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Risk and protective factors for children's and adolescents' mental health: results of the BELLA study

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■ **Abstract** *Background* Since prevalence rates of mental health problems in children and adolescents are high and of considerable relevance to public health, determinants of mental health, such as risk and protective factors, are of special interest. *Objectives* The present paper reports the frequencies and distributions of potential risk and protective factors and analyses their effects on children's mental health. *Methods* The BELLA study is the mental health module of the German National Health Interview and Examination Survey among Children and Adolescents (KiGGS). Mental health problems and their assumed determinants are examined in a representative sub-sample of 2,863 families with children and adolescents aged 7–17. In order to identify mental health problems, the extended version of the Strengths and Difficulties Questionnaire was administered. Data on psychosocial risk factors as well as on protective factors in terms of personal, familial and social resources were collected by questioning the parents and, from the age of 11 years upwards, the

children themselves. *Results* Adverse family climate stands out particularly as a negative contributor to children's mental health. When several risk factors occur simultaneously, the prevalence of mental health problems increases markedly. Conversely, pronounced individual, family and social resources coincide with a reduced occurrence of mental health problems, especially in children with a limited number of risk factors. *Conclusions* The results suggest that differential prevention strategies are needed depending on the risk level: in the low risk group, to which most children belong, effective prevention programmes should define strengthening resources as a key objective. In the smaller group of children with a high number of risk factors, more complex intervention designs are required, which must consider the reduction of risks as well as strengthening resources.

■ **Key words** risk factors – protective factors – children and adolescents – mental health – survey

Introduction

Over the past century the pattern of child health and illness has changed considerably. In a phenomenon known as the 'new morbidity', problems such as epidemics, acute infectious morbidity and high infant mortality have decreased radically in importance [44]. However, at the same time new challenges have developed, such as the rising importance of emotional problems and conduct problems. Nowadays, within the framework of the so-called 'millennial morbidity' (dated to the period between 2000 and the present) increasing mental health problems have advanced to achieve significant importance within child and adolescent health [44]. Prevalence estimates of mental health problems range mostly between 10% and 20% [5, 12, 33, 45, 47].

Mental health problems are associated with a considerable burden on the children and adolescents concerned, e.g. regarding school functioning or their relationships with family and peers [12, 43, 45]. Furthermore, mental health problems have a poor prognosis – they are highly persistent, partly resulting in chronic impairment [33]. Because of the burden associated with child and adolescent mental health problems, it is of special interest to gain a better understanding of the factors that influence their occurrence.

To date, several environmental risk factors have been found to be associated with poor mental health in children and adolescents. Regarding psychosocial factors, results from several studies indicate, for example, an association between mental health problems in young people and physical illness of the child [32] or a parent [4], parental conflicts [34], family breakdown [1], large family size and overcrowding in the home [48], parental psychiatric illness [30, 51], parental alcoholism [15], socio-economic disadvantage [8, 37], or early parenthood [31]. Furthermore, experiences of violence or sexual molestation are discussed as risk factors regarding mental health problems [9]. However, risk factors are not limited to psychosocial conditions; biological risk factors such as premature birth [24] as well as smoking [19] or drinking [65] during pregnancy have also been shown to be significant influences.

In general, risk factors do not emerge in isolation, but tend to cluster together and interact. The vulnerability to risk factors varies with age and gender, is dependent on the duration of risk impact and on the sequential or simultaneous occurrence of the factors [55]. Several cumulative models have shown higher rates of disruption when multiple risks occur together [22, 49, 53].

However, many risk factors can hardly be influenced. Given inalterable adverse circumstances, it is most necessary to identify factors that can modify the effects of existing risks in order to focus them in preventive interventions. This search for factors that promote health instead of concentrating on risks, corresponds to the salutogenetic approach of Aaron Antonovsky [2], which has considerably influenced research in public health and other disciplines. Within the framework of developmental psychology a similar perspective is applied; research on resilience focuses on children and adolescents who show positive developmental outcomes despite experiences of significant adversity [42].

Protective factors in children contributing to resilient development have been identified in longitudinal developmental studies (e.g. [52, 63, 64]). These are factors specific to the child (referred to as personal resources), specific to the family (familial resources) as well as to its broader social environment (social resources).

Personal resources describe features of the child's or adolescent's personality such as high self-efficacy or pronounced optimism. High self-efficacy is conceptualised as a stable trait of personality and describes the firm belief in personal competence to manage stressful situations efficiently [57]. Different studies provide evidence for the association between high self-efficacy and fewer mental health problems [57]. In contrast, optimism describes a general positive outcome expectation – irrespective of the belief in one's own personal competence [54].

Familial resources such as parental support, authoritative child-raising, and good family climate or cohesion are also discussed as important resources [14]. Earlier research showed that children raised in authoritative homes (characterised by warmth, involvement, support of autonomy as well as clear rules and expectations) display less psychological and behavioural dysfunction [38]. Supportive parenting and a positive parent-adolescent relationship are associated with lower levels of depression and less impaired functioning [22, 35].

Social resources describe the availability of social support outside the nuclear family, such as by friends or teachers, relationships in sports clubs or church. Social support systems relieve the child or adolescent, encourage coping and contribute to the development of individual competencies. The protective effects of social support regarding mental health have been demonstrated in a variety of studies [18, 61, 62].

However, important conceptual and methodological pitfalls have to be taken into account regarding the research into resources. The examination of

protective factors requires their theoretical and methodological distinction from risk factors, i.e. they must not describe the opposite or the absence of risk factors. If this precondition is not fulfilled, effects that are interpreted as protective might in fact be attributable to a lower burden of risks [40]. A 'protective factor' that is associated with psychopathology in general – irrespective of the presence of adverse circumstances – can be referred to as an unspecific promotive factor [40], but it does not qualify as a protective factor. Rutter [50] stresses the importance of this distinction and postulates the verification of a buffering effect as a precondition for assuming protective factors. The factor in question has to operate differently depending on the given level of risk. Therefore, the examination of statistical interactions between existing risk variables and putative protective factors is crucial. Two kinds of interaction are possible: either the protective factor is associated with lower rates of mental health problems only in children and adolescents experiencing adverse circumstances, or else the protective factor is linked to fewer mental health problems in all children, but interacts significantly with the risk factor and proves more effective in risk-exposed children [41, 50].

Despite the considerable amount of literature examining risk factors or resources, studies including different kinds of risk as well as protective factors in representative population samples are rare [36, 42]. However, the comprehensive examination of risk and protective factors is especially important in order to establish a scientific basis for the development of prevention and intervention programmes. This requires reliable information regarding high-risk groups. Furthermore, the identification of effective resources facilitates new strategies for programmes that have to focus and strengthen children's and adolescents' resources in the context of risk factors that cannot be changed.

In order to provide such information, the BELLA study examined a variety of individual, familial and social risks and resources. The selection of risk and protective factors included in the study was based on a pretest including many of the factors discussed in the literature [6].

The present paper addresses risk and protective factors in a population sample of children and adolescents. The frequencies and distributions of risk as well as protective factors are analysed with respect to age and gender. The effects of the factors examined on the presence of mental health problems are determined. Cumulative effects of risks as well as resources are analysed, and different effects of postulated resources in the context of low and high risk burden are identified.

Methods

■ Recruitment and sampling

The conceptualisation, design and procedure used by the mental health module (BELLA study) are described in detail elsewhere [46].

The participants of the BELLA study were randomly recruited from the national representative sample of 17,641 families participating in the German Health Interview and Examination Survey for Children and Adolescents (KiGGS) conducted by the Robert Koch-Institute. The KiGGS and the BELLA survey took place between May 2003 and May 2006 in 167 cities and communities, representative for Germany. The overall response rate was 66.6% (KiGGS). A total of 4,199 families with children aged 7–17 randomly selected from the KiGGS sample were asked to participate in the BELLA study. Of these eligible families, 70% agreed to participate and 68% (1,389 girls and 1,474 boys) were in fact surveyed. Of the 2,863 families that participated in the BELLA study, 1,142 had children aged 7–10, 780 had children aged 11–13, and 941 had children aged 14–17 years. After weighting the data to represent the citizenship structure of the German population, the sample included 960 children aged 7–10, as well as 750 and 1,153 adolescents aged 11–13 and 14–17, respectively. In each family, one parent was questioned using a standardised computer-assisted telephone interview. Children aged 11 and older were questioned as well. In addition, the participants were asked to fill in mailed paper and pencil questionnaires, which were returned completely by 89% of the families with younger children and by 81% of the families with children aged 11 or older.

■ Instruments

Assessment of mental health

Children and adolescents with mental health problems were identified by means of the extended version of the Strengths and Difficulties Questionnaire (SDQ; [25, 26]). Parents and children (if at least 11 years old) answered 20 questions assessing symptoms of behaviour problems, emotional problems, hyperactivity, and peer problems. Each item was rated to be 'not true', 'somewhat true' or 'certainly true' scored as 0, 1, or 2. The total difficulties score was calculated by summing the scores of the 20 items and categorised into three groups indicating 'normal', 'borderline', or 'abnormal' scores [26].

Additional questions belonging to the SDQ impact supplement [25] take into account the burden asso-

ciated with the reported symptoms. If in the first question the respondent reports at least 'minor' perceived difficulties in the areas emotions, concentration, behaviour, or being able to get on with other people, he/she is asked seven further questions about distress and associated social impairment. The item scores are summed up to generate the 'impact score' [25].

In order to predict the clinical status, the information from the self- and parent-reported SDQ total difficulties and impact scores was combined by means of the algorithm developed by Goodman et al. [28]. This computerised algorithm estimates the probability of mental health problems being 'unlikely', 'possible', or 'probable' [27]. One slight modification of this algorithm was made: if a parent reported the child as having a psychiatric illness, this was considered a 'probable' disorder in the algorithm.

Assessment of risk factors

In addition to conditions such as growing up with a single parent or with a step-parent, which were examined in the parent's questionnaire of the KiGGS survey, the BELLA study asked about further risk factors in the parent's interview, such as a mental disorder or a chronic disease in one parent, and burden through unemployment of one parent during the child's lifetime. Likewise a high level of conflicts in the family, conflicts in the relationship, family conflicts during one parent's childhood and adolescence, and circumstances such as the child resulting from an unwanted pregnancy and low social support received by the interviewed parent during the child's first year of life were asked after. Early parenthood was defined as one parent being younger than 18 at the time of the child's birth. Likewise, information on the number of older and younger siblings was drawn from the sociodemographic data.

In order to identify high alcohol consumption, the parent interviewed was asked whether he/she ever thought about cutting down on his/her drinking and whether he/she was ever angry about being criticised for his/her drinking habits. Furthermore, the respondent was asked whether his/her partner ought to cut down on his/her drinking and whether he/she ever criticised his/her partner for drinking. If both questions were answered in the affirmative, either for the respondent him-/herself or for the partner, this was considered an indicator of problematic alcohol consumption.

Low socioeconomic status was determined by means of the Winkler Index [66] which takes into account educational as well as occupational status and income of both parents [39].

Other risk factors such as parental strain, low parental health-related quality of life (on the physical as well as the psychological dimension) and high parental psychiatric symptom scores were assessed using continuous measures. In order to establish two groups, with presence and absence of the risk, a cut-off score was chosen for each scale at the 90th percentile and those 10% of the distribution with the most unfavourable scores were defined as the risk group.

A high parental strain was studied using a catalogue of questions asking about the particular burden caused for example by housekeeping, by being a single parent, by tending a family member in need of care, by job-related problems, or by financial problems. Respondents rated their burden regarding 11 areas as well as their overall burden using five response options ranging from 'not at all' to 'very strong'.

Parental physical as well as psychological health-related quality of life was determined by means of the SF-12 [10]. The SF-12 is an abridged version of the SF-36 and its physical and mental health summary scores correlate highly with the SF-36 results [23]. High parental psychopathology regarding the symptom dimensions somatisation, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism was determined using a short form of the German translation of the Symptom Checklist-90-R [21]. Furthermore biological risk factors, such as smoking or drinking by the mother during pregnancy and health problems of the child in the first 4 weeks after birth, were assessed. Self-reported risk factors obtained from children aged 11 and older included presence of a chronic disease, having been the victim of violence and having experienced sexual molestation.

Assessment of protective factors

Within the BELLA study, several protective factors were assessed in the children's and adolescents' questionnaires and interviews [7]: personal resources (self-efficacy, self concept, optimism), familial resources (family climate, parental support), and social resources (social support, peer competence). The present paper refers exclusively to self-reported resources of respondents aged 11–17.

■ Personal resources

Self-efficacy was measured using the General Perceived Self-Efficacy Scale [58]. This scale includes ten items, each targeting a stable expectation of personal competence to deal efficiently with challenging situations.

Self concept was assessed by means of the global self-worth subscale of the German version of the Self-Perception Profile for Children (SPPC-D; [3]). It includes six items referring, for example, to the children being happy or unhappy about themselves, about the way they are and the things they do.

Overall perception of and satisfaction with one's health and one's self was assessed by administering the satisfaction domain of the Child Health and Illness Profile-Adolescent Edition (CHIP-AE; [59]).

Optimism was measured using the four-item subscale from the 'Berner Fragebogen zum Wohlbefinden' (BFW; 'Bernese Questionnaire of Subjective Well-Being'; [29]).

Personal resources in general were measured as an aggregate score using a scale developed in the pretest of the survey [6]. By means of five items it enquires into individual attributes of the child, such as self-efficacy, optimism and sense of coherence.

■ Familial resources

Family climate was measured by administering a modified version of the Family Climate Scale [56]. It contains nine items (e.g. 'in our family everybody cares about each other's worries' or 'we often go to the cinema, visit sport events or go on excursions').

Parental support was measured using a scale previously administered in the international Health Behaviour in School-Aged Children study (HBSC; [13]). It includes eight items concerning perceived support by the parent(s) such as 'my parents are loving' or 'my parents understand my problems and worries'.

■ Social resources

Social support was measured by means of the German translation of the Social Support Scale [16]. Items not applicable for children and adolescents were eliminated and the wording was modified slightly. It contains eight items enquiring into the level of support received by the respondent, e.g. being listened to, being shown affection or being given information.

Peer competence was measured by means of five items (such as 'it is hard for me to find friends'). This scale had also been previously administered in the

international Health Behaviour in School-Aged Children study (HBSC; [13]).

■ Statistical analysis

All the analyses in the present paper regarding the effects of risks and protective factors are based on the mental health status of the children and adolescents as classified by the SDQ prediction algorithm ('unlikely', 'possible', or 'probable' mental health problems) as the target variable.

Univariate logistic regression analyses were used to assess the associations between the presence of a potential risk factor and probable mental health problems as indicated by the SDQ algorithm. ORs with 95% CIs were calculated. Subsequently a multivariate logistic regression was performed, including the independent variables found to be significant in the univariate analysis.

Since the current paper focuses on psychosocial factors that can be modified after the perinatal period, results for biological risk factors (pregnancy, childbirth) were not included in the psychosocial risk index, for which the number of psychosocial risk factors present in each child was added up. To ensure comparability of risk scores across age groups, only parent-reported risk factors were considered. The χ^2 test was used to compare the percentage of children with probable and possible mental health problems in the groups with different numbers of risk factors.

For all protective factors, scale sum scores were calculated and transformed to values between 0 and 100, with higher values indicating higher levels of the protective factors. Equality of the means of protective factors was tested by comparing the age groups and sexes using Student's *t* tests. Univariate analyses of variance adjusted for age and gender were employed to compare the means of the protective factors in the three groups, with mental problems being unlikely, versus possible, versus probable. 95% CIs were calculated.

For each of the three groups of resources (familial, social, personal), one core scale was chosen for in-depth analysis: the aggregated personal resources scale, the family climate scale and the social support scale. These three core scales were dichotomised at their medians with scores below and above the median indicating low and high availability of resources in the given area. For each child the number of resources scoring above the median was counted, resulting in values between 0 (no resources scale above the median) and 3 (all three core resources scales above the median). The χ^2 test was used to compare the per-

centage of children with mental health problems in the groups with different resource availabilities.

The sample was categorised into different groups according to the number of risk factors present as well as according to the availability of resources. The percentage of children with mental health problems in the different groups was calculated. Kruskal–Wallis tests were used to determine differences in mental health between subgroups with different levels of resources within each risk group.

Missing values did not exceed 4% in the assessment of risk factors except for few risk factors assessed using questionnaires (parental strain, parental HRQoL). Similarly, missing values in the protective factors were present in up to 4% of the sample, with the exception of the self concept scale. Missing data were excluded from analyses casewise, resulting in case numbers for each analysis deviating slightly from the total number of participants.

P values <0.05 were considered statistically significant in all tests that were conducted. Effect sizes *d* of 0.2–0.5 were designated as small; those between 0.51 and 0.8 were considered moderate and those over 0.8 large [11]. Effect sizes η^2 were considered small (0.01–0.03), moderate (0.04–0.15) and large (>0.16) according to Cohen [11]. In all analyses, pairwise deletion of missing values was used.

The statistical analyses are based on the weighted sample data to represent the age, sex, regional and citizenship structure of the German population (reference data 31 December 2004). The number of cases reported in tables and in the text refers to weighted data and thus may deviate from the number of cases reported in the former description of the sample. All analyses were performed using SPSS version 15.0.

Results

■ Sample

A total of 2,863 families were enrolled in the BELLA study. Parent-reported risk factors were assessed using a questionnaire administered during their visit in the KiGGS examination centre (filled in by 2,790 parents) and during the standardised BELLA telephone interview approximately 3 weeks after the examination (2,789 parent interviews).

A total of 1,903 children and adolescents from the sample aged 11–17 were also asked to fill in the KiGGS self-report questionnaire during their visit to the KiGGS examination centre and to participate in the standardised BELLA telephone interview. Since protective factors were assessed predominantly by means

of a self-report, the analyses presented including data on protective factors refer only to children and adolescents aged 11–17.

■ Prevalence rates of risk factors and their effects

Table 1 presents the frequencies of significant risk factors. Some risk factors (mental or chronic disease in one parent, growing up with a single parent or step-parent, unemployment, low parental physical HRQoL and high parental psychiatric symptom score) are more frequent in adolescents aged 11–17 than in younger children (data not shown). Especially with respect to chronic diseases in one parent, an increase from 24.8% in the younger children to 32.8% in the adolescents was observed. Conversely, analysis did not reveal any gender-specific risk factors (data not shown).

All risk factors shown in Table 1 proved to be significant predictors of children's mental health in univariate analyses. Univariate analyses further reveal that conflicts in the family, parental strain, low subjective mental health according to the SF-12 as well as high parental psychiatric symptom scores show the strongest associations with probable mental health problems, as indicated by ORs of at least 4.0. No significant effects on probable mental health problems

Table 1 Prevalence of risk factors and effects on SDQ-prediction of probable mental health problems

Risk factor	Risk prevalence	Regression on mental health problems			
		Univariate		Multiple	
		OR	95% CI	OR	95% CI
Low SES	25.3%	1.6**	(1.2–2.1)	1.1	(0.8–1.6)
Conflicts in family	5.9%	4.9***	(3.3–7.4)	2.0**	(1.2–3.3)
Mental disorder parent	13.2%	2.4***	(1.7–3.3)	1.4	(0.9–2.0)
Family of parents	12.3%	2.8***	(2.0–3.8)	1.5*	(1.0–2.2)
Conflicts in partnership	8.0%	2.7***	(1.9–4.0)	1.5	(0.9–2.4)
Single parent	13.1%	2.1***	(1.5–2.9)	1.6*	(1.1–2.5)
Step-parent	9.0%	2.4***	(1.7–3.6)	2.4***	(1.6–3.7)
Unwanted pregnancy	4.0%	2.0*	(1.2–3.6)	1.5	(0.8–2.8)
Low social support	3.7%	2.7***	(1.5–4.5)	1.3	(0.7–2.4)
1st year					
Chronic disease parent	30.0%	1.8***	(1.4–2.3)	1.4	(1.0–1.9)
Unemployment	11.2%	1.7**	(1.2–2.5)	0.9	(0.6–1.5)
Parental strain	9.9%	4.7***	(3.4–6.6)	2.0**	(1.3–3.0)
Low SF-12 physical	10.0%	2.9***	(2.1–4.1)	1.8**	(1.2–2.7)
Low SF-12 psychological	10.0%	4.2***	(3.0–5.8)	1.7*	(1.1–2.6)
Parental psychiatric symptoms	10.1%	4.0***	(2.8–5.6)	1.6*	(1.0–2.4)

N = 2,754–2,863; parental strain *n* = 2,398; SF-12 *n* = 2,413

* *p* < 0.05 ** *p* < 0.01 *** *p* < 0.001

were found for factors such as problematic alcohol consumption and early parenthood (data not shown). Likewise no risk was associated with having more than one, two, three, or four siblings, respectively. There was also no risk associated with being the only child or the second-born (data not shown).

After adjusting for the other factors included in the regression, almost all ORs decrease and some do not reach statistical significance any more. Family conflicts and parental strain are still among the strongest predictors of mental health problems, however growing up with a step-parent shows the highest association. Furthermore a high psychiatric symptom score of the parent in the SCL-9-R, low physical and psychological SF-12 sum scores, growing up with a single parent as well as a disharmonic childhood and adolescence of one parent remain significant predictors.

Self-reported information on risk factors was only available for children from 11 years on. Self-reported chronic disease was associated with an increased chance of mental health problems (reported by 12.1%; OR = 1.7, $p < 0.05$) as was the experience of sexual molestation (reported by 1.6% of the boys and 5.3% of the girls; OR = 2.3, $p < 0.05$), and having been a victim of violence at least once (10.8%; OR = 4.4, $p < 0.001$) or more than once (3.3%; OR = 5.0, $p < 0.001$).

Among the biological risk factors, smoking ‘once in a while’ during pregnancy (reported by 17.8%; OR = 1.7) and health problems in the first 4 weeks after birth (reported by 25.1%; OR = 1.7) were significantly linked to mental health problems in the child. However, premature birth (reported by 10.6%) as well as low birth weight (<2,500 g; reported by 5.7%) did not qualify as risk factors. Alcohol con-

sumption during pregnancy did not prove to be a statistically significant risk factor either.

■ The cumulative effect of risk factors

For each child the number of existing psychosocial risk factors from Table 1 was counted. Afterwards children were categorised into groups according to the numbers of risk factors they were exposed to. It was found that in 29% of the children no risk factor was present. A further 29% have one risk factor. With higher numbers of risk factors the percentage of children in the group decreases: two risk factors are present in 19%, three risk factors in 11%, four risk factors in 5%, five risk factors in 3%, six risk factors in 2% and seven or more risk factors are present in 2% of the participating children and adolescents.

Figure 1 shows the percentage of children with possible and probable mental health problems, grouped by the number of risk factors present. A top category of seven and more is displayed due to the small number of children in these high risk groups. It is evident that the percentage of possible as well as probable mental health problems rises steadily with every additional risk factor ($\chi^2 = 261.4$; $df = 14$; $p < 0.001$). The percentage of children and adolescents showing at least signs of mental health problems (possible and probable outcome in the SDQ algorithm) is 13% in the group without any risk factors, increasing to 16% when one risk factor is present and 24% when two risk factors are present. This increase in mental health problems reaches extreme levels in children and adolescents with six or even more risk factors: the majority of these participants experiences mental health problems (55% and 67% respectively).

Fig. 1 Cumulative risks: SDQ-algorithm prediction of possible and probable mental health problems in youth with different numbers of risk factors ($n = 2,253$)

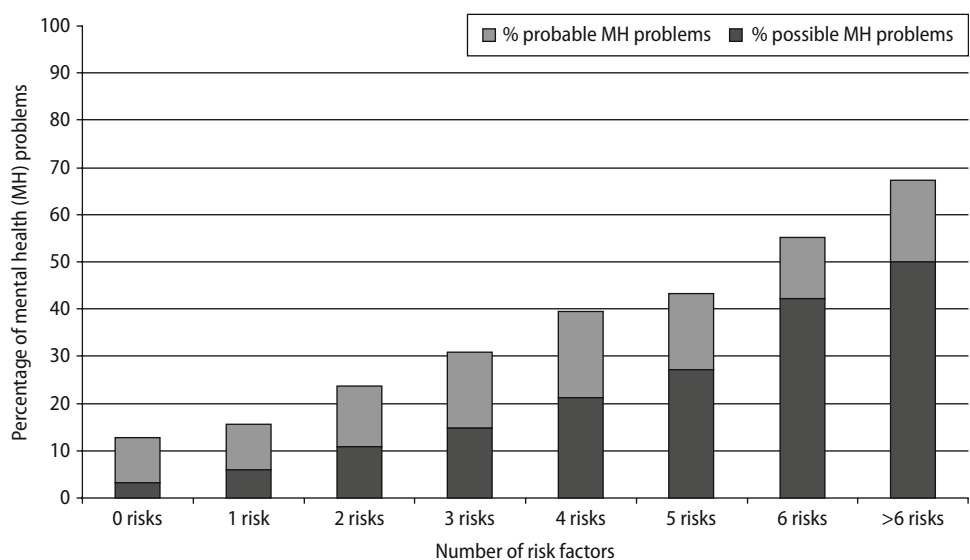


Table 2 Protective factors in different age groups (self-report) and in groups with different mental health status

	Age group			Mental health problems				
	11–13 years Mean (SD)	14–17 years Mean (SD)	<i>p</i>	Unlikely Mean (95% CI)	Possible Mean (95% CI)	Probable Mean (95% CI)	<i>p</i>	η^2
Personal resources	69.2 (14.8)	68.9 (15.2)	0.592	70.5 (69.6–71.3)	69.2 (67.2–71.2)	61.1 (58.8–63.4)	<0.001	0.034
Self-efficacy	72.0 (12.4)	71.4 (12.9)	0.318	72.6 (71.9–73.3)	72.1 (70.4–73.8)	64.6 (62.6–66.6)	<0.001	0.033
Optimism	74.8 (11.9)	70.6 (14.0)	<0.001	73.4 (72.7–74.1)	71.2 (69.5–73.0)	65.3 (63.3–67.4)	<0.001	0.034
Satisfaction	77.2 (12.5)	73.2 (12.7)	<0.001	75.8 (75.1–76.5)	73.1 (71.5–74.8)	67.9 (66.0–69.9)	<0.001	0.036
Self concept*	76.3 (19.5)	71.4 (20.4)	<0.001	76.3 (75.2–77.4)	65.9 (63.2–68.6)	60.9 (57.7–64.0)	<0.001	0.072
Family climate	63.4 (15.4)	58.2 (16.3)	<0.001	62.0 (61.2–62.9)	54.6 (52.5–56.7)	52.7 (50.2–55.2)	<0.001	0.048
Parental support	81.2 (10.7)	82.6 (13.2)	0.010	83.7 (83.0–84.3)	79.9 (78.3–81.6)	77.4 (75.5–79.3)	<0.001	0.031
Social support	77.1 (18.9)	79.3 (17.8)	0.010	80.0 (79.1–81.0)	75.0 (72.6–77.4)	72.7 (69.9–75.5)	<0.001	0.021
Peer competence	77.5 (15.4)	77.8 (15.0)	0.751	78.4 (77.6–79.3)	75.2 (73.1–77.2)	74.3 (71.9–76.7)	<0.001	0.010

* Self concept: $n = 596$ (11–13 years) $n = 963$ (14–17 years)

■ Protective factors

In Table 2, mean values of the protective factors are presented separately for the age groups 11–13 and 14–17. Differences between the sexes were only observed on two protective factors: boys scored higher in the satisfaction domain of the CHIP-AE ($d = 0.26$) whereas girls reported higher social support ($d = 0.40$) (data not shown). As presented in Table 2, more significant differences were detected between the two age groups. The 14- to 17-year olds scored significantly lower regarding family climate, optimism, satisfaction and self-concept with small effect sizes ranging from $d = 0.24$ to $d = 0.32$. However in the protective factors parental and social support – they scored significantly higher than the 11- to 13-year olds, but these differences only reached effect sizes of $d = 0.12$.

Table 2 also presents a comparison between the mean scores in the various resources scales in children and adolescents with different mental health status based on the SDQ algorithm. On all resources scales, children and adolescents without signs of mental health problems (SDQ algorithm = unlikely) had the highest scores, followed by the children with possible mental health problems. Without exception, the lowest scores are found in the children and adolescents with probable mental health problems. The mean differences between these three groups are statistically significant for all resources scales. However the differences have small effect sizes, with only the family climate reaching a medium-sized effect of $\eta^2 = 0.048$.

■ Cumulative effects of protective factors

Further analyses were conducted to examine whether protective factors also have cumulative effects on

children's mental health. Therefore, on the three core scales regarding personal, familial, and social resources, a median split was carried out, and for every child the number of resources above the median (high resources) was counted. Based on this number of high resource scale scores, the adolescents were categorised into groups. The resulting four groups were comparably large: 22% of the children did not score above the median in any of the resources scales, 27% had high resources in one scale, likewise 27% had high resources in two scales and 24% obtained high resources scores on all three scales. Figure 2 compares the percentages of adolescents with probable and possible mental health problems in the four groups with different numbers of resources scores above the median. It shows that the percentage of possible and probable mental health problems decreases with every additional high resources score ($\chi^2 = 32.5$; $df = 6$; $p < 0.001$). The percentage of children and adolescents showing at least signs of mental health problems (possible and probable outcome in the SDQ algorithm) is 30% in the group without any high resources scale decreasing to 24% when one resources score is above the median and 22% when two resources scales reach high scores. In adolescents with high resources in all areas, only 14% have possible or probable mental health problems.

■ Interaction of risk and protective factors

Figure 3 presents the percentage of adolescents with low, medium or high availability of resources in groups with different numbers of risk factors. The percentage of adolescents with medium availability of resources is similar in the different risk groups. The significant χ^2 statistic ($\chi^2 = 38.9$; $df = 12$; $p < 0.001$) derives from the different percentage of adolescents

Fig. 2 Cumulative effects of protective factors in adolescents ($n = 1,586$)

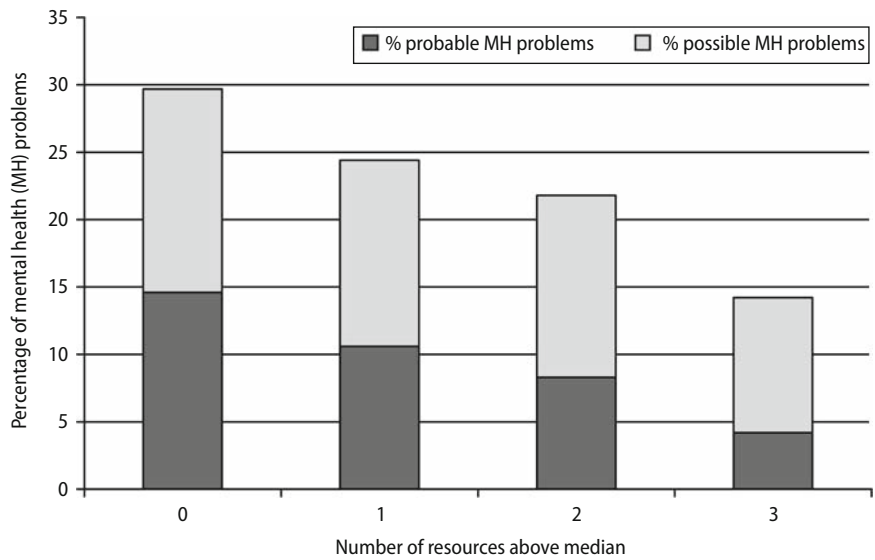
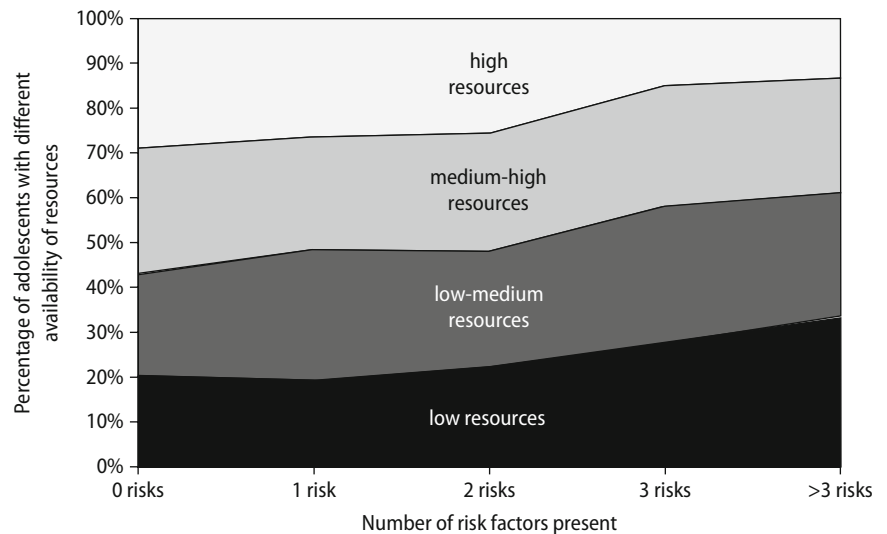


Fig. 3 Availability of resources in different risk groups ($n = 1,433$)



with low and high availability of resources. This difference is especially pronounced when the lower risk groups are compared with the groups with three or more risk factors.

Differentiating between personal, familiar, and social resources, it was found that availability of familiar as well as social resources differs significantly between the groups with different numbers of risk factors. Personal resources are available on a similar level, regardless of the number of risk factors (data not shown).

Since resources are supposed to show their protective effects only or especially given the exposure to risk factors, their associations with mental health outcomes were explored in different risk groups. Adolescents

were categorised into groups according to the number of existing risk factors as well as according to the availability of resources. In order to maintain sufficient case numbers, the four groups of resources availability presented above were collapsed to three groups, with either low resources (no resource scale above the median), medium resources (one or two scales above the median) or high resources (all three resources scales above the median). Regarding risk factors, five groups are distinguished including adolescents with zero, one, two, three and four or more risk factors.

Figure 4 presents the percentages of adolescents with mental health problems in the 15 subgroups. The first three bars on the left show that the availability of resources is not significantly linked to the presence of

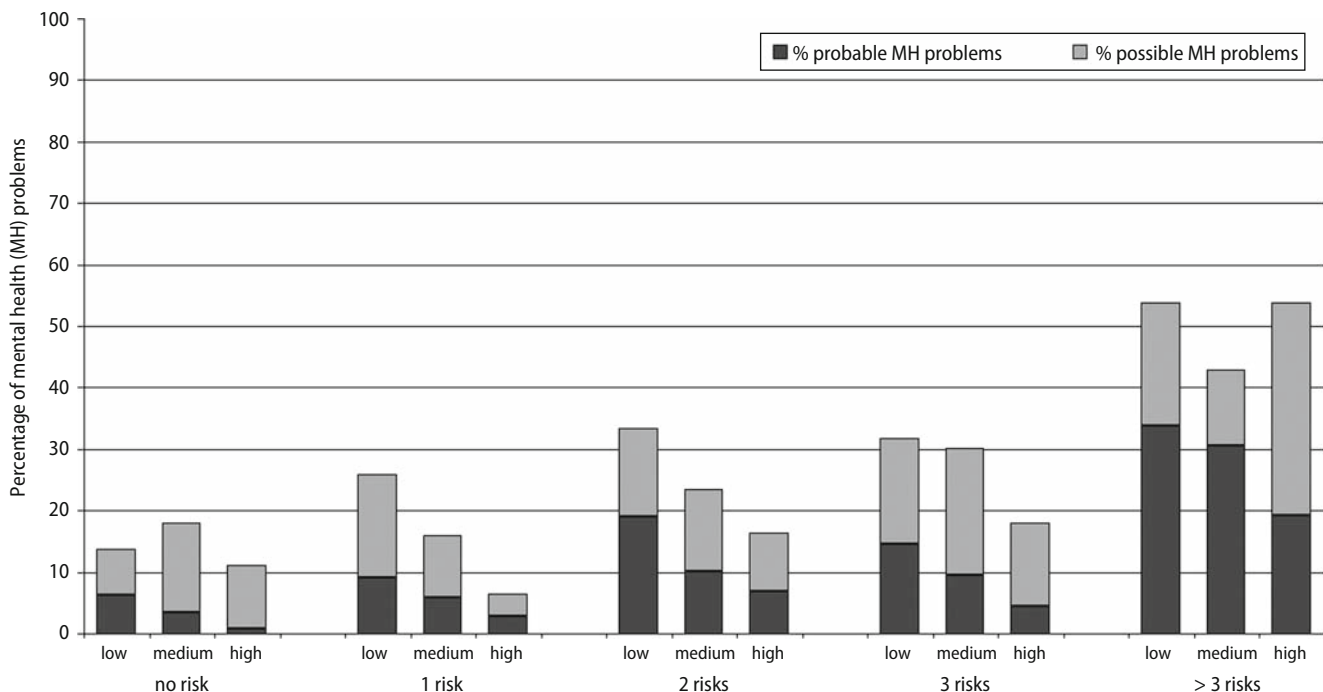


Fig. 4 Mental health problems in adolescents with different numbers of risk factors and low/medium/high availability of resources ($n = 1,433$)

mental health problems among adolescents without any risk factor present ($P = 0.193$). However looking at adolescents with one risk factor, a significant association between availability of resources and mental health problems can be observed: 26% of adolescents with one risk factor show signs of mental health problems (possible and probable outcome in the SDQ algorithm) when no resources are at hand. The percentage of mental health problems decreases to 16% if a medium availability of resources exists. In adolescents with high resources, the percentage of mental health problems even decreases to a level of 7% ($p = 0.002$). A similar picture, but on a higher level, can be found in adolescents with two risk factors. With increasing resources the percentage of mental health problems decreases from 33% in adolescents with low resources, over 24% in those with medium resources, to 16% in participants with three high resources scores ($p = 0.049$). In adolescents with three risk factors the picture becomes less clear: in adolescents with low and medium availability of resources 32% and 30% respectively develop mental health problems. A noticeable decrease is only observed in adolescents with three high resources scores (18% mental health problems). The Kruskal-Wallis test for mental health differences in the three resources groups therefore does not show a significant association ($p = 0.436$). In adolescents with four and more risk factors, no association is found be-

tween availability of resources and mental health problems ($p = 0.393$), even though a trend can be observed regarding the stricter definition of mental health problems (probable prediction of the SDQ).

Discussion

The nationally representative BELLA data set provides comprehensive information about the occurrence and distribution of risk and protective factors as well as about their association with children's mental health. Regarding the psychosocial risk factors, high prevalence rates can be found for chronic disease of one parent (30%) or low socioeconomic status (25%). The risk factors were equally present in boys and girls. A higher burden of risk factors in adolescence was found, indicating that the life-time risk of certain adverse factors increases with age.

Similarly age-related effects were observed regarding the availability of resources. Adolescents reported fewer resources in a variety of domains even though these differences have small effect sizes. The differences in favour of the adolescents – higher mean scores regarding parental and social support – were very small. Even though differences are small, the smaller number of resources in adolescents deserves attention in view of the fact that adolescents are at the same time exposed to a higher number of risk factors,

making them a vulnerable group for mental health problems.

Most of the psychosocial risk factors showed the expected associations with mental health problems of the children. For instance, our findings confirmed that a mental disorder in a parent or growing up with a single or step-parent enhances the risk of mental health problems in the child [20]. A particularly high impact on mental health was observed for conflicts in the family and parental strain. However, some circumstances such as early parenthood, previously discussed as risk factors [60], did not show adverse effects in our analyses.

The decrease of almost all ORs if adjusted for the other relevant risk factors in multivariate logistic regression points to the high level of interconnectedness. Several risk factors tend to occur together. In the multiple regression analysis, the confounding between the factors is taken into account and partialised out. The resulting ORs represent the unique contribution of the particular risk factors. E.g. since a high psychopathological symptom score in the SCL-9-R and a low psychological SF-12 sum score are significant predictors of mental health problems in the child, a mental disorder diagnosed in one parent might not explain additional variance. Similarly, it seems plausible that if a low physical SF-12 sum score proves to be a significant predictor, the information about a chronic disease of one parent will not make a significant additional contribution. Likewise, the effects of conflicts in the relationship may be absorbed in the question for family conflicts in general, which remains one of the most important risk factors. Low social support during the first year of parenthood may be associated with the parent's poor evaluation of his/her own childhood and adolescence and therefore the absence of reliable relationships with the family of origin. Regarding unemployment and low SES it must be considered to what extent these risk factors may be mediated by additional variables, such as psychosocial stressors associated with them. Furthermore, in general, the meaning of the parental strain scale as a risk factor has to be taken into account since it assesses the degree of worries associated with different potential problems, which partly overlap with the other risk factors, such as financial worries or problems with the partner. The OR for growing up with a step-parent stayed the same when adjusted for other risk factors.

The present results support previous studies indicating a higher probability of mental health problems when several adverse factors occur together and accumulate [53]. In contrast to Rutter [49], our results show that even children and adolescents with one isolated risk factor are more likely to report poor mental health. This can be explained by the fact that

only risk factors that proved to be associated significantly with children's mental health were included in our cumulative risk index. With higher numbers of risk factors the rate of mental health problems increases continuously, with impressively high rates of disruption in the children and adolescents experiencing multiple risks. Although this approach to examining the effects of an adverse environment on young people's mental health simplifies complex contextual processes in the development of mental health problems, it enables the identification of children and adolescents with a high probability of displaying disturbed development.

In this nationally representative data we found evidence that higher availability of resources, such as a good family climate and high social support, as well as personality features, are associated with lower prevalences of mental health problems. As hypothesised, young people without mental health problems reach the highest scores on each of the resources scales whereas children and adolescents affected by mental health problems obtain the lowest scores. The largest effect sizes are found regarding the self concept and the family climate. However, it has to be taken into account that the availability of resources also differs within the risk groups. There are more adolescents with low resources in the higher risk groups whereas there are more adolescents with high resources in the lower risk groups, indicating a lack of resources in groups with higher exposure to adversity.

In a first analysis, targeting a putative cumulative effect of resources, a pattern emerged for the whole sample whereby better mental health was associated with higher numbers of different available resources. A possible interpretation of this result is that a child's or adolescent's coping abilities are enhanced with each further supporting resource. When children are experiencing risk factors it may be especially helpful for them if several sources of support are available.

In order to pursue this aspect, we focussed on the interaction between the risk index and the availability of resources by comparing the percentage of mental health problems in the different risk groups taking into account the availability of resources. We found a significant buffering effect of the protective factors in the groups exposed to one or two risk factors, as well as a trend towards fewer mental health problems in children with three risks but high resources. Since children without exposure to risks did not benefit from the availability of resources whereas children with low risk did, the particular importance of the protective factors in the presence of risk factors became evident. This observed effect corresponds to the theoretical assumptions and justifies referring to

these factors as truly protective factors, for which it was required that they show effects only or at least particularly in the presence of risk factors [42, 50].

A further important result of the analysis was that no effect of the resources under investigation was observed in children exposed to high risks. However, this has to be interpreted carefully since resources were defined according to the number of scales scoring beyond the median. If high resources had been defined, for example, based on the number of scores beyond the 80th percentile, the results might have been different. Therefore the present results only allow conclusions to be drawn about the effectiveness of resources scoring just above the average level.

In summary, our results reveal a buffering effect indicating that in children and adolescents not experiencing adversity, the resources under investigation do not influence poor mental health. However, children who are exposed to moderate adversity but have strong resources at their disposal display levels of disturbance similar to children without risk exposure. Personal, familial and social protective factors obviously enhance compensatory processes in development. However, our results also indicate that resources have much less of an impact on mental health problems when the child or adolescent is exposed to a highly stressful environment. In these circumstances, the support drawn from their resources may not be sufficient in order to help them to cope with the difficulties that they face.

Within the scope of this overview it has not been possible to address conceptual and methodological issues of risk and protective factors and their interaction comprehensively. Regarding the present study, the extent to which the distinction between risk and protective factors is sufficient needs to be analysed in detail, especially when they are conceptually related to each other. For instance, good family climate was designated as a protective factor whereas family conflicts are referred to as a risk factor. It was decided that this was justifiable since the absence of family conflicts (given in 94% of the sample) is not necessarily associated with a good atmosphere and cohesion in the family. However it is obvious that family conflicts will lead to low family climate scores, and thus an association does exist between the risk factor and the protective factor.

For some risk factors the validity of their measurement has to be critically examined, and therefore the results have to be interpreted carefully. This is the case especially regarding the risk factors connected with alcohol consumption. Problematic alcohol consumption by at least one parent did not prove to be a significant risk factor. However, questions such as 'Have you ever thought about cutting down on your drinking?' are perhaps not valid indicators since they

may be more likely to be affirmed by health-conscious parents with moderate drinking behaviour than by parents who tend to deny their alcoholism. Similar caution is necessary when interpreting the results regarding alcohol consumption during pregnancy. Since only six mothers in the sample admitted to have drunk regularly during pregnancy, no further analysis on regular consumption as a risk factor was possible. In contrast, the statement by 14.3% to have drunk alcohol 'once in a while' during pregnancy covers a very wide range of consumption patterns including very low consumption, which might explain why no association was found.

The observed strong effects of the parental mental state and perceived strain indicate that these factors increase children's probability of developing mental health problems. However, the strength of this association might be enhanced by a perception bias of the parents: since the young person's mental health status is estimated to a large extent by means of parent-reported data, there might be an influence of parents who tend to report problems – regardless of whether they are asked about problems of their own or problems of their children.

The finding that no effects of resources (beyond the median split) were observed in high risk groups suggests that differential prevention and intervention strategies are necessary for low and high risk groups. While, strengthening and activation of resources may be sufficient to prevent mental health problems in the low risk group, the high risk groups need more comprehensive interventions. Especially, the importance of addressing the whole family system in high-risk children must be stressed. Since risks such as unemployment and low subjective mental health of the parent or a mental disease and conflicts between the parents often occur together, interventions for high risk groups should aim at preventing the accumulation of risk factors. To achieve this, it has to be determined which risks can be avoided or influenced in every single case.

In this context it must be stated that both target groups – with a low versus a high number of psychosocial risk factors – are of comparable epidemiological importance. Only approximately 12% of the children are exposed to high numbers of risk factors, but their likelihood of developing mental health problems is extraordinarily high and therefore requires targeted interventions taking into account the particular characteristics of this group. In contrast, almost 60% of the sample belongs to the low risk groups who are exposed to one, two or three risk factors. Although their rates of mental health problems are much lower than in the high risk group, they still show a moderate increase compared to the group without any risk factors. Considering the prevalence

of exposure to a low numbers of risks, this increase affects many children and adolescents and therefore accounts for a large proportion of mental health problems in the study population. From an epidemiological perspective, prevention measures in this low to moderate risk group have to be given the same priority as prevention targeting high risk groups, since both groups contribute in equal shares to the attributable population risk.

Future work will have to address the conceptual and methodological issues connected with resilience research. Theoretical and empirical models taking into account the relative impact of different risk and protective factors and their interaction as well as the development and accumulation of risk factors have to be specified. Since the currently available data are cross-sectional, the results do not allow causes to be distinguished from consequences, e.g. low personal and social resources as well as unfavourable family climate may be a consequence of mental health problems. This also holds true of some risk factors,

such as parental strain, so that it cannot be decided whether parental strain is an antecedent (and therefore a risk factor) or a consequence of the child's mental health problems. Special attention has to be given to the identification of underlying developmental processes also enabling the differentiation if factors influence the onset versus the course of mental health problems. These questions are undoubtedly best addressed using longitudinal data.

Furthermore the effects of risk and protective factors regarding different specific mental health disorders have to be analysed. Previous research found that risk factors have the same impact regarding internalising as well as externalising disorders, influencing the severity but not the kind of disorder [17]. Whether this can be confirmed for the protective factors as well, justifying the authors' conclusion that 'the same preventive interventions might be effective for both classes of problems' has yet to be examined.

■ **Conflict of interest** All authors declare no conflict of interest.

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