This consisted of four components: dyad cooperation, emotional reciprocity, parental responsiveness, and child’s responsiveness. A principal component analysis revealed one factor, explaining 60% of the variance. Accordingly, and as suggested in Deater-Deckard and O’Connor (2000), the four items were standardised and averaged to create a single composite of dyadic mutuality \((z=.81, z = .75, \text{ for mother–child and father–child mutuality, respectively})\).

**Parental use of discipline.** Harshness of parental discipline was obtained using a semi-structured interview, adapted from Deater-Deckard et al. (1996). Mothers and fathers were interviewed separately about the frequency of their use of different discipline strategies. Based on the interview, the interviewer completed a global rating of the harshness of discipline for each parent ranging from 1 = ‘non-restrictive, mostly positive guidance’, through 3 = ‘moderately restrictive discipline, without physical punishment’, to 6 = ‘severe, strict, usually physical punishment’. Inter-rater reliability was carried out on 20% of the interviews and revealed good agreement (inter-rater \(r = .89\)).

**Measures at the exosystem level**

**Family socio-economic status (SES).** SES was assessed using the following information: the mothers’ or fathers’ highest educational level, the mothers’ or fathers’ highest occupational status and an index of crowding (i.e., the ratio of number of people in the household to number of rooms in the house). Principal component analysis of these variables yielded a single SES factor that explained 50% of the variance. These three indicators were standardised (and reversed if needed) and averaged to create a single SES composite, with higher scores representing higher SES.

**Parental marital relationship.** Both mothers and fathers completed the Dyadic Adjustment Scale (DAS; Spanier, 1976). The DAS is an instrument widely used to measure overall marital satisfaction. The DAS consists of 32 items across the following aspects of the marital relationship: satisfaction, cohesion, consensus, and affectional expression. In the current study, four items relating to the affectional expression domain were not used due to their intimate nature, which were perceived during a feasibility study as embarrassing and inappropriate by many participants. A sum of the 28 items yielded a global measure of marital adjustment. Internal reliability for the total adjustment scale was excellent, and similar for both mothers’ and fathers’ reports \((z = .91)\).

**Parental social support.** Parental social support was examined using Pollack & Harris’s Measurement of Social Support (MSS; Pollack & Harris, 1983). The MSS is a 23-item questionnaire, in which parents indicated how much they agreed with each statement, ranging from ‘Not at all true’ (1), to ‘Extremely true’ (4). Internal reliability was good, .80 and .69 for mothers’ and fathers’ reports, respectively.

**Parental job spillover.** Parental job spillover was assessed using Small & Riley’s (1990) questionnaire. Both parents completed the 20-item measure of work spillover. Spillover was assessed in four separate contexts: spillover into the marital relationship, spillover into the parent–child relationship, spillover into leisure time, and spillover into household tasks. A sum of all 20 items together produced a global measure of negative job spillover \((z = .91 \text{ for both mothers’ and fathers’ reports})\). A higher score indicates a more negative perception of the influence of the job on these others aspects of life.

**Results**

**Preliminary analyses**

Risk factors are defined in this study as aspects of the child or her or his environment that are associated with elevated levels of problem behaviour. Bivariate analyses revealed the factors at the different ecological levels that acted as risk factors. At the individual level, boys were at more risk for total problem behaviour as well as externalising problems \([M = 29.28, \ sd = 17.37, \ M = 10.67, \ sd = 8.20, \text{ respectively}]\) than were girls \([M = 23.33, \ sd = 14.57, \ M = 6.56, \ sd = 4.94, \text{ respectively}]\). These gender differences were significant \([t (121.06) = 2.08, \ p < .05; t (98.48) = 3.36, \ p < .01, \text{ for total problem behaviour and externalising problems respectively}]\). In addition, children who had lower levels of self-worth, lower IQ scores, and less adaptive temperament (i.e., higher levels of emotionality, activity and shyness and lower levels of sociability) were at higher risk for exhibiting problem behaviour (Table 1). At the microsystem level (Table 2), having mothers and fathers who showed more parental negative behaviour, less warmth and positive behaviour, and more

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1 Similar patterns of risk were found when the analyses were conducted using maternal risk factors (e.g., maternal warmth, maternal social support) with paternal report of children’s problem behaviour and vice versa. Owing to space limitations, only the combined parental composites of children’s problem behaviour are presented here. Results presented separately for mothers’ and fathers’ reports are available from the first author.
harsh discipline, was associated with higher levels of child problem behaviour. Furthermore, children who had more negative rather than positive friend and sibling relationship quality and who were growing up in less balanced families (i.e., lower in adaptability and cohesion), were at higher risk. Finally, at the exosystem level (see Table 3), less parental social support and more parental job spillover, as well as lower levels of paternal (but not maternal) marital satisfaction, were all related to higher levels of problem behaviour. In addition, at the macrosystem level, ethnicity was found to act as a risk factor, with Indian children displaying significantly more internalising problems ($M = 8.07, sd = 5.70$) than did the English children ($M = 5.81, sd = 4.74$).

### Creating cumulative scores

Risk factors were defined when correlations with problem behaviours were equal to or greater than .25. This analysis revealed 21 risk factors that were moderately to substantially correlated with children’s problem behaviour. Children’s problem behaviour scores were associated with variables from the four ecological levels: the individual level [being a boy, being more emotional and shy, and having a lower IQ; $rs$ ranged from .28 to .49], the microsystem level [more sibling rivalry and hostility (child report), more maternal and paternal negativity (child, maternal and paternal report), less balanced family (maternal report), less maternal and paternal warmth (observer report), more maternal and pater-
nal use of harsh discipline (interviewer rated), and less mother–child dyadic mutuality (videotaped coding); rs ranged from .25 to .43), the exosystem level [less maternal and paternal social support (maternal and paternal reports), more maternal job spillover (maternal report) and less paternal marital satisfaction (paternal report); rs ranged from .25 to .50]. Next, in order to compute cumulative risk composites, all scores were first standardised and reverse-scored where necessary, such that a higher score reflected more risk. These scores were then summed. This procedure yielded a total cumulative risk variable (total CRV), which was the sum of the 19 dimensional risk variables (all risk variables specified above, except for gender and ethnicity). In addition, 3 different cumulative risk variables, representing the sum of the standardised risk variables at each ecological level (i.e., ‘individual CRV’, ‘microsystem CRV’, and ‘exosystem CRV’) were computed. As ethnicity and gender are categorical variables, they were not part of the cumulative scores, and were considered separately.

Total cumulative risk and problem behaviour

In order to examine the extent of the contribution of the total CRV to the manifestation of problem behaviour, hierarchical regression analyses, which included three steps, were conducted. In the first step, ethnicity and gender were included. Next, the total CRV was added. Finally, the interaction of CRV × ethnicity was added. Standardised beta weights as well as the explained variance of these regression analyses are presented in Table 4. Overall, the 21 risk variables significantly (p < .001) accounted for 47% of the variance in total problem behaviour, 42% of the variance in externalising problems, and 29% of the variance of internalising problems. Furthermore, none of the interaction effects were significant, suggesting that this pattern of results was the same for both ethnic groups.

Cumulative risk at the different ecological levels and problem behaviour

Following the regression results involving the total CRV, it was of interest to examine the specific prediction of the CRVs at the different ecological levels. Therefore, two regression models were utilised. The first highlights the basic contribution of each CRV (individual, microsystem, and exosystem), without taking into account the contribution of the other variables. This initial contribution of each ecological level CRV will be described using the ‘individual CRV’ as an example. In the first step, ethnicity and gender were included. In the second step, the ‘individual CRV’ was added. Finally, the interaction variable, ‘individual CRV × ethnicity’ was included.

The second regression model assessed the contribution of each CRV above and beyond the other CRVs. This type of regression model, taking into account the contribution of the other ecological levels, estimates the unique contribution of each specific CRV in light of the others. This estimation was done using hierarchical regression, and as before will be described using the ‘individual CRV’ as an example. In the first step, ethnicity and gender were included. Secondly, all CRVs apart from the one of interest were added (i.e., the microsystem CRV and the exosystem CRV). Next, the ‘individual CRV’ was included. In the fourth step, the interaction variable ‘individual CRV × ethnicity’ was added.

The regression analyses revealed an interesting pattern of results (see Table 5). Whereas all three CRVs significantly predicted total problem behaviour (with the microsystem CRV providing most prediction), the microsystem CRV was the largest predictor of externalising problems, and the exosystem and the individual CRVs were the main predictors of internalising problems (although the exosystem CRV was a stronger predictor). Specifically, the

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Table 3 Correlations between the exosystem level variables and total problem behaviour, externalising and internalising problems (n = 94–125)

<table>
<thead>
<tr>
<th></th>
<th>Total problem</th>
<th>Externalising problems</th>
<th>Internalising problems</th>
</tr>
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<tbody>
<tr>
<td>Maternal report</td>
<td>−.09</td>
<td>−.10</td>
<td>−.12</td>
</tr>
<tr>
<td>Social support</td>
<td>−.36***</td>
<td>−.28**</td>
<td>−.42***</td>
</tr>
<tr>
<td>Job spillover</td>
<td>.48***</td>
<td>.30**</td>
<td>.50***</td>
</tr>
<tr>
<td>Parental report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital satisfaction</td>
<td>−.20*</td>
<td>−.10</td>
<td>−.25**</td>
</tr>
<tr>
<td>Social support</td>
<td>−.23*</td>
<td>−.13</td>
<td>−.30**</td>
</tr>
<tr>
<td>Job spillover</td>
<td>.19*</td>
<td>.08</td>
<td>.24**</td>
</tr>
<tr>
<td>SES</td>
<td>−.23**</td>
<td>−.22*</td>
<td>−.12</td>
</tr>
</tbody>
</table>

Note: *p < .10; *p < .05; **p < .01, ***p < .001.

Table 4 Regression weights (β) and explained variance (R²), for ethnicity, gender and the total cumulative risk variable (CRV), in the prediction of children’s problem behaviour

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>β</th>
<th>ΔR²</th>
<th>β</th>
<th>ΔR²</th>
<th>β</th>
<th>ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ethnicity</td>
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<td>.05</td>
<td>.05</td>
<td>.09</td>
<td>.22</td>
<td>.05</td>
</tr>
<tr>
<td>2</td>
<td>Gender</td>
<td>−.18</td>
<td>−.29</td>
<td>−.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Total CRV</td>
<td>.66</td>
<td>.40</td>
<td>.57</td>
<td>.29</td>
<td>.51</td>
<td>.23</td>
</tr>
<tr>
<td>4</td>
<td>Total CRV ×</td>
<td>.04</td>
<td>.00</td>
<td>−.00</td>
<td>.04</td>
<td>.05</td>
<td>.00</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CRV = cumulative risk variable; *p < .10; *p < .05; **p < .01; ***p < .001.

2 Similar results were found when using one parent’s report of risk factors with the other parent’s report of children’s problem behaviour. Owing to space limitations, these results are not presented, but are available from the first author.
individual, the microsystem and the exosystem CRVs were all found to significantly predict children’s total problem behaviour before (β = .42, β = .55, β = .43, for individual, microsystem and exosystem CRVs, respectively) and after (β = .26, β = .32, β = .26, respectively) overlapping covariance was taken into account, explaining 23%, 34% and 21%, respectively, of the variance of total problem behaviour. In addition, the microsystem CRV was found to be the main predictor of externalising behaviours before (β = .54) and after (β = .42) the two other CRVs were taken into account, explaining 37% of the variance. However, both the exosystem and the individual CRVs were initially significant (β = .50, β = .40, respectively) and remained significant (β = .38, β = .32, respectively) predictors of internalising problems after considering the overlapping covariance with the other two cumulative risk variables, explaining 27% and 23% of the variance, respectively. 3

Ethnic group differences in the way cumulative risk operates

None of the interactions between the different ecological level CRVs and ethnicity was significant (see Table 5), indicating that the pattern of statistical prediction of children’s problem behaviour from the CRVs did not differ for the two ethnic groups.

In addition to moderation by ethnicity, tests for gender moderation were conducted to explore whether cumulative risk processes were similar for boys and girls. Although two significant moderation effects were found (i.e., the links between both total CRV and microsystem CRV with externalising problems were moderated by gender), follow-up analyses examining the correlations for both groups separately revealed similar pattern of influence: substantial positive correlations between the total CRV and externalising problems (r = .60 and r = .54 for boys and girls, respectively), and between the microsystem CRV and externalising problems (r = .63 and r = .48 for boys and girls, respectively).

Discussion

This study addressed three main goals. The first goal was to investigate whether risk factors for problem behaviour operate in a cumulative way. The second goal was to explore the contributions that risk at each ecological level (i.e., individual, microsystem, and exosystem levels) had on children’s problem behaviour. Finally, the third goal was to explore whether the patterns of prediction of the overall cumulative risk as well as the cumulative risk stemming from the distinct ecological levels were similar for both cultures.

Cumulative risk as a predictor of internalising, externalising, and total problem behaviour

As hypothesized, the more accumulated risk children experienced, the higher the levels of total problem behaviour, externalising and internalising problems that they displayed. This indicates that the level of cumulative risk, regardless of the specific type of risk, is an important element in accounting for problem behaviour. Furthermore, statistical prediction was good; the cumulative risk factors along with gender and ethnicity accounted for about half of the variance in total problem behaviour, almost

Table 5 Unique and Initial regression weights (β) and explained variance (R²), in the prediction of parental reports of children’s problem behaviour, through ethnicity, gender and the CRVs at the different ecological levels (individual, microsystem and exosystem)

<table>
<thead>
<tr>
<th></th>
<th>Total problem behaviour: R² = .40***</th>
<th>Externalising problems: R² = .32***</th>
<th>Internalising problems: R² = .38***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>I</td>
<td>U</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>.14</td>
<td>.05</td>
<td>.21*</td>
</tr>
<tr>
<td>Individual CRV</td>
<td>.42***</td>
<td>.24**</td>
<td>.26**</td>
</tr>
<tr>
<td>Individual CRV × Ethnicity</td>
<td>.05</td>
<td>-.09</td>
<td>-.11</td>
</tr>
<tr>
<td>Microsystem CRV</td>
<td>.55***</td>
<td>.54***</td>
<td>.42***</td>
</tr>
<tr>
<td>Microsystem CRV × Ethnicity</td>
<td>-.01</td>
<td>.01</td>
<td>.05</td>
</tr>
<tr>
<td>Exosystem CRV</td>
<td>.43***</td>
<td>.24*</td>
<td>.09</td>
</tr>
<tr>
<td>Exosystem CRV × Ethnicity</td>
<td>.00</td>
<td>.03</td>
<td></td>
</tr>
</tbody>
</table>

Note: CRV = cumulative risk variable; I = Initial contribution; U = Unique contribution. R² is the explained variance of the third model (i.e., ethnicity, gender, individual CRV, microsystem CRV and exosystem CRV).

1p < .10; * p < .05; ** p < .01; *** p < .001.

3 As before, these results were replicated using one parent’s report of risk factors with the other parent’s report of children’s problem behaviour. The pattern of findings was similar, and these results are available from the first author.
one-third of the variance in internalising problems and about 40% of the variance in externalising problems. These findings are consistent with previous research indicating that the extent of risk – the additive level of risk – rather than specific type of risk is important in the prediction of children’s outcomes, including cognitive and behavioural adaptation (e.g., Burchinal, Roberts, Hooper, & Zeisel, 2000; Deater-Deckard et al., 1998). The support for the cumulative hypothesis found in this study highlights the importance of having as broad a picture as possible of children’s characteristics and environmental components when analysing children’s adjustment. It is proposed that by identifying solely ‘extreme’ risk, children who are at higher risk due to experience of multiple medium-level risks are neglected.

Cumulative risk at the different levels of the ecological model

The cumulative analyses in the current study extended previous work in that as well as creating a general risk variable from all of the risk factors, the cumulative risk deriving from each different ecological level was also examined. The hierarchical regression analyses allowed for the assessment of the initial as well as the unique (i.e., above and beyond the contribution of all other cumulative risks) contribution of cumulative risk originating from each ecological level. This investigation demonstrated that the cumulative risk at each of the three ecological levels made an initial significant contribution to the prediction of total problem behaviour, externalising and internalising problems, before considering the overlapping covariance with the other two cumulative risk variables. However, when examining the unique contribution of each ecological CRV in the prediction of problem behaviour, all three CRVs contributed to the prediction of total problem behaviour, whereas the microsystem CRV was the only significant predictor of externalising problems, and both the individual and the exosystem CRVs predicted internalising problems.

Why are externalising, internalising and total problem behaviour associated differently with the different ecological levels? In order to answer this question, it is worth considering the distinction between these problem behaviour constructs. Whereas the externalising cluster measures delinquent and aggressive behaviour, the internalising cluster measures withdrawn, anxious and depressed behaviours, as well as somatic complaints. Finally, the total problem behaviour construct, as reflected in its name, consists of different types of problems, and includes all of the above as well as attention problems, social problems, and thought problems (Achenbach, 1991). The results in this study suggest that children who exhibit more externalising problems are more likely to experience accumulated risk deriving from settings that are directly linked to them (i.e., from the microsystem level). These results are consistent with previous findings indicating that family risk factors are more associated with conduct disorders than with other disorders (Fendrich, Warner, & Weissman, 1990). Furthermore, children who experienced more internalising problems were more likely to experience cumulative risk originating at the exosystem level, although risk at the individual level also played a role. Together, these findings are consistent with those from a very different sample – referred 9- to 16-year-old children of Dutch nationality – in which it was found that the mother–child relationship (a microsystem variable) was a more important predictor of externalising problems, whereas the parental marital relationship (an exosystem variable) was a predictor of internalising problems (Mathijssen, Koot, Verhulst, DeBruyn, & Oud, 1998).

Campbell (1990) emphasised that the main difference between externalising and internalising problems is that whereas externalising problems are ‘expressed outward against others or have an impact on the child’s environment’ (p. 66), internalising problems ‘have a major impact on the child himself’ (p. 66). Accordingly, it seems that the difference in the behaviours children exhibit is linked to differences in the contextual sources of risk. In other words, children who experience more microsystem risk exhibit more externalising problems, perhaps in reaction to negative circumstances in their direct environment. That is, children recognise the source of risk and ‘fight back’. Similarly, children exhibit internalising problems – reacting against themselves – when experiencing more individual risk (i.e., risk that originates from their own characteristics). However, a different explanation seems to apply to internalising behaviour shown when children have risk stemming from settings in which they are not active participants (i.e., the exosystem). This indicates that children are affected by things that are happening around them, even if they are not directly involved, and instead of acting out against the environment – the origin of the risk – they act against themselves. This finding is consistent with the results of Grys, Seid, and Fincham (1992) who found that children responded to angry adult interaction with increased distress, shame, and self-blame. Similarly, Shaw, Winslow, and Flanagan (1999) found that children of parents experiencing difficulties in their marital relationship were more likely to respond to the parental bitterness by exhibiting symptoms of distress and anxiety rather than acting in a disruptive way.

Finally, total problem behaviour was predicted by the three cumulative risk factors, indicating that multiple types of risk are associated with this broader cluster. These results suggest differential prediction of externalising, internalising and total problem behaviours, in terms of overall effect size and the origins of risk (according to ecological level).
The findings in this research indicate that looking only at total problem behaviour would have obscured these distinct patterns, stressing the importance of exploring these clusters separately.

Ethnic differences in cumulative risk

The last goal was to explore ethnic group differences in the covariation of cumulative risk and problem behaviour. In general, although the Indian children were reported by parents to exhibit more internalising problems, the risk factors for Indian and English children acted in the same manner. In both ethnic groups, higher cumulative risk indicated more problem behaviour. Furthermore, the same pattern of influence for the different ecological levels was seen for both ethnic groups. These results are consistent with those reported by Deater-Deckard et al. (1998). Although Deater-Deckard and colleagues found that ethnicity moderated the links between risk factors and externalising problems when using teachers’ and peer reports, moderation effects were not evident while considering parental reports.

Limitations and future directions

Several limitations should be noted. Firstly, risk factors and problem behaviour were all measured at a single time point, and due to the nature of the study, variables were not manipulated experimentally. Accordingly, the nature of the data is correlational, and clear conclusions about the direction of causal influence cannot be established. In other words, these findings may also indicate that children’s problem behaviours influence the risk factors they experience. This is unlikely for a risk such as gender, though very possible for a risk such as parental negativity. Furthermore, correlational results may be explained by a third variable not examined in the specific analysis, responsible for the association found between the risk factor and problem behaviour. In addition, as this study was cross-sectional, conclusions cannot be drawn as to the developmental trajectories of risk factors or the adjustment of children. Replication of this study in different developmental periods would be necessary in order to understand change and continuity in risk influences. A longitudinal study would enable more confident inferences regarding causal direction. In particular, the temporal manner in which risk factors influence each other and the manifestation of problem behaviour could be determined.

Finally, in the current study, we examined one specific ethnic minority group – children of Indian origin and Hindu religion. As children from different minority groups may experience different adjustment processes (e.g., Berry, 1997) and may be exposed to different type of risk, it would be worth while to replicate this study with other ethnic minority groups. Such a replication may indicate whether the results seen in this study are unique to the Indian group living in Britain, or whether they can be generalised to other ethnic groups that have settled in Britain.

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