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# Siblings of youths with chronic conditions: a school-based survey

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## Abstract

**Purpose:** The purpose of this study was to explore the differences between youths with a sibling affected by a chronic condition or a disability (SCDD) and their peers with healthy siblings.

**Method:** Using data from the second wave of GenerationFree study, we compared adolescents from each gender with healthy siblings to adolescents with SCDD on demographical, familial, internalizing and externalizing behavior variables. Subsequently we repeated the analysis excluding from each group adolescents who suffer from a chronic condition or disability themselves.

**Results:** At bivariate and multivariate level, among those with SCDD, healthy females reported more somatic symptoms, healthy males more violent behaviors, and both genders were more often in non-intact families. When considering both healthy and unhealthy adolescents, at bivariate analysis female adolescents with SCDD were more likely to have a poorer relationship to their mother, to be unhealthy, to smoke, to be at risk for disordered eating and to report somatic symptoms. At multivariate level, only the association with CDD and smoking remained. Male adolescents with SCDD, at both bivariate and multivariate analysis, were more likely to be unhealthy and to live in larger and non-intact families.

**Conclusion:** Adolescents with a SCDD are more at risk if they are healthy themselves. Health professionals in contact with adolescents should always consider them in a systemic approach. Parents should be informed about potential effect on the siblings of a child with CDD, but also reassured, as most other variables were not significantly raised among adolescents with SCDD.

## Introduction

### Background

Approximately 10% of children and adolescents are affected by a chronic condition(1). As mentioned by Knecht (2), a child or adolescent's chronic condition can be conceptualized as a family affair, which may imply changes, adaptations, worries and stressors for the whole family. Hence, the psychological adjustment, quality of life and well-being of siblings of children with chronic conditions have been the focus of several recent reviews and meta-analysis (2–7), and the effect on siblings of several conditions, especially cancer, cystic fibrosis and diabetes have also been the subject of qualitative and cross-sectional studies (4,8–11).

Even though it is well acknowledged in the literature that chronic conditions not only influence the ill child, there are several contradictions on who, among the siblings, is more at risk of developing a problematic response, which one, and why. Variables such as age, gender, illness characteristics, family size, or parental situation among others have been associated to different outcomes for the siblings, although sometimes contradictory or unclear.

### Characteristics influencing the sibling's experience

As Williams et al. showed in their literature review (12), **age** together with **gender**, act as demographic variables determining the type of behavior adopted to react to stress. Thus, they found that younger brothers tend to have externalizing behaviors (aggression and delinquency), whereas older sisters tend to have more internalizing behaviors (depression and anxiety). This meets the conclusion of Hamama et al. (8), according to whom female gender on its own is a risk factor for more severe symptoms of anxiety among siblings. Hollidge (9) showed that boys seem to have globally more adjustment difficulties than girls to their sibling's diabetes. Vermaes et al. (7), however, concluded in their meta-analysis that gender was not a moderator in the psychological functioning of siblings of chronic patients.

In the dynamic system of a family, parental well-being, mental health and communication are important determinants of the children's health and well-being. In a review of family factors associated with mental health in siblings of children with chronic conditions, Incledon et al. (13) found several studies showing that emotional support, especially from parents, plays a protective role for the siblings' mental health. Corollary, they also found a positive association between maternal emotional distress, maternal dissatisfaction with social support and sibling behavior problems. **Family size** is to be taken into consideration too, as it has been related to contradictory findings: in one study (8), anxiety is higher in larger families, whereas according to Horowitz and Kazak (14), larger families are better at coping with stress responses caused by sickness.

Illness-related variables also modify the siblings' experiences. Their definition, however, varies significantly from one study to another. Considering only those adopting a "non-categorical approach" as defined by Stein and Jessop (15), **life-limitability** (16) and impact on **functioning** (5) are shown to influence the siblings' experience. Sharpe and Rossiter (5) showed in their meta-analysis that the impact on the sibling is higher if the condition affects day-to-day functioning, rather than if it is life-limiting, due to the higher caregiving demand and parental attention it causes. On the contrary, Havermans et al. (17) suggested that conditions such as diabetes or cystic fibrosis, which require a daily routine of treatment, give a better sense of control to the family, and are experienced as less threatening than congenital heart disease and cancer, which represent more of a hidden stress, causing a more negative effect on the siblings' quality of life. In this second perspective, day-to-day confrontation of the illness is positive, as it allows better sense of control.

However, Vermaes et al. (7) stated in their meta-analysis that neither gender nor type of chronic condition had a significant moderating effect.

### Expressions of the sibling's experience

In terms of expressions of the experience among the healthy sibling, different variables have been taken into consideration: psychosocial well-being (3), health-related quality of life (6), school performance (18) and psychological functioning (7). Sharpe and Rossiter (5) found an increased proportion of internalizing symptoms, which they explained by their more acceptable nature than externalizing behaviors, given the family's fragility caused by the condition. O'Brien's literature review (19) also found several articles showing an association between having a chronically ill sibling and developing psychosomatic symptoms. Gan et al. (18) concluded from their systematic review that siblings overall experienced emotional changes expressed both somatically and behaviorally.

Nonetheless, most studies until now only focused on a single condition (such as cancer (4, 8) or diabetes (9, 10)), didn't use a control group (11), or were based on a clinical sample (8, 16, 17). Furthermore, considered chronic conditions vary, encompassing mental conditions or only physical conditions, chronic over decades versus life-threatening but shorter, etc. As revealed by Barlow and Ellard in their systematic review (3), results are still unclear, due to several reasons such as diversity of conditions and control groups, lack of longitudinal studies and failure to include standardized measures. Alderfer et al. (20) similarly concluded in their systematic review that risk factors and moderators had still insufficiently been studied, and according to Fullerton et al. (16), the evidence base for appropriate interventions is limited.

Hence, as Limbers et al. (6) acknowledged in their meta-analysis, studies with larger siblings' samples allowing for greater statistical power are yet to be conducted. In order to fill in this gap, we used a post-mandatory school-based sample of adolescents to explore the variables associated with having an affected sibling on both healthy and affected adolescents. We hypothesized that they might experience some degree of emotional distress and express it by internalizing and externalizing behaviors.

## Method

### Data

Data were drawn from the second wave of the GenerationFree longitudinal study (21) assessing lifestyles gathered during the academic year 2016-17. All second-year students in post-mandatory education in the Canton of Fribourg (Switzerland) were asked to answer a web-based self-administered anonymous questionnaire during class, under the supervision of a teacher. With a potential sample of 3276 students (number of second-year students registered at the beginning of the school year, as reported by the schools), 2700 questionnaires were filled in (82.4%), out of which 183 (6.8%) responders refused to participate. 106 (3.9%) participants estimated their answers as non-sincere, 106 (3.9%) were not in the selected age-group (16-25years), and 42 reported no longer attending school. The study protocol was approved by the Ethics-committee of the canton of Vaud. Data were weighted to match the population of the Canton of Fribourg in terms of language (French or German), gender, age and academic track (students or apprentices).

Based on a non-categorical approach (15), participants with unhealthy siblings were defined by a positive answer to at least one of the following questions: "Do you have a brother/sister with a chronic condition i.e. a condition lasting for more than a year and requiring regular care (e.g. asthma, diabetes, scoliosis, etc.)?", "Do you have a brother/sister with a disability i.e. a lesion affecting the body's integrity and limiting its function, not allowing to do the same activities as their peers?". The participant's own health was evaluated through corresponding questions related to themselves. If answering positively, the participant was asked to specify the disease or disability.

First, we hypothesized that adolescents express stress and emotional changes in different ways depending on their gender (22). Thus, we divided the sample into four groups: For each gender, one group of adolescents with healthy siblings (females n=853, males n= 1001) and one group of adolescents with siblings affected by a chronic condition or a disability (females n=106, males n=116). Then,

following the hypothesis that the effect of their own health is stronger than the effect of a sibling's health (7), we excluded from each group those affected by a condition themselves, leaving two sets of groups of healthy participants with either healthy or unhealthy siblings (females  $n=717$  and  $n=64$ , males  $n=850$  and  $n=81$ ). Participants with no siblings ( $N=159$ ) were not included in the sample.

### Variables

We compared groups on the variables described as being expressions and moderators of their experience (2, 3, 7, 8, 12-14, 18, 19, 23). To control for sociodemographic correspondence between the groups, we took into account age, gender, parental place of birth (both parents born in Switzerland/one or both parents born abroad) and perceived socio-economic status (SES). To evaluate SES, we used the question from the European School Survey Project on Alcohol and other Drugs (ESPAD) (24): "Compared to the financial situation of other families in Switzerland, would you say that your family is..." with 7 possible answers ranging from very below to very above average and trichotomized them into above average, average and below average. Familial characteristics variables were explored as follows: family structure (whether the parents are together or not), relationship to mother and father (on a scale ranging from 1 (poor) to 10 (excellent)), parental support ("When confronted to a problem, you know you can count on your father/your mother" on a scale from 0 (not at all) to 4 (very much) and family size (number of siblings).

### *Internalizing behaviors*

Emotional well-being was assessed through the WHO-5 index (25) which contains 5 statements about well-being (e.g. "My daily life has been filled with things than can interest me") that are to be rated on a score of 0 (none of the time) to 5 (all of the time) for total ranging from 0 to 25. A total score  $<13$  is defined as poor emotional well-being. Stress level was rated using the Perceived Stress Scale (26). This scale rates the frequency over the previous month of experiencing 4 stressful situations (e.g. feel unable to control the important things of your life), on a score of 0 (never) to 4 (very often), a higher value indicating a higher stress level. We also assessed perceived health status, through a question taken from SMASH-02 survey (27) "How do you think your health is?" with five possible answers to the question dichotomized into good (excellent, very good, good) and poor (fair, poor). Disordered eating was measured through the SCOFF questionnaire (28), which includes 5 screening questions for eating disorders (e.g. "Do you make yourself sick because you feel uncomfortably full?"), with two or more positive answers considered as at risk. Somatic symptoms were explored using questions from SMASH-02 survey (27) about the presence in the past 12 months of 4 different symptoms (headache, abdominal pain, back pain and sleep disturbance). We dichotomized the frequency (never/rarely versus quite often/very often) for each symptom and added them up into a score from 0 (never/rarely any of the symptoms) to 4 (all symptoms quite often/very often).

### *Externalizing behaviors*

We used the following variables of externalizing behaviors: substance use, including alcohol misuse (at least one episode of drunkenness in the last 30 days), current tobacco smoking (yes/no), use of cannabis and other illegal drugs (at least once in the last 30 days); violent acts (at least one of the following in the past 12 months: carrying a weapon, using a weapon in a fight, snatching something from somebody, attacking an adult) and antisocial behavior (at least one of the following in the past 12 months: vandalism, stealing, setting fire to something, selling drugs including cannabis). School performance was self-assessed by the question "Do you consider yourself as a good, average or less good student?", and dichotomized into good/average and below average.

### Statistical analysis

We started by comparing both sets of adolescents with healthy siblings to their peers with unhealthy siblings at bivariate level. Continuous variables were compared using the student's T-test and categorical variables using the Chi2 test. All variables significant at the bivariate level ( $p<0.05$ ) were then included in a multivariate analysis using participants with healthy siblings as the reference

category for each pair and controlling for age. Then, we compared both sets of healthy adolescents with healthy siblings to their peers with unhealthy siblings. Data are presented as adjusted odds ratio (aOR) and 95% confidence interval.

## Results

### Model 1 : all participants, healthy siblings vs affected siblings (tables 1 & 2)

At the bivariate level, female adolescents with affected siblings were more likely to have a poorer relationship with their mother, to suffer from a chronic condition or a disability, to smoke, to be at risk for disordered eating and to report somatic symptoms. However, in the multivariate analysis, only suffering from a chronic condition or a disability (aOR=3.3,  $p < 0.05$ ) and being a **smoker** (aOR=1.9,  $p < 0.05$ ) remained significant.

At the bivariate and multivariate level, male adolescents with affected siblings were more frequently suffering from a condition or disability themselves (aOR=3.0,  $p < 0.05$ ), and lived in families that were more frequently **non-intact** (aOR=1.8,  $p < 0.01$ ) and **larger** (aOR=1.2,  $p\text{-value} < 0.05$ ). No other variables were significant between both groups.

### Model 2: healthy participants, healthy siblings vs affected siblings (tables 3 & 4)

At the bivariate level, among healthy adolescents, those with affected siblings lived more often in non-intact families, females were more at risk of disordered eating and reported more somatic symptoms, and males reported more violent behavior.

At multivariate level, more **non-intact families** (females: aOR=1.7,  $p < 0.05$ , males: aOR=2.1,  $p < 0.05$ ), **somatic symptoms** among females (aOR = 1.2,  $p < 0.05$ ) and **violent behavior** among males (aOR=2.1,  $p < 0.05$ ) remained significant.

## Discussion

This is, to our knowledge, the first study exploring the effect of having an unhealthy sibling on both unhealthy and healthy adolescents. When considering the adolescents who were healthy themselves, we found significant differences among those with unhealthy siblings compared to those with healthy siblings: females were more at risk of **somatic symptoms**, and males of **violent behavior**. When considering also those who had a chronic condition or disability themselves, we found more **smoking** among girls with affected siblings, but none of the other associations were significant. We also found an increased proportion of **non-intact families** among adolescents with affected siblings.

### Violence among boys and somatic symptoms among girls

As described by Gan et al. (18) both externalizing and internalizing behaviors are expressions of the emotional changes caused by the siblings' illness. Increased proportions of internalizing among girls and externalizing among boys are results that could be expected and confirm previous findings of gender-related determinants. Indeed, O'Brien (19) described adolescent females as a high-risk group for anxiety and Williams (12) identified sisters as more at risk for anxiety and depression and brothers more at risk for aggression and delinquency. However, this contradicts Vermaes' conclusions of an absence of gender effect (7).

We found more somatic symptoms among healthy girls when they had a sibling with a chronic condition. Somatic symptoms have been linked to psychological stress in adolescents (23, 29). It has also been described that siblings of affected children are increasingly concerned about their own health (2). This worry could cause more somatic symptoms as a consequence of somatosensory amplification, as described by Freyler et al. (23). Furthermore, previous studies showed that in the complex remodeling of family roles due to a child's illness, female members of the family tend to invest more in the caregiving of the ill child (30). In this sense, Sharpe and Rossiter (5) suggest

that internalizing behaviors appear in response to inflated care taking roles and that internalizing symptoms are more acceptable to the healthy sibling than externalizing behaviors such as aggression, given the family fragility caused by the illness. Similarly, Hollidge (9) established that guilt was the prevalent negative emotion felt by siblings, which conducts to psychosomatic symptoms, as having physical symptoms is the only acceptable reason for demanding extra attention and special privileges.

We also found that when considering all females, those with affected siblings were more often tobacco-smokers. Three hypotheses for this behavior can be formulated. First, tobacco smoking is used as a reinforcement of sense of normality (31). This need for normality could be accentuated among girls who not only have an affected sibling, but also have a chronic condition themselves. Second, it could be used as a way to control their weight, although we found no difference in mean BMI between groups (data not shown). Third, it could be an expression of stress related to their sibling's illness, as stress in adolescence has been linked with increased smoking (32). Further research focusing on tobacco smoking in the context of youths with chronic conditions and their siblings would be needed to explore this relationship.

It should be noted, however, that most studied variables were not statistically significant, especially emotional well-being, stress level, school performance and substance use (except tobacco). These reassuring results, even though contradicting some previous studies (2, 9, 12, 16, 18), join the conclusions of several meta-analysis including Sharpe and Rossiter (5) who found only a modest-sized negative effect, and Havermans (17) who even found better self-evaluated quality of life among siblings of chronic patients. O'Brien also found that not all siblings experience negative effects, and that some children even gained increased maturity and positive effects from their siblings' condition (19).

However, Havermans (17) also suggested that siblings of affected children might be accustomed to compare their ails to their affected siblings' and therefore lower their estimated severity, or might also preserve their parents from further worry by reducing their complaints.

### Healthy adolescents are more at risk

We found that adolescents who are not suffering from any condition themselves are more at risk of somatic concerns when female and violent behavior when male. Two hypotheses can be made to explain this association. First, as shown by Vermaes et al. in their meta-analysis (7), suffering from a chronic condition has more negative impact than having an unhealthy sibling. Thus, those who have a condition themselves are less likely to show an effect from their sibling's illness, as their own condition overcomes it. Second, the sibling's illness causes an asymmetry in parental attention and leads healthy siblings – consciously or not – to react with somatic complaints or violent acts. Hollidge et al. (9) hypothesize that somatic concerns are used by children as an attempt to signal support and nurturance from parents. When also affected, this asymmetry in need for care is probably reduced or absent and therefore affected adolescents do not increase their attention-seeking behaviors when their sibling is affected.

### Increased proportion of non-intact families

We found more non-intact families among adolescents with affected siblings, whether the affected participants were included or not. We can hypothesize the following links to explain this association: First, the stressor of having an affected child affects the relationship between the parents and increases their risk of separation. Nonetheless, previous research showed no difference in marital status of parents of children with disability or cancer (33, 34) nor generally among parents who are caregivers for a child with health problems (35). Second, single-parenting, in association with poorer socio-economic status, acts as a risk factor for several chronic illnesses for children (36). However, we controlled for self-reported socio-economic status and there was no difference between the groups. This association needs further investigation and longitudinal studies would help determinate its direction and explore moderators and causes.

### Strengths and limitations

The main strength of this research is that, contrary to most studies about siblings of chronic patients conducted so far, it includes a large school-based sample of adolescents rather than a clinical one. This has allowed us to include both healthy and affected siblings in our groups and to isolate in a second step the healthy adolescents of each gender.

Nevertheless, some limitations need to be discussed. First, the cross-sectional nature of our study does not allow conclusions about causality. Second, self-reported data may cause response or social desirability biases, although the anonymity of the questionnaire has shown to reduce this effect (35). Furthermore, as suggested by Barlow (3), denial-like coping strategies of children used to preserve their family's frail state may mask self-reported emotional distress among siblings. In this sense, Sharpe and Rossiter (5) also noted a more negative effect when reported by parents than by children themselves. Third, the non-categorical approach, as described by Stein and Jessop (15) comprehends all types of chronic illnesses and considers their similarities in experience and effects on families. However, some moderator effects of illness characteristics have been described, such as time since diagnosis (2-4), life-limitability (16) and day-to-day confrontation (17), which we were not able to explore in this study. Yet, we tested if there was a difference when the condition was described as limiting daily activity and found no significant differences between groups (data not shown). Even though there was a trend, when the condition was limiting, for increased somatic symptoms and eating disorders among girls, and violence among boys, our sample included too few participants to have sufficient statistical power (participants with siblings with limitations: 16 females, 24 males).

### Conclusion

Adolescents with a sibling affected by a chronic condition are more at risk of negative effects if they are healthy. Health professionals in contact with adolescents should always consider adolescents in a systemic approach and be aware of the importance of health status of the rest of the family. Parents of chronically affected children should be informed about the potential effect of a chronic illness on their other children and supported with it. They should also be reassured, as most siblings do not seem to experience any increase in the internalizing nor the externalizing behaviors included in this survey. Whether coping strategies may mask self-reported emotional distress among siblings remains to be studied.



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Table 1: All females	Healthy sib- lings N=853	Unhealthy siblings N=106	P-value bivariate	aOR (CI)	P-value mul- tivariate
Age (mean ±SD )	17.8±.04	17.8±.13	0.946	0.9 (8.0-1.0)	0.095
SES (below average)	7.9%	12.4%	0.101		
Parents (not together)	29.7%	35.5%	0.193		
Parental place of birth (both Swiss)	60.4%	58.9%	0.303		
Number of siblings (mean ±SD )	1.9±.04	2.0±.09	0.265		
Relationship to father (mean ±SD)	7.7±.07	7.5±.22	0.292		
Relationship to mother (mean ±SD)	8.6±.05	8.3±.17	<b>0.032</b>	0.9 (0.8-1.0)	0.153
Parental support (mean ±SD)	3.4±.02)	3.3±.08	0.179		
Having a chronic condition(yes)	15.2%	38.8%	<b>&lt;0.001</b>	3.3 (2.1-5.3)	<b>&lt;0.001</b>
Emotional wellbeing (mean ±SD)	27.4%	31.3%	0.365		
Stress level (mean ±SD)	6.5(.10)	6.7(.30)	0.369		
Perceived health status (mean ±SD)	5.1%	6.7%	0.471		
Disordered eating (at risk)	26.3%	35%	<b>0.045</b>	1.2 (0.7-1.8)	0.412
Somatic symptoms (mean ±SD)	1.6 ±.04	1.8±.04	<b>0.017</b>	1.0 (0.8-1.2)	0.868
Violent behavior (yes)	6.6%	7.1%	0.808		
Anti-social behavior(yes)	14.5%	13.9%	0.862		
Current smoking (yes)	31.6%	47%	<b>0.001</b>	1.9 (1.2-2.9)	<b>0.002</b>
Alcohol misuse (yes)	35.4%	40.1%	0.285		
Cannabis (yes)	13.6%	17.5%	0.250		
Illegal drugs (yes)	8.8%	9.4%	0.836		
School performance (below average)	4.8%	3.7%	0.735		

  

Table 2: All males	Healthy siblings N=1001	Unhealthy siblings N=116	P-value bivariate	aOR (CI)	P-value mul- tivariate
Age (mean ±SD )	17.7±.05	17.7±.16	0.715	1.0 (0.8-1.1)	0.709
SES (below average)	8.8%	10.1%	0.660		
Parents (not together)	27.3%	40.8%	<b>0.007</b>	1.8 (1.1-2.9)	<b>0.011</b>
Parental place of birth (both Swiss)	58.7%	57.2%	0.960		
Number of siblings (mean ±SD )	1.8±.04	2.2±.14	<b>0.035</b>	1.2 (1.1-1.4)	<b>0.003</b>
Relationship to father (mean ±SD)	8.1±.08	7.8±.24	0.283		
Relationship to mother (mean ±SD)	8.7±.05)	9.5±.19	0.267		
Parental support (mean ±SD)	3.5±.03	3.5±.07	0.967		
Having a chronic condition(yes)	13.8%	30.5%	<b>&lt;0.001</b>	3.0 (1.8-4.8)	<b>&lt;0.001</b>
Emotional wellbeing (mean ±SD)	15.7%	18.0%	0.579		
Stress level (mean ±SD)	5.3 ±.11	5.0±.30	0.442		
Perceived health status (mean ±SD)	2.9%	5.1%	0.242		
Disordered eating (at risk)	9.5%	13.3%	0.231		
Somatic symptoms (mean ±SD)	0.9±.03	1.1±.12	0.166		
Violent behavior (yes)	14.5%	21.3%	0.096		
Anti-social behavior(yes)	29.4%	34.1%	0.349		
Current smoking (yes)	38.2%	42.4%	0.453		
Alcohol misuse (yes)	56.2%	60.5%	0.464		
Cannabis (yes)	24.8%	23.4%	0.773		
Illegal drugs (yes)	9.8%	13.2%	0.296		
School performance (below average)	7.1%	2.1%	0.195		

SD : standard deviation. aOR : adjusted Odd-ratio. CI : 95% confidence interval.

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Table 3: Healthy females	Healthy siblings N= 717	Unhealthy siblings N=64	p-value bivariate	aOR (CI)	p-value multivariate
Age (mean ±SD )	17.8 ±.05y	17.5±.1y	0.10	0.9(0.7-1.1)	0.073
SES (below average)	7.5%	9.2%	0.59		
Parents (not together)	29.6%	41.8%	<b>0.03</b>	1.7(1.0-2.8)	<b>0.043</b>
Parental place of birth (both Swiss)	60.2%	53.8%	0.25		
Number of siblings (mean ±SD )	1.9 ±.04	2.2±.13	0.09		
Relationship to father (mean ±SD)	7.8±.08	7.6±.28	0.58		
Relationship to mother (mean ±SD)	8.7 ±.05	8.3±.20	0.06		
Parental support (mean ±SD)	3.4±.02	3.3 ±.09	0.27		
Emotional wellbeing (mean ±SD)	25.1%	28.3%	0.55		
Stress level (mean ±SD)	6.3±.11	6.6±.37	0.41		
Perceived health status (mean ±SD)	2.2%	1.2%	0.24		
Disordered eating (at risk)	24.5%	36.3%	<b>0.02</b>	1.5 (0.9-2.5)	0.114
Somatic symptoms (mean ±SD)	1.4 ±.0	1.8 ±.1	<b>0.008</b>	1.2 (1.0-1.5)	<b>0.023</b>
Violent behavior (yes)	6.5%	7.7%	0.68		
Anti-social behavior(yes)	14.7%	16.3%	0.71		
Current smoking (yes)	31.7%	40.5%	0.13		
Alcohol misuse (yes)	35.8%	41.2%	0.40		
Cannabis (yes)	13.9%	18.0%	0.34		
Illegal drugs (yes)	8.2%	8.2%	0.99		
School performance (below average)	4.3%	0.5%	0.45		

Table 4: Healthy males	Healthy sib- lings N= 850	Unhealthy siblings N=81	p-value bivariate	aOR (CI)	p-value multi- variate
Age (mean ±SD )	17.6 ±.05	17.6 ±.2	0.70	0.9 (0.7-1.1)	0.373
SES (below average)	7.6%	3.7%	0.20		
Parents (not together)	27.7%	41.7%	<b>0.02</b>	1.8 (1.1-3.2)	<b>0.028</b>
Parental place of birth (both Swiss)	59.6%	61.3%	0.43		
Number of siblings (mean ±SD )	1.9±.04	2.2±.15	0.06		
Relationship to father (mean ±SD)	8.7±.06	8.3±.26	0.15		
Relationship to mother (mean ±SD)	8.2±.08	7.9±.27	0.57		
Parental support (mean ±SD)	3.5±.03	3.5±.08	0.51		
Emotional wellbeing (mean ±SD)	14.3%	15.1%	0.88		
Stress level (mean ±SD)	5.2±.11	4.7±.37	0.23		
Perceived health status (mean ±SD)	2.2%	3.1%	0.40		
Disordered eating (at risk)	9.1%	9.8%	0.84		
Somatic symptoms (mean ±SD)	0.8 ±.04	0.9±.13	0.53		
Violent behavior (yes)	13.4%	24.5%	<b>0.02</b>	2.1 (1.1-3.9)	<b>0.021</b>
Anti-social behavior(yes)	28.2%	32.0%	0.52		
Current smoking (yes)	38.0%	42.2%	0.54		
Alcohol misuse (yes)	57.5%	62.0%	0.53		
Cannabis (yes)	25.2%	29.7%	0.44		
Illegal drugs (yes)	8.8%	13.7%	0.18		
School performance (below average)	6.6%	0%	0.15		

SD : standard deviation. aOR : adjusted Odd-ratio. CI : 95% confidence interval.

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