

**Weekly Headache in Children and Adolescents:  
Biopsychosocial Correlates and Their Specificity**

Dissertation

zur Erlangung des Doktorgrades

der Mathematisch-Naturwissenschaftlichen Fakultäten

der Georg-August-Universität zu Göttingen

vorgelegt von

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Göttingen, 2006

D7

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Tag der mündlichen Prüfung: 03. Mai 2006

*Every head has its own headache.*

Arab Proverb

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## 1. INTRODUCTION

The health of children and adolescents gives cause for concern, according to German experts in the field (Hurrelmann, Klocke, Melzer, & Ravens-Sieberer, 2003). While advances in medical care and improved control of infectious diseases have reduced infant and child mortality and led to better overall pediatric health, certain somatic complaints and chronic illnesses seem to be alarmingly on the rise (Neuhauser, Dippelhofer, & Holling, 2002; Newacheck, Budetti, & McManus, 1984). Headache appears to belong to this group of increasingly prevalent pediatric health issues: A number of studies have reported waxing rates of headache and weekly headache among children and adolescents (Bandell-Hoekstra et al., 2001; Scheidt, Overpeck, Wyatt, & Aszmann, 2000; Sillanpää & Anttila, 1996).

Headache often begins in puberty or adolescence, though onset can also occur in childhood. The majority of children and adolescents experience headache (e.g., King & Sharpley, 1990; Rhee, 2000; Zwart, Dyb, Holmen, Stovner, & Sand, 2004), and more severe and impairing headache is also common: One in ten children and adolescents report having headache on a weekly basis (Laurell, Larsson, & Eeg-Olofsson, 2004; Passchier & Orlebeke, 1985). In addition, headache has a tendency to recur. Longitudinal studies have shown it to be a relatively stable health condition (Brattberg, 1994; Schmidt, Blanz, & Esser, 1992; Virtanen et al., 2002). Given this situation, it is unsurprising that pediatric headache is receiving increased attention (McGrath & Hillier, 2001). Implementing effective interventions at an early age has been given priority, especially as a means to prevent headache from becoming a life-long health condition (World Health Organization, 2000).

Children and adolescents with *weekly headache* are at elevated risk not only for the development of adult headache, but also for multiple physical symptoms and psychiatric morbidity in adulthood (Fearon & Hotopf, 2001). These children and adolescents are therefore in particular need of effective intervention. The best manner with which this can be provided is through the development of prevention programs tailored to the specific needs of this group. However, this requires detailed knowledge of the biological, psychological, and social aspects of weekly headache. The goal of the present research is to provide such knowledge by first identifying biopsychosocial correlates of weekly headache in comparison to good health and then determining the specificity of these correlates for weekly headache in comparison to other chronic illnesses.

## 2. THEORETICAL & EMPIRICAL BACKGROUND

### 2.1 Pediatric Headache

Headache is thought to have first been described about 25 centuries ago by Hippocrates, and given the name “hemicrania” 600 years thereafter by Galen (Rothner, 2001). More recently (as early as the 16th century), pediatric headache was distinguished from headache in adulthood (e.g., Tissot, 1780; cited according to Connelly, 2003) and it was included in Day’s (1873) “Essays on Diseases in Children” (cited according to Rothner, 2001). Nevertheless, it was not until the last two decades that headache in childhood and adolescence began to receive real scientific and clinical attention (McGrath & Hillier, 2001).

Pediatric headache, like headache in general, can be differentiated according to causation into primary and secondary headache. Headache that can be directly attributed to a specific underlying cause or condition (e.g., infection, disease, injury) is referred to as secondary or symptomatic headache. Headache that occurs on its own (i.e., not as a ‘side effect’ of some other underlying cause or condition) is referred to as primary or idiopathic headache. Primary headache is the predominant type of headache, being present in 90% to 95% of all occurrences of head pain (Denecke & Kröner-Herwig, 2000; Göbel, 1997). While the exact pathophysiology of primary headache is yet unknown (Connelly, 2003), etiologies of the central nervous system (Hershey, 2005) and contributing genetic, biochemical, psychological, and environmental factors (Connelly, 2003) have been postulated.

Frequency, duration, and intensity of pediatric headache can be characterized as being quite heterogeneous (McGrath, 2001). Headache frequency can vary from less than once a month to several times a week (McGrath et al., 2000). Headache may even occur on a daily basis (Scalas & Calistri, 2005; Wiendels, van der Geest, Neven, Ferrari, & Laan, 2005). Duration of headache can range from episodes of less than 15 minutes to almost constant pain, while intensity can vary from slight to severe (McGrath & Koster, 2001). Additionally, headache can occur as a solitary complaint or be accompanied by further somatic and/or neurological symptoms.

In line with the variability of headache features and accompanying symptoms, pediatric headache, and headache in general, can take on different forms. Historically, two main types of headache, migraine and tension-type headache, have been distinguished on the basis of accompanying symptoms (e.g., nausea, photophobia) and pain quality (e.g., pulsing, tightening; Connelly, 2003). The International Headache Society (IHS) published operationalized criteria for these and other headache disorders in 1988 and a revised version thereof in 2004 (Headache Classification Committee of the International Headache Society, 1988, 2004). The criteria are known as the International Classification of Headache Disorders, versions I and II (ICHD-I and -II). The current criteria for migraine and tension-type headache (from the ICHD-II) can be found in Appendix A.

In general, children tend to describe headache pain as either throbbing or aching. These descriptions of headache quality typically correspond to diagnoses of migraine and tension-type headache, respectively (McGrath, 2001). In addition to the throbbing or pulsating quality of headache, children with migraine tend to rate their pain as moderate to



severe and report accompanying symptoms of nausea, vomiting, and photophobia (Labbé, 1998). Generally, migraine pain is unilateral and located in the frontal or temporal area (Labbé, 1998); however, bilateral pain is also common in children and adolescents (Headache Classification Committee of the International Headache Society, 2004; McGrath, 2001). Children with tension-type headache describe pain of an aching or tightening quality that is less severe and localized at the back of the head and shoulders or in the frontal area (Labbé, 1998).

Despite these differences and the presence of operational classification criteria, it is not always easy to distinguish between migraine and tension-type headache (Connelly, 2003). Children often have difficulties describing the quality of their headache pain (Rossi et al., 2001). In addition, characteristics of both migraine and tension-type headache may be present in a single headache episode (Rossi et al., 2001). Accordingly, some skepticism has been voiced regarding the applicability of the ICHD to children and adolescents (deGrauw, Hershey, Powers, & Benti, 1999; Rossi et al., 2001; Seshia, 1996). A final consensus has not yet been reached. Nevertheless a large portion of pediatric headache research has focused and continues to focus on headache diagnoses and associated characteristics and variables.

Research has, however, also concentrated on the frequency with which pediatric headache occurs. Headache occurrence has been examined in comparison to non-occurrence (Aromaa, Rautava, Helenius, & Sillanpää, 1998), frequent headache has been compared to infrequent or no headache (Gordon, Dooley, & Wood, 2004; Larsson, 1988; Luka-Krausgrill & Reinhold, 1996), and predictors of headache frequency have been investigated (Passchier & Orlebeke, 1985). In line with this second area of headache research, the focus of the present study is on headache that occurs frequently (i.e., at least once a week) without further differentiation according to headache diagnosis.

## **2.2 Epidemiology of Pediatric Headache**

Over forty years ago, Bille (1962) conducted the first large-scale epidemiological study on headache in children and adolescents. In this seminal study, headache was reported for 58.6% of the sample, which comprised approximately 9,000 Swedish school children, aged 7 to 15.

International research in the past decades has confirmed that headache is a common experience in childhood and adolescence. However, the reported prevalence rates vary substantially. Lifetime prevalence rates for having ever experienced headache have been reported to range from 21.7% (Aromaa et al., 1998) to 37.7% (Sillanpää, 1976) for preschool children, and from 58.6% (Bille, 1962) to 97% (Bandell-Hoekstra et al., 2001) for older children and adolescents. Reported 12-month prevalence rates for headache among school children are somewhat lower, varying from 44.8% (Laurell et al., 2004) to 92%, (Bandell-Hoekstra et al., 2001).

The prevalence of frequent headache has also been investigated: Headache occurring *at least once a week* in the past 12 months has been reported to range from 10.8% for 7- to 15-year-olds (Laurell et al., 2004) to 29.7% for adolescents and young adults aged

11 to 21 (Rhee, 2000). Lower prevalence rates have also been reported: Linna, Moilanen and Keistinen (1991) found 2.8% of 8-year-olds to have experienced weekly headache, while a 6-month prevalence of 8.1% was reported for adolescents aged 13 to 18 (Zwart et al., 2004). A comprehensive overview of epidemiological findings regarding *weekly* headache is given in Table 1. The studies are listed in ascending order according to prevalence.

**Table 1. Prevalence of *weekly* headache in the extant epidemiological literature**

Research group	Country	Size of sample	Age of sample	Type of prevalence	Prevalence rate
Sillanpää (1976)	Finland	4,235	7	not specified	2.5%
Sillanpää & Antilla (1996)	Finland	1,433	7	6-month	2.6%
Linna et al. (1991)	Finland	1,101	8	not specified	2.8% <sup>a</sup>
Carlsson (1996)	Sweden	1,144	7-16	not specified	6% <sup>b</sup>
Kristjánsdóttir (1997)	Iceland	2,098	11-12, 15-16	6-month	6.2%
Linnet, Stewart, Celentano, Ziegler, & Sprecher (1989)	USA	3,158	12-17	4-week	7%
Zwart et al. (2004)	Norway	5,847	13-18	6-month	8.1%
Sillanpää (1983b)	Finland	3,784	13	12-month	8.3%
Sillanpää (1983a)	Finland	2,915	14	not specified	8.7%
Egermark-Eriksson (1982)	Sweden	402	7, 11, 15	not specified	9%
Laurell et al. (2004)	Sweden	1,371	7-15	12-month	10.8%
Engström (1992)	Sweden	3,878	8-19	12-month	11%
Larsson (1988), survey II	Sweden	1,564	16-18	not specified	14%
Larsson (1988), survey I	Sweden	1,287	16-18	not specified	15%
Passchier & Orlebeke (1985)	Netherlands	2,181	10-17	12-month	16.9%
Brattberg & Wickman (1992)	Sweden	1,245	8, 11, 13, 17	not specified	17.6% <sup>c</sup>
Frankenberg & Pothmann (1995)	Germany	4,835	8-9, 12-13, 15-16	lifetime	21.2%
Kristjánsdóttir & Wahlberg (1993)	Iceland	2,140	11-12, 15-16	not specified	21.9%
Petersen, Bergström, & Brulin (2003)	Sweden	1,155	6-13	6-month	22.6%
Bandell-Hoekstra et al. (2001)	Netherlands	2,358	10-17	12-month	23%
Ravens-Sieberer, Thomas, & Erhart (2003)	Germany	5,650	11-15	6-month	24.5% <sup>d</sup>
Scheidt, Overpeck, Wyatt, & Aszmann (2000)	Germany	4,792	11-15	6-month	25% <sup>d,e</sup>
Gordon et al. (2004)	Canada	2,900	12-13	6-month	26.6%
King & Sharpley (1990)	Australian	900	10-18	not specified	29.4%
Rhee (2000)	USA	6,072	11-21	12-month	29.7%
Fichtel & Larsson (2002)	Sweden	793	13-19	6-month	32.5%

<sup>a</sup> Possible underestimation as percentage pertains to headache "more than once a week"

<sup>b</sup> Possible underestimation as percentage pertains to headache "several times a week", "once a week" was not included

<sup>c</sup> Possible overestimation as head and neck pain were assessed together

<sup>d</sup> Possible overestimation as percentage pertains to headache "almost every week" or more often

<sup>e</sup> Mean prevalence rate calculated on the basis of the reported gender and age-specific rates

Epidemiological research on pediatric headache in *Germany* has just recently begun. Pothmann, von Frankenberg and colleagues conducted the first such study a decade ago with a school-based sample of 4,835 students, aged 8 to 16 (Frankenberg & Pothmann,

1995; Pothmann, Frankenberg, Müller, Sartory, & Hellmeier, 1994). The vast majority of the students, namely 88.8%, reported having experienced headache at some point in their lives. Approximately every fifth child reported having frequent headache, with 5.7% reporting daily and further 15.5% weekly headache (21.2% in total).

To date, research on children and adolescents in Germany has shown headache to be common, though probably less widespread than first thought. While no data are currently available regarding preschool children, reported lifetime prevalence rates for older children and adolescents range from 15.5% (Essau, Conradt, & Petermann, 1999) to 88.8% (Frankenberg & Pothmann, 1995). A 12-month prevalence rate of 39.4% for 12- to 16-year-olds (Kolip, Nordlohne, & Hurrelmann, 1995) and a 3-month rate of 65.6% for children and adolescents aged 10 to 18 (Roth-Isigkeit, Thyen, Raspe, Stoven, & Schmucker, 2004) have also been reported. Rates of headache occurring *at least once a week* in the past 6 months has been reported to range for adolescents from 15.5% (Luka-Krausgrill & Reinhold, 1996) to 25% (Scheidt et al., 2000). However, limitations regarding two of the German studies should be noted: First, the focus of the study from Essau et al. (1999) was on somatoform and other psychiatric disorders. It is possible that headache was less likely to be affirmed within this context, resulting in an underestimation of its prevalence. Second, due to the small sample size ( $n=226$ ) in the study from Luka-Krausgrill and Reinhold (1996), the reported proportion of children with headache should be considered a rough estimate rather than a reliable prevalence rate.

In general, the prevalence of pediatric headache has been found to increase with age (e.g., Carlsson, 1996; Egermark-Eriksson, 1982; Egger, Angold, & Costello, 1998; Laurell et al., 2004; Mortimer, Kay, & Jaron, 1992; Ravens-Sieberer et al., 2003; Sillanpää, 1983). There is evidence of an age-related increase in the prevalence of *weekly* headache (Egermark-Eriksson, 1982; Scheidt et al., 2000) as well. In addition, headache prevalence has been found to be higher among female children and adolescents than among their male counterparts (e.g., Essau et al., 1999; Grøholt, Stigum, Nordhagen, & Kohler, 2003; Ravens-Sieberer et al., 2003; Zwart et al., 2004). The relevance of age and gender for headache will be covered in more detail in the section on Correlates of Pediatric Headache.

Altogether, there is a considerable variability in the prevalence rates that have been published in the literature, German and otherwise. This variability has been attributed to differences in sampling method, age and sex distribution of study population, diagnostic criteria, and country of origin (McGrath, 2001). An additional and more alarming attribution has also been proposed, namely that headache prevalence has increased substantially in the past decades.

On the basis of the literature since 1960, Sillanpää and Anttila (1996) came to the conclusion that, although the results of the studies were not necessarily comparable (e.g., due to differing methodology and headache criteria), they seemed to indicate that prevalence of pediatric headache had increased over time from 35% to 38% in the 1960s to 1970s to 42% to 50% in the 1980s and 1990s.

To investigate this assumption, Sillanpää and Anttila (1996) replicated an earlier epidemiological study (Sillanpää, 1976), while utilizing the same design, age group, and child

population in order to facilitate comparison. The resulting data confirmed a significant increase in headache prevalence among Finnish 7-year-olds. While 14.4% experienced headache in 1974, the proportion of 7-year-olds with headache more than tripled to 51.5% in 1992. Corresponding developments were also reported for recurrent headache: Monthly headache increased from 3.4% to 9.1%, and weekly headache from 1.3% to 2.6% in the same time span.

More recently, a similar development was reported in the Health Behavior in School-Aged Children (HBSC) study, a cross-national research project that is conducted in collaboration with the World Health Organization (WHO) at four-year intervals in numerous countries: According to Scheidt et al. (2000), the prevalence of headache increased approximately 5% between the surveys that took place in 1993/1994 and 1997/1998.

There is also evidence that the prevalence of *weekly* headache has increased over time: Rhee (2000) reported a prevalence rate of 29.8% for U.S. students, aged 11 to 21, which in comparison to a previously reported prevalence rate of 7% (Linnet et al., 1989), suggested “a rapid increase in the number of adolescents with recurrent headaches in the United States” (Rhee, 2000, p. 534). Furthermore, Bandell-Hoekstra et al. (2001) assessed headache in Dutch school children aged 10 to 17 using the prevalence questions previously employed by Passchier and Orlebeke (1985) and found the prevalence of weekly headache to have increased from 17% to 23%.

In sum, research has shown that pediatric headache is widespread. The majority of children and adolescents have experienced headache in the past year, and at least one in ten has experienced weekly headache. There is also evidence that pediatric headache has increased in the past decades. The question is, what natural course does pediatric headache follow (i.e., is it of a transient or enduring nature)?

### **2.3 Natural Course of Pediatric Headache**

Studies on *migraine* have reported a moderate to high stability of headache, depending on the length of the investigated time span: In a 4-year follow-up study, Metsähonkala et al. (1997) found migraine to remain stable in 83.3% of a Finnish adolescent migraineur sample. A further 11.9% of the sample reported non-migrainous headache, while only 4.8% of the children were headache-free. In a sample of Italian adolescents with migraine, 70.3% continued to have headache at 5-year follow-up, though the type of headache had changed in 37.5%. Less than one third (29.7%) of the sample had become headache-free (Camarda et al., 2002). In a 7-year follow-up Sillanpää (1983) found that migraine occurring at age 7 had disappeared by age 14 in 22%, was improved in 37%, but remained unchanged or grew more severe in 41% of a Finnish sample. Finally, in an unparalleled follow-up study of Swedish children with migraine, Bille documented headache evolution of 73 children over a time span of 40 years (Bille, 1962, 1989, 1997). At the 40-year follow-up, 46% were migraine-free, half of which had been migraine-free since age 25 (23% of total sample). On the other hand, 51% of the study participants continued to experience migraine.

Moderate to high rates of headache stability have also been found in studies on children and adolescents *presenting at headache clinics*. Some of these studies have additionally investigated diagnosis-specific differences in stability. In a 2- to 5-year follow-up study, Zebenholzer et al. (2000) reported headache stability of 71% in a pediatric patient sample, though type of headache had changed in 20%. Less than one third (29%) of the patients had become headache-free. In an 8-year follow-up of Italian patients Guidetti and Galli (1998) found stability of headache to be 71.9% for migraine and 55.6% for tension-type headache. Similarly, in a 10-year follow-up of consecutive pediatric patients, Dooley and Bagnell (1995) found headache stability of 50% for tension-type headache, 79.6% for migraine without aura, and 100% for migraine with aura (i.e., migraine with antecedent neurological symptoms affecting vision, sensation or speech, see Appendix A). Less than a third of the patient sample (27.3%) had become headache-free.

Unselected *community- and school-based studies* have reported somewhat lesser rates of headache stability. On the basis of data reported by Brattberg (1994), frequent headache remained stable in 62.5% of Swedish students over a 2-year period (48% of the sample reported frequent headache at first assessment and 30% of the total sample had headache at both assessments). Headache that disturbed daily activities was found to remain stable in 40.8% of Finnish children over a period of 6 years (Virtanen et al., 2002). Moderate to high rates of headache stability were also found in a longitudinal cohort study of 399 German children (Schmidt et al., 1992): Regarding a time span of five years, stability rates of 73% (age 8 to age 13) and 56% (age 13 to age 18) were reported. For a time span of ten years headache stability was 47% (age 8 to age 18). Data from the National Birth Cohort Study in Great Britain also corroborates the association between headache in childhood and adult headache (Fearon & Hotopf, 2001). Furthermore, the results indicate that the risk of having headache in adulthood is particularly increased in children with recurrent headache.

Altogether, research indicates that pediatric headache is not a transient complaint. Indeed, the stability of the pain over time points to a high risk of headache becoming an enduring health condition, in some cases intractable over the lifespan. Children and adolescents with frequent headache appear to be at particular risk.

In addition, there is mounting evidence that children and adolescents with headache are faced with long-term consequences beyond an elevated risk for adult headache. Data from the National Birth Cohort Study has indicated childhood headache to be associated with both multiple physical symptoms (i.e., presence of 3 or more physical symptoms) and psychiatric morbidity (i.e., presence of 4 or more symptoms of the Malaise Inventory) in adulthood (Fearon & Hotopf, 2001). In line with the latter, Waldie and Poulton (2002) have reported childhood headache to confer a particular risk for anxiety disorder in young adulthood (age 18 and 21). On the basis of their data, (Fearon & Hotopf, 2001, p. 3) appropriately concluded that “children with headache do not simply ‘grow out’ of their somatic complaint and may also ‘grow into’ others”.

## 2.4 Correlates of Pediatric Headache

Weekly headache in children and adolescents clearly needs to be addressed. In order to do so properly, knowledge about the biological, psychological, and social aspects of weekly headache is needed (Schwarzer, 2004). Numerous studies examining such correlates of and risk factors for headache have been conducted. However, the bulk of pediatric headache research has focused on headache in general or different types of headache. In addition, research that has focused on frequent headache has been hampered by the lack of a concrete definition of what is meant with “frequent” in some studies, and by the use inconsistent operationalizations of the terms “recurrent” and “frequent”<sup>1</sup> in others. Nevertheless, a number of the studies on “frequent” or “recurrent” headache examined headache that occurred at least once a week and thus offer information regarding pediatric weekly headache. However, due to the small number of such studies, the following review of the empirical literature will cover pediatric headache as a whole, while emphasizing results regarding weekly headache.

### 2.4.1 Age and Gender

Numerous studies have documented that headache prevalence increases substantially with age (Barea, Tannhauser, & Rotta, 1996; Carlsson, 1996; Egermark-Eriksson, 1982; Egger et al., 1998; Laurell et al., 2004; Mortimer et al., 1992; Ravens-Sieberer et al., 2003; Sillanpää, 1983). There is also evidence of an age-related increase in prevalence of *weekly* headache (Egermark-Eriksson, 1982; Scheidt et al., 2000). However, some contradictory results have also been reported. For example, Kristjánsdóttir (1993) found a significant inverse relationship, with both headache and *weekly* headache being more prevalent among younger than older children. In addition, a number studies found age to be unrelated to headache (King & Sharpley, 1990, age 10 to 18; Rhee, 2000, age 11 to 21; Zwart et al., 2004, age 13 to 18) and unrelated to *weekly* headache (Carlsson, 1996; King & Sharpley, 1990; Passchier & Orlebeke, 1985).

A gender difference has been reported in the majority of epidemiological studies, with more females than males experiencing headache (Brattberg & Wickman, 1992; Essau et al., 1999; Fichtel & Larsson, 2002; Grøholt et al., 2003; Kristjánsdóttir & Wahlberg, 1993; Laurell et al., 2004; Pine, Cohen, & Brook, 1996; Ravens-Sieberer et al., 2003; Zwart et al., 2004). Studies also indicate a female preponderance in *weekly* headache (Bandell-Hoekstra et al., 2001; Brattberg & Wickman, 1992; Carlsson, 1996; Fichtel & Larsson, 2002; King & Sharpley, 1990; Larsson, 1988; Passchier & Orlebeke, 1985; Rhee, 2000; Scheidt et al., 2000; Sillanpää, 1983; Zwart et al., 2004). The female predominance, however, first seems to appear around 10 to 12 years of age (Bille, 1981; Carlsson, 1996; Guidetti & Galli, 1998; Laurell et al., 2004), or perhaps even later (Kristjánsdóttir & Wahlberg, 1993; Sillanpää, 1983). Therefore, the gender differences may well reflect an interaction between age and

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<sup>1</sup> For example, ‘recurrent’ headache has been defined as headache in the past 4 weeks plus headache prior thereto (Zuckerman, Stevenson, & Bailey, 1987), headache more than twice in the past year (Cooper, Bawden, Camfield, & Camfield, 1987), and headache once a week or more (Linna et al., 1991). Similarly, ‘frequent’ headache has been defined as headache more than once a month (Virtanen et al., 2002) or more than once a week (Gordon et al., 2004).

gender. Indeed, some of studies that found no gender difference employed prepubertal samples (Anttila, Metsähonkala, Helenius, & Sillanpää, 2000; Aromaa et al., 1998; Waldie, 2001). However, a lack of gender difference has also been reported for older samples (Egger et al., 1998, age 9 to 13; Virtanen et al., 2002, age 12).

Though some contradictory results have been reported, the majority of studies have indicated an age-related increase in headache prevalence and a female preponderance. The latter has also been reported for *weekly* headache. However, due to contradictory results further research is necessary before any definitive conclusions regarding the relationship between *weekly* headache and age can be drawn.

#### **2.4.2 Socioeconomic Variables**

The extent to which socioeconomic variables influence headache in children and adolescents has been investigated in a number of studies. Depending on the study, individual components of social class (e.g., household income, educational level of parents, occupational prestige of parents), an aggregate measure thereof, or other related socioeconomic variables have been examined. The relevant findings of the studies will be presented in the following paragraphs, grouped according to socioeconomic variable. Subsequently, the empirical status of the reported variables will be determined.

Studies investigating household income, an individual component of social class, have yielded conflicting results. While Grøholt et al. (2003) reported recurrent pediatric headache to be associated with lower disposable household income, Carlson (1996) found no association between *weekly* headache and average net income of households in the district of residence. Parental unemployment, a closely related variable, has also been investigated: While Metsähonkala, Sillanpää and Tuominen (1998) found no influence of maternal employment status on pediatric headache, fathers' employment status was associated with migraine. Additionally, Carlsson (1996) found *weekly* headache to be more common in high unemployment districts, though unrelated to need for social security benefits.

Parental educational level has been found to be related to headache, with lower parental education associated with non-migrainous headache (Metsähonkala et al., 1998) and recurrent headache (Grøholt et al., 2003). However, other studies have yielded contradictory results, finding parental educational level to be unrelated to headache (Zuckerman et al., 1987) and *weekly* headache (Carlsson, 1996).

While in some studies occupational prestige of the parents was not significantly associated with headache (Grøholt et al., 2003; Pothmann et al., 1994; Virtanen et al., 2002) or *weekly* headache (Carlsson, 1996), in at least one study a significant association was reported (Fearon & Hotopf, 2001), with headache being related to lower occupational prestige.

On the aggregate level, results regarding the influence of social class on headache are equally contradictory. Some studies have found a significant association, indicating a higher prevalence of pediatric headache in the lower social class (Ravens-Sieberer et al., 2003; Sillanpää, Piekkala, & Kero, 1991). Other studies found no relationship between

headache and social class of family (Kristjánsdóttir & Wahlberg, 1993; Zuckerman et al., 1987) or district (Passchier & Orlebeke, 1985), or between *weekly* headache and social class (Larsson, 1988)

Housing conditions are related to socioeconomic status and have been investigated in headache studies. Sillanpää et al. (1991) found pediatric headache to be significantly associated with a lower housing standard and poorer living conditions. They also found a significant association between household crowding (i.e., higher number of inhabitants per room) and headache. On the other hand, Karwautz et al. (1999) found neither objectively measured nor subjectively perceived household crowding to be associated with headache. Nor did Zuckerman et al. (1987) find an association between household crowding and recurrent headache in preschool children.

Altogether, the number of studies indicating a significant association between socioeconomic variables and headache was equal or similar to the number of opposing studies. This was the case for both components of social class and aggregate measures thereof, with one exception: The number of studies which found headache to be unrelated to occupational prestige outweighs the single study reporting such an association. This is understood as an indication that occupational prestige is unrelated to headache. One study per variable, at most, examined *weekly* headache, thus it is not possible to draw any conclusions in this area. In sum, the results regarding socioeconomic variables can best be described as being inconclusive.

#### **2.4.3 Child Psychological Variables**

Psychological variables have also been investigated in pediatric headache studies. The examined variables have ranged from psychiatric disorders over psychological symptoms to aggregate measures of such symptoms. The results will be depicted followed by the evaluation of the variables' empirical status.

Evidence of an association between pediatric headache and psychiatric disorder has been provided by several studies. According to Maratos and Wilkinson (1982), patients with childhood migraine were significantly more likely to have a psychiatric disorder than non-headache controls. Similarly, Schmidt et al. (1992) found the likelihood of having a psychiatric disturbance to be twice as high among children with headache as compared to their headache-free counterparts in a German birth cohort study.

Psychiatric disorders were also found to be associated with *weekly* headache in a population-based study of U.S. school children (Egger et al., 1998). Of children who met the criteria of the Diagnostic and Statistical Manual for Mental Disorders (third edition, revised [DSM-III-R]) for at least one psychiatric diagnosis, 20.5% reported *weekly* headaches, compared to 9.2% of children without psychiatric disorder. The relationships between individual disorders and headache were also examined. Neither oppositional defiant disorder nor attention deficit disorder was associated with *weekly* headache. However, conduct disorder was associated with the presence of *weekly* headaches in boys: The likelihood of having such headache was twice as high among boys with the disorder. Furthermore, anxiety disorders and mood disorders were associated with *weekly* headache in girls: In comparison to girls without a disorder, girls with any anxiety disorder were twice, and girls



with mood disorder fourfold more likely to have *weekly* headache. In contrast, Engström (1992) found DSM-III-R psychiatric diagnoses to be no more common among children and adolescents with *weekly* tension-type headache than among healthy controls.

Anxiety, nervousness, and related psychological symptoms have been investigated in association with pediatric headache in a number of studies. Children and adolescents with headache have been found to report significantly more anxiety-related symptoms such as anxiety/nervousness, worry/fright, restlessness (Carlsson, Larsson, & Mark, 1996). In addition, pediatric patients with headache (Mazzone, Vitiello, Incorpora, & Mazzone, 2006) and migraine (Smith, Martin-Herz, Marsigan, & Womack, 2003) have been found to report more anxiety than headache-free controls. Children with *weekly* headache have also been found to have higher levels of anxiety than those with infrequent or no headache (Fichtel & Larsson, 2002), or than healthy children (Engström, 1992). Similarly, Larsson (1988) found nervous problems and anxiety to be more common among students with *weekly* headache (aged 16 to 18) than those without.

Two further studies partially corroborated the relationship. Andrasik et al. (1988) found anxiety to be associated with *weekly*<sup>2</sup> migraine among adolescents, but not among younger children, and Martin-Herz, Smith, and McMahon (1999) found trait anxiety to be related to *weekly*<sup>3</sup> headache in boys, but not in girls.

On the other hand, neither Cunningham et al. (1987) nor Cooper et al. (1987) found anxiety to be related to occurrence of migraine, though it was positively correlated with migraine frequency and severity (Cooper et al., 1987). Similarly, Kowal and Pritchard (1990) reported a significant association between anxiety and severity of pediatric headache (defined as headache frequency plus headache intensity), though not between anxiety and headache occurrence, frequency, or intensity, when examined individually.

Turning to a different psychological variable, a number of studies investigated depressive symptoms in relation to pediatric headache. Higher depression scores in comparison to headache-free counterparts have been found for pediatric patients with headache (Mazzone et al., 2006), migraine (Cooper et al., 1987), and *weekly* migraine (Andrasik et al., 1988). There is also evidence that the magnitude of the association increases with age: While younger patients with *weekly* migraine scored twice as high as controls, adolescent migraineurs scored almost three times higher (Andrasik et al., 1988).

Large-scale population-based studies have corroborated the presence of an association between depression scores and headache (Fearon & Hotopf, 2001; Rhee, 2000). This association has been found to extend to frequent headache (Luka-Krausgrill & Reinhold, 1996) and *weekly* headache as well: For example Gordon et al. (2004) found *weekly* headache to be negatively associated with personal happiness and future optimism, and positively associated with depression. Similarly, Engström (1992) found children with *weekly*

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<sup>2</sup> Andrasik et al. (1988) did not explicitly study *weekly* migraine. However, the migraine subjects reported an average of 9.5 headaches during a 4-week monitoring period and on the basis of this data, it can be assumed that they experienced *weekly* headache.

<sup>3</sup> Martin-Herz et al. (1999) did not explicitly study *weekly* headache. However, the subjects in their "frequent headache" group reported a median rating of more than one headache a week. Therefore, it can be assumed that they experienced *weekly* headache.

tension-type headache to score significantly higher on a measure of depression than healthy children. The relationship between depression and *weekly* headache has been confirmed in two further studies (Fichtel & Larsson, 2002; Martin-Herz et al., 1999).

In addition, suicidal ideation has also been found to be more common in children with headache than the headache-free counterparts (Aromaa, Sillanpää, Rautava, & Helenius, 2000), with Gordon et al. (2004) reporting that 13% of young adolescents with *weekly* headache endorse having given committing suicide “serious consideration” in comparison to 4% of those with infrequent or no headache.

On the other hand, Kowal and Pritchard (1990) and Anttila et al. (2004) found headache and depression to be unrelated. In addition, no difference with regard to depression was found between children with migraine, other pain, and no pain (Cunningham et al., 1987), or between pediatric migraine patients and healthy controls (Smith et al., 2003).

In a further study, children and adolescents with *weekly* tension-type headache were found to have reported significantly lower self-esteem than healthy controls (Engström, 1992).

Insomnia and sleeping disorders, which can be considered to be psychophysiological disturbances (Riemann, Backhaus, Schramm, & Hohagen, 1996), have also been investigated in association with pediatric headache. While Kowal and Pritchard (1990) found no significant association between sleeping difficulties and headache occurrence in 9- to 12-year-old Australian children, insomnia has been found to be related to pediatric headache in population-based studies in the United States (Rhee, 2000) and the Nordic countries of Sweden, Norway, Finland, and Denmark (Grøholt et al., 2003; Laurell, Larsson, & Eeg Olofsson, 2005). Furthermore, in a study by Aromaa et al. (1998), sleeping difficulties at age 3 were found to be predictive of later headache.

Along with measures tapping individual psychological variables, aggregate measures of emotional problems and internalizing disorders (i.e., depression, anxiety, withdrawal, and somatization) have also been employed in headache studies. For example, Anttila et al. (2004) found scores on an aggregate measure of anxiety and depression to be unrelated to headache in Finnish 13-year-olds. However, using the same measure, children and adolescents with migraine (but not tension-type headache; Just et al., 2003) and adolescents with *weekly* headache (Larsson, 1988) were found to be more anxious and depressed than their headache-free counterparts. Using a different measure, pediatric migraine patients were found to exhibit significantly lower emotional functioning in comparison to normative data on healthy controls (Powers, Patton, Hommel, & Hershey, 2003). Adolescent *weekly* headache was also found to be significantly associated with elevated scores on measures of emotional disorders (Gordon et al., 2004), and mental health difficulties (Martin-Herz et al., 1999). However, Engström (1992) found emotional maladjustment to be no more common among children and adolescents with *weekly* tension-type headache than among healthy controls.

In addition, significantly higher scores on an aggregate measure of internalizing disorders have been reported for children and adolescents with headache (Just et al., 2003), pediatric headache patients (Mazzone et al., 2006), and patients with *weekly* migraine (Andrasik et al., 1988) in comparison to their headache-free counterparts. Using the same

measure Cunningham et al. (1987) found children with migraine to exhibit more internalizing behavior than no-pain counterparts, but not than other pain controls. Similarly, Anttila et al. (2004) found elevated internalizing in adolescents with migraine, but not in those with tension-type headache. Finally, children with *weekly* tension headache scored higher on the measure than healthy children (Engström, 1992).

While some evidence linking anger and pain has been reported (Bandell-Hoekstra, Abu-Saad, Passchier, & Knipschild, 2000; Fernandez & Turk, 1995), anger and related variables have received only marginal attention in research on headache in children and adolescents. Carlsson et al. (1996) found getting easily angry or annoyed to be more common among children with headache than headache-free controls. Temper tantrums were also found to be more common among children with headache as among those without (Sillanpää et al., 1991).

A significant association between aggressive behavior and migraine with aura (though not with other headache) was reported by Just et al. (2003). Associations approaching significance between *weekly* headache and aggressive behavior or conduct disorder were reported by Gordon et al. (2004). In contrast, a number of studies found headache to be unrelated to aggressive behavior (Anttila et al., 2004; Cunningham et al., 1987) and delinquent behavior (Anttila et al., 2004; Cunningham et al., 1987; Just et al., 2003).

Inattentiveness and hyperactivity have been examined in a number of headache studies with inconclusive results. Just et al. (2003) found attention problems and hyperactivity to be more common among children and adolescents with migraine (but not tension-type headache) than among headache-free controls, while others found them to be unrelated to headache (Anttila et al., 2004), or migraine (Cunningham et al., 1987). Gordon et al. (2004) reported an association between attention problems or hyperactivity and *weekly* headache that approached significance. On the other hand, Aromaa et al. (1998) found concentration problems at age 5 to be predictive of headache one year later in Finnish children.

Aggregate measures tapping behavioral problems and externalizing disorders (e.g., aggressive behavior, delinquent behavior) have also been investigated in several headache studies. For example, Mazzone et al. (2006) reported externalizing to be more common among pediatric headache patients than healthy controls. Similarly, Just et al. (2003) found children and adolescents with migraine (but not tension-type headache) to score significantly higher on a measure of externalizing than their headache-free counterparts. Partial corroboration was also provided by Andrasik et al. (1988), who reported male children and adolescents with *weekly* migraine (but not female ones) to score significantly higher on the externalizing measure than headache-free controls. In contrast, no significant difference in comparison to healthy controls was reported for adolescents with headache (Anttila et al., 2004), or children and adolescents with *weekly* tension-type headache (Engström, 1992).

Stress has been repeatedly reported as a headache trigger in children and adolescents (Bandell-Hoekstra et al., 2001). In a German study, 29% of adolescents with *weekly* headache and 10% of adolescents with seldom headache reported believing their

headaches were stress-related (Luka-Krausgrill & Reinhold, 1996). Similarly, Cooper et al. (1987) reported that 41% of migraine children and 46% of their parents cited stress as a trigger for headache. Additionally, children with headache have been found to report more everyday stress (Carlsson et al., 1996; Luka-Krausgrill & Reinhold, 1996) and greater difficulties to relax (Carlsson et al., 1996) than headache-free controls. More everyday stress has also been reported for adolescents with *weekly* headache (Larsson, 1988).

While coping with stress has been incorporated in treatment programs for pediatric headache (Denecke & Kröner-Herwig, 2000; Kerbeck & Luka-Krausgrill, 1999), it has received scant attention in research on headache. In the only study that has investigated it to date, Luka-Krausgrill and Reinhold (1996) found adolescents with frequent headache to use avoidance strategies significantly more often than children with seldom or no headache, no differences were found with regard to the use of active or internal coping strategies.

In sum, the results indicate that pediatric headache is related to stress and tentatively related to psychiatric disorders, depressive symptoms, sleeping disorders, internalizing disorders, and anger. It can also be tentatively concluded that pediatric headache is unrelated to aggressive and delinquent behavior. The results regarding anxiety, hyperactivity/inattentiveness, externalizing disorders, and coping strategies are inconclusive. The pattern of results for *weekly* headache is somewhat different. They indicate that weekly headache is related to anxiety and depression and tentatively associated with internalizing disorders. No conclusions can be drawn regarding psychiatric disorders, emotional problems, aggressive behavior, hyperactivity/inattentiveness, and externalizing disorders. Substantial further research is necessary in order to confirm the tentative associations and to elucidate the inconclusive ones.

#### **2.4.4 Child Health Variables**

It has been suggested that pediatric headache may be a manifestation of a child's general tendency to experience somatic symptoms when under stress (Aromaa et al., 2000; Martin & Smith, 1995) and numerous studies have investigated the association between headache and somatic symptoms. The examined variables have ranged from non-headache pains (e.g., back pain, stomach ache) over other somatic complaints (e.g., dizziness, tiredness), to aggregate somatic symptom scales.

Children and adolescents with headache seem to experience non-headache pain more often than their headache-free counterparts. For example, several studies have shown pediatric headache to be significantly associated with stomach aches or pains (Aromaa et al., 2000; Carlsson et al., 1996; Grøholt et al., 2003). Indeed, Sillanpää et al. (1991) found stomach ache to be about fourfold as frequent in 5-year-old Finnish children with headache than in children without headache. Similarly, back pain has been found to be more frequent in children and adolescents with headache (Carlsson et al., 1996; Grøholt et al., 2003), though one study found no such relationship (Aromaa et al., 2000). Significant associations have been also found between headache and growing pains in 7-year-olds (Aromaa et al., 2000), and neck pain in Swedish students, aged 8 to 15 (Carlsson et al., 1996). Two thirds of adolescents with *weekly* headache have reported experiencing at least one non-headache pain (Fichtel & Larsson, 2002). Furthermore, according to Aromaa et al. (2000) the parents of

children with headache were more likely to describe their child as extremely sensitive to pain than parents of headache-free children.

Other somatic complaints also appear to be more common among children and adolescents with headache. Significant associations have been found between pediatric headache and tiredness (Aromaa et al., 2000; Carlsson et al., 1996), dizziness (Grøholt et al., 2003), motion sickness (Aromaa et al., 1998), loss of appetite (Carlsson et al., 1996; Grøholt et al., 2003), breathing problems (Carlsson et al., 1996), and nocturnal or diurnal enuresis (Aromaa et al., 1998; Sillanpää et al., 1991).

Furthermore, numerous studies have documented that children and adolescents with headache score significantly higher than their headache-free counterparts on somatic symptom scales that encompass both various pains and somatic symptoms (Anttila et al., 2004; Carlsson et al., 1996; Just et al., 2003; Kowal & Pritchard, 1990; Luka-Krausgrill & Reinhold, 1996). The same relationship has been found for children and adolescents with *weekly* headache (Engström, 1992; Larsson, 1988; Martin-Herz et al., 1999) and pediatric migraine patients (Smith et al., 2003). Indeed, in a study that employed *three* different aggregate measures of somatic complaints, children and adolescents with *weekly* migraine were found to have scored significantly higher than headache-free controls on *each* of the three measures (Andrasik et al., 1988). Children with migraine were also found to score higher on a somatic symptom scale than children with other pain (e.g., chronic musculoskeletal pain), or pain-free controls (Cunningham et al., 1987).

Finally, Powers et al. (2003) reported that in comparison to normative data on healthy controls, pediatric migraine patients exhibited significantly lower physical functioning, a compound variable encompassing low energy level, aches and pains, and ability to perform basic physical activities.

Altogether, research indicates non-headache pain and other somatic complaints are factors relevant to both pediatric headache and pediatric *weekly* headache. Though almost no studies have reported on associations between individual pains or somatic symptoms and *weekly* headache, the results regarding the aggregate measure of somatic complaints are convincing.

#### **2.4.5 Family Variables**

Family characteristics, such as marital relationship, number of siblings, and family conflict, have been the focus of interest in a number of headache studies. However, the results have been largely inconclusive.

A few studies have indicated that divorce or separation is associated with tension-type headache (Karwautz et al., 1999), headache in general (Carlsson et al., 1996), and *weekly* headache (Larsson, 1988) in children and adolescents. The majority of studies, however, have found no such relationship between headache and parental status (Aromaa et al., 1998; Fearon & Hotopf, 2001; Metsähonkala et al., 1998; Pothmann et al., 1994; Virtanen et al., 2002; Zuckerman et al., 1987). Nor has an association between quality of marital relationship and headache (Zuckerman et al., 1987) or *weekly* headache (Larsson, 1988) been found, though one study indicated that a poor marital relationship was more common

among adolescents with migraine and comorbid psychiatric problems (Maratos & Wilkinson, 1982).

Number of siblings was not found to be significantly associated with headache in children and adolescents (Aromaa et al., 1998; Carlsson et al., 1996; Metsähonkala et al., 1998). One study indicated that children with non-migrainous headache are often the eldest child in the family (Metsähonkala et al., 1998). However, in view of age-specific increases in headache prevalence, it seems unclear whether this result should be attributed to birth order or child's age.

Turning to family environment, difficulties talking with mother (but not with father) have been found to be significantly associated with headache in children and adolescents (Brattberg, 1994). Additionally, it has been found that familial conflicts leading to open quarreling and sulking are significantly more often present in families of children with headache than in those with headache-free children (Aromaa et al., 2000). In a study by Kowal and Pritchard (1990), parents of children with headache reported significantly less achievement orientation than control parents.

Altogether, the results indicate that pediatric headache is unrelated to separation / divorce of parents and tentatively unrelated to number of siblings. On the other hand, there is tentative evidence that headache is related to a negative family environment. However, the aspects of negative family environment that have been investigated are so diverse that caution is warranted regarding generalizations. In addition, with the exception of parental separation or divorce, the number of studies conducted per variable is small. Further studies are needed before definitive conclusions can be drawn. This is particularly true for *weekly* headache, as almost no research focusing on family variables and *weekly* headache has been conducted. Noteworthy is, however, that 11% of German adolescents with *weekly* headache have cited their family as a headache trigger (Luka-Krausgrill & Reinhold, 1996).

#### **2.4.6 School Variables**

Many different variables related to school have been investigated in association with headache in children and adolescents. The focus of the examined variables has ranged from school performance (e.g., difficulties with specific courses of study, repeating a grade) to school climate (e.g., fear of classmates, being bullied).

Metsähonkala et al. (1998) found difficulties with writing and mathematics to be more common among girls with non-migrainous headache, and difficulties in sports to be more common among boys with non-migrainous headache than among their respective headache-free counterparts. Similarly, Gordon et al. (2004) reported poor academic achievement to be associated with *weekly* headache. In contrast, Karwautz et al. (1999) found repeating a grade to be no more common among headache patients than among headache-free controls and Metsähonkala et al. (1997) found no significant differences between boys with frequent migraine and boys with infrequent or no migraine in coping with school subjects. Along the same lines, Egermark-Eriksson (1982) reported average grades in all classes except physical education to be unrelated to headache in Swedish school children. Further studies indicated that headache was not associated with school problems (Passchier & Orlebeke, 1985), or with needing extra supervision by a teacher (Metsähonkala et al., 1998). Indeed,

Engström (1992) found no significant differences on an aggregate measure of academic performance, need of special education, and having to repeat a school grade between children with *weekly* tension headache and healthy children.

With regard to homework, Larsson (1988) reported spending more time on homework to be significantly associated with both *weekly* headache and headache severity. Similarly, Luka-Krausgrill and Reinhold (1996) found that in comparison to adolescents with no or seldom headache, more adolescents with recurrent headache tended to report investing two or more hours on homework a day (14.3% and 18.5% vs. 34.4%, respectively). On the other hand, less frequent homework completion was also reported to be significantly associated with *weekly* headache (Gordon et al., 2004). It is, however, unclear what this exactly implies.

Metsähonkala et al. (1998) found “stressing about school” to be more common in children with headache than in their headache-free counterparts. Similarly, Passchier and Orlebeke (1985) found headache and headache parameters to be significantly associated with fear of failure, though unrelated to achievement motivation. However, suffering under stress of performance in school has been found to be no more common among headache patients than among headache-free controls (Karwautz et al., 1999). Along the same line, Larsson (1988) reported satisfaction with school to be unrelated to *weekly* headache.

With regard to school climate, Gordon et al. (2004) found negative feelings about school, being unfairly treated by teachers, and feeling “left out” to be significantly associated with *weekly* headache in Canadian adolescents. Feelings of loneliness and being an outsider have also been found to be associated with headache (Brattberg, 1994). In addition, Brattberg (1994) reported that fear of one or more classmates was present in 12% of a Swedish student sample (aged 10 to 16), and that headache was significantly more prevalent within this group than among students without such fear. Similarly, Gordon et al. (2004) found feeling unsafe at school or while traveling to and from school to be associated with *weekly* headache. Being bullied at school has also been found to be more common in children and adolescents with headache than in their headache-free counterparts (Brattberg, 1994; Metsähonkala et al., 1998; Williams, Chambers, Logan, & Robinson, 1996).

Finally, Powers et al. (2003) reported that in comparison to normative data on healthy controls, pediatric migraine patients exhibited significantly lower school functioning, a compound variable encompassing attentiveness in class, keeping up with homework, and school absence.

Altogether, the results indicate that pediatric headache is related to a negative school climate, but unrelated to poor academic achievement. Further studies are needed before conclusions can be drawn with regard to time spent on homework and fear of failure. The former as too few studies have been conducted to date, the latter because the results are inconclusive. Further research is also necessary with regard to *weekly* headache, as almost no studies have investigated school variables. The only conclusion that can be drawn is that a negative school climate is relevant to *weekly* headache. Noteworthy is that school has also been reported as a headache trigger: Twenty-nine percent of adolescents with *weekly* headache and 19% of adolescents with seldom headache reported believing their headaches were school-related (Luka-Krausgrill & Reinhold, 1996).

### 2.4.7 Leisure Variables

A number of variables related to recreation and use of leisure time have been investigated in headache studies. Oksanen et al. (2005) found that children with migraine engaged in physical activity more often than headache-free children. Similarly, Carlsson et al. (1996) reported that children with headache played sports more often during their spare time than headache-free controls. Other studies, however, found no association between physical activity and occurrence of headache (Brattberg, 1994), or *weekly* headache (Gordon et al., 2004).

While Sillanpää et al. (1991) reported headache to be associated with recreational activities, Aromaa et al. (2000) found an inverse relationship, with headache children participating in significantly fewer social hobbies such as scout or club meetings than their headache-free counterparts. In line with the latter, Engström (1992) found children with *weekly* tension-type headache to score significantly lower on an aggregate measure of physical activity, hobbies, and household tasks than healthy children. No significant association was found between recreational activities and *weekly* headache (Gordon et al., 2004), or time spent on hobbies and migraine (Metsähonkala et al., 1997).

Watching television has been documented as a headache trigger (Luka-Krausgrill & Reinhold, 1996) and children with headache have been found to watch significantly more television daily than their headache-free counterparts (Aromaa et al., 2000). The amount of television watched at age 3 and 5, however, was not predictive of headache occurring at age 6 (Aromaa et al., 1998). A further sedentary activity, spending time on a computer, has also been investigated: Oksanen et al. (2005) found that children with headache used computers significantly more often than children without headache.

Moderate to poor peer relationships have been reported to be more common in children with headache than in their headache-free counterparts (Metsähonkala et al., 1998). In contrast, no significant difference was found between headache and non-headache children with regard to friends (Aromaa et al., 2000), or between those with *weekly* headache and no headache with regard to satisfaction with peers (Larsson, 1988). Similarly, Engström (1992) reported finding no significant differences between children with *weekly* tension-type headache and healthy children on an aggregate measure tapping amount of friends, quality of peer relationships, and hobbies. In contrast, Cunningham et al. (1987) found children with migraine to score significantly lower on this aggregate measure than pain-free and other pain controls. Pediatric migraine patients have also been found to exhibit lower social functioning (a compound variable encompassing peer relationships, teasing, and ability to participate in leisure activities) in comparison to normative data on healthy controls (Powers et al., 2003).

The results regarding leisure activities can be characterized as being inconclusive at best, for both headache and *weekly* headache. The only tentative conclusion that can be drawn is that poor peer relations are related to headache. Altogether, too few studies have examined leisure activities in relation to pediatric headache. In addition, the results regarding physical activities, recreational activities, TV, and peer relations are contradictory. Further research is necessary before conclusions can be drawn in this area.



### 2.4.8 Life Events

Stressful experiences have been shown to be significantly associated with somatization (Poikolainen, Aalto-Setälä, Marttunen, Tuulio-Henriksson, & Lonnqvist, 2000) and the development of many acute and chronic illnesses (Cooper et al., 1987; Haggerty, 1983). Unsurprisingly, both individual negative life events and aggregate indices thereof have been examined in association with pediatric headache.

On the level of individual life events, Sillanpää et al. (1991) found children with headache to have relocated more often than headache-free children. In addition, Fearon and Hotopf (2001) found a significant association between maternal (but not paternal) chronic physical illness and pediatric headache, while Larsson (1988) reported parental illness to be unrelated to pediatric *weekly* headache. Conflicting results have also been reported regarding parental rating of a subjective poor family financial situation: While Sillanpää et al. (1991) found a significant association between pediatric headache and poor financial situation, Aromaa et al. (2000) found no such relationship.

Research that has examined the loss of a family member or significant other (through relocation, separation, death) in relation to pediatric headache has focused almost exclusively on parental divorce or separation. In the present research, loss of a family member or significant other is understood as a life event and parental status as a family variable. The latter has, therefore, been previously covered in detail in the section on Family Variables. The results can be summarized as follows: A few studies have indicated divorce or separation to be related to pediatric headache (Carlsson et al., 1996; Karwautz et al., 1999; Larsson, 1988), but the majority reported no such relationship (Aromaa et al., 1998; Fearon & Hotopf, 2001; Metsähonkala et al., 1998; Pothmann et al., 1994; Virtanen et al., 2002; Zuckerman et al., 1987).

On the more general or aggregate level, Liakopoulou-Kairis et al. (2002) found children with headache to have experienced significantly more negative life events than their headache-free counterparts, though no difference was found between children with headache and children with recurrent abdominal pain. In a study by Cooper et al. (1987), children with migraine did not differ from migraine-free best friends on a life event scale, or with regard to maternal life events. Similarly, Karwautz et al. (1999) found no significant association between pediatric headache and maternal or paternal life events. On the other hand, Kowal and Pritchard (1990) reported a significant association between units of life change (i.e., total need for readjustment associated with the experienced life events) and severity of pediatric headache (defined as headache frequency plus headache intensity). Units of life change, however, were not associated with headache presence, frequency, or intensity, when examined individually. Along the same line, Andrasik et al. (1988) reported *weekly* migraine to be unrelated to units of life change.

The results regarding life events, on both the individual and aggregate level, can be characterized as being inconclusive. Exceptions are parental separation or divorce and parental life events, both of which appear to be unrelated to pediatric headache. Further research is needed to increase the number of studies conducted per variable and to

elucidate contradictory results. In addition, almost no research has focused on *weekly* headache making this an area wanting attention.

#### **2.4.9 Parental Psychological Variables**

The psychological characteristics of parents have only received marginal attention in pediatric headache research and this marginal attention has been focused primarily on maternal psychological variables, such as maternal depression.

Study results indicate that headache in children and adolescents is associated with elevated maternal depression scores (Zuckerman et al., 1987) and a history of maternal depression (Mortimer, Kay, Jaron, & Good, 1992). A tendency for headache to be associated with elevated maternal depression scores has also been reported (Liakopoulou-Kairis et al., 2002). Similarly, Larsson (1988) found an association between pediatric *weekly* headache and parental nervous problems that approached significance.

In a recent study, a number of parental psychophysiological complaints, including insomnia, were investigated in association with headache in children and adolescents: Grøholt et al. (2003) found parental insomnia to be significantly associated with child's recurrent headache.

Liakopoulou-Kairis et al. (2002) examined the relevance of maternal psychological variables for pediatric headache in a clinical sample: No significant associations were found between pediatric headache and maternal scores for obsessive-compulsiveness, anxiety, phobic anxiety, interpersonal sensitivity, anger/hostility, paranoid ideation or psychoticism. Paternal psychological variables were not investigated. A further study indicated that parental anxiety (state and trait) was unrelated to child's headache (Cunningham et al., 1987).

Finally, Aromaa et al. (1998) found parents of children with headache to be so concerned about their child's headache that they reported having symptoms of fear, anxiety, tension, nervousness, excessive worry, or insomnia. Though the reported symptoms were viewed as reactions to child's headache, they may be an indication of parental vulnerability for psychological symptoms.

The results of these studies tentatively indicate that maternal depression is a factor relevant to pediatric headache, while further research is necessary in order to determine the relevance of the other parental psychological variables to headache. Only one study investigated parental psychological variables and *weekly* headache. This lack of research needs to be remedied before any conclusions regarding *weekly* headache can be drawn.

#### **2.4.10 Parental Health Variables**

Parental health variables have received substantially more attention than parental psychological variables in research on pediatric headache. In particular, parents' general health, headache, and non-headache pain have been examined.

Pediatric headache has not been found to be significantly associated with parental general health status (Karwautz et al., 1999; Zuckerman et al., 1987), or number of maternal doctor appointments (Zuckerman et al., 1987).

In contrast, a family history of headache, maternal headache in particular, has long been considered a risk factor for pediatric headache (McGrath, 2001). Studies of both cross-sectional and longitudinal nature have provided evidence for this relationship (Aromaa et al., 1998; Larsson, 1988). For example, Virtanen et al. (2002) found Finnish adolescents to be significantly more likely to have headache if frequent headache was present in a family member (mother, father, or sibling). A history of maternal migraine was also found to increase the likelihood of child's migraine or other headache (Mortimer et al., 1992). Similarly, parental headache was found to be significantly associated with both recurrent (Grøholt et al., 2003) and *weekly* pediatric headache (Larsson, 1988). Longitudinally, both mother's frequent headache prior to pregnancy and earlier history of headache in other family members have been found to be predictive of child's later headache (Aromaa et al., 1998). Indeed, a history of maternal headache has been found not only to increase the risk of frequent headaches in childhood, but also to increase the likelihood of the child experiencing migraine and combined headache in adulthood (Waldie & Poulton, 2002).

With regard to parental non-headache pain, Grøholt et al. (2003) found parental back pain and abdominal pain to be significantly associated with recurrent pediatric headache. An association between parental abdominal pain and adolescent *weekly* headache that approached significance was also reported by Larsson (1988). Similarly, maternal weekly pain was found to be significantly associated with child's headache (Brattberg, 1994). However, significant associations were not found between paternal weekly pain and child's headache (Brattberg, 1994) or between a history of chronic pain in a family member (mother, father, or sibling) and child's migraine (Cunningham et al., 1987).

With regard to parental other somatic complaints, Liakopoulou-Kairis et al. (2002) found maternal somatization to be unrelated to pediatric headache. Though Grøholt et al. (2003) reported dizziness and loss of appetite to be significantly associated with recurrent pediatric headache, when controlling for these and all other somatic and pain complaints in a multivariate model only parental headache remained significantly associated with pediatric headache.

Altogether the studies indicate that parental headache is related to pediatric headache, while parental general health is not. The results regarding parental non-headache pain and somatic complaints are contradictory and the number of studies limited. In addition, almost no research has investigated the relevance of the factors for *weekly* headache. Further research is necessary before any conclusions can be drawn in these areas.

#### **2.4.11 Summary**

The studies investigating pediatric headache and potentially related variables have yielded mixed results. For some of the variables only one study has been conducted to date. Drawing conclusions on the basis of a single study can be seen as being premature. Therefore, these variables are classified as being inconclusive pending further research. The status of a second group of variables is also inconclusive, as contradictory results have been reported that are relatively balanced between affirmation and refutation of the given variable's association with headache. In these cases further research is necessary in order to clarify the relevance of the variables. For a third group of variables, tentatively conclusive

results have been reported, as the status of the variable has been corroborated in several studies and the number of studies affirming its status (as related or unrelated) exceeds the number of opposing studies by at least two. For a final group of variables, the status of the variable has been conclusively corroborated, as the number of studies affirming its status (as related or unrelated) exceeds the number of opposing studies by at least four. The empirical status of the reviewed variables as inconclusive, tentative, or conclusive is shown for headache in Table 2 and for *weekly* headache in Table 3.

**Table 2. Current empirical status of variables potentially relevant to pediatric headache**

Related <sup>a</sup>	Unrelated <sup>a</sup>	Tentatively related <sup>b</sup>	Tentatively unrelated <sup>b</sup>	Inconclusive due to contradictory results	Inconclusive due to examination in a single study
- Age	- Delinquent behavior	- Psychiatric disorder	- Occupational prestige	- Parental unemployment	- Household income
- Gender	- Divorce / Separation	- Depression	- Aggressive behavior	- Parental educational level	- Housing conditions
- Stress	- Poor academic achievement	- Sleeping disorders	- Number of siblings	- Social class	- Birth order
- Non-headache pain		- Internalizing	- Parental life events	- Household crowding	- Lower emotional functioning
- Other somatic complaints		- Anger	- Parental anxiety	- Anxiety	- Avoidance coping
- Somatic symptom scales		- Negative family environment	- Parental general health	- Anxiety / Depression	- Active coping
- Negative school climate		- Poor peer relations		- Hyperactivity	- Internal coping
- Parental headache		- Maternal depression		- Externalizing	- Lower physical functioning
				- Fear of failure	- Time spent on homework
				- Physical activities	- Lower school functioning
				- Recreational activities	- Time spent on computer / game console
				- Time spent on TV / video	- Relocation
				- Financial situation	- Parental Insomnia
				- Index of life events	- Parental chronic illness
				- Parental other pain	
				- Parental other somatic complaints	

<sup>a</sup> The number of studies affirming the variable's status exceeds the number of opposing studies by at least four

<sup>b</sup> The number of studies affirming the variable's status exceeds the number of opposing studies by at least two

The disparity in the amount of research that has been conducted on headache as opposed to *weekly* headache is easily recognizable by comparing Table 2 to Table 3. While data regarding the empirical status of 55 variables is shown for headache in Table 2, only 34 variables are presented with regard to *weekly* headache in Table 3. In addition, the majority of the potentially relevant variables for *weekly* headache have only been investigated in a single study, while this is the case for only one fourth of the variables examined with regard to headache. This inequality is unsurprising as *weekly* headache and potentially relevant variables have only been investigated in eight studies to date (Andrasik et al., 1988;

Carlsson, 1996; Egger et al., 1998; Engström, 1992; Fichtel & Larsson, 2002; Gordon et al., 2004; Larsson, 1988; Martin-Herz et al., 1999).

Table 2 and Table 3 also reveal that the majority of the examined variables are of either tentative or inconclusive status. This is true for both headache and *weekly* headache. Indeed, only eight variables can be seen as being conclusively related to headache, namely age, gender, stress, non-headache pain, other somatic complaints, somatic symptoms (as measured with a somatic symptoms scale), negative school climate, and parental headache. An additional three variables with conclusive status have been found to be unrelated to headache (delinquent behavior, divorce / separation, poor academic achievement). In contrast, only four variables can be seen as being conclusively related to *weekly* headache, namely gender, anxiety, depression, and somatic symptoms (as measured with a somatic symptoms scale). To date, no variables have been found to be conclusively unrelated to *weekly* headache.

**Table 3. Current empirical status of variables potentially relevant to pediatric *weekly* headache**

Related <sup>a</sup>	Unrelated <sup>a</sup>	Tentatively related <sup>b</sup>	Tentatively unrelated <sup>b</sup>	Inconclusive due to contradictory results	Inconclusive due to examination in a single study
- Gender		- Emotional problems	- Poor peer relations	- Age	- Household income
- Anxiety		- Internalizing		- Divorce / Separation	- Parental unemployment
- Depression		- Stress		- Psychiatric disorder	- Parental educational level
- Somatic symptom scales		- Negative school climate		- Externalizing	- Occupational prestige
				- Poor academic achievement	- Social class
				- Recreational activities	- Anxiety / Depression
					- Lower self-esteem
					- Aggressive behavior
					- Hyperactivity
					- Non-headache pain
					- Physical activities
					- Time spent on homework
					- Index of life events
					- Parental nervous problems
					- Parental headache
					- Parental other pain
					- Parental chronic illness

<sup>a</sup> The number of studies affirming the variable's status exceeds the number of opposing studies by at least four

<sup>b</sup> The number of studies affirming the variable's status exceeds the number of opposing studies by at least two

Clearly, further studies focusing on *weekly* headache are needed in order to ameliorate the existing research disparity and to extend current knowledge of related variables by confirming variables of tentative status, elucidating those of inconclusive status, and investigating potentially relevant variables that as yet have not been examined with regard to *weekly* headache.

Limitations pertaining to a number of the reviewed studies warrant comment. Some of the studies focused on a single headache type, migraine or tension-type headache, instead of investigating headache in general (Andrasik et al., 1988; Cunningham et al., 1987; Engström, 1992; Powers et al., 2003). In addition, a number of the studies investigated pediatric headache patients as opposed to non-clinical or population-based samples (Andrasik et al., 1988; Cooper et al., 1987; Maratos & Wilkinson, 1982; Mazzone et al., 2006; Powers et al., 2003; Smith et al., 2003). In the present review of headache research, utmost care was taken to indicate those studies that examined a subgroup of pediatric headache or employed a clinical sample. Nevertheless, the final conclusions were drawn on the basis of all of the reviewed studies in order integrate results from a maximal number of studies.

A final limitation concerns the comparison groups that were employed in the reviewed studies. In the majority of the studies, children with headache or *weekly* headache were compared only to a group of headache-free controls. Further controls groups (e.g., of children with a comparable disorder) were not employed. While comparisons of children with and without *weekly* headache allow for the identification of the variables that are relevant to *weekly* headache, they do not allow for determining whether the identified correlates are unique to *weekly* headache or common to a larger category that comprises pediatric headache as well as other comparable disorders (e.g., pediatric chronic illness or pediatric frequent non-headache pain). In other words, a further issue that needs to be addressed is the uniqueness, or specificity, of the potentially related variables.

## 2.5 Specificity

Specificity denotes the presence of a *unique* relationship between a given factor and a given outcome. Research that focuses on the question of uniqueness versus commonality can accordingly be termed specificity research. In an article on stress and psychopathology McMahon, Grant, Compas, Thurm, and Ey (2003) reviewed specificity from a theoretical perspective and described three different investigative approaches that have been utilized in specificity research. These approaches are illustrated in Figure 1.

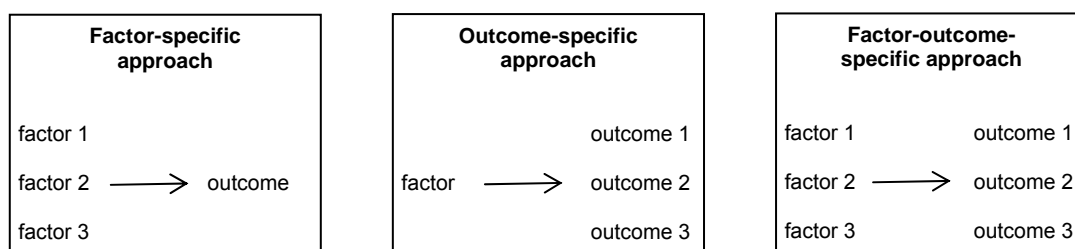
In the first of the three approaches, the *factor-specific approach*<sup>4</sup>, several potentially relevant factors and one outcome are examined. Using this approach, it is possible to determine the specificity of the potentially relevant factors in relation to the one outcome. However, since only one outcome is examined, it cannot be ruled out that the factors are related to other outcomes as well. In other words, it is not possible to determine the specificity of the outcome.

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<sup>4</sup> McMahon et al. (2003) use the term stressor specific in accordance with their focus was on stress and associated psychopathology. To enhance generalizability the term factor is used in this presentation in lieu of stressor.

In the *outcome-specific approach*, on the other hand, one potentially relevant factor and several different outcomes are examined. Using this approach, it is possible to determine the specificity of the outcomes in relation to the one factor. However, as only one factor is examined, it cannot be ruled out that the outcomes are related to other factors as well (i.e., it is not possible to determine the specificity of the factor).

Finally, in the *factor-outcome-specific approach*, a heterogeneous selection of potentially relevant factors and a number of different outcomes are examined. Using this approach, it is possible to determine the specificity of the relationships between potentially relevant factors and the different outcomes. It is also possible to determine relations between factors and outcomes that are common.



**Figure 1. Approaches used in specificity research (McMahon et al., 2003)**

McMahon et al. (2003) conclude that the *factor-outcome-specific approach* is the most comprehensive of the three approaches and can therefore be considered the optimal approach in specificity research. Garber and Hollon (1991) concur that specificity is typically investigated by comparing an outcome of interest with one or more other clinical outcomes in order to determine whether unique associations exist between the outcome of interest and the potentially relevant factors. The authors go on to describe two different types of specificity, broad and narrow specificity, and the corresponding requirements for the comparison outcome(s).

In *broad specificity* the question is whether a potentially relevant factor (e.g., a certain biological abnormality) is unique to the outcome of interest (e.g., unipolar depression) or whether it is common to all outcomes of a higher-order category which encompasses the outcome of interest (e.g., psychopathology). In *narrow specificity* the question is whether a potentially relevant factor is unique to the outcome of interest or common to other instantiations of a higher-order category (e.g., bipolar affective disorder, general anxiety disorder).

Garber and Hollon (1991) suggest that it is appropriate to begin specificity research in a given domain by first addressing the question of *broad specificity* while using a heterogeneous sample of other outcomes belonging to the same higher-order category. If a factor is found to be specific to the outcome of interest, it can be concluded that the factor is not simply a function of membership in the corresponding higher-order category. Once *broad specificity* has been determined, the question of *narrow specificity* then becomes relevant. In order to determine whether the feature is unique to the outcome of interest relative to other instantiations of the higher-order category, homogeneous control groups are necessary.

Transferred to the domain of *weekly* headache, *broad specificity* would be the question whether potentially relevant factors (e.g., anxiety, depression) are unique to *weekly* headache or are common to a higher-order category that encompasses *weekly* headache. *Narrow specificity* would pertain to the question whether potentially relevant factors are unique to *weekly* headache or common to other instantiations of the higher-order category.

The question is what higher-order category is appropriate for specificity research regarding pediatric *weekly* headache. To date, comparison groups from two higher-order categories have been employed in research on pediatric headache. A number of studies have compared children and adolescents with headache to those with pain at other locations (Cunningham et al., 1987; Egger, Costello, Erkanli, & Angold, 1999; Grøholt et al., 2003; Liakopoulou-Kairis et al., 2002), while several other studies have compared children with headache to children with chronic illness (Engström, 1992; Powers et al., 2003; Smith et al., 2003). Of these two possibilities, pediatric chronic illness appears the more appropriate higher-order category for the present research, as *weekly* headache and other chronic illnesses are health issues that affect the afflicted children and adolescents regularly. In order to verify pediatric chronic illness as a suitable higher-order category for *weekly* headache it seems fitting to look at chronic illness in more depth.

## 2.6 Chronic Illness

There is no one universally accepted definition for chronic illness (Perrin et al., 1993; Warschburger, 2000) and the breadth of health conditions that have been subsumed under this term has ranged from physical disease, over physical impairment, to mental disorders (Hoepner-Stamos, 1995; Newacheck & Taylor, 1992). Inherent in the term chronic illness, however, is chronicity and its implication of a lengthy duration. Accordingly, there is a consensus that chronic illnesses are health conditions that persist for an extended period of time.

Mattsson (1972, p. 801) defined chronic illness as “a disorder with a protracted course which can be progressive and fatal, or associated with a relatively normal life span despite impaired physical or mental functioning” and offered the following examples: asthma, epilepsy, cardiac conditions, cerebral palsy, and diabetes. Though emphasizing lengthiness of the condition, Mattsson (1972) proposed no specific duration threshold in his definition.

A concrete duration criterion was, however, proposed by Pless and Douglas (1971) in their characterization of chronic illness as “a physical, usually non-fatal condition which lasted longer than three months in a given year”. This proposed 3-month criterion has become the standard in the field of pediatric chronic illness research (Stein, Bauman, Westbrook, Coupey, & Ireys, 1993). In empirical studies, it has been implemented by ascertaining which, if any, of a prepared list of conditions was present in a child and whether the actual or expected duration of the condition exceeded 3 months (e.g., Gortmaker, Walker, Weitzman, & Sobol, 1990). Employing the 3-month definition, “*frequent or severe headache*” has been classified as a chronic illness together with 13 other chronic diseases (e.g., asthma, diabetes, arthritis, eczema) and 5 impairments (e.g., deafness and hearing loss, speech defects; Newacheck & Stoddard, 1994; Newacheck & Taylor, 1992).



Criticism has been voiced, however, that the 3-month duration criterion may allow for the misclassification of acute illness or injury as a chronic condition (Perrin et al., 1993; Stein et al., 1993). Several solutions for this problem have been suggested, e.g., the addition of an impairment criterion (Perrin et al., 1993), or the extension of the duration criterion to 12 months (Stein et al., 1993). Thus, one recent definition of chronic illness requires the presence of a condition with actual or expected duration of at least 12 months and associated consequences such as functional limitation, dependence on compensatory mechanisms, or elevated use of health care services (see Figure 2; Stein et al., 1993; Stein & Silver, 1999).

- Chronic pediatric health conditions are defined as disorders that:
1. Have a biological, psychological, or cognitive basis, *and*
  2. Have lasted or are relatively certain to last at least 12 months, *and*
  3. Produce one or more of the following sequelae:
    - a. Limitation of function, activities, or social role in comparison with healthy age peers in the general areas of physical, cognitive, emotional, and social growth and development
    - b. Dependency on one of the following to compensate for or minimize limitations of function, activities, or social roles:
      - (1) Medication
      - (2) Special diet
      - (3) Medical technology
      - (4) Assistive device
      - (5) Personal assistance
    - c. Need for medical care, psychological or educational services in excess of the usual for the child's age, or for special ongoing treatments, interventions, or accommodations at home or in school

**Figure 2. Noncategorical definition of pediatric chronic health conditions (Stein et al., 1993)**

It can be argued that pediatric headache that occurs at least once a week over a time span of 6 months qualifies as a chronic illness on the basis of duration, as the time span of 6 months lies in the middle ground between the proposed duration criteria of 3 months (Perrin et al., 1993; Pless & Douglas, 1971) and 12 months (Stein et al., 1993). Furthermore, as recurrent pediatric headache has been found to be associated with functional disability (Connelly, 2003; Holden, Deichmann, & Levy, 1999; Luka-Krausgrill & Reinhold, 1996; McGrath, 2001) and increased usage of health care services (Connelly, 2003; Luka-Krausgrill & Reinhold, 1996; McGrath, 2001), it also fulfills the impairment criterion and thus clearly warrants classification as a chronic illness. Therefore, in the present research, pediatric headache occurring at least once a week over a time span of 6 months is considered to be a chronic illness.

Consequently, pediatric chronic illness (comprising such illnesses as asthma, atopic dermatitis, and diabetes) is considered to be the appropriate higher-order category with which pediatric weekly headache can be compared in order to determine the *broad specificity* of its correlates. As previously mentioned, several pediatric headache studies

have employed a chronic illness comparison group. These studies will be the focus of the next section.

## 2.7 Specificity Research Regarding Pediatric Headache

Three studies have been conducted, to date, that have examined pediatric headache in comparison to other chronic illnesses. These studies offer information regarding the specificity of variables related to headache, though they were not explicitly designated as “specificity” studies.

Powers et al. (2003) compared the functioning of consecutive migraine patients at a headache clinic (aged 2 to 18) to preexisting normative data on children and adolescents with cancer, rheumatoid conditions, and healthy controls in the first study. Parent and child report<sup>5</sup> on four domains of functioning (i.e., physical, emotional, social, school) were examined. The authors also looked at psychosocial functioning (aggregate measure of emotional, social, and school functioning) and functioning in general (aggregate measure over all four domains).

In comparison to healthy controls, migraineurs were found to exhibit significantly lower general and psychosocial functioning, and lower functioning in each of the four domains, in both parent and child report. The comparison with children and adolescents with chronic illnesses yielded more complex results: On the basis of child report, migraineurs did not differ from children and adolescents with cancer or rheumatoid conditions with regard to general or psychosocial functioning, but they reported significantly higher physical and social functioning, and significantly lower school and emotional functioning than the other two chronic illness groups. Parent report yielded equivalent results regarding general and psychosocial functioning, as well as physical and social functioning. In the other two domains (school and emotional) migraineurs functioning was rated as lower than that of children with cancer, but similar to that of children with rheumatoid conditions.

In the second study, clinic-referred adolescents with migraine or chronic fatigue syndrome (aged 11 to 18) were compared to healthy controls (Smith et al., 2003). For the analyses, the authors differentiated between chronic fatigue syndrome as defined by the Centers for Disease Control and Prevention (CDC-CFS) and idiopathic chronic fatigue syndrome not fulfilling all CDC criteria (I-CFS).

The results indicated that adolescents with migraine and CDC-CFS had significantly higher anxiety scores than those with I-CFS or healthy controls. Depression scores were elevated in CDC-CFS in comparison to all other groups, which did not differ from one another. With regard to somatization, adolescents CDC-CFS reported significantly more symptoms than all others, but adolescents with migraine and I-CFS reported more symptoms than healthy controls.

In the final of the three studies, Engström (1992) compared children and adolescents with chronic illnesses (*weekly* tension-type headache, inflammatory bowel disease [IBD], and

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<sup>5</sup> For children age 2 to 4 only parent report was assessed.

diabetes) with one another and with healthy controls. Parent and child report on a number of questionnaires were examined.

Psychiatric interviews were conducted with the children and adolescents in order to determine whether the DSM-III-R criteria for a mental disorder were fulfilled. While children with IBD had a mental disorder significantly more often than healthy controls, those with *weekly* headache and diabetes did not differ significantly from IBD, each other, or healthy children. Accordingly, children with IBD scored significantly higher on a scale of emotional maladjustment than healthy controls. Children with *weekly* headache and diabetes did not differ significantly from IBD, each other, or healthy children.

Symptoms of depression assessed via questionnaire were significantly higher in children with *weekly* headache and IBD than in healthy controls, but did not differ from children with diabetes. Children with *weekly* headache also reported more symptoms of anxiety than healthy controls, though there was no difference in comparison to the other chronic illness groups. On the level of constituent anxiety subscales, children with *weekly* headache reported significantly more physiological anxiety than children with IBD or healthy controls, but did not differ from those with diabetes. No differences between groups were found on the scales Worry and Oversensitivity, and Concentration Anxiety.

Children with *weekly* headache did not differ from those with other chronic illnesses or healthy controls with regard to externalizing. However, they and children with IBD had elevated internalizing scores in comparison to healthy controls, though they did not differ from one another or from children with diabetes<sup>6</sup>. Children with IBD scored significantly lower on the composite Social Competence scale than healthy controls, but did not differ from children with *weekly* headache or diabetes. No other comparisons yielded significant results. On the level of the constituent subscales of Social Competence, children with *weekly* headache and IBD scored significantly lower on the Activities subscale than healthy controls, but did not differ from children with diabetes or from one another. There were no significant differences with regard to the subscales Social or School.

Children with *weekly* headache and IBD also reported significantly lower self-esteem than healthy controls, but did not differ from children with diabetes. Subscales of the instrument focused on different areas of self esteem. On this level, children with *weekly* headache and IBD reported significantly lower self-esteem regarding Mental Characteristics and Relations with Others in comparison to healthy controls. No differences were found on the subscales Physical Characteristics, Skills and Talents, and Relations with Parents.

Altogether, the results of the two comparative studies that focused on migraine can be summarized as follows: Impairment in school functioning and in emotional functioning were found to be specific to children and adolescents with headache (Powers et al., 2003), while anxiety (Smith et al., 2003), and impairment in psychosocial and general functioning (Powers et al., 2003) were found to be common to both headache and other chronic illness. Finally, somatization (Smith et al., 2003), depression (Smith et al., 2003), and impairment in

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<sup>6</sup> Engström (1992) also compared the groups with regard to the gender-specific, empirically derived subscales of the Child Behavior Checklist (CBCL). This data, however, will not be presented here, as the empirically derived subscales do not lend themselves to integration with the previously covered studies which opted for the evaluation of symptom subscales.

social functioning (Powers et al., 2003) were determined to be more specific to other chronic illness than to headache. However, none of the results are conclusive, as only one study per variable addressed the question of specificity. Therefore, confirmation of the results is needed before tentative conclusions can be drawn. Furthermore, both studies are employed clinical samples and focused on migraine alone, thus limiting the generalizability of the result to the whole of pediatric headache.

With regard to *weekly* headache Engström (1992) identified five variables as being common to *weekly* headache and to at least one of the examined chronic illnesses. The common variables were anxiety, depression, internalizing, fewer recreational activities, and lower self-esteem. No variables were identified as being specific to *weekly* headache or to one of the other chronic illnesses. Once again, these results are not to be considered as being conclusive, as only one study investigated the specificity of the variables for *weekly* headache. Before tentative conclusions can be drawn, the results must be confirmed in further research. In addition, the study focused on *weekly* tension-type headache as opposed to *weekly* headache in general. Furthermore, the study is limited by the small size of the comparison groups (n=20).

Though three studies, to date, have employed a comparison group of children and adolescents with chronic illness, two focused on migraine without regard to headache frequency and the third investigated only *weekly* tension-type headache. None of the studies addressed the specificity of variables related to *weekly* headache. In addition, all three studies investigated narrow rather than broad specificity, though the latter has been suggested as the appropriate type of specificity to initially study (Garber & Hollon, 1991). The present research aims at filling the gap by addressing the question of *broad specificity* with regard to *weekly* headache.

## 2.8 Objectives of the Present Research

The health of children and adolescents as a whole has been found to give cause for concern (Hurrelmann et al., 2003) and there are substantial grounds for considering children and adolescents with *weekly* headache to be a subgroup warranting particular concern: *Weekly* headache is common (Laurell et al., 2004; Passchier & Orlebeke, 1985) and on the rise (Rhee, 2000), has been found to persist over time (Brattberg, 1994; Schmidt et al., 1992; Virtanen et al., 2002), and appears to be a stepping stone on the path to physical and psychiatric symptoms in adulthood (Fearon & Hotopf, 2001).

Clearly, there is a demand for interventions targeting *weekly* headache. Sufficient knowledge of the biological, psychological, and social factors associated with *weekly* headache is required as the basis upon which such interventions can be developed. However, the current status of knowledge regarding *weekly* headache does not suffice: The vast majority of studies that have examined potentially relevant variables have focused on headache in general or different types of headache. Only a limited amount of research has focused on *weekly* headache. In addition, the majority of the variables that have been investigated with regard to *weekly* headache are of either tentative or inconclusive status (see Table 3).

Furthermore, almost all studies that have examined variables potentially relevant to headache have compared children with headache to those without. The few exceptions to this rule have implemented comparison groups of children and adolescents with pain at other locations (Cunningham et al., 1987; Egger et al., 1999; Grøholt et al., 2003; Liakopoulou-Kairis et al., 2002) or with chronic illness (Engström, 1992; Powers et al., 2003; Smith et al., 2003). The latter three studies were described in some detail, as chronic illness was deemed the appropriate comparison group for *weekly* headache. However, none of these studies examined *weekly* headache in general, nor did they employ comparison groups of children with heterogeneous chronic illnesses. Instead comparison groups that were homogeneous to a particular chronic illness were implemented (see section Specificity Research Regarding Pediatric Headache). Thus, all three studies investigated narrow rather than broad specificity.

The present research aims at extending the currently limited knowledge of variables related to *weekly* headache by investigating variables of tentative and inconclusive status, as well as potentially relevant variables that, as yet, have not been examined in studies on *weekly* headache. Variables of conclusive status will also be examined in order to determine the relative importance of the individual variables for *weekly* headache. In total, a broad range of variables coming from all of the depicted variable domains will be investigated (see section Correlates of Pediatric Headache).

In addition the present research aims at investigating the *broad specificity* of the variables related to *weekly* headache by comparing children and adolescents with *weekly* headache to a group of children and adolescents with diverse chronic illnesses (e.g., asthma, atopic dermatitis, diabetes). However, in order to allow for identification of variables (1) specific to *weekly* headache, (2) common to chronic illnesses including *weekly* headache, and (3) specific to chronic illness other than *weekly* headache, it is necessary to identify the variables related to chronic illness (vs. good health) prior to the direct comparison of children and adolescents with *weekly* headache to those with other chronic illnesses.

In sum, the objectives of the present research are

- to identify variables related to *weekly* headache by comparing children and adolescents with *weekly* headache to those in good health,
- to identify variables related to chronic illness (excluding *weekly* headache) by comparing a heterogeneous group of children and adolescents with diverse chronic illnesses (e.g., asthma, atopic dermatitis, diabetes) to those in good health,
- and finally to determine the specificity of the variables related to *weekly* headache by comparing children and adolescents with *weekly* headache to those with chronic illness (excluding *weekly* headache).

### **3. METHODS**

#### **3.1 The Children, Adolescents & Headache Study**

The present research was conducted within the framework of the Children, Adolescents & Headache Study (Kinder, Jugendliche & Kopfschmerz), an ongoing longitudinal study funded by the German Ministry of Research and Education (Bundesministerium für Bildung und Forschung, BMBF; Förderkennzeichen 01EM0521). The Children, Adolescents & Headache Study is one of a number of BMBF-funded research projects that are collaboratively united within the German Headache Consortium (Deutsches Kopfschmerz-Konsortium).

The objectives of the Children, Adolescents & Headache Study include the assessment of headache prevalence in German children and adolescents, the identification of biopsychosocial risk factors for recurrent and chronic headache, and the analysis of change in headache status (e.g., spontaneous recovery, development of chronic headache) over a period of four years. Results will be analyzed for their utility in the development of preventive programs targeting recurrent and chronic pediatric headache.

The Children, Adolescents & Headache Study is conceptualized as a longitudinal postal survey with four annual waves. The first wave of the study took place from October 2003 to January 2004. Questionnaires were mailed out to a random sample of households with a child between 7 and 14 years of age. Parent questionnaires were sent to all households in the sample. Child questionnaires were sent to households with a child age 9 or older.

#### **3.2 Sample**

The sample size necessary for the stated objectives of the Children, Adolescents & Headache Study was ascertained with the help of the Institute for Medical Informatics, Biometry and Epidemiology at the University of Duisburg-Essen. Conservative estimates for the prevalence of headache per age group of children and adolescents and an estimated nonresponse rate of 40% and were taken into account in the calculation. This procedure was implemented to ensure adequate sample size for the calculation of reliable age-specific prevalence rates and for the identification of risk factors for chronic pediatric headache.

According to the calculation, the total sample size needed for the Children, Adolescents & Headache Study comprised 8,800 households. For the youngest subjects (7- to 10-year-olds) 1,200 households per age group were determined necessary, and for the older subjects (11- to 14-year-olds) 1,000 households per age group. This difference reflects expected increases in headache prevalence with age, as the higher the expected headache rate (based on the literature), the smaller the required sample size in order to reliably determine prevalence within the study.

The sample of 8,800 households was randomly selected from community registries in four districts of southern Lower Saxony and the city of Hannover. German citizenship was required for inclusion in the sample. This criterion was selected as the best estimate of German language capability available in the data of the community registries. The Southern

Lower Saxony Center for Municipal Data Administration (Kommunale Datenverwaltungs-zentrale Südniedersachsen) performed the random selection and subsequent compilation of data sets for the districts of Göttingen, Holzminden, Osterode and Northeim after receiving approval from the constituent community registries. The community registry of the city of Hannover performed the random selection and compilation of data sets for Hannover. The complete data set (southern Lower Saxony and Hannover) was manually checked for multiply drawn households. If a specific household was drawn for more than one age group, a substitute household was obtained from the applicable registry.

### **3.3 Questionnaire Development and Pretesting**

A detailed search of the literature on headache in children and adolescents, and related biopsychosocial correlates and risk factors served as the foundation for the selection of variables for assessment in the Children, Adolescents & Headache Study. The following nine variable domains were determined relevant for the study:

- sociodemographic variables,
- child psychological variables,
- child health variables,
- family variables,
- school variables,
- leisure variables,
- life events,
- parental psychological variables,
- parental health variables.

Assessment measures utilized in headache studies were reviewed with regard to psychometric properties, and German translations or alternative German-language measures were identified. Standard instruments tapping relevant variables were also examined. When possible, items or scales from psychometrically validated and/or frequently employed measures were selected for questionnaire inclusion. Some items and scales were translated into German for the questionnaire, and several further items were developed specifically for the study. The result was a first draft of the parent questionnaire and the child questionnaire.

Rigorous pretesting of the questionnaires and the planned study method was conducted following the testing phases delineated by Dillman (2000). A first draft of the questionnaires was reviewed by project coordinators, knowledgeable colleagues, and analysts with regard to aspects of comprehension, question-response-fit, age-appropriateness and statistical analysis. On this basis of the illicit feedback, a second draft of the questionnaires was completed.

In the second phase of pretesting, 10 children of the appropriate age range and one parent of each child completed the respective questionnaire under observation of the researchers, who noted any subject behavior indicative of possible comprehension problems (e.g., hesitation, confused expression, making corrections). Questions requiring long deliberation were also noted. Following questionnaire completion, retrospective interviews concerning these issues were conducted with the subjects. The noted possible comprehension problems were queried, as were item comprehension in general,

comprehension of instruction sheet, and attractiveness of questionnaire and auxiliary survey material (e.g., cover letter, instruction sheet, logo, envelope, return envelope). The child questionnaire proved to be too time consuming and difficult for the youngest subjects. As a result it was decided (1) to forgo administration to 7- and 8-year-olds and (2) to administer a shortened version to 9- and 10-year-old children. A third draft of the assessment measures (parent questionnaire, child questionnaire for 9- and 10-year-olds, child questionnaire for 11- to 14-year-olds) was then developed.

In the third phase of pretesting, a pilot study was conducted in order to evaluate the planned procedure for the survey in every methodological respect. A random sample of 100 households with children aged 7 to 14, selected from the community registry of the city of Göttingen, was contacted (postal survey). The response rate was high (82%). Questionnaire items were analyzed with regard to missing values and to response consistency. A number of questionnaire items were modified as a result. It was possible to shorten the adult questionnaire. Subsequently, the fourth draft of the questionnaires was completed.

In the fourth and final phase of pretesting, six colleagues, who had not been involved in the questionnaire development, double checked the questionnaires. The final draft of the parent questionnaire consisted of 111 items and a total of 28 pages. The child questionnaire for 9- and 10-year-old comprised 35 items, the child questionnaire for 11- to 14-year-olds 43 items. Both child questionnaires were 12 pages long. The parent questionnaire and other relevant study materials can be found in Appendix B.

### **3.4 Operationalization of the Outcome Variables Weekly Headache, Chronic Illness, and Good Health**

The objectives of the present research are

- to identify the correlates of *weekly* headache by comparing children and adolescents with *weekly* headache to those in good health,
- to identify the correlates of other chronic illness by comparing children and adolescents with other chronic illnesses to those in good health, and finally
- to determine the specificity of the variables related to *weekly* headache by comparing children and adolescents with *weekly* headache to those with other chronic illnesses.

In order to focus on these three groups, children and adolescents with other health conditions (e.g., impairments or disabilities) had to be excluded, as did children and adolescents with comorbid *weekly* headache and other chronic illness. Therefore, the three health status groups of interest were defined as follows: *Weekly* headache was defined as (1) the presence of headache episodes occurring at least once a week in the past six months, (2) the absence of impairment or disability, and (3) the absence of any other chronic illness. Chronic illness was defined as (1) the presence of a chronic illness, (2) the absence of impairment or disability, and (3) headache occurring less than once a month. Good health was defined as (1) the absence of impairment or disability, (2) headache occurring less than once a month, and (3) the absence of chronic illness.

Several questionnaire items asked about child's headache. A gate question asked whether the child had experienced headache in the past six months. If this initial question



was answered with “no” or “don’t know”, the parent was instructed to skip the section on child’s headache and continue with the next section of the questionnaire. If the gate question was answered with “yes”, a number of questions regarding the child’s headache were to be completed. A mixed format question, combining multiple choice and fill in the blank, queried the frequency of child’s headache. The parent was asked to check the appropriate frequency category (“at least once a week”, “at least once a month, but less than once a week”, or “less than once a month”) and then to specify the absolute number of headache episodes in the appropriate time span (per week, per month, or per six months). This information allowed the calculation of the absolute number of child’s headache episodes in the past six months. If the specific number of headache episodes was not reported, a conservative estimate of one headache episode per given time span was made (e.g., if the frequency category of “at least once a week” was checked but the absolute number of episodes per week not reported, a value of 1 headache episode per week was assumed, equaling 26 headache episodes in the past six months). In some cases, the frequency category was left missing but the absolute number of headache episodes was reported. Therefore, the absolute number of headache episodes in the past six months was used to re-categorize for headache frequency into the following four groups (“*weekly* headache”, “*monthly* headache”, “*seldom* headache”, “*no* headache”). Additionally, the frequency was recoded into a new variable indicating whether the child had experienced chronic headache, defined as headache at least once a week in the past six months. Values for this variable were scored “no” (0) and “yes” (1).

Impairments and disabilities were assessed with items asking whether the following conditions were present: (a) delayed development or mental retardation, (b) hearing impairment or deafness, (c) communication disorder/s, (d) vision impairment or blindness. Values were scored “no” (0) and “yes” (1).

Chronic illness was assessed with items asking whether the child had the following chronic illnesses: (a) asthma, (b) atopic dermatitis, (c) epilepsy, (d) congenital heart disease, (e) inflammatory bowel disease, (f) chronic kidney disease, (g) muscle diseases, (h) juvenile rheumatoid arthritis, (i) diabetes, (j) other. Values were scored “no” (0) and “yes” (1).

### **3.5 Operationalization of the Potentially Relevant Biopsychosocial Variables**

The biopsychosocial variables investigated in the present research are shown in Table 4 together with the domain to which they belong. Some operationalizations were taken from psychometrically validated instruments. The sources are listed in the right-hand column of Table 4. Other operationalizations were generated during questionnaire development. Detailed information regarding the operationalization of the variables will be provided in the subsequent sections.

**Table 4. Overview of variable domains, potentially relevant variables, and their source**

Domain	Variable	Source
Control variables	Age	Community registry
	Gender	
Sociodemographic variables	Socioeconomic status	Winkler Index
	Household crowding	Number of household members / Number of rooms
Child psychological variables	Habitual coping strategies	German Coping Questionnaire for Children and Adolescents (SVF-KJ)
	Anger expression	State-Trait Anger Expression Inventory (STAXI)
	Anxiety / depression	Child Behavior Checklist (CBCL)
	Aggressive behavior	Child Behavior Checklist (CBCL)
	Hyperactivity	Child Behavior Checklist (CBCL)
	Sleep disturbance	
Child health variables	Pain other than headache	
	Other somatic complaints	
Family variables	Number of parents in household	
	Number of children in household	
	Negative family environment	Mannheim Parent Interview (MEI)
	Negative conflict solving strategies	
	Weekly family conflict	Mannheim Parent Interview (MEI)
School variables	School difficulties	
	Time spent on homework	
	School stress	
	Reaction to failure	Hamburger Personality Questionnaire for Children (HAPEF-K)
Leisure variables	Physical activities	
	Recreational activities	
	Amount of free time	
	Time spent on TV / videos	
	Time spent on computer / game console	
	Amount of good friends	
Life events	Life events	
Parental psychological variables	Anxiety / depression	Child Health Questionnaire - Parent Report (CHQ-PF50)
	Anxiety	
	Depression	
	Habitual worry	Penn State Worry Questionnaire (PSWQ)
	Sleep disturbance	
Parental health variables	General health	
	Doctor appointments	
	Regular medication	
	Headache	
	Pain other than headache	
	Other somatic complaints	

The psychometrically validated scales were abridged for the present research. Length constraints associated with a large-scale epidemiological survey such as the Children, Adolescents & Headache Study made this necessary. Research has shown that response rates have a tendency to decline the more extensive and time consuming the questionnaire (Dillman, 2000). Therefore, in order to cover a broad range of potentially relevant variables the number of items per variable had to be limited.

In addition, original response categories were modified to a five point Likert scale, when possible. This adaptation was performed in order to simplify completion of the questionnaire and reduce potential errors.

### **3.5.1 Age and Gender**

The data sets compiled by the Southern Lower Saxony Center for Municipal Data Administration and Hannover's community registry included child's age at time of sample selection and child's gender. Additionally, child's date of birth and gender were inquired in the parental questionnaire. This "redundant" information made it possible to determine through cross-checking, whether the data in the questionnaire referred to the intended child. Since date of questionnaire completion was not documented, age at time of sample selection was selected as the relevant operationalization of child's age for the statistical analyses.

As substantial research has indicated age and gender to be relevant to both pediatric headache and pediatric *weekly* headache, and as age and gender effects are not uncommon in the further potentially relevant biopsychosocial variables, age and gender will be treated as control variables in the present research.

### **3.5.2 Sociodemographic Variables**

The first item of the parent questionnaire assessed the constellation of the child's primary caregivers and allowed for the differentiation between (a) two biological parents, (b) biological parent plus significant other, (c) single biological parent, (d) adoptive or foster parents, (e) grandparents or other relatives, or (f) home or institution. A further item assessed which caregiver completed the questionnaire: (a) mother, (b) father, (c) both, (d) grandparents or other relatives, (e) other caregiver. On the basis of these items, it was possible to determine whether the family, parental psychological and parental health variables should be included in the analyses. These variables were only included if the person completing the questionnaire was the child's (biological or other) parent.

Household socioeconomic position was selected as the measure of social class to be used in the analyses. Socioeconomic position in two-parent households was determined according to the "dominance approach", i.e., by equating household class "with the most dominant and powerful individual class position in the household, regardless of gender" (Krieger, Williams, & Moss, 1997, p. 352). In order to compute socioeconomic status using the Winkler index (Winkler, 1998) questions regarding the parents' level of educational, occupational prestige and the household net income were included in the questionnaire. Missing values on one of the constituent variables (education, occupational status, net

income) were substituted by the mean of the other two constituent variables. If two variables were missing, the Winkler index was not computed.<sup>7</sup>

Household crowding was assessed via an item asking about the number of rooms in the household (excluding the bathroom/s) and an item asking about the number of people living in the household. The household crowding index was calculated by dividing the number of household residents by the number of rooms in the household.

### **3.5.3 Child Psychological Variables**

Child's maladaptive stress coping strategies were assessed using items from the German Coping Questionnaire for Children and Adolescents (Stressverarbeitungsfragebogen für Kinder und Jugendliche, SVF-KJ) from Hampel, Petermann, and Dickow (2001). The subscales Passive Avoidance, Rumination, Resignation, and Aggression were selected for inclusion in the parental questionnaire. Internal consistencies for the subscales have been described as ranging from .74 for Aggression to .86 for Rumination (Hampel et al., 2001). The maladaptive coping strategies have been shown to correlate positively with psychological distress and negatively with psychological well-being. A moderate intercorrelation of the subscales ( $r=.38$  to  $r=.58$ ) has also been reported (Hampel et al., 2001). The original instructions, which differentiated between interpersonal stress situations and academic stress situations, were combined to enable direct assessment of cross-situational coping. Item formulations were reworded for parent rating and while the five-point Likert scale was retained, the response labels were modified from 1 ("not at all") to 5 ("in any case") to range from 1 ("never") to 5 ("always"). For each of the scales, 2 of the original 4 items were selected for inclusion on the basis of item content and factor loading. To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 2 to 10; the higher the score, the more prevalent the particular maladaptive coping strategy.

Child's mode of anger expression (e.g., the tendency to generally hold anger in, to express anger outwardly, or to remain calm and control anger) was assessed using items from the State-Trait Anger Expression Inventory (STAXI) from Spielberger (1988) and in German translation from Schwenkmezger, Hodapp and Spielberger (1992). The following three subscales were employed: Anger-Out, Anger-In, Anger Control. For these anger expression scales internal consistencies ranging from .73 to .89 have been reported (Schwenkmezger et al., 1992). For each of the subscales, 2 of the original 8 items were selected for inclusion on the basis of item content and factor loading. Item formulations were reworded for parent rating and the response categories of the items were modified from a 4-point Likert scale from 1 ("almost never") to 4 ("almost always") to the standard five-point scale of the questionnaire from 1 ("never") to 5 ("always"). Though "don't know" was also offered as a response category (=6) in the parent questionnaire, it was treated as a missing value in the analyses. To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in

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<sup>7</sup> The Robert Koch Institute courteously provided the necessary questions and analysis syntax.

the parent questionnaire. Total sum scores for each subscale ranged from 2 to 10; the higher the score, the greater tendency to engage in that particular mode of anger expression.

Items from the Anxious/Depressed subscale of the Child Behavior Checklist (CBCL) from Achenbach (1991) in German translation (Arbeitsgruppe Deutsche Child Behavior Checklist, 1998) were employed to assess child's anxiousness and depressivity. For the German version of this subscale Cronbach's alphas of .83 to .89 have been reported (Döpfner, Schmeck, Berner, Lehmkuhl, & Poustka, 1994). Eight of the original 16 items were selected for inclusion on the basis of item content and factor loading. Items assessing suicidal ideation and behavior were excluded. The response categories were modified to a five-point Likert scale from 1 ("never") to 5 ("always"). To minimize the effect of skipped items, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 8 to 40; the higher the score, the more anxious and depressed the child.

Items from the Aggressive Behavior subscale of the CBCL (Achenbach, 1991) in German translation (Arbeitsgruppe Deutsche Child Behavior Checklist, 1998) were employed to assess child's aggressive behavior. For the German version of this subscale Cronbach's alphas of .89 to .83 have been reported (Döpfner et al., 1994). Three of the original 19 items were selected for inclusion on the basis of item content and factor loading. Again, the response categories were modified to a five-point Likert scale from 1 ("never") to 5 ("always"). To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 3 to 15; the higher the score, the more aggressive the child's behavior.

Items from the Attention Problems subscale of the CBCL (Achenbach, 1991) in German translation (Arbeitsgruppe Deutsche Child Behavior Checklist, 1998) were employed to assess child's hyperactivity. The Cronbach's alphas reported for this subscale ranged from .81 to .84 (Döpfner et al., 1994). Three of the original 9 items were selected for inclusion on the basis of item content and factor loading. Items that focused on symptoms of hyperactivity were selected in particular. Once again, response categories were modified to a five-point Likert scale from 1 ("never") to 5 ("always"). To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 3 to 15; the higher the score, the stronger the child's hyperactivity.

In a single question the frequency of child sleep disturbance was assessed. Values were scored from 1 ("never") to 5 ("always").

#### **3.5.4 Child Health Variables**

Child's pain other than headache was assessed via two questions that asked about the frequency of stomach pain and back pain in the past three months. Values were scored from 1 ("never") to 5 ("always"). Total sum scores ranges from 2 to 10; the higher the score, the more frequent the other pain.

Other somatic complaints were assessed via six questionnaire items that asked about the frequency of (a) lack of appetite, (b) dizziness, (c) constipation, (d) nausea or vomiting (in the absence of headache), (e) travel sickness, (f) tiredness/fatigue. Values were scored from 1 (“never”) to 5 (“always”). Total sum scores ranges from 6 to 30; the higher the score, the larger the number and/or the more frequent the occurrence of other somatic complaints. The sum was calculated only for cases without missing data on any of the six items.

### **3.5.5 Family Variables**

One item of the questionnaire asked about the number of other children residing in the household. These could be biological siblings, adoptive, half- or step-siblings. The original question required the parent to report whether the child was an only child, and if not to indicate how many older, younger, and same aged children lived in the household. The answers to these questions were summed in order to calculate the total number of other children residing in the household.

Negative family environment was assessed with three items, which were based on the Mannheim Parent Interview (Mannheimer Elterninterview, MEI) from Esser, Blanz, Geisel and Laucht (1989). In the original version these questions focused on the parental relationship. The wording was modified to tap family relationships in general. The frequency with which the family had enough time for one another, engaged in satisfying familial activities, and spoke about problems and worries was assessed. Values were scored from 1 (“never”) to 5 (“always”). Prior to calculation of the total sum, all questions were coded inversely to facilitate interpretation of negative family environment. To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 3 to 15; the higher the score, the more negative the family environment.

Negative conflict solving strategies were assessed using three items. The questions asked (a) whether the family tries to solve problems by talking about them, (b) whether they fight loudly with one another, or (c) whether when the family fights “plates sometimes fly”. The first question was coded inversely for consistency. Values were scored from 1 (“never”) to 5 (“always”). To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 3 to 15; the higher the score, the more negative the familial problem solving strategies.

The presence of weekly fights in the family was assessed using an item which was based on the Mannheim Parent Interview (Esser et al., 1989). The item asked how often fights had occurred in the past three months in the family, with “daily”, “several times a week”, “once a week”, “more seldom”, and “never” as response categories. The frequency was recoded into a new variable for analyses which indicated whether fights had occurred on a weekly basis. Values were scored from 0 (“no”) to 1 (“yes”).

### **3.5.6 School Variables**

School difficulties were assessed via questions that asked whether the child had the following four school-related problems: (a) being held back / repeating a grade, (b) having

learning difficulties or other school problems, (c) deteriorating school performance, (d) potentially jeopardized passing of required courses. Values for each item were scored from 0 (“no”) to 1 (“yes”). An index was created by summing the presence of the four school difficulties. Index scores ranged from 0 to 4; the higher the score was, the larger the extent of school difficulties.

Time spent on homework was assessed via a single question asking how much time the child spent on homework per day. The response categories were “up to 1 hour”, “1 to 2 hours”, “2 to 3 hours”, and “more than three hours”.

School stress was assessed via six questionnaire items that asked about the frequency of the following potentially stressful school experiences: (a) negative school climate, (b) being academically over-challenged, (c) being teased or bullied by other students, (d) being alone or isolated in school, (e) being afraid of school or of certain teachers, (f) being bored or academically under-challenged. Values were scored from 1 (“never”) to 5 (“always”). Though the response category “don’t know” was offered as a response category, it was treated as a missing value in the analyses. To minimize the effect of skipped items, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 6 to 30; the higher the score, the more frequent the child’s school stress.

Items from the Reaction to Failure scale of the Hamburg Personality Questionnaire for Children (Hamburger Persönlichkeitsfragebogen für Kinder, HAPEF-K) from Wagner and Baumgärtel (1978) were employed to assess child’s neurotic reaction to failure. The Reaction to Failure scale has an internal consistency reported to range from .82 to .84, and has been shown to correlate positively with measures of test anxiety, effort avoidance and manifest anxiety (Wagner & Baumgärtel, 1978). Three of the original 11 items were selected for inclusion on the basis of item content and factor loading. The item formulations were reworded for parent response. The original six-point Likert scale for item response from 1 (“always or almost always”) to 6 (“never or almost never”) was modified to a five-point Likert scale from 1 (“never”) to 5 (“always”). To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 3 to 15; the higher the score, the stronger the child’s neurotic reaction to failure.

### **3.5.7 Leisure Variables**

Physical activities were assessed via items that inquired how often the index child engaged in the following physical activities per week outside of school physical education: (a) cycling, (b) ball games (e.g., volleyball, soccer), (c) swimming, (d) racquet sports (e.g., tennis, badminton), (e) gymnastics, (f) track and field athletics, (g) outdoor physical activities (e.g., running, climbing), (h) dancing, (i) horseback riding, (j) skating (e.g., inline skates, skateboard). The response categories were “less than once a week”, “1 to 2 times a week”, “3 to 5 times a week”, “more than 5 times a week”, and “my child does not engage in this physical activity”. The response categories were given the values 1 thru 4 and 0, respectively. An index for the amount and frequency of physical activity was calculated by summing the values for each of the physical activities.

Other recreational activities were assessed via items that asked how often the index child engaged in the following other activities per week outside of school: (a) reading, (b) painting/drawing/handicrafts, (c) listening to music, (d) playing an instrument. The response categories were “less than once a week”, “1 to 2 times a week”, “3 to 5 times a week”, “more than 5 times a week”, and “my child does not engage in this activity”. The response categories were given the values 1 thru 4 and 0, respectively. An index for the amount and frequency of these other activities was calculated by summing the values for each of the other activities.

A single question asked how often the child had free time with the response categories “never”, “seldom”, “sometimes”, “often”, “always” and “don’t know”. The category “don’t know” was treated as a missing value in the analyses. The remaining response categories were considered to be continuous with values from 1 (“never”) to 5 (“always”).

The amount of time spent on electronic media daily was assessed (a) for television and videos and (b) for computer, internet, and game consoles. The response categories were “not at all”, “less than 30 minutes”, “about 30 to 60 minutes”, “about 1 to 2 hours”, “about 3 to 4 hours”, “more than 4 hours”. The response categories are considered to be continuous for the analyses with values ranging from 1 (“not at all”) to 6 (“more than 4 hours”).

A single mixed format question, combining multiple choice and fill in the blank, queried the number of good friends the child has. The parent was asked to check the appropriate amount category (“no good friends”, “one good friend”, “more than one good friend”, “don’t know”) and then to specify the absolute number of good friends, if the category “more than 1” was checked. This information allowed the calculation of the absolute number of child’s good friends. The response category ‘don’t know’ was considered a missing value. For the analyses the absolute number of friends was grouped into the following categories: “no or one good friend”, “2 to 5 good friends”, and “6 or more good friends” with corresponding values ranging from 1 to 3.

### **3.5.8 Life Events**

Life events were assessed via questions that asked whether, in the past five years, the index child had (a) been in a home or at boarding school, (b) changed schools (other than normal change from primary school to secondary school), (c) experienced the loss of a family member or other significant person (through death, divorce, relocation), (d) experienced gaining a new family member (birth of a sibling, new significant other of parent). Further items inquired whether there had been (e) a severe accident in the family in the past five years, (f) chronic somatic illness with severe impairment in the family, (g) a high financial burden, or (h) home caregiving. Values were scored from 0 (“no”) to 1 (“yes”). An additional fill-in-the-blank item regarding in-patient treatment queried the absolute number of nights the child had spent in in-patient treatment in the past 12 months. For the purpose of the life event index the response was categorized into presence of in-patient treatment in the past 12 months 0 (“no”) to 1 (“yes”). Finally, a life event index was calculated by summing the presence of the individual life events. Index scores ranged from 0 to 9; the higher the score, the more life events experienced.



### **3.5.9 Parental Psychological Variables**

Parental anxiety and depression was assessed with the Parental Mental Health scale of the Child Health Questionnaire - Parent Report (CHQ-PF50) from Landgraf et al. (1998). Values were scored from 1 (“never”) to 5 (“always”). To minimize the effect of skipped items, the sum was calculated as the product of the mean item value and the corresponding number of items answered. Total sum scores ranges from 5 to 25; the higher the score, the more symptoms of anxiety and depression were present.

The frequency of parental anxiety and depressed mood were also assessed directly with two corresponding items. Values were scored from 1 (“never”) to 5 (“always”).

Parental habitual worry was assessed with items of the Penn State Worry Questionnaire (PSWQ) from Meyer, Miller, Metzger and Borkovec (1990) in German translation (Stöber, 1995). The questionnaire taps generalized worry. A Cronbach’s alpha of .85 has been reported for the German version (Stöber, 1995). Three of the original 16 items were selected for inclusion on the basis of item content and factor loading (of the German version). Values were scored from 1 (“not at all typical of me”) to 5 (“very typical of me”). To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 3 to 15; the higher the score, the stronger the parental tendency to worry habitually.

In a single question the frequency of parental sleep disturbance was assessed. Values were scored from 1 (“never”) to 5 (“always”).

### **3.5.10 Parental Health Variables**

Parental general health was assessed with two items. The items inquired whether the parent considered herself/himself to be generally healthy and whether the parent believed that she/he is more prone to illness than others. The second question was coded inversely for consistency. Values were scored from 1 (“not at all typical of me”) to 5 (“very typical of me”). To minimize the effect of a skipped item, the sum was calculated as the product of the mean item value and the total number of corresponding items included in the parent questionnaire. Total sum scores ranges from 2 to 10; the higher the score, the better the parental general health.

The number of parental doctor appointments was assessed via a single questionnaire item. The fill in the blank item queried the absolute number of doctor appointments in the past six months.

A single item asked the parent whether she/he took medication regularly. Values were scored from 0 (“no”) to 1 (“yes”).

Several questionnaire items asked about parental headache in the past 6 months. These items were formulated analogous to the child’s headache prevalence questions. The absolute number of parental headache episodes in the past six months was calculated. For the purpose of the present research the frequency was recoded into a new variable

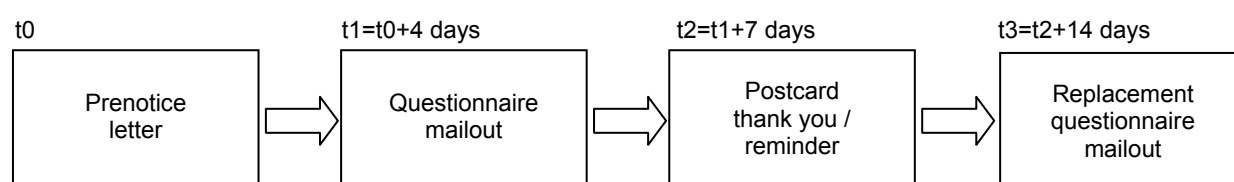
indicating whether the parent had experienced headache in the past six months. Values were scored from 0 (“no”) to 1 (“yes”).

The presence of parental pain other than headache was assessed via a single question that queried the frequency of pain at other locations (e.g., back, joint). Values were scored from 1 (“never”) to 5 (“always”).

Other parental somatic complaints were assessed via four questionnaire items that asked about the frequency of (a) gastrointestinal complaints / disorders, (b) asthma / allergies, (c) thyroid disease, (d) high blood pressure / heart problems / circulatory problems. Values were scored from 1 (“never”) to 5 (“always”). Total sum scores ranges from 4 to 20; the higher the score, the larger the number and/or the more frequent the occurrence of parental other somatic complaints. The sum was calculated only for cases without missing data on any of the four items.

### 3.6 Survey Conduction

The first wave of the postal survey took place between October 2003 and January 2004 and was conducted in accordance with Dillman’s (2000) recommendations for survey implementation and response optimization (see Figure 3).



**Figure 3. Survey implementation timeline**

Several days before the questionnaires were mailed, a prenotice letter was sent to all sample households to inform them about the survey and the material they would soon receive. Four days later the questionnaire(s) and auxiliary survey material (cover letter, additional instruction sheet, return envelope) were mailed. A postcard thanking those subjects who had returned the questionnaires for their participation, and requesting the remaining subjects to complete the questionnaires was mailed a week later. Two weeks following the postcard all nonresponders were sent replacement questionnaire packets (all survey materials can be found in Appendix B).

A lottery with a chance to win one of a total of 21 prizes ranging from a mini hi-fi system to various gift certificates (for books, music CDs, movie tickets etc.) was implemented as an incentive for participation. The lottery drawing took place approximately 3 months after completion of the first survey wave. Prize winners were randomly drawn from the survey responders.

Contact information (address, email-address, telephone number of the project coordinators) was provided in all the letters and inside the questionnaires in case questions should arise. Postcards with an Easter greeting were sent to all participating households in April to maintain contact with the study sample.

Returned questionnaires were sent to a contractor for computerization of the data. The quality of data entry was verified at the project center by manually comparing 5% of total data (randomly selected) with the original questionnaires. The error rate for data entry was substantially lower than the maximum allowable rate of 1.5% (0.11% error rate for parent questionnaires).

### 3.7 Ethics

Ethical issues were considered in every phase of the study. Recommendations regarding confidentiality and data protection issues were obtained from the data protection officer of the University of Göttingen and rigorously followed throughout study implementation. Approval for the study was also gained from the Ethics Committee of the German Psychological Association. The surveyed households were informed of data protection regulations and procedure, the aims of the study, and the voluntary nature of study participation.

### 3.8 Data Analysis

Statistical computations were performed with the Statistical software Package for Social Sciences, version 12.0 (SPSS Inc., Chicago, Illinois).

Prior to data analysis the metric variables were z-transformed. The Z-scores were used in the crude and multivariate logistic regression analyses. Before the multivariate full model analyses were performed (see Table 5), correlation matrices were inspected and multicollinearity diagnostics conducted. Data transformations were necessary prior to calculation of some of the correlation matrices, e.g. values of continuous variables were rounded to obtain discrete variables and thus enable the calculation of Spearman correlations.

Table 5 depicts the data analyses performed. As shown, analyses were computed for three outcome comparisons: (a) *weekly* headache vs. good health, (b) chronic illness vs. good health, (c) *weekly* headache vs. chronic illness. The following four consecutive analysis steps were performed for the first two comparisons:

- First, a control model was analyzed via direct logistic regression with health status as outcome and age and gender as predictor variables. This was done in order to determine the predictivity of the control variables, on their own.
- Second, single-predictor models were analyzed via direct logistic regression on health status as outcome, age and gender as control variables, and each of the potentially relevant variables, individually. This was done in order to determine the predictivity of each individual variable while controlling for age and gender.
- Third, full domain models were analyzed. A multivariate sequential logistic regression was performed on health status as outcome, age and gender as control variables (block 1), and all variables of a given variable domain (block 2), in order to determine the predictivity of the domain variables, as a set, and to determine whether the domain variables significantly added to health status prediction above that afforded by the control variables alone.

- Fourth, full aggregate models were analyzed via sequential logistic regression with health status as outcome, age and gender as control variables (block 1), and all variables, which reached significance ( $p < .01$ ) in the domain analyses (block 2). This was done in order to determine the predictivity of the variables, individually and as a set, and to determine whether the variables significantly added to health status prediction above that afforded by the control variables alone.

**Table 5. Overview of data analyses**

Weekly headache vs. Good health	Chronic illness vs. Good health	Specificity Weekly headache vs. Chronic illness
Control model	Control model	Control model
Method: Direct logistic regression	Method: Direct logistic regression	Method: Direct logistic regression
Predictors: Age, gender	Predictors: Age, gender	Predictors: Age, gender
Outcome: Health status	Outcome: Health status	Outcome: Health status
Single-predictor model	Single-predictor model	Single-predictor model
Method: Direct logistic regression	Method: Direct logistic regression	Method: Direct logistic regression
Predictors: Each potentially relevant variables	Predictors: Each potentially relevant variables	Predictors: Each variables that reached significance ( $p \leq .01$ ) in one of the full aggregate models
Controls: Age, gender	Controls: Age, gender	Controls: Age, gender
Outcome: Health status	Outcome: Health status	Outcome: Health status
Full domain model	Full domain model	
Method: Sequential logistic regression	Method: Sequential logistic regression	
Predictors: All potentially relevant domain variables	Predictors: All potentially relevant domain variables	
Controls: Age, gender	Controls: Age, gender	
Outcome: Health status	Outcome: Health status	
Full aggregate model	Full aggregate model	Full specificity model
Method: Sequential logistic regression	Method: Sequential logistic regression	Method: Sequential logistic regression
Predictors: All variables that reached significance ( $p \leq .01$ ) in the full domain models	Predictors: All variables that reached significance ( $p \leq .01$ ) in the full domain models	Predictors: All variables that reached significance ( $p \leq .01$ ) in one of the full aggregate models
Controls: Age, gender	Controls: Age, gender	Controls: Age, gender
Outcome: Health status	Outcome: Health status	Outcome: Health status

In the specificity analyses, comparing weekly headache to chronic illness, all variables that maintained their significance in one of the full aggregate models ( $p < .01$ ) were examined. Three consecutive analysis steps were performed:

- First, a control model was analyzed via direct logistic regression with health status as outcome and age and gender as predictor variables.
- Second, single-predictor models were analyzed via direct logistic regression on health status as outcome, age and gender as control variables, and each of the variables that reached significance ( $p < .01$ ) in one of the full aggregate models.
- Third, the full specificity model was analyzed via sequential logistic regression with health status as outcome, age and gender as control variables (block 1), and all of the variables that reached significance ( $p < .01$ ) in one of the full aggregate models (block 2).

In the single-predictor analyses only those cases with non-missing data on age, gender, and the variable of interest were included. In the multivariate analyses of the full domain model, full aggregate model, and full specificity model only those cases with non-missing data on all variables were included. Hence the results in the tables for the single-predictor model and the various full models are based on samples of slightly varying size.

Note that for dichotomous or categorical variables simple contrasts to a reference group were performed.

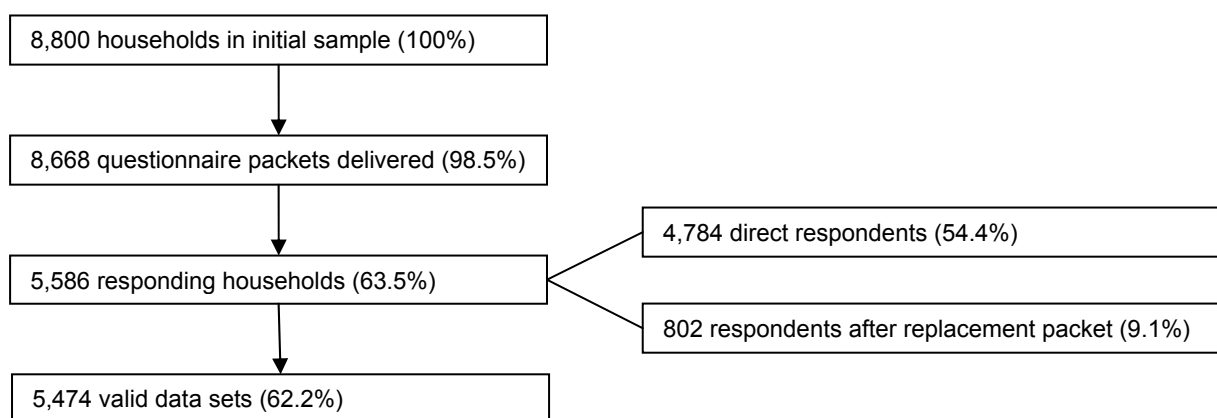
## 4. RESULTS

### 4.1 Descriptive Results

Questionnaires were mailed out to the entire sample of 8,800 households in the first wave of the study. As 132 of the questionnaires were returned to sender (e.g., address unknown), it can be assumed that 8,668 questionnaires were successfully delivered. Over half of the sample, 4,784 households, returned the parent questionnaires within three weeks. Further 802 households responded after receiving a replacement questionnaire packet. Parent questionnaires were completed and returned by 5,586 households, yielding a crude response rate of 63.5%. However, among these were a number of questionnaires deemed invalid for analysis. Data from 112 questionnaires had to be excluded from statistical analysis for one of the following reasons:

- data in the questionnaire did not refer to the intended child,
- missing data made confirmation that the questionnaire referred to the intended child impossible, or
- missing data in questionnaire exceeded 50%.

The progression from the initial random sample of 8,800 households to the 5,474 parental questionnaires (62.2%) deemed valid for analysis is illustrated in Figure 4.



**Figure 4. Response to the first wave of the Children, Adolescents & Headache Study**

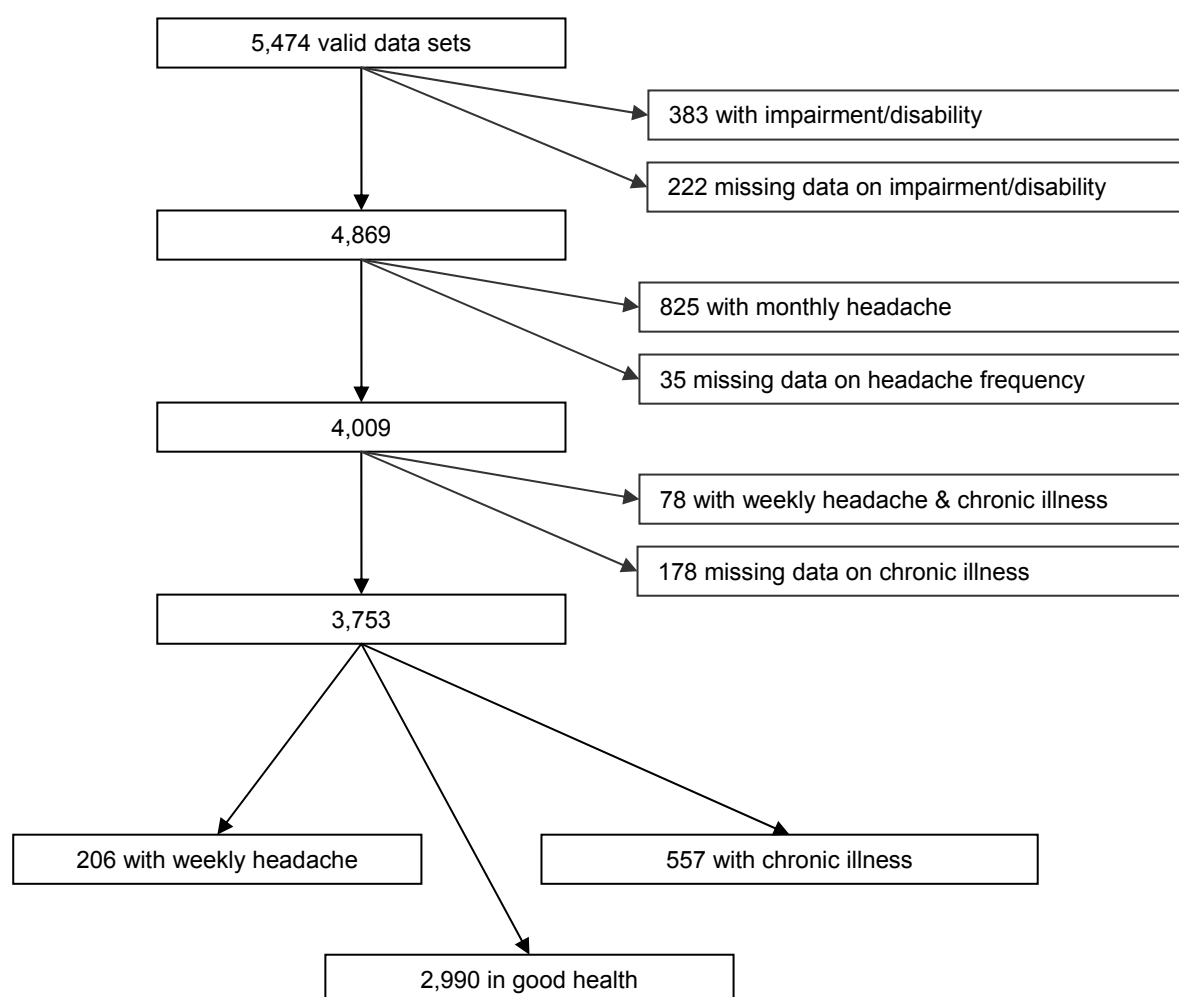
Valid parent questionnaire data was reported for a total of 5,474 children and adolescents. The gender distribution of the children was approximately equal with 2,706 females (49.4%) and 2,768 males (50.6%). The children and adolescents ranged in age from 7 to 14 and had a mean age of 10.3 years.

Prevalence rates for *weekly* headache and chronic illnesses were calculated on the basis of the 5,474 valid parental questionnaires prior to creation of the outcome groups of interest. This was done to maintain comparability of the results to prior epidemiological research. *Weekly* headache was reported for 6.5% and chronic illness (excluding *weekly* headache) for 17.9% of the children and adolescents. The prevalence of chronic illness is 22.6% if *weekly* headache is included.

Of the children and adolescents with valid data sets, 3,753 fulfilled the criteria for the outcome groups of interest (i.e., weekly headache, chronic illness, good health). The remaining 1,901 children did not fulfill the criteria and were filtered out prior to statistical analysis for one of the following reasons:

- presence of impairment or disability,
- missing data regarding impairment or disability,
- presence of monthly headaches,
- missing data regarding headache frequency,
- presence of chronic headache *and* chronic illness (i.e., comorbidity), or
- missing data regarding chronic illness.

Figure 5 depicts the progression from the total 5,474 children and adolescents to the three outcome groups of interest.



**Figure 5. Progression of the Children, Adolescents & Headache Study sample from 5,474 valid data sets to the three comparison groups for statistical analysis**

In the first step of sample progression, 605 children were filtered out. The presence of impairment or disability was reported for 383 (7%) of the children and adolescents (see Appendix C). For 222 (4.1%) missing data regarding the conditions made it impossible to

determine with certainty whether an impairment or disability was present. As absence of impairment or disability was a defining criterion for each of the three outcome groups of interest, the above 605 children were filtered out prior to analysis.

In the second step, 860 children were filtered out. Monthly headache was reported for 825 (16.9%) of the children without an impairment or disability (see Appendix C). For 35 (0.7%) children missing data made it impossible to determine headache frequency. As weekly headache was the defining criterion for the outcome weekly headache, and the absence of weekly or monthly headache was a defining criterion for both other outcome groups, the above 860 children were filtered out prior to analysis.

In the third and final step, 256 children were filtered out. Among the 4,009 children without monthly headache and without impairment or disability, 78 had both weekly headache and other chronic illness (see Appendix C). For 178 children (4.4%) missing data regarding the individual chronic illnesses made it impossible to determine with certainty whether chronic illness was absent. As absence of chronic illness was a defining criterion for the outcome groups good health and *weekly* headache, these 256 children were filtered out prior to analysis.

**Table 6. Absolute and relative frequency of the outcome groups weekly headache, chronic illness (with differentiation according to individual illnesses), and good health in 3,753 children and adolescents**

	Female (n=1881)	Male (n=1872)	Total (n=3753)
Weekly headache	138 (7.3%)	68 (3.6%)	206 (5.5%)
Chronic illness	266 (14.1%)	291 (15.5%)	557 (14.8%)
Asthma	64 (3.4%)	121 (6.5%)	185 (4.9%)
Atopic dermatitis	161 (8.6%)	134 (7.2%)	295 (7.9%)
Epilepsy	1 (0.1%)	4 (0.2%)	5 (0.1%)
Congenital heart disease	23 (1.2%)	21 (1.1%)	44 (1.2%)
Chronic inflammatory bowel disease	1 (0.1%)	1 (0.1%)	2 (0.1%)
Chronic kidney disease	4 (0.2%)	2 (0.1%)	6 (0.2%)
Muscle diseases	1 (0.1%)	2 (0.1%)	3 (0.1%)
Juvenile rheumatoid arthritis	4 (0.2%)	4 (0.2%)	8 (0.2%)
Diabetes	1 (0.1%)	3 (0.2%)	4 (0.1%)
Other	38 (2.0%)	53 (2.8%)	91 (2.4%)
Good health	1,477 (78.5%)	1,513 (80.8%)	2,990 (79.7%)

The remaining 3,753 children and adolescents fulfilled the criteria for the three outcome groups of interest: weekly headache, other chronic illness, and good health. Thus they compose the relevant sample for the present research. The vast majority of these children and adolescents were in good health, approximately one in six had chronic illness, and one in twenty chronic headache. The absolute and relative frequencies of the outcome groups and of the individual chronic illnesses are shown in Table 6. While most of the



children in the chronic illness group were affected by only one chronic illness, multiple illnesses were reported for 81 of them (2.2%).

The gender distribution was approximately equal in the outcome groups good health with 1,477 females (49.4%) and 1,513 males (50.6%), and chronic illness with 266 females (47.8%) and 291 males (52.2%). However, a substantial gender difference was evident in the chronic headache group with 138 females (67.0%) versus 68 males (33.0%). Mean age of the children and adolescents in the good health group was 10.1 years and in the chronic illness group 10.0; values approximating the mean age of the initial sample of 8,800 children (10.3 years). However, the mean age of 11.3 years in the chronic headache group was somewhat higher. These differences underscore the importance of controlling for age and gender in the statistical analyses. Descriptive data for all of the variables examined in the present study, differentiated according to outcome group, is shown in Table 7.

**Table 7. Means and standard deviation for metric variables, absolute and relative frequency for non-metric variables, differentiated according to outcome group**

Domain	Variable	Weekly headache <i>M (SD) / f (%)</i>	Chronic illness <i>M (SD) / f (%)</i>	Good health <i>M (SD) / f (%)</i>
Control variables	Age	11.3 (2.05)	10.0 (2.18)	10.1 (2.27)
	Gender			
	Female	138 (67.0%)	266 (47.8%)	1477 (49.4%)
	Male	68 (33.0%)	291 (52.2%)	1513 (50.6%)
Sociodemographic variables	Social class			
	Lower	21 (10.2%)	31 (5.6%)	192 (6.4%)
	Middle	92 (44.7%)	239 (42.9%)	1289 (43.1%)
	Upper	80 (38.8%)	270 (48.5%)	1369 (45.8%)
	Household crowding index <sup>a</sup>	.767 (.243)	.708 (.203)	.730 (.216)
	<i>Maladaptive coping</i>			
	Passive avoidance <sup>a</sup>	.426 (1.28)	-.034 (.984)	-.117 (.899)
	Rumination <sup>a</sup>	.309 (.996)	.000 (1.00)	-.109 (.958)
	Resignation <sup>a</sup>	.339 (1.18)	-.012 (.978)	-.116 (.909)
	Aggression <sup>a</sup>	.266 (1.03)	-.029 (.971)	-.116 (.973)
Psychological variables	<i>Anger expression</i>			
	Anger-in <sup>a</sup>	.160 (.987)	-.053 (.989)	-.074 (.981)
	Anger-out <sup>a</sup>	-.015 (1.02)	.090 (.970)	-.051 (.993)
	Anger control <sup>a</sup>	-.075 (.997)	-.030 (.962)	.036 (1.00)
	Anxiety/depression <sup>a</sup>	.421 (1.10)	-.068 (.953)	-.166 (.908)
	Hyperactivity <sup>a</sup>	.010 (1.03)	.009 (.993)	-.113 (.938)
	Aggressive behavior <sup>a</sup>	.028 (.978)	-.033 (.963)	-.064 (.912)
	Sleep disturbance <sup>a</sup>	.291 (1.13)	.033 (1.03)	-.142 (.890)
Health variables	Pain other than headache <sup>a</sup>	.858 (1.29)	-.137 (.950)	-.212 (.845)
	Other somatic complaints <sup>a</sup>	.719 (1.16)	-.101 (.879)	-.208 (.845)

<sup>a</sup> Z-scores

Table 7. continued

		Weekly headache	Chronic illness	Good health
		<i>M (SD) / f (%)</i>	<i>M (SD) / f (%)</i>	<i>M (SD) / f (%)</i>
Family variables	Number of parents in household			
	One	32 (15.8%)	71 (12.9%)	412 (14.0%)
	Two	171 (84.2%)	481 (87.1%)	2522 (85.6%)
	Number of other children in household	1.15 (.899)	1.04 (.774)	1.13 (.893)
	Negative family environment <sup>a</sup>	.128 (1.07)	.012 (.975)	-.084 (.968)
	Negative conflict solving strategies <sup>a</sup>	.154 (1.10)	-.032 (.941)	-.040 (.985)
Weekly family conflict	No	134 (65.0%)	397 (71.3%)	2229 (74.5%)
	Yes	69 (33.5%)	150 (26.9%)	686 (22.9%)
School variables	Index of school difficulties	.543 (.758)	.293 (.615)	.266 (.581)
	Time spent of homework			
	< 1 hour	105 (51.0%)	348 (62.5%)	1924 (64.3%)
	1-2 hours	76 (36.9%)	161 (28.9%)	840 (28.1%)
	2-3 hours	15 (7.3%)	20 (3.6%)	97 (3.2%)
	> 3 hours	5 (2.4%)	2 (0.4%)	7 (0.2%)
School stress <sup>a</sup>	.428 (1.17)	.004 (.890)	-.162 (.905)	
Reaction to failure <sup>a</sup>	.148 (1.10)	.023 (1.01)	-.100 (.978)	
Leisure variables	Physical activities <sup>a</sup>	-.104 (.963)	.102 (.990)	.037 (1.01)
	Recreational activities <sup>a</sup>	.080 (1.01)	.062 (.991)	.046 (.992)
	Amount of free time <sup>a</sup>	-.159 (1.13)	-.037 (1.02)	.047 (.941)
	Time spent on TV / video <sup>a</sup>	.309 (1.07)	-.141 (.933)	-.048 (.985)
	Time spent on computer / game console <sup>a</sup>	-.038 (.988)	-.110 (.916)	-.028 (.986)
	Amount of friends			
0-1 friend	99 (48.1%)	368 (66.1%)	1791 (59.9%)	
2-5 friends	22 (10.7%)	31 (5.6%)	224 (7.5%)	
>5 friends	74 (35.9%)	144 (25.9%)	894 (29.9%)	
Life events	Index of life events	1.29 (1.24)	1.05 (1.10)	.968 (1.09)
Parental psychological variables	Anxiety/Depression (index) <sup>a</sup>	.269 (1.06)	-.022 (1.01)	-.120 (.937)
	Habitual worry <sup>a</sup>	.250 (1.04)	-.025 (1.02)	-.107 (.965)
	Sleep disturbance <sup>a</sup>	.205 (1.14)	-.095 (.985)	-.099 (.942)
Parental health variables	General health <sup>a</sup>	-.140 (1.04)	-.055 (1.05)	.094 (.953)
	Number of doctor appointments <sup>a</sup>	.244 (1.63)	.063 (1.06)	-.074 (.920)
	Regular medication			
	No	129 (62.6%)	397 (71.3%)	2227 (74.5%)
	Yes	71 (34.5%)	149 (26.8%)	678 (22.7%)
	Headache			
	No	43 (20.9%)	211 (37.9%)	1347 (45.1%)
Yes	153 (74.3%)	327 (58.7%)	1534 (51.3%)	
Pain other than headache <sup>a</sup>	.114 (1.12)	.054 (1.00)	-.100 (.981)	
Other somatic complaints <sup>a</sup>	.137 (.976)	.127 (1.04)	-.106 (.957)	

<sup>a</sup> Z-scores

## 4.2 Multicollinearity Analyses

Prior to the logistic regression analyses, the degree of multicollinearity, or redundancy, between the independent variables was determined using the following two methods (cf. Glantz & Slinker, 2001; Stevens, 2002). First, bivariate correlations were calculated for variables belonging to the same domain plus age and gender. In accordance with the literature, correlations exceeding  $r=.80$  were seen as an indication of possible multicollinearity (Glantz & Slinker, 2001; Tabachnik & Fidell, 2001). Second, SPSS multicollinearity diagnostics were run for variables belonging to the same domain plus age and gender. This procedure yields a variance inflation factor (VIF) for each independent variable. The value of a variable's VIF indicates whether there is a linear association between it and the remaining variables. VIFs exceeding a value of 4 are viewed as worthy of investigation values of 10 or more as an indication of serious multicollinearity (Glantz & Slinker, 2001). Correlation matrices and VIFs can be found in Appendix D.

### 4.2.1 Age and Gender

The intercorrelation between the control variables, age and gender, was close to null ( $r = -.004$ ), indicating together with the VIFs of 1.000 the absence of problematic multicollinearity.

### 4.2.2 Sociodemographic Variables

Moderate to high intercorrelations ( $r = .494$  to  $r = .628$ ) between the constituent variables of socioeconomic position (education, occupational position, household net income) led to the decision to utilize the aggregate variable socioeconomic position in the analyses. Intercorrelations between control variables and sociodemographic variables (after aggregation of socioeconomic class) ranged from  $r = -.169$  to  $r = .022$  and VIFs from 1.001 to 1.029, indicating the absence of problematic multicollinearity.

### 4.2.3 Child Psychological Variables

Moderate intercorrelations were found between a number of independent variables: Maladaptive coping strategies were moderately intercorrelated with one another ( $r = .390$  to  $r = .496$ ) and with anxiety / depression ( $r = .404$  to  $r = .548$ ). Furthermore, anger control was moderately intercorrelated with outward expression of anger ( $r = -.552$ ). However, as these subscales were designed to tap different constructs and the VIFs were satisfactory (1.073 to 1.974), the variables were maintained in their original form in the analyses.

### 4.2.4 Child Health Variables

Pain other than headache and other somatic complaints were moderately intercorrelated ( $r = .529$ ). However, as differentiation between pain and other somatic complaints was of particular relevance for the research focus on chronic headache and as the VIFs were satisfactory (1.023 to 1.428), the separate indices were maintained in the analyses.

#### **4.2.5 Family Variables**

Intercorrelations between control variables and family variables ranged from  $r = -.126$  to  $r = .488$  and VIFs from 1.000 to 1.526, indicating the absence of problematic multicollinearity.

#### **4.2.6 School Variables**

Intercorrelations between control variables and school variables ranged from  $r = -.112$  to  $r = .359$  and VIFs from 1.021 to 1.273, indicating the absence of problematic multicollinearity.

#### **4.2.7 Leisure Variables**

Intercorrelations between control variables and leisure variables ranged from  $r = -.372$  to  $r = .359$  and VIFs from 1.024 to 1.458, indicating the absence of problematic multicollinearity.

#### **4.2.8 Life Events**

Intercorrelations between control variables and the index of life events ranged from  $r = -.028$  to  $r = -.004$  and the VIFs had values of 1.000 to 1.001, indicating the absence of problematic multicollinearity.

#### **4.2.9 Parental Psychological Variables**

Moderate to high intercorrelations ( $r = .522$  to  $r = .668$ ) between the individual items assessing anxieties and depressed mood and the mental health scale (CHQ-PF50) led to the decision to aggregate these to form an index of parental anxiety and depression. The aggregation was deemed appropriate as the contents of the five mental health items focused on anxiety and depression. Intercorrelations between control variables and parental psychological variables (after aggregation of anxiety and depression) ranged from  $r = -.022$  to  $r = .462$  with the exception of the pairwise correlation between anxiety / depression and habitual worry which reached  $r = .624$ . Despite the overlap, no further aggregation was performed because of the differing constructs tapped by the mental health scale and the PSWQ. The VIFs ranged from 1.001 to 1.862, indicating the absence of problematic multicollinearity.

#### **4.2.10 Parental Health Variables**

Intercorrelations between control variables and parental health variables ranged from  $r = -.334$  to  $r = .420$  and VIFs from 1.001 to 1.351, indicating the absence of problematic multicollinearity.

### **4.3 Analyses Regarding Weekly Headache vs. Good Health**

#### **4.3.1 Age and Gender (Control Model)**

A direct logistic regression analysis was performed on health status as outcome (weekly headache vs. good health) and the control variables age and gender as predictors. Data from

3,196 families were available for this analysis: 206 children with chronic headache and 2,990 healthy children.

A test of the control model against the constant-only model indicated that inclusion of the control variables, as a set, significantly improved model fit ( $\chi^2_{2, 3196} = 77.94$ ,  $p < .001$ ). However, the amount of variance in health status accounted for by the control variables is small (Nagelkerke's  $R^2 = .065$ ).

The odds ratios (OR), 99% confidence intervals (CI), Wald statistics, and p-values for the control variables are presented in Table 8. Weekly headache was significantly associated with both age (OR = 1.27, 99% CI = 1.17-1.38) and gender (OR = 2.12, 99% CI = 1.42-3.15).

**Table 8. Association between weekly headache and age and gender**

	Weekly headache vs. Good health <sup>a</sup>			
	Single-predictor model <sup>b</sup>			
	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000

<sup>a</sup> Reference group

<sup>b</sup> Gender controlled for age and age controlled for gender

<sup>c</sup> Categorical variables

#### 4.3.2 Sociodemographic Variables

Logistic regression analyses were performed on health status as outcome (weekly headache vs. good health), age and gender as control variables, and the following two sociodemographic variables as predictors: social class, household crowding index.

In the single-predictor model analyses, weekly headache was significantly associated with household crowding (OR = 7.82<sup>8</sup>, 99% CI = 1.07-5.59). In addition, the association between weekly headache and the categorical variable social class approached significance, though the individual constituent contrasts did not (lower class vs. middle class; upper class vs. middle class; see Table 9, left-hand side).

In a second step, a sequential logistic regression analysis was performed on health status as outcome (weekly headache vs. good health), with age and gender as control variables in block one, and the sociodemographic variables in block two. Data from 2,967 families were available for analysis of the full model: 188 children with chronic headache and 2,779 healthy children.

A test of the full domain model (sociodemographic plus control variables) against the control model indicated that inclusion of the sociodemographic variables, as a set, significantly improved model fit ( $\chi^2_{5, 2967} = 12.32$ ,  $p = .006$ ). Nevertheless, the variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .081$ ), and the

<sup>8</sup> Note that the large odds ratio is due to the unit of measurement.

amount of variance accounted for by the sociodemographic variables (beyond that explained by age and gender) is minute (Nagelkerke's  $R^2 = .011$ ).

Though inclusion of sociodemographic variables increased model fit, neither of the sociodemographic variables was significantly associated with weekly headache in the analysis of the full domain model. In other words, the multivariate analysis of the full domain model indicated that neither household crowding nor social class was independently associated with weekly headache (see Table 9, right-hand side).

**Table 9. Association between weekly headache and sociodemographic variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.29	1.18 - 1.41	53.06	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.26	1.49 - 3.45	25.12	.000
Social class <sup>c</sup>			8.12	.017			7.44	.024
Lower / Middle class <sup>a]</sup>	1.62	.83 - 3.16	3.45	.063	1.72	.87 - 3.41	4.17	.041
Upper / Middle class <sup>a</sup>	.78	.52 - 1.18	2.36	.125	.81	.53 - 1.25	1.54	.215
Household crowding index	2.45	1.07 - 5.59	7.82	.005	1.74	.71 - 4.26	2.53	.111

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

### 4.3.3 Child Psychological Variables

Logistic regression analyses were performed on health status as outcome (weekly headache vs. good health), with age and gender as control variables, for each of the following eleven child psychological variables: passive avoidance, rumination, resignation, aggression, anger-in, anger-out, anger control, anxiety/depression, hyperactivity, aggressive behavior, sleep disturbance.

In the single-predictor model analyses, an increased risk of weekly headache was significantly associated with the four maladaptive coping strategies: passive avoidance (OR = 1.51, 99% CI = 1.28-1.77), rumination (OR = 1.49, 99% CI = 1.23-1.82), resignation (OR = 1.47, 99% CI = 1.24-1.73), and aggression (OR = 1.44, 99% CI = 1.19-1.74). Weekly headache was also associated with child's anxiety/depression (OR = 1.70, 99% CI = 1.43-2.03), hyperactivity (OR = 1.34, 99% CI = 1.10-1.63), aggressive behavior (OR = 1.26, 99% CI = 1.04-1.53), and sleep disturbance (OR = 1.50, 99% CI = 1.27-1.77). Furthermore, the association between increased risk of weekly headache and anger-in (OR = 1.19, 99% CI = .99-1.43) approached significance. However, anger out was not associated with weekly headache, and anger control was associated with a *reduced* risk of weekly headache

(OR = .83, 99% CI = .68-1.00). The results of the single-predictor model analyses are presented in Table 10 (left-hand side).

Then, a sequential logistic regression analysis was performed with age and gender as control variables in block one, and the eleven child psychological variables as predictors in block two. Data from 2,750 families were available for analysis: 182 children with weekly headache and 2,568 healthy children.

**Table 10. Association between weekly headache and child psychological variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.25	1.13 - 1.37	34.47	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.16	1.35 - 3.44	17.87	.000
<i>Maladaptive coping</i>								
Passive avoidance <sup>d</sup>	1.51	1.28 - 1.77	43.43	.000	1.15	.92 - 1.43	2.73	.099
Rumination <sup>d</sup>	1.49	1.23 - 1.82	27.42	.000	1.16	.89 - 1.52	2.16	.141
Resignation <sup>d</sup>	1.47	1.24 - 1.73	35.54	.000	1.04	.81 - 1.34	.15	.704
Aggression <sup>d</sup>	1.44	1.19 - 1.74	23.90	.000	1.03	.77 - 1.37	.06	.808
<i>Anger expression</i>								
Anger-in <sup>d</sup>	1.19	.99 - 1.43	5.73	.017	1.01	.79 - 1.29	.01	.932
Anger-out <sup>d</sup>	1.07	.88 - 1.29	.80	.372	.71	.54 - .94	9.84	.002
Anger control <sup>d</sup>	.83	.68 - 1.00	6.70	.010	.81	.62 - 1.05	4.33	.038
Anxiety/depression <sup>d</sup>	1.70	1.43 - 2.03	61.82	.000	1.41	1.08 - 1.84	11.25	.001
Hyperactivity <sup>d</sup>	1.34	1.10 - 1.63	14.23	.000	1.00	.76 - 1.33	.00	.995
Aggressive behavior <sup>d</sup>	1.26	1.04 - 1.53	9.28	.002	1.11	.87 - 1.42	1.24	.266
Sleep disturbance <sup>d</sup>	1.50	1.27 - 1.77	38.65	.000	1.37	1.13 - 1.66	17.57	.000

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full domain model (child psychological plus control variables) against the control model indicated that inclusion of the psychological variables, as a set, significantly

improved model fit ( $\chi^2_{11, 2568} = 93.71, p < .001$ ). The variance in health status accounted for by the full model is moderate (Nagelkerke's  $R^2 = .149$ ), and the amount of variance accounted for by the psychological variables alone is small (Nagelkerke's  $R^2 = .084$ ).

In the multivariate analysis of the full domain model, increased risk of weekly headache was associated with child's anxiety/depression (OR = 1.49, 99% CI = 1.08-1.84), and sleep disturbance (OR = 1.49, 99% CI = 1.13-1.66). On the other hand, a *reduced* risk of weekly headache was significantly associated with the outward expression of anger (OR = 1.49, 99% CI = .54-.94). However, the pattern of results indicated that anger-out is a traditional suppressor variable (Bortz, 1989): Examined alone (in the single-predictor model) it is not significantly associated with health outcome, but in the full model anger-out became significantly negatively associated with weekly headache. As anger out is moderately correlated with the other domain variables ( $r=.169$  to  $r=.459$ , see also Appendix D), it can be presumed that anger-out suppresses some of what would otherwise be error variance in the other domain variables. None of the other child psychological variables were significantly associated with weekly headache. In other words, The variables passive avoidance, rumination, resignation, aggression, anger-in, anger control, hyperactivity, and aggressive behavior were not independently associated with weekly headache in the multivariate analysis of the full model (see Table 10, right-hand side).

#### 4.3.4 Child Health Variables

The child health variables pain other than headache and other somatic complaints were examined in logistic regression analyses together with age and gender as control variables and health status (weekly headache vs. good health) as the outcome variable..

In the single-predictor model analyses, an increased risk of weekly headache was significantly associated with both health variables; pain other than headache (OR = 2.24, 99% CI = 1.88-2.67), other somatic complaints (OR = 2.24, 99% CI = 1.87-2.70).

**Table 11. Association between weekly headache and child health variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.19	1.08 - 1.31	21.70	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	1.53	.98 - 2.39	6.02	.014
Pain other than headache <sup>d</sup>	2.24	1.88 - 2.67	138.79	.000	1.72	1.39 - 2.13	43.66	.000
Other somatic complaints <sup>d</sup>	2.24	1.87 - 2.70	127.89	.000	1.70	1.37 - 2.12	39.98	.000

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores



In a subsequent step, a sequential logistic regression analysis was performed on health status as outcome (weekly headache vs. good health), with age and gender as control variables in block one, and the two child health variables as predictors in block two. Data from 3,002 families were available for this analysis: 183 children with chronic headache and 2,819 healthy children.

A test of the full domain model (child health and control variables) against the control model (age, gender, and constant) indicated that inclusion of the child health variables, as a set, significantly improved model fit ( $\chi^2_{2, 3002} = 167.71, p < .001$ ). The variance in health status accounted for by the full model is moderate (Nagelkerke's  $R^2 = .206$ ), as is the amount of variance accounted for by the child health variables (Nagelkerke's  $R^2 = .145$ ).

In the multivariate analysis of the full domain model, increased risk of weekly headache was again significantly associated with both child health variables, pain other than headache (OR = 1.72, 99% CI = 1.39-2.13), and other somatic complaints (OR = 1.70, 99% CI = 1.37-2.12; see Table 11, right-hand side).

#### **4.3.5 Family Variables**

Using the same outcome variable (weekly headache vs. good health) and age and gender as control variables, each of the following five family variables was examined via logistic regression: number of parents in the household, number of other children in the household, negative family environment, negative family conflict solving strategies, and weekly family conflict.

In the single-predictor model analyses, increased risk of weekly headache was associated with a negative family environment (OR = 1.21, 99% CI = 1.00-1.46) and the presence of weekly family conflict (OR = 1.69, 99% CI = 1.12-2.53). In addition, the association between increased risk of weekly headache and negative family conflict solving strategies (OR = 1.19, 99% CI = .99-1.43) approached significance. On the other hand, weekly headache was not associated with the number of parents or children in the household (see Table 12, left-hand side).

In a second step, a sequential logistic regression analysis was performed with age and gender as control variables in block one, and all six family variables as predictors of health status (weekly headache vs. good health) in block two. Data from 3,048 families were available for the analysis of this domain: 195 children with weekly headache and 2,853 healthy children.

A test of the full domain model (family plus control variables) against the control model indicated that inclusion of family variables, as a set, significantly improved model fit ( $\chi^2_{5, 3048} = 12.81, p = .011$ ). However, the variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .078$ ) and the variance accounted for by family variables alone is minute (Nagelkerke's  $R^2 = .013$ ).

**Table 12. Association between weekly headache and family variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.26	1.16 - 1.38	47.15	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.16	1.43 - 3.25	23.23	.000
Number of parents in household <sup>c</sup> One / Two <sup>a</sup>	1.17	.70 - 1.98	.62	.430	1.15	.68 - 1.97	.47	.491
Number of children in household	1.02	.82 - 1.27	.06	.807	1.01	.82 - 1.26	.02	.884
Negative family environment <sup>d</sup>	1.21	1.00 - 1.46	6.85	.009	1.17	.94 - 1.45	3.24	.072
Negative conflict solving strategies <sup>d</sup>	1.19	.99 - 1.43	6.08	.014	1.03	.82 - 1.30	.10	.752
Weekly family conflict <sup>c</sup> Yes / No <sup>a</sup>	1.69	1.12 - 2.53	11.03	.001	1.46	.91 - 2.35	4.17	.041

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

Though inclusion of family variables increased model fit, none of the individual family variables was significantly associated with weekly headache. In other words, the multivariate analysis indicated that the variables number of parents in household, number of other children in household, negative family environment, negative conflict solving strategies, and weekly family conflict were not independently associated with weekly headache (see Table 12, right-hand side).

#### 4.3.6 School Variables

Logistic regression analyses were performed on health status (weekly headache vs. good health) as outcome, with age and gender as control variables, and each of the following four school variables: index of school difficulties, time spent on homework, school stress, and reaction to failure.

In the analyses of the single-predictor models, an increased risk of weekly headache was significantly associated with the index of school problems (OR = 1.64, 99% CI = 1.27-2.12), school stress (OR = 1.77, 99% CI = 1.48-2.12), and reaction to failure (OR = 1.42, 99% CI = 1.17-1.72). In addition, an increased risk of weekly headache was significantly associated with the categorical variable time spent on homework, as a whole, and with the constituent contrast "> 3 hours" as opposed to "< 1 hour" spent on homework (OR = 9.94, 99% CI = 2.02-48.94). The other constituent contrasts were not significantly associated with weekly headache (see Table 13, left-hand side).

A sequential logistic regression analysis was then performed on health status (weekly headache vs. good health) as outcome, with age and gender as control variables in block one, and the four school variables as predictors in block two. Data from 2,884 families were available for analysis: 185 children with chronic headache and 2,699 healthy children.

A test of the full domain model (school and control variables) against the control model indicated that the inclusion of school variables, as a set, significantly improved model fit ( $\chi^2_{6, 2884} = 82.977, p < .001$ ). The variance in health status accounted for by the full model is moderate (Nagelkerke's  $R^2 = .138$ ), and the amount of variance accounted for by the school variables alone is small (Nagelkerke's  $R^2 = .073$ ).

In the multivariate analysis of the full domain model, increased risk of weekly headache was significantly associated with school stress (OR = 1.66, 99% CI = 1.34-2.05). In addition, the association between weekly headache and the categorical variable time spent on homework, as a whole, approached significance. Once again, weekly headache was significantly associated with "> 3 hours" as opposed to "< 1 hour" spent on homework (OR = 9.94, 99% CI = 1.19-41.29). The other constituent contrasts did not yield significant associations with weekly headache. In addition, the multivariate analysis of the full model indicated that neither school difficulties nor reaction to failure were independently associated with weekly headache (see Table 13, right-hand side).

**Table 13. Association between weekly headache and school variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.24	1.13 - 1.37	35.09	.000
Gender <sup>c</sup> female / male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.43	1.56 - 3.77	27.02	.000
Index of school difficulties	1.64	1.27 - 2.12	24.47	.000	1.17	.88 - 1.57	1.96	.162
Time spent on homework <sup>c</sup>			17.73	.000			10.36	.016
1-2 hours/< 1 hour <sup>a</sup>	1.21	.80 - 1.84	1.39	.239	1.07	.69 - 1.66	.14	.709
2-3 hours/< 1 hour <sup>a</sup>	1.94	.89 - 4.22	4.77	.029	1.72	.74 - 3.98	2.77	.096
> 3 hours/< 1 hour <sup>a</sup>	9.94	2.02 - 48.94	13.76	.000	7.01	1.19 - 41.29	8.01	.005
School stress <sup>d</sup>	1.77	1.48 - 2.12	67.74	.000	1.66	1.34 - 2.05	36.80	.000
Reaction to failure <sup>d</sup>	1.42	1.17 - 1.72	22.14	.000	1.20	.95 - 1.50	4.15	.042

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

#### 4.3.7 Leisure Variables

Using the outcome variable health status (weekly headache vs. good health) and age and gender as control variables, each of the following six leisure variables was examined via logistic regression: physical activities, other recreational activities, amount of free time, time spent on TV/video, time spent on computer/game console, and amount of friends.

In the analyses of the single-predictor models, an increased risk of weekly headache was significantly associated with time spent on TV / video (OR = 1.30, 99% CI = 1.07-1.58). None of the other leisure variables were significantly associated with weekly headache. In other words, the analyses of single-predictor models indicated that physical activities, recreational activities, amount of free time, time spent on computer/game console, and amount of friends were not significantly associated with weekly headache (see Table 14, left-hand side).

In a second step, sequential logistic regression analysis was performed on health status as outcome (weekly headache vs. good health), with age and gender as control variables in block one, and the six leisure variables as predictors in block two. Data from 2,967 families were available for analysis: 186 children with chronic headache and 2,781 healthy children.

**Table 14. Association between weekly headache and leisure variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	P	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.22	1.10 - 1.34	25.97	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	1.86	1.14 - 3.05	10.65	.001
Physical activities <sup>d</sup>	.98	.81 - 1.18	.10	.752	1.01	.83 - 1.24	.03	.873
Recreational activities <sup>d</sup>	.99	.80 - 1.23	.01	.939	1.05	.83 - 1.33	.27	.603
Amount of free time <sup>d</sup>	.87	.72 - 1.04	4.03	.045	.78	.64 - .96	9.57	.002
Time spent on TV / video <sup>d</sup>	1.30	1.07 - 1.58	11.74	.001	1.40	1.12 - 1.75	14.62	.000
Time spent on computer / game console <sup>d</sup>	.96	.77 - 1.20	.19	.660	.89	.70 - 1.13	1.58	.209
Amount of friends <sup>c</sup>			5.75	.057			5.34	.069
0-1friends/2-5 friends <sup>a</sup>	1.70	.89 - 3.25	4.52	.034	1.69	.87 - 3.29	4.14	.042
>5 friends/2-5 friends <sup>a</sup>	1.30	.86 - 1.98	2.70	.101	1.30	.85 - 2.01	2.48	.115

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full domain model (leisure and control variables) against the control model indicated that inclusion of leisure variables, as a set, significantly improved model fit ( $\chi^2_{7, 2967} = 26.15, p < .001$ ). However, the variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .084$ ), and the amount of variance accounted for by the leisure variables in addition to age and gender is minimal (Nagelkerke's  $R^2 = .023$ ).

In the multivariate analysis of the full domain model, increased risk of weekly headache was significantly associated with the amount of time spent on TV / video (OR = 1.40, 99% CI = 1.12-1.75). On the other hand, a *reduced* risk of weekly headache was significantly associated with amount of free time (OR = .78, 99% CI = .64-.96). Finally, the multivariate analysis of the full model indicated that physical activities, recreational activities, time spent on computer/game console, and amount of friends were not significantly associated with weekly headache (see Table 14, right-hand side).

#### 4.3.8 Life Events

As an index was calculated to quantify the number of life events experienced by the child and this index is the only variable of the domain, the first step of analyzing single-predictor models became unnecessary. Therefore, the statistical analysis began with a sequential logistic regression performed on health status (weekly headache vs. good health) as outcome, with age and gender as control variables, and the index of life events as a predictor. Data from 2,939 families were available for analysis: 206 children with chronic headache and 2,990 children in good health.

A test of the full domain model (index of life events and control variables) against the control model indicated that inclusion of the index significantly improved model fit ( $\chi^2_{1, 2990} = 18.012, p < .001$ ). However, the variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .079$ ), and the amount of variance accounted for by the index of life events alone is minimal (Nagelkerke's  $R^2 = .014$ ). Nevertheless, the multivariate analysis of the full domain model indicated that increased risk of weekly headache was significantly associated with the number of life events experienced by the child (OR = 1.29, 99% CI = 1.11-1.50; see Table 15, right-hand side).

**Table 15. Association between weekly headache and life events**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.28	1.17 - 1.39	54.76	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.13	1.43 - 3.18	24.03	.000
Index of life events					1.29	1.11 - 1.50	19.36	.000

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

#### 4.3.9 Parental Psychological Variables

Logistic regression analyses were performed on health status (weekly headache vs. good health) as outcome, with age and gender as control variables, and each of the following three parental psychological variables: parental anxiety/depression (index), parental habitual worry, and parental sleep disturbance.

In the single-predictor model analyses, increased risk of weekly headache was significantly associated with each of the investigated parental psychological variables: parental anxiety/depression (index) (OR = 1.51, 99% CI = 1.25-1.82), parental habitual worry (OR = 1.44, 99% CI = 1.20-1.73), and parental sleep disturbance (OR = 1.35, 99% CI = 1.13-1.63; see Table 16, left-hand side).

Then a sequential logistic regression analysis was performed on health status as outcome, with age and gender as control variables in block one, and the parental psychological variables as predictors in block two. Data from 3,044 families were available for analysis: 195 children with chronic headache and 2,849 healthy children.

**Table 16. Association between weekly headache and parental psychological variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.27	1.16 - 1.38	48.34	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.16	1.43 - 3.26	23.31	.000
Anxiety / depression (index) <sup>d</sup>	1.51	1.25 - 1.82	31.75	.000	1.26	.98 - 1.62	5.42	.020
Habitual worry <sup>d</sup>	1.44	1.20 - 1.73	25.38	.000	1.20	.95 - 1.53	3.92	.048
Sleep disturbance <sup>d</sup>	1.35	1.13 - 1.63	17.85	.000	1.17	.95 - 1.44	3.53	.060

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full domain model (parental psychological and control variables) against the control model (age, gender, and constant) indicated that inclusion of parental psychological variables, as a set, significantly improved model fit ( $\chi^2_{3, 3044} = 38.09, p < .001$ ). However, the variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .095$ ), as is the amount of variance accounted for by the parental psychological variables (Nagelkerke's  $R^2 = .032$ ).

Though inclusion of parental psychological variables increased model fit, none of the individual variables was significantly associated with weekly headache. In other words, the multivariate analysis of the full domain model indicated that parental anxiety/depression,

parental habitual worry, and parental sleep disturbance were not independently associated with weekly headache (see Table 16, right-hand side)

#### 4.3.10 Parental Health Variables

Using health status (weekly headache vs. good health) as the outcome variable, and age and gender as control variables, each of the following six parental health variables was examined via logistic regression: general health, doctor appointments, regular medication, headache, pain other than headache, and other somatic complaints.

**Table 17. Association between weekly headache and parental health variables**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.27	1.17 - 1.38	52.27	.000	1.24	1.13 - 1.35	36.80	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	2.16	1.41 - 3.30	21.72	.000
General health <sup>d</sup>	.79	.66 - .95	11.49	.001	.92	.75 - 1.15	.88	.348
Number of doctor appointments <sup>d</sup>	1.20	1.05 - 1.38	12.62	.000	1.16	.99 - 1.36	5.68	.017
Regular medication <sup>c</sup> Yes / No <sup>a</sup>	1.71	1.14 - 2.56	11.62	.001	1.40	.86 - 2.27	3.19	.074
Headache <sup>c</sup> Yes / No <sup>a</sup>	3.17	2.00 - 5.02	41.84	.000	2.86	1.77 - 4.63	31.60	.000
Pain other than headache <sup>d</sup>	1.22	1.01 - 1.49	6.96	.008	1.03	.83 - 1.28	.13	.718
Other somatic complaints <sup>d</sup>	1.24	1.04 - 1.49	9.47	.002	.99	.79 - 1.24	.01	.917

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

In the analyses of the single-predictor models, weekly headache was significantly associated with each of the investigated parental health variables. Increased risk of weekly headache was associated with number of doctor appointments (OR = 1.20, 99% CI = 1.05-1.38), regular medication (OR = 1.71, 99% CI = 1.14-2.56), headache (OR = 3.17, 99% CI = 2.00-5.02), pain other than headache (OR = 1.22, 99% CI = 1.01-1.49), and other somatic complaints (OR = 1.24, 99% CI = 1.04-1.49), while a *reduced* risk of weekly headache was associated with general health (OR = .79, 99% CI = .66-.95; see Table 17, left-hand side).

In a second step, sequential logistic regression analysis was performed on health status as outcome (weekly headache vs. good health), with age and gender as control variables in block one, and the six parental health variables as predictors in block two. Data

from 2,954 families were available for analysis: 184 children with chronic headache and 2,770 healthy children.

A test of the full domain model (parental health and control variables) against the control model indicated that inclusion of parental health variables, as a set, significantly improved model fit ( $\chi^2_{6, 2954} = 60.40, p < .001$ ). The variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .110$ ), as is the amount of variance accounted for by the parental health variables alone (Nagelkerke's  $R^2 = .053$ ).

Though inclusion of parental health variables increased model fit, only one of the variables, namely parental headache, was significantly associated with weekly headache (OR = 2.86, 99% CI = 1.77-4.63) in the multivariate analysis of the full domain model. In addition, the association between number of doctor appointments and weekly headache approached significance (OR = 1.16, 99% CI = .99-1.36). None of the other variables was associated with weekly headache. In other words, the multivariate analysis of the full domain model indicated that regular medication, pain other than headache, and other somatic complaints were not independently associated with weekly headache (see Table 17, right-hand side).

#### 4.3.11 Summary of Full Domain Model Analyses

The amount of variance explained by each set of domain variables is presented in Table 18. Variable domains are listed in descending order according to the amount of variance explained beyond that explained by age and gender. As Table 18 shows, only child health variables, child psychological variables, and school variables explain more variance than the two control variables, age and gender.

**Table 18. Amount of variance explained per domain (beyond that explained by age and gender)**

Domain	Weekly headache vs. Good health	
	Nagelkerke's $R^2$	Rank
Age & Gender	6.5%	
Child health variables	14.5%	1
Child psychological variables	8.4%	2
School variables	7.3%	3
Parental health variables	5.3%	4
Parental psychological variables	3.2%	5
Leisure variables	2.3%	6
Life events	1.4%	7
Family variables	1.3%	8
Sociodemographic variables	1.1%	9



#### 4.3.12 Aggregate Model

In order to integrate the data from the nine domains an aggregate model was created comprising age and gender, as control variables, and the following eleven variables which reached significance ( $p \leq .01$ ) in the multivariate domain analyses:

- anger-out
- anxiety/depression
- sleep disturbance
- pain other than headache
- other somatic complaints
- time spent on homework
- school stress
- amount of free time
- time spent on TV/video
- index of life events
- parental headache.

The results of the single-predictor model analyses for these variables are presented in Table 19 (left-hand side). This information is a reiteration of the single-predictor model data reported the respective domain analyses tables.

Prior to the analysis of the aggregate model, the degree of multicollinearity between the independent variables was determined via pairwise correlations and VIFs. The intercorrelation of all but five of the variables was minimal ( $r = -.159$  to  $r = .287$ ). However, pain other than headache was moderately correlated with other somatic complaints ( $r = .532$ ), anxiety/depression ( $r = .308$ ), and sleep disturbances ( $r = .334$ ). The variable other somatic complaints was also moderately correlated with anxiety/depression ( $r = .356$ ), and sleep disturbance ( $r = .383$ ). Finally, anxiety/depression was also moderately correlated with sleep disturbance ( $r = .308$ ), and school stress ( $r = .501$ ). However, the VIFs were satisfactory (range: 1.05-1.54), indicating the absence of problematic multicollinearity. The variables were, therefore, maintained in their original form in the analyses. Detailed information on the intercorrelation of the variables and the corresponding VIFs can be found in Appendix E.

A sequential logistic regression analysis was performed on health status as outcome (weekly headache vs. good health), with age and gender as control variables, and the eleven variables, which reached significance ( $p \leq .01$ ) in the multivariate domain analyses. Data from 2,672 families were available for analysis: 168 children with chronic headache and 2,504 healthy children.

A test of the full aggregate model (significant predictors from the full domain models plus control variables) against the control model (age, gender, and constant) indicated that inclusion of the selected variables, as a set, significantly improved model fit ( $\chi^2_{13, 2672} = 214.00$ ,  $p < .000$ ). The variance in health status accounted for by the full aggregate model is substantial (Nagelkerke's  $R^2 = .262$ ), as is the amount of variance accounted for by the selected (non-control) variables (Nagelkerke's  $R^2 = .201$ ).

**Table 19. Association between weekly headache and all significant variables from domain analyses**

	Weekly headache vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full aggregate model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	P
Age	1.27	1.17 - 1.38	52.27	.000	1.16	1.04 - 1.29	12.12	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.12	1.42 - 3.15	23.69	.000	1.55	.96 - 2.52	5.42	.020
Anger-out <sup>d</sup>	1.07	.88 - 1.29	.80	.372	.81	.64 - 1.03	4.90	.027
Anxiety/depression <sup>d</sup>	1.70	1.43 - 2.03	61.82	.000	1.11	.86 - 1.44	1.12	.290
Sleep disturbance <sup>d</sup>	1.50	1.27 - 1.77	38.65	.000	1.08	.85 - 1.35	.65	.420
Pain other than headache <sup>d</sup>	2.24	1.88 - 2.67	138.79	.000	1.55	1.23 - 1.97	23.23	.000
Other somatic complaints <sup>d</sup>	2.24	1.87 - 2.70	127.89	.000	1.57	1.22 - 2.02	21.56	.000
Time spent on homework <sup>c</sup>			17.73	.000			6.79	.079
1-2 hours/< 1 hour <sup>a</sup>	1.21	.80 - 1.84	1.39	.239	.97	.59 - 1.60	.03	.875
2-3 hours/< 1 hour <sup>a</sup>	1.94	.89 - 4.22	4.77	.029	1.69	.65 - 4.39	2.03	.154
> 3 hours/< 1 hour <sup>a</sup>	9.94	2.02 - 48.94	13.76	.000	5.62	.71 - 44.64	4.60	.032
School stress <sup>d</sup>	1.77	1.48 - 2.12	67.74	.000	1.39	1.07 - 1.79	10.77	.001
Amount of free time <sup>d</sup>	.87	.72 - 1.04	4.03	.045	.90	.71 - 1.13	1.43	.231
Time spent on TV/video <sup>d</sup>	1.30	1.07 - 1.58	11.74	.001	1.21	.95 - 1.53	4.24	.040
Index of life events	1.29	1.11 - 1.50	19.36	.000	1.05	.86 - 1.27	.35	.553
Parental headache <sup>c</sup> Yes / No <sup>a</sup>	3.17	2.00 - 5.02	41.84	.000	2.36	1.39 - 3.98	17.70	.000

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

In the multivariate analysis of the full aggregate model, increased risk of weekly headache was significantly associated with age (OR = 1.16, 99% CI = 1.04-1.29), pain other than headache (OR = 1.55, 99% CI = 1.23-1.97), other somatic complaints (OR = 1.57, 99% CI = 1.22-2.02), school stress (OR = 1.39, 99% CI = 1.07-1.79), and parental headache (OR = 2.36, 99% CI = 1.39-3.98). The association between weekly headache and gender

(OR = 1.55, 99% CI = .96-2.52) approached significance. None of the other variables was significantly associated with weekly headache. In other words, in the multivariate analysis of the full aggregate model, anger-out, anxiety/depression, sleep disturbance, time spent on homework, amount of free time, time spent on TV/video, and index of life events were not independently associated with weekly headache (see Table 19, right-hand side).

#### 4.4 Analyses Regarding Chronic Illness vs. Good Health

##### 4.4.1 Age and Gender (Control Model)

A direct logistic regression analysis was performed on health status as outcome (chronic illness vs. good health) and the control variables age and gender as predictors. Data from 3,547 families were available for analysis: 557 children with chronic illness and 2,990 healthy children.

A test of the control model against the constant-only model indicated that the inclusion of the control variables, as a set, did not significantly improve model fit ( $\chi^2_{2, 3547} = 1.829$ ,  $p = .401$ ). Accordingly, almost no variance in health status is accounted for by the control variables (Nagelkerke's  $R^2 = .001$ ).

Table 20 shows odds ratios, 99% confidence intervals, Wald statistics, and p-values for the two control variables. Chronic illness was not significantly associated with age or gender.

**Table 20. Association between chronic illness and control variables**

	Chronic illness vs. Good health <sup>a</sup>			
	Single-predictor model <sup>b</sup>			
	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456

<sup>a</sup> Reference group

<sup>b</sup> Gender controlled for age and age controlled for gender

<sup>c</sup> Categorical variables

Though the control variables were not significantly associated with chronic illness, sequential logistic regression with control variables in the first block and domain variables in the second block were performed in order to maintain procedural continuity.

##### 4.4.2 Sociodemographic Variables

Logistic regression analyses were performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables, and the following two sociodemographic variables as predictors: social class, household crowding index.

In the single-predictor model analyses, chronic illness was not significantly associated with either of the sociodemographic variables (see Table 21).

In a second step, a sequential logistic regression analysis was performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables in block one, and the sociodemographic variables in block two. Data from 3,310 families were available for the multivariate analysis: 531 children with chronic headache and 2,779 healthy children.

A test of the full domain model (sociodemographic and control variables) against the control model indicated that inclusion of the sociodemographic variables did not significantly increase model fit ( $\chi^2_{3, 3310} = 3.823, p=.281$ ). The variance in health status accounted for by the full model is minute (Nagelkerke's  $R^2 = .003$ ), as is the amount of variance accounted for by the sociodemographic variables alone (Nagelkerke's  $R^2 = .002$ ). Accordingly, neither of the two sociodemographic variables, social class and household crowding, were significantly associated with chronic illness in the full domain model.

**Table 21. Association between chronic illness and sociodemographic variables**

	Chronic conditions vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.98	.93 - 1.03	1.18	.277
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.91	.71 - 1.16	.99	.321
Social class			1.24	.539			.02	.989
Lower / Middle class <sup>a</sup>	.87	.51 - 1.47	.49	.482	.99	.58 - 1.70	.00	.996
Upper / Middle class <sup>a</sup>	1.07	.83 - 1.37	.44	.509	1.01	.78 - 1.31	.02	.898
Household crowding index	.60	.33 - 1.08	5.04	.025	.65	.35 - 1.19	3.35	.067

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

#### 4.4.3 Child Psychological Variables

Using health status (chronic illness vs. good health) as outcome and age and gender as control variables, each of the following eleven psychological variables was examined via logistic regression: passive avoidance, rumination, resignation, aggression, anger-in, anger-out, anger control, anxiety/depression, hyperactivity, aggressive behavior, sleep disturbance.

In the single-predictor model analyses, an increased risk of chronic illness was significantly associated with anger-out (OR = 1.15, 99% CI = 1.02-1.30), and sleep disturbance (OR = 1.21, 99% CI = 1.07-1.36). In addition, associations approaching significance were found between chronic illness and rumination (OR = 1.13, 99% CI = .99-1.28), resignation (OR = 1.13, 99% CI = 1.00-1.28), anxiety/depression (OR = 1.12, 99% CI = .99-1.27) and hyperactivity (OR = 1.13, 99% CI = 1.00-1.28). On the other hand, chronic

illness was not significantly associated with passive avoidance, aggression, anger-in, anger control, and aggressive behavior (see Table 22, left-hand side).

**Table 22. Association between chronic illness and child psychological variables**

	Chronic illness vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.96	.91 - 1.02	2.81	.094
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.97	.74 - 1.27	.07	.790
<i>Maladaptive coping</i>								
Passive avoidance <sup>d</sup>	1.11	.98 - 1.26	4.53	.033	1.00	.85 - 1.18	.00	.960
Rumination <sup>d</sup>	1.13	.99 - 1.28	5.80	.016	1.05	.89 - 1.23	.53	.466
Resignation <sup>d</sup>	1.13	1.00 - 1.28	6.34	.012	1.10	.92 - 1.31	1.81	.179
Aggression <sup>d</sup>	1.10	.97 - 1.24	3.97	.046	.97	.82 - 1.16	.18	.671
<i>Anger expression</i>								
Anger-in <sup>d</sup>	1.03	.91 - 1.17	.47	.495	1.01	.86 - 1.17	.01	.916
Anger-out <sup>d</sup>	1.15	1.02 - 1.30	8.82	.003	1.11	.93 - 1.33	2.48	.115
Anger control <sup>d</sup>	.95	.84 - 1.07	1.42	.234	1.01	.85 - 1.19	.01	.905
Anxiety/depression <sup>d</sup>	1.12	.99 - 1.27	5.41	.020	.98	.82 - 1.18	.05	.826
Hyperactivity <sup>d</sup>	1.13	1.00 - 1.28	6.33	.012	1.06	.90 - 1.26	.92	.337
Aggressive behavior <sup>d</sup>	1.02	.90 - 1.17	.21	.650	.94	.80 - 1.11	.93	.334
Sleep disturbance <sup>d</sup>	1.21	1.07 - 1.36	16.70	.000	1.18	1.03 - 1.36	9.72	.002

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

Subsequently a sequential logistic regression analysis was performed on health status as outcome, with age and gender as control variables in block one, and the eleven child psychological variables as predictors in block two. Data from 3,062 families were available for analysis: 494 children with chronic illness and 2,568 healthy children.

A test of the full domain model (child psychological and control variables) against the control model indicated that inclusion of the child psychological variables, as a set,

significantly improved model fit ( $\chi^2_{11, 3062} = 25.39, p = .008$ ). The variance in health status accounted for by the full domain model is small (Nagelkerke's  $R^2 = .016$ ), as is the amount of variance accounted for by the child psychological variables alone (Nagelkerke's  $R^2 = .015$ ).

Though inclusion of the child psychological variables increased model fit, only one of the variables, sleep disturbance (OR = 1.18, 99% CI = 1.03-1.36) was significantly associated with chronic illness in the multivariate analysis of the full model. None of the other child psychological variables were significantly associated with chronic illness (see Table 22). In other words, in the multivariate analysis of the full domain model, chronic illness was not independently associated with passive avoidance, rumination, resignation, aggression, anger-in, anger-out, anger control, anxiety/depression, hyperactivity, and aggressive behavior.

#### 4.4.4 Child Health Variables

The child health variables, pain other than headache and other somatic complaints, were examined in logistic regression analyses together with age and gender as control variables and health status (chronic illness vs. good health) as outcome.

In the single-predictor model analyses, an increased risk of chronic illness was significantly associated with child's other somatic complaints (OR = 1.18, 99% CI = 1.01-1.33). However, chronic illness was not significantly associated with pain other than headache (see Table 23, left-hand side).

A sequential logistic regression analysis was then performed with age and gender as control variables in block one, and the child health variables as predictors of health status in block two. Data from 3,336 families were available for analysis: 517 children with chronic illness and 2,819 healthy children.

**Table 23. Association between chronic illness and child health variables**

	Chronic conditions vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.98	.93 - 1.04	.64	.423
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.90	.70 - 1.16	1.11	.291
Pain other than headache <sup>d</sup>	1.12	.98 - 1.28	4.41	.036	1.05	.89 - 1.23	.50	.481
Other somatic complaints <sup>d</sup>	1.16	1.01 - 1.33	7.39	.007	1.13	.97 - 1.33	4.17	.041

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full domain model (health and control variables) against the control model (age, gender, and constant) indicated that inclusion of the child health variables, as a set, improved model fit to a degree that approached significance ( $\chi^2_{2, 3336} = 7.72, p = .021$ ). However, the variance in health status accounted for by the full model is minute (Nagelkerke's  $R^2 = .005$ ), as is the amount of variance accounted for by the health variables alone (Nagelkerke's  $R^2 = .004$ ).

In line with the lack of significant model fit, the multivariate analysis of the full domain model indicated that neither of the child health variables (i.e., pain other than headache and other somatic complaints) was significantly associated with chronic illness (see Table 23, right-hand side).

#### **4.4.5 Family Variables**

Using the same outcome variable (chronic illness vs. good health) and age and gender as control variables, each of the following five family variables was examined via logistic regression: number of parents in the household, number of other children in the household, negative family environment, negative conflict solving strategies, and weekly family conflict.

In the single-predictor analyses, none of the individual family variables was significantly associated with chronic illness (see Table 24, left-hand side). In other words, the analyses indicated that the variables number of parents in household, number of other children in household, negative family environment, negative conflict solving strategies, and weekly family conflict were not significantly associated with chronic illness.

In a subsequent step, a sequential logistic regression analysis was performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables in block one, and the five family variables as predictors in block two. Data from 3,395 families were available for the analysis of this domain: 542 children with chronic illness and 2,853 healthy children.

A test of the full domain model (family plus control variables) against the control model indicated that inclusion of family variables, as a set, significantly improved model fit ( $\chi^2_{5, 3395} = 16.10, p = .007$ ). However, the variance in health status accounted for by the full model is minute (Nagelkerke's  $R^2 = .009$ ), as is the variance accounted for by family variables alone (Nagelkerke's  $R^2 = .008$ ).

Though inclusion of family variables increased model fit, only the association between negative family environment and chronic illness (OR = 1.14, 99% CI = .99-1.32) approached significance. None of the other family variables was independently associated with chronic illness (see Table 24, right-hand side).

**Table 24. Association between chronic illness and family variables**

	Chronic conditions vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	P	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.97	.92 - 1.03	1.54	.214
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.93	.73 - 1.18	.66	.418
Number of parents in household <sup>c</sup> One / Two <sup>a</sup>	.90	.63 - 1.29	.54	.461	.84	.58 - 1.21	1.48	.223
Number of children in household	.89	.77 - 1.03	4.21	.040	.88	.76 - 1.02	5.18	.023
Negative family environment <sup>d</sup>	1.11	.98 - 1.25	4.76	.029	1.14	.99 - 1.32	5.96	.015
Negative conflict solving strategies <sup>d</sup>	1.01	.89 - 1.14	.02	.878	.91	.78 - 1.06	2.65	.103
Weekly family conflict <sup>c</sup> Yes / No <sup>a</sup>	1.23	.93 - 1.61	3.72	.054	1.29	.94 - 1.75	4.40	.036

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

#### 4.4.6 School Variables

Logistic regression analyses were performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables, and the following four school variables: index of school difficulties, time spent on homework, school stress, and reaction to failure.

In the single-predictor model analyses, an increased risk of chronic illness was significantly associated with school stress (OR = 1.21, 99% CI = 1.07-1.38). In addition, the association between an increased risk for chronic illness and reaction to failure (OR = 1.13, 99% CI = 1.00-1.28) approached significance. None of the other school variables were significantly associated with chronic illness in the single-predictor model analyses (see Table 25, left-hand side).

Then a sequential logistic regression analysis was performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables in block one, and the four school variables as predictors in block two. Data from 3,195 families were available for analysis: 496 children with chronic headache and 2,699 healthy children.

A test of the full domain model (school and control variables) against the control model indicated that inclusion of the school variables, as a set, significantly improved model fit ( $\chi^2_{6, 3195} = 17.05, p = .009$ ). The variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .010$ ), as is the amount of variance accounted for by the school variables alone (Nagelkerke's  $R^2 = .009$ ).



**Table 25. Association between chronic illness and school variables**

	Chronic conditions vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.30	1.32	.251	.98	.92 - 1.04	8.34	.361
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.95	.73 - 1.22	.30	.583
Index of school difficulties	1.09	.88 - 1.34	1.10	.295	.99	.79 - 1.24	.02	.885
Time spent on homework <sup>c</sup>			1.54	.673			1.10	.776
1-2 hours/< 1 hour <sup>a</sup>	1.11	.84 - 1.46	.86	.354	1.06	.80 - 1.42	.31	.577
2-3 hours/< 1 hour <sup>a</sup>	1.20	.62 - 2.32	.53	.468	1.28	.66 - 2.50	.92	.338
> 3 hours/< 1 hour <sup>a</sup>	1.67	.21 - 13.28	.41	.524	.87	.05 - 14.30	.02	.900
School stress <sup>d</sup>	1.21	1.07 - 1.38	15.26	.000	1.20	1.03 - 1.39	9.49	.002
Reaction to failure <sup>d</sup>	1.13	1.00 - 1.28	6.13	.013	1.07	.93 - 1.23	1.44	.231

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

In the multivariate analysis of the full domain model, increased risk of chronic illness was significantly associated with school stress (OR = 1.20, 99% CI = 1.03-1.39). None of the other school variables were significantly associated with chronic illness. In other words, the multivariate analysis of the full model indicated that school difficulties, time spent on homework, and reaction to failure were not significantly associated with chronic illness (see Table 25, right-hand side)

#### 4.4.7 Leisure Variables

Using the same outcome variable (chronic illness vs. good health) and age and gender as control variables, each of the following six leisure variables was examined via logistic regression: physical activities, other recreational activities, amount of free time, time spent on TV / video, time spent on computer/internet/game console, amount of friends.

In the single-predictor model analyses, not one of the leisure variables was significantly associated with chronic illness. In other words, chronic illness was not significantly associated with physical activities, recreational activities, amount of free time, time spent on TV / video, time spent on computer/game console, or amount of friends (see Table 26, left-hand side).

Nevertheless, a sequential logistic regression analysis was performed on health status as outcome, with age and gender as control variables in block one, and the six leisure

variables as predictors in block two. Data from 3,298 families were available for analysis: 517 children with chronic headache and 2,781 healthy children.

**Table 26. Association between chronic illness and leisure variables**

	Chronic conditions vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	P	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	1.00	.94 - 1.06	.02	.891
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.86	.65 - 1.14	1.89	.169
Physical activities <sup>d</sup>	1.06	.94 - 1.20	1.53	.216	1.06	.93 - 1.21	1.24	.266
Recreational activities <sup>d</sup>	1.03	.90 - 1.17	.27	.605	1.01	.87 - 1.16	.01	.924
Amount of free time <sup>d</sup>	.90	.80 - 1.02	4.38	.036	.92	.80 - 1.05	2.93	.087
Time spent on TV / video <sup>d</sup>	.92	.81 - 1.04	3.34	.068	.94	.81 - 1.08	1.31	.253
Time spent on computer / game console <sup>d</sup>	.90	.78 - 1.04	3.34	.067	.91	.78 - 1.07	2.11	.146
Amount of friends <sup>c</sup>			7.38	.025			6.20	.045
0-1friends/2-5 friends <sup>a</sup>	.67	.40 - 1.13	3.88	.049	.67	.39 - 1.15	3.64	.057
>5 friends/2-5 friends <sup>a</sup>	.79	.60 - 1.05	4.63	.031	.82	.61 - 1.08	3.45	.063

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full domain model (leisure and control variables) against the control model indicated that inclusion of the leisure variables, as a set, improved model fit to a degree that approached significance ( $\chi^2_{7, 3298} = 17.53$ ,  $p = .014$ ). The variance in health status accounted for by the full model is minimal (Nagelkerke's  $R^2 = .010$ ), as is and the amount of variance accounted for by the leisure variables alone (Nagelkerke's  $R^2 = .009$ ).

In line with the lack of significant model fit and the results from the single-predictor model analyses, the multivariate analysis of the full domain model indicated that none of the leisure variables was significantly associated with chronic illness (see Table 26, right-hand side).

#### 4.4.8 Life Events

Again, as an index was calculated to quantify the number of life events experienced by the child and this index is the only variable of the domain, the first step of analyzing single-predictor models became unnecessary. Therefore, the statistical analysis began with a sequential logistic regression analysis that was performed on health status as outcome

(chronic illness vs. good health), with age and gender as control variables in block one, and the index of life events as predictor in block two. Data from 3,547 families were available for analysis: 557 children with chronic illness and 2,990 healthy children.

**Table 27. Association between chronic illness and life events**

	Chronic illness vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.98	.93 - 1.03	1.09	.296
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.93	.74 - 1.19	.55	.460
Index of life events					1.07	.96 - 1.19	2.35	.125

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

A test of the full domain model (life event index and control variables) against the control model indicated that the inclusion of the index of life events did not significantly improve model fit ( $\chi^2_{1, 3547} = 2.312$ ,  $p = .128$ ). The variance in health status accounted for by the full model is minute (Nagelkerke's  $R^2 = .002$ ), as is the amount of variance accounted for by the index of life events alone (Nagelkerke's  $R^2 = .001$ ). Accordingly, the multivariate analysis of the full domain model indicated that number of experienced life events was not significantly associated with chronic illness (see Table 27, right-hand side).

#### 4.4.9 Parental Psychological Variables

Logistic regression analyses were performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables, and the following three parental psychological variables: parental anxiety/depression (index), parental habitual worry, and parental sleep disturbances.

In single-predictor model analyses, none of the parental psychological variables was significantly associated with chronic illness (see Table 28, left-hand side).

Nevertheless, in a second step, a sequential logistic regression analysis was performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables in block one, and the three parental psychological variables as predictors in block two. Data from 3,380 families were available for analysis: 531 children with chronic illness and 2,849 healthy children.

A test of the full domain model (parental psychological and control variables) against the control model (age, gender, and constant) indicated that inclusion of the parental psychological variables, as a set, did *not* significantly improve model fit, ( $\chi^2_{3, 3380} = 5.371$ ,  $p = .147$ ). Accordingly, almost no variance in health status accounted for by the full model (Nagelkerke's  $R^2 = .003$ ), and the amount of variance accounted for by the parental psychological variables, alone, is minute (Nagelkerke's  $R^2 = .002$ ).

**Table 28. Association between chronic illness and parental psychological variables**

	Chronic illness vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.98	.93 - 1.04	.73	.394
Gender <sup>2c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.93	.73 - 1.18	.63	.426
Parental anxiety / depression <sup>d</sup>	1.11	.98 - 1.26	4.73	.030	1.12	.95 - 1.33	3.09	.079
Parental worry as trait <sup>d</sup>	1.09	.96 - 1.23	3.19	.074	1.02	.87 - 1.19	.10	.750
Parental sleep disturbance <sup>d</sup>	1.00	.88 - 1.14	.01	.937	.95	.82 - 1.10	.90	.342

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

In line with the lack of significant model fit and the results from the single-predictor model analyses, the multivariate analysis of the full domain model indicated that none of the parental psychological variables was significantly associated with chronic illness. In other words, chronic illness was not significantly associated with parental anxiety/depression, parental habitual worry, or parental sleep disturbances (see Table 28, right-hand side).

#### 4.4.10 Parental Health Variables

Using health status (chronic illness vs. good health) as the outcome variable, with age and gender as controls, each of the following six parental health variables was examined via logistic regression: general health, number of doctor appointments, regular medication, headache, pain other than headache, and somatic complaints.

In the analyses of single-predictor models, an increased risk of chronic illness was associated with number of doctor appointments (OR = 1.20, 99% CI = 1.02-1.27), parental headache (OR = 1.20, 99% CI = 1.06-1.74), parental pain other than headache (OR = 1.20, 99% CI = 1.04-1.33), and parental other somatic complaints (OR = 1.20, 99% CI = 1.12-1.41). A *reduced* risk of chronic illness was associated with general health (OR = 1.20, 99% CI = .77-.97). Chronic illness was not associated with regular medication (see Table 29, left-hand side).

In a subsequent step, a sequential logistic regression analysis was performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables in block one, and the six parental health variables as predictors in block two. Data from 3,281 families were available for analysis: 511 children with chronic illness and 2,770 healthy children.

**Table 29. Association between chronic illness and parental health variables**

	Chronic illness vs. Good health <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full domain model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.98	.93 - 1.04	.83	.363
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.94	.73 - 1.20	.45	.504
General health <sup>d</sup>	.86	.77 - .97	10.50	.001	.97	.84 - 1.11	.43	.513
Number of doctor appointments <sup>d</sup>	1.14	1.02 - 1.27	9.08	.003	1.07	.93 - 1.23	1.50	.221
Regular medication <sup>c</sup> Yes / No <sup>a</sup>	1.24	.95 - 1.63	4.16	.041	.94	.68 - 1.29	.28	.595
Headache <sup>c</sup> Yes / No <sup>a</sup>	1.36	1.06 - 1.74	10.14	.001	1.26	.97 - 1.63	5.01	.025
Pain other than headache <sup>d</sup>	1.17	1.04 - 1.33	11.27	.001	1.07	.94 - 1.23	1.81	.179
Other somatic complaints <sup>d</sup>	1.26	1.12 - 1.41	25.59	.000	1.20	1.04 - 1.38	10.89	.001

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full domain model (parental health and control variables) against the control model indicated that inclusion of the parental health variables, as a set, significantly improved model fit ( $\chi^2_{6, 3281} = 35.021, p < .001$ ). The variance in health status accounted for by the full model is small (Nagelkerke's  $R^2 = .019$ ), as is the amount of variance accounted for by the parental health variables alone (Nagelkerke's  $R^2 = .018$ ).

In the multivariate analysis of the full domain model, an increased risk of chronic illness was significantly associated with parental other somatic complaints (OR = 1.20, 99% CI = 1.04-1.38). None of the other parental health variables was significantly associated with chronic illness. In other words, in the multivariate analysis of the full model chronic illness was not independently associated with general health, number of doctor appointments, regular medication, headache and pain other than headache (see Table 29, right-hand side).

#### 4.4.11 Summary of Full Domain Model Analyses

The amount of variance explained by each set of domain variables is presented in Table 30. Variable domains are listed in descending order according to the amount of variance explained beyond that explained by age and gender. However, as Table 30 shows, the amount of variance explained by the individual domains is quite small.

**Table 30. Amount of variance explained per domain (beyond that explained by age and gender)**

Domain	Chronic illness vs. Good health <sup>a</sup>	
	Nagelkerke's R <sup>2</sup>	Rank
Age & Gender	0.1%	
Parental health variables	1.8%	1
Child psychological variables	1.5%	2
School variables	0.9%	3
Leisure variables	0.9%	3
Family variables	0.8%	5
Child health variables	0.4%	6
Sociodemographic variables	0.2%	7
Parental psychological variables	0.2%	7
Life events	0.1%	9

#### 4.4.12 Aggregate Model

In order to integrate the data regarding chronic illness from all nine domains, an aggregate model was created comprising age and gender, and the following three variables which reached significance ( $p \leq .01$ ) in the multivariate full domain model analyses:

- sleep disturbance,
- school stress,
- other parental somatic complaints.

The results of the single-predictor model analyses for these variables are presented in Table 31 (left-hand side). This information is a reiteration of the single-predictor model data reported in the respective domain analyses tables.

Prior to the analysis of the aggregate model, the degree of multicollinearity between the independent variables was determined via pairwise correlations and VIFs. The intercorrelation of the variables was minimal ( $r = -.038$  to  $r = .231$ ). Accordingly, the VIFs were satisfactory (range: 1.01-1.07), indicating the absence of problematic multicollinearity. The variables were, therefore, maintained in their original form in the analyses. Detailed information on the intercorrelation of the variables and the corresponding VIFs can be found in Appendix E.

A sequential logistic regression analysis was performed on health status as outcome (chronic illness vs. good health), with age and gender as control variables in block one, and the three variables which reached significance ( $p \leq .01$ ) in the multivariate domain analyses in block two. Data from 3,249 families were available for analysis: 504 children with chronic illness and 2,745 healthy children.

A test of the full aggregate model (above three variables plus control variables) against the control model indicated that inclusion of the three variables, as a set, significantly increased model fit ( $\chi^2_{10, 3249} = 43.70$ ,  $p < .000$ ). However, the variance in health status

accounted for by the full model is small (Nagelkerke's  $R^2 = .024$ ). The bulk of the explained variance is accounted for by the three variables alone (Nagelkerke's  $R^2 = .023$ ).

**Table 31. Association between chronic illness and all significant variables from domain analyses**

	Chronic illness vs. Good health <sup>a</sup>							
	Single predictor model <sup>b</sup>				Full aggregate model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	.98	.93 - 1.03	1.32	.251	.97	.92 - 1.03	1.82	.178
Gender <sup>c</sup> Female / Male <sup>a</sup>	.93	.74 - 1.18	.56	.456	.93	.72 - 1.19	.62	.433
Sleep disturbance <sup>d</sup>	1.21	1.07 - 1.36	16.70	.000	1.16	1.02 - 1.32	8.73	.003
School stress <sup>d</sup>	1.21	1.07 - 1.38	15.26	.000	1.16	1.02 - 1.33	8.29	.004
Parental other somatic complaints <sup>d</sup>	1.26	1.12 - 1.41	25.59	.000	1.21	1.07 - 1.37	16.69	.000

<sup>a</sup> Reference group

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

In the multivariate analysis of the full aggregate model, increased risk of chronic illness was significantly associated with sleep disturbance (OR = 1.16, 99% CI = 1.02-1.32), school stress (OR = 1.16, 99% CI = 1.02-1.33), and parental other somatic complaints (OR = 1.21, 99% CI = 1.07-1.37) Chronic illness was not significantly associated with age or gender (see Table 31, right-hand side).

#### 4.5 Specificity Model (Analyses Regarding Weekly Headache vs. Chronic Illness)

Finally, in order to determine the specificity of the variables significantly related with weekly headache logistic regression analyses were performed on health status as outcome (weekly headache vs. chronic illness), with age and gender as control variables, and each of the following six variables which achieved significance ( $p \leq .01$ ) in the aggregate model for either weekly headache or chronic illness:

- pain other than headache,
- other somatic complaints,
- sleep disturbance,
- school stress,
- parental headache, and
- parental other somatic complaints.

Prior to the analyses, the degree of multicollinearity between the independent variables was determined via pairwise correlations and VIFs. The intercorrelation of all but three of the variables was minimal ( $r = -.047$  to  $r = .281$ ). However, the variable sleep disturbance was moderately correlated with pain other than headache ( $r = .319$ ), and other

somatic complaints ( $r=.379$ ). There was also a moderate intercorrelation of pain other than headache and other somatic complaints ( $r=.529$ ). However, the VIFs were satisfactory (range: 1.02-1.49), indicating the absence of problematic multicollinearity. The variables were, therefore, maintained in their original form in the analyses. Detailed information on the intercorrelation of the variables and the corresponding VIFs can be found in Appendix E.

In the single-predictor model analyses, weekly headache was significantly associated with pain other than headache (OR = 1.92, 99% CI = 1.55-2.39), other somatic complaints (OR = 2.04, 99% CI = 1.60-2.60), sleep disturbance (OR = 1.24, 99% CI = 1.02-1.52), school stress (OR = 1.51, 99% CI = 1.21-1.90), and parental headache (OR = 2.47, 99% CI = 1.46-4.19). Other parental somatic complaints were not significantly associated with either of the health outcomes in the specificity model (see Table 32, left-hand side).

In a second step, a sequential logistic regression analysis was performed on health status (weekly headache vs. chronic illness) as outcome, with age and gender as control variables in block one, and the above six variables as predictors in block two. Data from 633 families were available for analysis: 168 children with weekly headache and 465 children with chronic illness.

**Table 32. Association between weekly headache and chronic illness**

	Weekly headache vs. Chronic illness <sup>a</sup>							
	Single-predictor model <sup>b</sup>				Full specificity model			
	OR	99% CI	Wald	p	OR	99% CI	Wald	p
Age	1.34	1.21 - 1.48	52.14	.000	1.25	1.10 - 1.41	19.92	.000
Gender <sup>c</sup> Female / Male <sup>a</sup>	2.36	1.50 - 3.74	23.46	.000	1.79	1.03 - 3.11	7.29	.007
Pain other than headache <sup>d</sup>	1.92	1.55 - 2.39	60.59	.000	1.45	1.10 - 1.91	12.27	.000
Other somatic complaints <sup>d</sup>	2.04	1.60 - 2.60	56.64	.000	1.69	1.22 - 2.34	17.02	.000
Sleep disturbance <sup>d</sup>	1.24	1.02 - 1.52	7.78	.005	.951	.73 - 1.24	.23	.631
School stress <sup>d</sup>	1.51	1.21 - 1.90	22.04	.000	1.26	.96 - 1.67	4.64	.031
Parental headache <sup>c</sup> Yes / No <sup>a</sup>	2.47	1.46 - 4.19	19.58	.000	1.91	1.05 - 3.48	7.79	.005
Other parental somatic complaints <sup>d</sup>	1.04	.83 - 1.30	.22	.642	.83	.63 - 1.09	3.01	.083

<sup>a</sup> Reference group for contrast

<sup>b</sup> All variables controlled for age and gender, except gender (controlled for age) and age (controlled for gender)

<sup>c</sup> Categorical variables

<sup>d</sup> Z-scores

A test of the full specificity model with all six predictors against the control model (age, gender, and constant) indicated that inclusion of the variables, as a set, significantly increased model fit ( $\chi^2_{13, 633} = 94.73$ ,  $p < .000$ ). The variance in health status (weekly



headache vs. chronic illness) accounted for by the full model is moderate (Nagelkerke's  $R^2 = .311$ ), as is the variance accounted for by the six variables alone (Nagelkerke's  $R^2 = .185$ ).

In the multivariate analysis of the full specificity model, increased risk of weekly headache was significantly associated with pain other than headache (OR = 1.45, 99% CI = 1.10-1.91), other somatic complaints (OR = 1.69, 99% CI = 1.22-2.34), and parental headache (OR = 1.91, 99% CI = 1.05-3.48). In addition, weekly headache was significantly associated with the control variables age (OR = 1.25, 99% CI = 1.10-1.41) and gender (OR = 1.79, 99% CI = 1.03-3.11). None of the other variables were significantly associated with weekly headache or chronic illness (see Table 32, right-hand side). In other words, in the multivariate analysis of the specificity model sleep disturbance, school stress, and parental other somatic complaints were not significantly associated with the health outcome of interest.

## 5. DISCUSSION

Three topics will be covered in the following discussion. First, the prevalence of weekly headache will be discussed within the context of national and international epidemiological studies. Second, the results concerning correlates of weekly headache will be discussed. The single-predictor analyses will be summarized and integrated with previous research, thus yielding an updated appraisal of the empirical status of the examined variables. Results from the domain models and the final aggregate model will then be covered. As a third topic, the results regarding the specificity of the correlates for weekly headache will be discussed. Finally, directions for future research will be outlined.

### 5.1 Prevalence of Weekly Headache

The prevalence of weekly headache in the present sample of German children and adolescents (aged 7 to 14) was 6.5%. This prevalence rate is relatively low in comparison to international studies which have reported rates of headache occurring at least once a week in the past 12 months to range from 10.8% for 7- to 15-year-olds (Laurell et al., 2004) to 29.7% for 11- to 21-year-olds (Rhee, 2000; see also Table 1).

Nevertheless, similar rates have been reported in several studies. For example, Carlsson (1996) found a 6% prevalence rate for headache occurring at least “several times a week” in Swedish school children of a similar age range (7 to 16 years). In addition, Kristjánsdóttir (1997) reported weekly headache to be experienced by 6.2% of Icelandic adolescents (aged 11 to 12 and 15 to 16), and a prevalence rate of 7% was reported for 12- to 17-year-olds in USA (Linnet et al., 1989). However, these three studies were conducted about a decade ago, and as there is evidence that the prevalence of both headache and weekly headache has increased in the past decades (Rhee, 2000; Scheidt et al., 2000; Sillanpää & Anttila, 1996), a higher rate of weekly headache was to be expected in the present research. On the other hand, a recent study from Norway reported weekly headache to occur in 8% of adolescents aged 13 to 18 (Zwart et al., 2004). Thus, it could be argued that the present prevalence of 6.5% was acceptably within the range of rates reported in the literature.

Noteworthy is, however, that the prevalence rate found in the present study differs drastically from those reported in other *German* studies. The three large-scale studies that have assessed weekly headache among German children and adolescents have found prevalence rates ranging from 21.2% to 25% (Frankenberg & Pothmann, 1995; Ravens-Sieberer et al., 2003; Scheidt et al., 2000). A possible explanation for this divergence is the use of different sources of information. While child report data was analyzed in the other three studies (Frankenberg & Pothmann, 1995; Ravens-Sieberer et al., 2003; Scheidt et al., 2000), the present research employed parental questionnaires. It is possible that parents underreport child’s headache, as their ability to estimate headache frequency depends on the extent to which the child verbalizes experiencing headache and on parents’ ability to perceive non-verbal indicators of child’s headache.

Evidence of parental underreporting of child headache has been documented by Grøholt et al. (2003). The rate of headache prevalence reported by parents with co-

responding children was 1.2 times higher than that reported by parents with non-responding children. A preliminary analysis of data from the *child* questionnaires of the Children, Adolescents & Headache Study revealed the presence of a similar situation. While a prevalence rate of 8.0%<sup>9</sup> for the 9- to 14-year-olds was calculated on the basis of parent report, a substantially higher rate was reported by children and adolescents, namely 16.7%.

In sum, the prevalence rate found in the present study is lower than the rates previously reported for German children and adolescents. Though it is within the range of prevalence rates for weekly headache that have been reported in the extant literature, it appears to underreport headache occurrence in comparison to child report.

## 5.2 Correlates of Weekly Headache

Pediatric headache has received unprecedented scientific attention in the past two decades (McGrath & Hillier, 2001) and numerous potentially related variables have been examined in this time. An overview of the research on these variables was given in the Theoretical and Empirical Background and the empirical status of the variables was evaluated. The results presented in the overview were primarily based on contingency tables and  $\chi^2$  tests or regression analyses looking at single independent variables. As a consequence, the empirical status of the variables presented in Table 2 and Table 3 was determined on the basis of single-predictor models or their equivalents. Accordingly, integration of the present research was performed on the basis of single-predictor models comparing weekly headache to good health. The revised status of the variables, subsequent to this integration, is presented in Table 33.

As a reiteration, the classification of the variables as being inconclusively, tentatively, or conclusively associated with weekly headache depended on the number of studies investigating the variable and the reported results: Variables examined in a single study were classified as inconclusive pending further research, as it was thought unsuitable to draw conclusions on the basis of a single study. Variables with conflicting results that were relatively balanced between affirmation and refutation were also classified as being inconclusive (due to contradiction). Variables were classified as tentatively conclusive if they had been corroborated in several studies and the number of studies affirming or refuting the association exceeded the number of opposing studies by at least two. Finally, variables were classified as conclusive if they had been corroborated in several studies and the number of studies affirming or refuting the association exceeded the number of opposing studies by at least four.

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<sup>9</sup> This prevalence rate differs from the previously reported 6.5%, as it was calculated for the children and adolescents aged 9 to 14. The younger children (7- and 8-year-olds) were excluded in order to make the prevalence rates from parent- and child-report comparable. This was necessary as child questionnaires were only sent to those 9 or older.

**Table 33. Empirical status of variables potentially relevant to pediatric *weekly* headache after integration of the present research**

Related <sup>a</sup>	Unrelated <sup>a</sup>	Tentatively related <sup>b</sup>	Tentatively unrelated <sup>b</sup>	Inconclusive due to contradictory results	Inconclusive due to examination in a single study
- Gender		- Age	- Social class	- Divorce / Separation	- Household income
- Anxiety		- Emotional problems	- Physical activities	- Psychiatric disorder	- Parental unemployment
- Depression		- Anxiety / Depression	- Poor peer relations	- Aggressive behavior	- Parental educational level
- Somatic symptom scales		- Internalizing		- Hyperactivity	- Occupational prestige
		- Stress		- Externalizing	- Household crowding
		- Non-headache pain		- Poor academic achievement	- Passive avoidance (coping)
		- Negative school climate / school stress		- Recreational activities	- Rumination (coping)
		- Time spent on homework		- Index of life events	- Resignation (coping)
		- Parental headache			- Aggression (coping)
					- Anger in
					- Anger out
					- Anger control
					- Lower self-esteem
					- Number of children in household
					- Negative family environment
					- Fear of failure
					- Negative family problem solving strategies
					- Weekly family conflict
					- Time spent on TV/video
					- Time spent on computer/game console
					- Amount of free time
					- Amount of friends
					- Parental nervous problems
					- Parental other pain
					- Parental chronic illness

<sup>a</sup> The number of studies including the present one affirming the variable's status exceeds the number of opposing studies by at least four <sup>b</sup> The number of studies including the present one affirming the variable's status exceeds the number of opposing studies by at least two

### 5.2.1 Age and Gender

Weekly headache was associated with age and gender in the analysis of the single-predictor model of the control variables. Together, age and gender explained 6.5% of the variance differentiating between weekly headache and good health. The odds ratio indicated that a one-year increase in age was associated with a 27% higher likelihood of weekly headache. However, gender was the stronger of the two control variables, with female gender being associated with an over twofold higher likelihood of weekly headache.

The empirical status of the variable age as being inconclusive due to contradictory findings is not changed by the present research. Age has not been a major focus of research on weekly headache: Only a few prior studies investigated its association with weekly headache, and the results were conflicting: While an inverse relation between age and prevalence of weekly headache was reported in one study (Kristjánsdóttir & Wahlberg, 1993), two other studies indicated that the prevalence of weekly headache increased with age (Egermark-Eriksson, 1982; Scheidt et al., 2000). In contrast, three further studies found age and weekly headache to be unrelated (Carlsson, 1996; King & Sharpley, 1990; Passchier & Orlebeke, 1985). Including the present research, three studies report a significant positive association between age and weekly headache, one study reports a significant negative relation, and three studies indicate age and weekly headache to be unrelated. Further research is necessary in order to clarify the status of the variable age.

The results regarding gender confirm its empirical status of being related to weekly headache. As yet, no contradictory findings have been reported. All known studies investigating gender and weekly headache have concluded that gender is a highly relevant factor (Bandell-Hoekstra et al., 2001; Brattberg & Wickman, 1992; Carlsson, 1996; Fichtel & Larsson, 2002; King & Sharpley, 1990; Larsson, 1988; Passchier & Orlebeke, 1985; Rhee, 2000; Scheidt et al., 2000; Sillanpää, 1983; Zwart et al., 2004).

### 5.2.2 Sociodemographic Variables

Weekly headache was significantly associated with household crowding in the single-predictor analysis. The odds ratio indicated that with a one unit increase in household crowding, the likelihood of weekly headache more than doubled. However, as no other studies on weekly headache have examined this variable, no conclusions regarding its status can be drawn. In addition, research on headache (without regard to frequency) has yielded conflicting results (Karwautz et al., 1999; Sillanpää et al., 1991; Zuckerman et al., 1987), rendering household crowding inconclusive in this area as well. Further research is necessary before it can be determined whether household crowding plays a role in weekly headache.

The other sociodemographic variable, social class, was not significantly associated with weekly headache in the single-predictor model. This is in line with the results from Larsson (1988) in the only other study that has investigated social class (as an aggregate variable) to date. Taken together, these results indicate that social class is tentatively unrelated to weekly headache.

Though the sociodemographic variables significantly increased model fit in the full model analysis of the domain, the amount variance explained by the two variables (beyond that explained by age and gender) was minimal. In addition, neither of the variables reached significance in the full model.

### 5.2.3 *Child Psychological Variables*

Weekly headache was associated with anxiety/depression in the single-predictor analysis. The odds ratio indicated that children and adolescents with one standard deviation more anxiety/depression were 70% more likely to have weekly headache. This corroborates data from Larsson (1988) and thus changes the status of anxiety/depression to that of a variable tentatively related to weekly headache. The relevance of anxiety and depression for weekly headache is further underscored by research that has examined these as separate variables and found both anxiety (Andrasik et al., 1988; Engström, 1992; Fichtel & Larsson, 2002; Larsson, 1988; Martin-Herz et al., 1999) and depression (Andrasik et al., 1988; Engström, 1992; Fichtel & Larsson, 2002; Gordon et al., 2004; Martin-Herz et al., 1999) to be significantly associated with weekly headache.

Aggressive behavior and hyperactivity were also significantly associated with weekly headache. The odds ratios indicated that children and adolescents with one standard deviation more hyperactivity were 34% more likely to have weekly headache. Those with more aggressive behavior were 26% more likely to have weekly headache. In the only other study to date that has investigated these variables with regard to weekly headache, Gordon et al. (2004) found associations approaching significance were for both variables. However, as only the present research has found significant associations, the status of aggressive behavior and hyperactivity remains inconclusive.

Weekly headache was significantly associated with sleep disturbance in the single-predictor analysis. The odds ratio indicated that children and adolescents with one standard deviation more frequent sleep disturbances were 50% more likely to have weekly headache. However, no real conclusions can be drawn regarding the status of the variable, as no other studies on weekly headache have examined it thus far. On the other hand, sleep disturbance was classified as being tentatively related to headache without regard to frequency (see Table 2), as four studies reported a significant association (Aromaa et al., 1998; Grøholt et al., 2003; Laurell et al., 2005; Rhee, 2000) and only one did not (Kowal & Pritchard, 1990). Further research is necessary before it can be determined, whether sleep disturbances are relevant to weekly headache and the results regarding headache in general suggest it worthwhile to pursue this issue.

All four of the maladaptive coping strategies (passive avoidance, rumination, resignation, aggression) reached significance in the single-predictor analyses. The odds ratios indicated that children and adolescents with one standard deviation more of the maladaptive coping strategies were 44% to 51% more likely to have weekly headache. As this is the only study that has examined stress coping strategies with regard to weekly headache, no conclusions can be drawn regarding the four coping strategies. However, a single study has investigated stress coping with regard to headache (Luka-Krausgrill & Reinhold, 1996). The authors found adolescents with monthly headache to employ

avoidance coping significantly more often than those with less frequent or no headache. No differences were found with regard to active or internal coping strategies. On the other hand, Hampel, Rudolph, Stachow, Laß-Lentzsch, and Petermann (2005) found that children and adolescents with chronic illness employed passive avoidance significantly *less* often than healthy controls. The authors concluded on the basis of this and other findings that “coping with a chronic illness may lead to more effective coping with everyday stressors” (p. 145). With respect to our results, this does not seem to be true for weekly headache.

Of the three types of anger expression, only anger control reached significance in the single-predictor analyses. The odds ratio indicated that one standard deviation *less* anger control increased the likelihood of weekly headache by 20%. On the other hand, the association between outward expression of anger and weekly headache approached significance. Nevertheless, no real conclusions can be drawn regarding anger control, or inward and outward expression of anger, as these variables have not yet been examined in any other studies on weekly headache. However, the tentative evidence of an association between anger and headache in general (Carlsson et al., 1996; Sillanpää et al., 1991), may be grounds for including anger expression in future research.

As a set, the child psychological variables significantly increased model fit in the full model analysis of the domain and explained a moderate amount (8.4%) of the variance differentiating children and adolescents with weekly headache from those without headache (beyond that explained by age and gender). Indeed, child psychological variables ranked second after child health variables among the nine domains with regard to amount of explained variance (see Table 18).

Though nine of the eleven child psychological variables reached significance in the single-predictor analyses, only anxiety/depression and sleep disturbance maintained significance in the multivariate analysis of the full domain model. A one standard deviation increase in anxiety/depression was associated with 41% higher likelihood of weekly headache. For sleep disturbances the risk of weekly headache increased by 37%. In addition, anger out reached significance in the multivariate analysis of the full model, though it was unrelated to weekly headache in the single-predictor analysis. However, this significance is ascribable to a suppressor effect, rather than indicating that outward expression of anger is a variable relevant to weekly headache in its own right.

#### **5.2.4 Child Health Variables**

Pain other than headache was significantly associated with weekly headache in the single-predictor analysis and the odds ratio indicated that children and adolescents with non-headache pain had an over twofold increased risk of weekly headache. This is in line with research by Fichtel and Larsson (2002), in which two-thirds of the adolescents with weekly headache reported experiencing at least one further weekly pain. Half of these had a single additional pain, while the others experienced two or more additional weekly pains. This combined with the present research makes pain other than headache a variable tentatively related to weekly headache.

The second child health variable, other somatic complaints was also significantly associated with weekly headache in the single-predictor analysis. The odds ratio indicated

that children and adolescents with one standard deviation more somatic complaints were also at an over twofold higher risk of experiencing weekly headache. Nevertheless, no conclusions regarding the status of this variable can be drawn, as no other studies on weekly headache have examined somatic complaints (excluding pain) as an individual variable.

Noteworthy is, however, that a number of prior studies on weekly headache have employed somatic symptoms scales, i.e., composite measures encompassing both non-headache pains and other physical symptoms. Scores on these scales have been consistently found to be associated with weekly headache (Andrasik et al., 1988; Engström, 1992; Larsson, 1988; Martin-Herz et al., 1999). Somatic symptoms (including pain) were accordingly classified as a variable related to weekly headache in Table 3. Unfortunately, these studies did not differentiate between non-headache pain and other somatic symptoms. Thus it is not possible to determine whether the elevated scores were due to one or the other of the variables, or both together. The results of the present study seem to indicate that both are relevant. This issue warrants clarification in future research.

Taken together, the child health variables significantly increased model fit in the multivariate analysis of the full domain model and explained a moderate amount (14.5%) of the variance in health outcome (weekly headache vs. good health). Indeed, child health variables ranked first in amount of explained variance among the nine domains (see Table 18). In addition, both variables maintained significance in the multivariate analysis of the full domain model. The odds ratios indicated that the likelihood of experiencing weekly headache increased by 70% with a one standard deviation increase in non-headache pains and by or 72% with a one standard deviation increase in other somatic symptoms.

### **5.2.5 Family Variables**

Weekly headache was not significantly related to whether the child lived in a one- or two-parent household in the single-predictor analysis. This is in contrast to Larsson's (1988) report that parents of children with headache were significantly more often divorced than those of healthy controls. However, the majority of these parents had been divorced for at least three years and no information was given on potential new relationships. Though often correlated, the number of parents in a household is not exclusively dependent on marital status. Taken together, the status of the variable one- vs. two-parent household is inconclusive. Differentiating between marital status and number of (biological or other) parents in a household seems appropriate in modern times and would help to clarify the role this family variable may play with regard to weekly headache.

Single-predictor analysis also indicated the number of children in the household was not significantly associated with weekly headache. This is in line with research on headache in general, which has consistently found headache to be unrelated to number of siblings (Aromaa et al., 1998; Carlsson et al., 1996; Metsähonkala et al., 1998). However, as the variable has not been investigated with regard to weekly headache in any further studies, no real conclusions regarding its status can be drawn.

On the other hand, weekly headache was significantly associated with both negative family environment and weekly family conflict in the single-predictor model analyses. Negative family environment was the weaker of the two variables, with a one standard



deviation increase thereof being associated with a 21% higher risk of weekly headache. In contrast, children and adolescents in families with weekly conflict had a 69% increased risk of weekly headache. Surprisingly, the variable negative conflict solving strategies was not significantly associated with weekly headache, despite its similarity to negative family environment and weekly conflict. As no other studies on weekly headache have investigated these variables, their status is inconclusive pending further research. Similar findings regarding headache in general (Aromaa et al., 2000; Brattberg, 1994; Kowal & Pritchard, 1990) may be seen as indicating it worthwhile to pursue these variables.

Though family variables, as a set, significantly increased model fit in the multivariate analysis of the full domain model, the amount of the variance that they explained was minute (1.3%). Family variables ranked eighth in amount of explained variance among the nine domains (see Table 18). In addition, neither of the two family variables that reached significance in the single-predictor analyses was able to maintain significance in the full domain model analysis.

#### **5.2.6 School Variables**

The index of school difficulties, which encompassed a number of indications of poor academic achievement, was significantly associated with weekly headache in the single-predictor analyses. The odds ratio indicated that the presence of an additional academic difficulty increased the risk of weekly headache by 64%. However, prior research on weekly headache has yielded contradictory results: Gordon et al. (2004) reported poor academic achievement to be related to weekly headache, but no such relation was found by Engström (1992). Taken together, the status of the variable poor academic achievement remains inconclusive due to contradictory results.

Single-predictor analysis also indicated that time spent on homework was significantly associated with weekly headache. According to the odds ratio, children and adolescents who spent more than 3 hours per day on homework were almost tenfold more likely to have weekly headache than those who spent less than an hour a day on homework. It could be postulated this association is an artifact, attributable to age-related increases in prevalence of weekly headache and amount of homework. However, the single-predictor model controlled for age, making this argument dismissible. Furthermore, the result is in line with data from the study by Larsson (1988). Therefore time spent on homework can be classified as a variable tentatively related to weekly headache.

Negative school climate (what was called school stress in the present research) was also associated with weekly headache. The odds ratio indicated that an increase in school stress of one standard deviation was associated with a 77% increase in risk of weekly headache. Thus the present research corresponds with the results reported by Gordon et al. (2004). As a consequence, the status of the variable negative school climate can be classified as tentatively related to weekly headache. This is in line with research on headache in general, which has also documented an association between negative school climate and headache (Brattberg, 1994; Metsähonkala et al., 1998; Williams et al., 1996).

Finally, weekly headache was also associated with fear of failure. The odds ratio indicated that a one standard deviation increase in neurotic reaction to failure was associated

with a 42% increase in risk of weekly headache. However, as the variable has not been investigated with regard to weekly headache in any further studies, no real conclusions regarding its status can be drawn. Research on headache in general has yielded conflicting results with two studies reporting a significant association between fear of failure and headache (Metsähonkala et al., 1998; Passchier & Orlebeke, 1985) and one finding the two to be unrelated (Karwautz et al., 1999).

Taken together, school variables significantly increased model fit in the multivariate analysis of the full domain model. They explained a moderate amount of the variance (7.3%) differentiating children and adolescents with weekly headache from those in good health. Indeed, school variables ranked third among the nine domains in amount of explained variance (see Table 18). Nevertheless, though all four variables reached significance in the single-predictor models, only two maintained significance in the full domain model, namely time spent on homework and negative school climate. According to the odds ratio from the full domain model, children and adolescents who spent more than 3 hours per day on homework were almost sevenfold more likely to have weekly headache than those who spent less than an hour a day on homework. Furthermore, those with one standard deviation more negative school climate were at a 66% higher risk of weekly headache.

### **5.2.7 Leisure Variables**

Neither physical activities nor other recreational activities were significantly associated with weekly headache in the single-predictor analyses of the present research. A previous study also documented the lack of significant associations between weekly headache and these variables (Gordon et al., 2004). In contrast, Engström (1992) found children and adolescents with weekly tension-type headache to score significantly lower on an aggregate measure of physical and recreational activities and household tasks than healthy controls. The latter data, however, does not lend itself to integration as it allows no differentiation between the three types of activities. Therefore, on the basis of the present research and the study by Gordon et al. (2004) physical and other recreational activities are classified as variables tentatively unrelated to weekly headache.

Amount of free time was not associated with weekly headache in the single-predictor analysis. However, it is not possible to draw conclusions regarding the status of this variable, as no other studies on weekly headache have examined it to date. Nor has it been examined in research on headache in general. Thus the variable is classified as being inconclusive.

Time spent watching TV / video was significantly associated with weekly headache in the single-predictor analysis. The odds ratio indicated one standard deviation of more time spent watching TV or videos was associated with a 30% higher risk of weekly headache. Unfortunately, no other studies on weekly headache have examined this variable to date. Thus it is classified as being inconclusive due to lack of further research. Noteworthy is, however, that research on headache has identified watching TV as a headache trigger (Luka-Krausgrill & Reinhold, 1996) and that, compared to their headache-free counterparts, children with headache have been reported to watch significantly more television (Aromaa et al., 2000).

The leisure variable time spent on computer / game console was not significantly associated with weekly headache in the single-predictor analysis. Unfortunately, the present research is, once again, the only study on weekly headache that has examined this variable to date. Time spent using a computer or game console is, therefore, classified as inconclusive pending further research. It may, however, be worthwhile to include this variable in future studies, as it was reported to be significantly associated with headache (without regard to frequency) in the only other study that has examined the variable to date (Oksanen et al., 2005).

Weekly headache was not significantly associated with amount of friends in the single-predictor analysis. This seems to correspond with Engström's (1992) finding that children with weekly tension-type headache did not differ from healthy controls on an aggregate measure tapping amount of friends, quality of peer relationships, and hobbies. However, as Engström did not differentiate between the constituent variables of the aggregate measure, it is not possible to integrate the results. Accordingly, the status of the variable amount of friends remains classified as being inconclusive.

Though leisure variables, as a set, significantly increased model fit in the multivariate analysis of the full domain model, the amount of the variance that they explained was minimal (2.3%). Leisure variables ranked sixth in amount of explained variance among the nine variable domains (see Table 18). Nevertheless, time spent on TV / video, the only variable that reached significance in the single-predictor analysis, was able to maintain its significance in the full model. According to the odds ratio, a one standard deviation increase in time spent watching TV or videos was associated with a 40% higher risk of weekly headache. Amount of free time also reached significance in the multivariate analysis of the full domain model, though it was unrelated to weekly headache in the single-predictor analysis. However, this significance is attributable to a suppressor effect, rather than indicating that lack of free time is a variable relevant to weekly headache.

### **5.2.8 Life Events**

Number of life events was significantly associated with weekly headache in the present research. The odds ratio indicated that experiencing an additional life event increased the risk of having weekly headache by 29%. However, previous research stands in contrast: Andrasik et al. (1988) found life events to be unrelated to weekly headache. No other studies on weekly headache have investigated life events to date. Therefore the variable is classified as inconclusive due to contradictory results. Interestingly, research on headache in general yields a similar lack of clarity, with one study that documented a significant association (Liakopoulou-Kairis et al., 2002) and two that did not (Cooper et al., 1987; Kowal & Pritchard, 1990).

Inclusion of the index of life events significantly increased model fit in the multivariate analysis of the domain. However, the amount of variance explained by the index was minimal (1.4%). Life events ranked seventh in amount of explained variance among the nine domains (see Table 18).

### 5.2.9 Parental Psychological Variables

Parental anxiety/depression was significantly associated with weekly headache in the single-predictor analysis. The odds ratio indicated that one standard deviation increase in parental anxiety/depression was associated with a 51% increase in risk of weekly headache. This is in line with Larsson's (1988) finding that weekly headache was associated with parental "nervous problems". Thus the variable parental anxiety/depression is classified as being tentatively related to weekly headache.

Weekly headache was also significantly associated with parental habitual worry in the single-predictor analysis. The odds ratio indicated that with an increase of one standard deviation in parental worry the risk of weekly headache increased by 44%. However, no other study on weekly headache has investigated parental worry to date, thus no real conclusions can be drawn regarding this variable. Nevertheless, the results of the present study suggest that inclusion of this variable in future research would be worthwhile.

The final of the three parental psychological variables, parental sleep disturbance, was also significantly associated with weekly headache. The odds ratio indicated that with one standard deviation increase in frequency of sleep disturbances, the risk of weekly headache increased by 35%. Unfortunately, this is the only study to date that has investigated parental insomnia with regard to weekly headache. Therefore no conclusions regarding the variable can be drawn, due to lack of sufficient studies. However, one study that looked at parent insomnia and child's headache (without regarding frequency) found a significant association between the two (Grøholt et al., 2003). This may be seen as grounds for inclusion of this variable in future research.

Taken together, parental psychological variables significantly improved model fit in the multivariate analysis of the full domain model. However, they only explained a small amount of variance (3.2%) beyond that explained by the control variables age and gender. Parental psychological variables ranked fifth among the nine domains with regard to the amount of explained variance (see Table 18). Furthermore, though all three variables reached significance in the single-predictor model, none of them was able to maintain significance in the full domain model.

### 5.2.10 Parental Health Variables

In the final of the nine domains, parental health, all six of the examined variables reached significance in the single-predictor analyses. General health was significantly associated with weekly headache. However, in contrast to the other parental health variables this association was negative: The odds ratio indicated that an increase in parental general health of one standard deviation was associated with a 52% *reduction* in risk for child's weekly headache. As this is the first study that has looked at general health and weekly headache, no conclusions can be drawn with regard to this variable. Interestingly, two studies looking at headache (without regard to frequency) reported it to be unrelated to parental general health (Karwautz et al., 1999; Zuckerman et al., 1987).

The related variables number of doctor appointments and regular medication were also significantly associated with weekly headache. The odds ratio indicated that an increase

of one standard deviation in the frequency of parental doctor appointments was associated with a 20% increase in child's risk of weekly headache. Children of parents taking regular medication had a 71% higher risk of weekly headache than those whose parents did not. However, as this is the first study to look at these variables with regard to weekly headache, it is not possible to draw conclusions regarding their status.

Weekly headache was also significantly associated with parental headache in the single-predictor analysis. The odds ratio indicated that child's risk of weekly headache was over threefold higher when there was a parental history of headache. This is in line with data from Larsson (1988). Thus, parental headache can be classified as a variable tentatively related to weekly headache. Furthermore, taking data on headache (without regard to frequency) into account, it seems highly probable that future research will confirm this association. As yet, negative results have not been reported, and the number of studies indicating an association between parental and child headache is substantial (Aromaa et al., 1998; Aromaa et al., 1998; Grøholt et al., 2003; Larsson, 1988; Mortimer et al., 1992; Virtanen et al., 2002; Waldie & Poulton, 2002).

Parental pain other than headache was also associated with weekly headache, though not as strongly as parental headache was. The odds ratio indicated that an increase of one standard deviation in parental other pain was associated with a 22% increase in the risk of weekly headache. The only other study that has looked at weekly headache and parental other pain found an association that approached significance (Larsson, 1988). However, as only the present research has found a significant association, the status of parental pain other than headache is still inconclusive. On the other hand, research on headache in general has indicated that child's headache is related to certain non-headache pains in the parent, e.g., back and abdominal pain (Grøholt et al., 2003), and maternal (but not paternal) weekly pain (Brattberg, 1994). These results seem to indicate that the variable warrants inclusion in future research.

The last of the parental health variables, other somatic complaints, was also significantly associated with weekly headache in the single-predictor analysis. The odds ratio indicated that children of parents with one standard deviation more other somatic complaints were at a 24% increased risk of weekly headache. To date, this is the only study that has investigated parental other somatic complaints. Therefore no conclusions can be drawn regarding this variable. However, research on headache in general has indicated that child's headache is related to some individual somatic complaints in the parent, e.g., dizziness and loss of appetite (Grøholt et al., 2003). This suggests that inclusion of the variable in future studies would be worthwhile.

As a set, the parental health variables significantly improved model fit in the multivariate analysis of the full domain model. However, they only explained a small amount of variance beyond that explained by the control variables age and gender (5.3%). This domain ranked fourth with regard to the amount of explained variance. Though all six variables reached significance in the single-predictor model, only parental headache was able to maintain significance in the full domain model. The odds ratio indicated that children had an almost threefold higher risk of weekly headache when there was a parental history of headache.

### 5.2.11 Summary

In sum, in the present study the sets of variables explaining a fair amount of variance beyond the control variables (age and gender) were child health variables, child psychological variables, and to a lesser degree school variables and parental health variables. The contribution of all other domains was minimal or negligible. Concerning individual variables, the present study corroborated previous findings in establishing gender as a confirmed correlate of weekly headache, and anxiety/depression, pain other than headache, negative school climate, parental headache and parental pain other than headache as tentative correlates thereof.

In addition, a number of variables, whose relevance to weekly headache was examined in the present research for the first time, reached significance in the single-predictor analyses. These variables warrant inclusion in future research in order to elucidate their status: Household crowding, sleeping disorders, maladaptive coping strategies (passive avoidance, rumination, resignation, aggression), anger control, other somatic complaints, negative family environment, weekly family conflict, time spent on TV / video, parental habitual worry, parental sleep disturbances, number of parental doctor appointments, parental regular medication, and parental other somatic complaints.

Finally, a number of the variables that attained significance in the single-predictor models were also able to maintain it in their respective full domain model. These variables formed the basis for the aggregate model for weekly headache, the topic of the next section.

### 5.3 Aggregate Model for Weekly Headache vs. Good Health

A total of eleven variables were identified in the full model analyses of the individual variable domains as being significantly ( $p \leq .01$ ) associated with weekly headache and were thus included in the aggregate model. In addition to the control variables age and gender, the aggregate model comprised the following variables: Anger out, anxiety/depression, sleep disturbance, pain other than headache, other somatic complaints, time spent on homework, school stress, amount of free time, time spent on TV / video, index of life events, and parental headache. Inclusion of these variables, as a set, significantly improved model fit in the multivariate analysis of the aggregate model. Altogether, the aggregate model explained 26.2% of the variance differentiating children and adolescents with weekly headache from those in good health.

Most prior research on headache has employed single-predictor models or their equivalents. Only a few studies have conducted multivariate analyses of full models and only one of them examined weekly headache (Larsson, 1988). Three others looked at headache frequency (Kowal & Pritchard, 1990; Luka-Krausgrill & Reinhold, 1996; Passchier & Orlebeke, 1985), and one study each focused on headache (Laurell et al., 2005) and recurrent headache (Grøholt et al., 2003). Therefore, in order to have a broader perspective, the results from all six of these prior studies employing multivariate analyses will be presented as context.

The amount of headache-related variance explained in these studies has varied widely. Two of the studies reported substantial explained variance: Larsson (1988)

investigated a full model consisting of ten variables that had demonstrated significance in univariate analyses. Six of these maintained their significance in the multivariate model and were able to explain 48% of the variance differentiating adolescents with weekly headache from those without. Luka-Krausgrill and Reinhold (1996) entered all of the twelve variables investigated in their study into a full model analysis. Five of the variables reached significance therein and explained 45% of the variance in headache frequency. In contrast, much lower amounts of explained variance in headache frequency were reported by Passchier and Orlebeke (1985): For children attending elementary school 12.1%, and 9.2% for those in secondary school. In the study by Kowal and Pritchard (1990), none of the four variables entered into the multivariate model contributed significantly to the prediction of headache frequency and no information regarding the explained variance was reported, though it was presumably minimal given the non-significance of the individual variables. In the final two studies, the multivariate analysis results were only reported regarding the individual variables and their significance, the total amount explained variance was not documented (Grøholt et al., 2003; Laurell et al., 2005).

Noteworthy is that the higher amount of variance explained in the study by Larsson (1988) may be due, in part, to the inclusion of the variable “school absence due to somatic complaints” in the multivariate analysis. According to the t-values, this variable was the second most important in the model. Therefore, a sizeable amount of the explained variance was attributable to this variable. As the headache group was composed of adolescents with weekly headache, recruited with the offer of subsequent psychological treatment, it is possible that these adolescents frequently experienced disabling headaches that interfered with their ability to attend school. As the author did not differentiate between school absence due to headache and school absence due to other somatic symptoms, the association between headache frequency and school absence could be ascribable to this overlap.

Perhaps the source of information may have influenced the amount of variance that was explained in the present research. In the study by Larsson (1988), three different sources of information were employed: adolescent, parent, teacher. In the multivariate model both child- and parent-report variables contributed significantly to the explained variance. Only one source of data was utilized in the studies by Passchier and Orlebeke (1985) and Luka-Krausgrill and Reinhold (1996), namely the children. In contrast, the present aggregate model employed parent report only. It is possible that this may have lessened the amount of explained variance. Other the other hand, the child-report variables in the study from Passchier and Orlebeke (1985) explained less variance than the parent-report variables of the present study.

In sum, the amount of explained variance in the present research was lower than that reported by Larsson (1988) and Luka-Krausgrill and Reinhold (1996), yet greater than that reported by Passchier and Orlebeke (1985). Presumably, it also exceeded the amount of variance explained by the multivariate model from Kowal and Pritchard (1990).

Turning to the individual variables included in the aggregate model, only four of the eleven variables were able to maintain significance in the multivariate analysis, namely

- pain other than headache,
- other somatic complaints,
- school stress, and
- parental headache.

Interestingly, though age remained significant in the aggregate model, the control variable gender only approached significance.

Again, in order to place these results in context, it is important to have an overview of the results regarding individual variables from the multivariate models in prior studies. Results from the six studies are presented in Table 34. In the top half of the table those variables are listed that maintained significance in the multivariate analysis, in the bottom half those variables that did not. As the outcome variables examined in the studies differed somewhat, these are also noted in the table.

In the present research, the control variable age was significantly associated with weekly headache. The odds ratio indicated that with an increase in age of one year, the likelihood of having weekly headache increased 16%. This is in line with the results reported by Luka-Krausgrill and Reinhold (1996), who found age to be significantly associated with headache frequency in their multivariate analysis. However, a further study investigating age and headache frequency in a multivariate model reported contradictory results (Passchier & Orlebeke, 1985). In this study two multivariate models were tested, one for children in elementary school and one for those in secondary school. It is possible that age could not achieve significance in the elementary school model as only two grades from the elementary school were assessed and the total variance in age was therefore limited. Within the model for children attending secondary school (four grades were assessed), the authors found a significant age-gender interaction. However, age itself remained non-significant. Finally, age was not significantly associated with headache in the multivariate model tested by Laurell et al. (2005). However, this is not meaningful as the headache and non-headache groups were matched for age.

The association between gender, the second control variable, and weekly headache approached significance in the present aggregate model. The odds ratio indicated that girls were at a 55% higher risk for weekly headache. However, contradictory results have been reported in the literature. While Passchier and Orlebeke (1985) found gender to be significantly related to headache frequency in their multivariate model, Luka-Krausgrill and Reinhold (1996) did not. In the study by Laurell et al. (2005) the headache and non-headache groups in the study were matched for gender, therefore their results are not interpretable.

Both pain other than headache and other somatic complaints were significantly associated with weekly headache in the multivariate analysis of the aggregate model. The odds ratios indicated that with a one standard deviation increase in pain other than headache, children were at a 55% higher risk of weekly headache and with one standard deviation increase in other somatic complaints at a 57% higher risk. This is in line with data



from Grøholt et al. (2003) who showed recurrent headache to be significantly associated with abdominal and back pain as well as loss of appetite and dizziness in a multivariate model. No other pain locations or physical symptoms were assessed in the study, therefore, it can be concluded that recurrent headache (at least once every other week) was significantly associated with other recurrent pains and other recurrent somatic symptoms. In addition, studies using scales encompassing both non-headache pain and other somatic symptoms found these symptoms to be significantly related to headache (Laurell et al., 2005) and weekly headache (Larsson, 1988) in multivariate models. On the other hand, somatic symptoms as assessed via parent-report were not significantly related with headache in Laurell et al.'s (2005) multivariate analysis. Two other studies have documented opposing results as well: Neither Kowal and Pritchard (1990) nor Luka-Krausgrill and Reinhold (1996) found somatic symptoms to be related to headache frequency.

**Table 34. Variables examined in multivariate analyses in pediatric headache research and their significance or non-significance**

	Headache	Recurrent headache	Weekly headache	Headache frequency		
	Laurell et al. (2005)	Grøholt et al. (2003)	Larsson (1988)	Passchier & Orlebeke (1985)	Kowal & Pritchard (1990)	Luka-Krausgrill & Reinhold (1996)
Significant variables	- Migraine among first-degree relatives	- Abdominal pain	- Nervous problems	- Gender		- Depression
	- Total number of physical symptoms	- Back pain	- Anxiety level <sup>b</sup>	- Fear of failure		- Age
Non-significant variables		- Sleeplessness	- Depression/anxiety	- School problems <sup>a</sup>		- Internal coping <sup>b</sup>
		- Dizziness	- Somatic symptom index			- Avoidance coping
Significant variables		- Loss of appetite	- Homework time			- Repeating a grade <sup>b</sup>
		- Parental headache	- School absence because of somatic complaints			
Non-significant variables	- Age	- Parental abdominal pain	- Stress level	- Age	- Anxiety	- Gender
	- Gender	- Parental back pain	- Parental marital status		- Depression	- Perceived social support
Significant variables	- Visits to school nurse	- Parental sleeplessness	- Visits to nurse because of headache		- Shy-sensitive	- Stress
	- Medication	- Parental Dizziness	- Parental headache		- Sleeping difficulties	- Time spent watching TV
Non-significant variables	- Injuries	- Parental loss of appetite			- Perfectionist-compulsive	- Time spent on homework
	- Somatic complaints in CBCL				- Psychomatic problems	- Physical symptoms <sup>c</sup>
Significant variables	- Physical symptoms among first-degree relatives				- Number of non-syndromic problems	
					- Life change units	
Non-significant variables					- Achievement orientation	

<sup>a</sup> School problems was only significant in the model for children in elementary schools, not for those in secondary schools

<sup>b</sup> The association with this variable was negative

<sup>c</sup> This variable was not explicitly listed among the non-significant variables, but appears to have been non-significant

Parental headache also maintained significance in the full aggregate model of the present study. The odds ratio indicated that children had an over twofold higher risk of weekly headache when there was a parental history of headache. This is in line with data from Grøholt et al. (2003), who found parental recurrent headache to be significantly associated with child's recurrent headache in a multivariate model. Similarly, migraine among first-degree relatives was significantly associated with child's headache in the multivariate model reported by Laurell et al. (2005). In contrast, the only previous study on weekly headache that conducted a multivariate analysis reported parental headache to be unrelated to child's headache (Larsson, 1988).

The final of the four variables that maintained significance in the multivariate analysis of the present study was negative school environment. The odds ratio indicated that a one standard deviation increase in school stress was associated with a 39% higher risk of weekly headache. None of the prior multivariate studies investigated negative school environment. Instead, their models included school variables tapping poor academic achievement (Luka-Krausgrill & Reinhold, 1996; Passchier & Orlebeke, 1985) or fear of failure (Passchier & Orlebeke, 1985).

It is not only of interest, which variables maintained significance in the aggregate model, but also which did not. A total of seven variables were not significantly associated with weekly headache in the multivariate analysis, namely

- outward expression of anger,
- anxiety/depression,
- sleep disturbance,
- time spent on homework,
- amount of free time,
- time spent on TV/video, and
- life events.

The present study is the first to examine outward expression of anger with regard to weekly headache. Therefore, it is not possible to compare the present results with any further research. It should be noted, however, that anger-out was included in the aggregate model due to its significance in the full domain model of child psychological variables, though it was not significantly associated with weekly headache in the single-predictor analysis. Thus, the significance of the variable in the full model analysis was due to a suppressor effect. Apparently the combination of variables in the aggregate model for weekly headache did not lend themselves to the creation of a suppressor effect the way the child psychological variables did. Inspection of the correlation matrices supports this assumption (see Appendixes D and E): While moderate intercorrelations ( $r \geq .350$ ) occurred between anger-out and four of other child psychological variables, no such intercorrelations were present in the aggregate model.

Though the variable anxiety/depression has been classified as being tentatively related to weekly headache, it was not able to maintain its significance in the present aggregate model. This result was unexpected and stands in contrast to data reported by Larsson (1988), who found anxiety/depression to be significantly related to weekly headache in his multivariate analysis. In addition, it also conflicts with results from studies on weekly

headache that examined anxiety and depression as separate variables and led to the classification of each as being conclusively related to weekly headache. However, the correlation matrix for the aggregate model supplies a possible explanation for the present results (see Appendix E): Anxiety/depression was moderately intercorrelated with two of the other variables: School stress ( $r=.501$ ), and other somatic complaints ( $r=.356$ ). It was also correlated with both sleep disturbances and pain other than headache, though to a somewhat lesser degree (both  $r=.308$ ). As both school stress and pain other than headache attained significance in the aggregate model, it is possible that the overlap between these variables and anxiety/depression rendered the latter insignificant in the full aggregate model.

Studies that examined anxiety and depression as separate variables in multivariate analyses reported mixed results: While Luka-Krausgrill and Reinhold (1996) documented the presence of a significant association between depression and headache frequency, Kowal and Pritchard (1990) found neither anxiety nor depression to be significantly associated with headache frequency in their multivariate analysis. However, the small size of the sample employed in the latter study ( $n=46$ ) may have contributed to the non-significance. Finally, Larsson (1988) found a measure of anxiety to be significantly, albeit *inversely*, related to weekly headache in his multivariate analysis. This was surprising, as anxiety had been positively associated with weekly headache in the univariate analysis. Unfortunately, Larsson (1988) did not comment on this peculiarity. The statistical pattern, however, points to a negative suppressor effect (Bortz, 1989).

Sleep disturbance was a further variable that was unable to maintain significance in the multivariate analysis. The present study was the first to examine this variable with regard to weekly headache. Therefore, the variable was classified as inconclusive though warranting further research because of its tentative relation to headache in general. The present multivariate result of non-significance stands in conflict with data from Grøholt et al. (2003), in which sleep disturbance was related to recurrent headache. Again, the non-significant result of the present research could, perhaps, be due to overlap between sleep disturbance and three of the other variables in the aggregate model: Sleep disturbance was correlated with anxiety/depression ( $r=.308$ ), pain other than headache ( $r=.334$ ), and other somatic complaints ( $r=.383$ ; see Appendix E). On the other hand, non-significance has also been reported by Kowal and Pritchard (1990), who found sleep disturbance to be unrelated to headache frequency.

Though the variable time spent on homework has been classified as being tentatively related to weekly headache, it was not able to maintain its significance in the present aggregate model. This result stands in contrast to data reported by Larsson (1988), who found time spent on homework to be significantly related to weekly headache in his multivariate analysis. It is, however, in line with data from one of the other multivariate studies which found time spent on homework to be unrelated to headache frequency (Luka-Krausgrill & Reinhold, 1996).

Amount of free time was a further of the seven variables that did not reach significance in the analysis of the aggregate model for weekly headache. Unfortunately it is not possible to compare this result with previous research, as the present study was the first to examine amount of free time. As was the case with anger-out, amount of free time was

included in the aggregate model due to its significance in the full model of its domain, though it was not significantly associated with weekly headache in the single-predictor analysis. Thus, the significance of the variable in the full model analysis was due to a suppressor effect. Apparently the combination of variables in the aggregate model for weekly headache did not lend themselves to the creation of a suppressor effect the way the leisure variables did.

The present study was also the first to examine time spent watching TV / video with regard to weekly headache. Therefore, it is not possible to compare the present non-significant results with any further research. However, the present non-significance is in line with data from Luka-Krausgrill and Reinhold (1996), who found time spent watching TV to be unrelated to headache frequency in their multivariate analysis.

Finally, number of life events did not reach significance in the present aggregate model for weekly headache. This is in line with data from the only other multivariate study that examined the variable and found units of life change to be unrelated to headache frequency (Kowal & Pritchard, 1990).

Up until now, multivariate models like the present aggregate model for weekly headache have only been examined in a limited number of headache studies: Only one prior study on weekly headache and six prior studies in total have conducted such analyses. Results from all six of these studies were taken into account in the discussion of the aggregate model of weekly headache. In sum, no set of variables consistently reached significance in multivariate analyses. However, pain other than headache, other somatic complaints, and parental headache were able to assert themselves in more multivariate analyses than not. It is conspicuous that these “assertive” variables were somatic or biological in nature, while the results regarding the examined psychosocial variables were more evenly balanced between significance and non-significance.

Research on headache would profit from a more widespread usage of multivariate analyses, as these promote a better understanding of the interrelations between examined variables (Glantz & Slinker, 2001), rather than disregarding other variables and their interrelations in order to focus on a single variable of interest, as is the case in single-predictor models. At the same time, the taking into account of other variables and their interrelations can complicate the interpretation of results. It would, therefore, be advantageous if *both* types of analyses were included in future studies.

#### **5.4 Specificity Model (Weekly Headache vs. Chronic Illness)**

As an intermediate step prior to calculation of the specificity model, it was necessary to determine which variables were significantly associated with chronic illness. These analyses were not only conducted to determine the correlates of chronic illness but also to ensure that all variables were included in the specificity analyses that were either significantly correlated with weekly headache *or* with chronic illness. As the analyses regarding chronic illness primarily serve the purpose of identifying correlates of chronic illness for inclusion in the specificity model, the results are summarized in Table 35 along with the results from the analyses comparing weekly headache to good health. The table indicates which variables

were significantly associated with weekly headache (left-hand side) and chronic illness (right-hand side) on the basis of both the single-predictor models and the full domain analyses. The variable domains explained between 1.1% and 14.5% of the variance differentiating children with weekly headache from those in good health. With regard to chronic illness the same domains only explained 0.1% to 1.8% of the variance.

Table 35 makes the discrepancy in the amount of variables significantly related to weekly headache as opposed to the amount related to chronic illness quite apparent. Including age and gender, 29 variables were significantly associated with weekly headache in single-predictor analyses and 13 of these maintained significance in the multivariate analyses of the respective variable domains. In comparison, 9 variables were significantly associated with chronic illness in the single-predictor analyses and a mere 3 variables maintained significance in the full model analyses of the respective domains. With regard to the variables reaching significance in the multivariate analyses there was an overlap. Two of the three variables significantly associated with chronic illness were also significantly associated with weekly headache in domain analyses: Sleep disturbance and school stress.

**Table 35. Variables that reached significance in the single-predictor model and full domain model analyses**

Domain	Variable	Weekly headache		Chronic illness	
		Single-predictor model	Full domain model	Single-predictor model	Full domain model
Control variables	Age	X	X		
	Gender	X	X		
Sociodemographic variables	Social class				
	Household crowding index <sup>a</sup>				
Psychological variables	<i>Maladaptive coping</i>				
	Passive avoidance <sup>a</sup>	X			
	Rumination <sup>a</sup>	X			
	Resignation <sup>a</sup>	X			
	Aggression <sup>a</sup>	X			
	<i>Anger expression</i>				
	Anger-in <sup>a</sup>				
	Anger-out <sup>a</sup>		X	X	
	Anger control <sup>a</sup>	X			
	Anxiety/depression <sup>a</sup>	X	X		
	Hyperactivity <sup>a</sup>	X			
	Aggressive behavior <sup>a</sup>	X			
Sleep disturbance <sup>a</sup>	X	X	X	X	

<sup>a</sup> Z-scores

Table 35. continued

		Weekly headache		Chronic illness	
		Single-predictor model	Full domain model	Single-predictor model	Full domain model
Health variables	Pain other than headache <sup>a</sup>	X	X		
	Other somatic complaints <sup>a</sup>	X	X	X	
Family variables	Number of parents in household				
	Number of other children in household				
	Negative family environment <sup>a</sup>	X			
	Negative conflict solving strategies <sup>a</sup>				
	Weekly conflict	X			
School variables	Index of school difficulties	X	X		
	Time spent of homework				
	School stress <sup>a</sup>	X	X	X	X
	Reaction to failure <sup>a</sup>	X			
Leisure variables	Physical activities <sup>a</sup>				
	Recreational activities <sup>a</sup>				
	Amount of free time <sup>a</sup>		X		
	Time spent on TV / video <sup>a</sup>	X	X		
	Time spent on computer / game console <sup>a</sup>				
	Amount of friends				
Life events	Index of life events		X		
Parental psychological variables	Anxiety/Depressivity (index) <sup>a</sup>	X			
	Habitual worry <sup>a</sup>	X			
	Sleep disturbance <sup>a</sup>	X			
Parental health variables	General health <sup>a</sup>	X		X	
	Number of doctor appointments <sup>a</sup>	X		X	
	Regular medication	X			
	Parental headache	X	X	X	
	Pain other than headache <sup>a</sup>	X		X	
	Other somatic complaints <sup>a</sup>	X		X	X

<sup>a</sup> Z-scores

The question arises, why so few of the variables were significantly associated with chronic illness. There are a number of possible explanations. First, the variables examined in the present research were selected on the basis of the extant research on pediatric headache and the empirical status of variables that have been investigated thus far. The discrepancy in the amount of related variables could be due to this selection process. It is

possible that the variables are less relevant to chronic illness, as a whole, than to weekly headache.

Second, in line with the concept of broad specificity (Garber & Hollon, 1991), a heterogeneous control group was employed in the present research. The heterogeneity of the children and adolescents in the chronic illness group may have contributed to the discrepancy in amount of relevant variables. It is possible that the degree to which the variables were present varied depending on the chronic illness and that the aggregation across all chronic illnesses leveled out significant differences present for individual chronic illnesses in comparison to healthy controls. For example, it is possible that anxiety/depression is significantly associated with asthma, but that children and adolescents with diabetes exhibit significantly less anxiety/depression. Averaged across both groups the extremes would be evened out. Note that research examining narrow specificity would lend itself to identifying such possible differences between the individual chronic illnesses.

However, if the group of children and adolescents with chronic illness were particularly heterogeneous with regard to the examined variables, it would be expected that the standard deviations in the chronic illness group would be elevated compared to the group of children with weekly headache. This was not the case. The standard deviations were comparable and in the few cases of discrepancy the children and adolescents with weekly headache exhibited the larger standard deviation. The only exception is parental general health (weekly headache SD=1.04 vs. chronic illness SD=1.05; see Table 7). Altogether, this seems to speak against the leveling out explanation.

Third, the proportional composition of the heterogeneous chronic illness group, which was determined by the prevalence of the individual chronic illnesses in the population-based sample, may have contributed to the disparity. Over half of the children and adolescents in the chronic illness group had atopic dermatitis (53%), and one third asthma (33%). Thus, the chronic illness group consisted mainly of children and adolescents with one of these two illnesses. It is possible that a different pattern of correlates would be identified had the heterogeneous group been recruited in a manner that balanced the presence of various chronic illnesses. However, a recruiting procedure of this kind could not be realized within the framework of the present population-based study.

The variables that reached significance in the domain models formed the basis from which the aggregate models for weekly headache and for chronic illness were generated. The results concerning the comparisons between weekly headache vs. good health and chronic illness vs. good health are depicted in Table 36. Note that the aggregate models differ with regard to the included variables because different variables were identified as correlates in the respective domain analyses. The specificity model comprised those variables that maintained significance in the aggregate model for weekly headache *or* chronic illness. The results of the specificity analysis are also shown in Table 36 (far right column).

In the specificity model, a number of variables were significantly associated with weekly headache and can therefore be seen as being *specific to weekly headache* in

comparison to chronic illness: Age, gender, pain other than headache, other somatic complaints, and parental headache.

**Table 36. Variables examined in the aggregate and specificity models and their significance or non-significance**

	Aggregate model for weekly headache	Aggregate model for chronic illness	Specificity model
Significant variables	<ul style="list-style-type: none"> <li>- Age</li> <li>- Pain other than headache</li> <li>- Other somatic complaints</li> <li>- School stress</li> <li>- Parental headache</li> </ul>	<ul style="list-style-type: none"> <li>- Sleep disturbance</li> <li>- School stress</li> <li>- Parental other somatic complaints</li> </ul>	<ul style="list-style-type: none"> <li>- Age</li> <li>- Gender</li> <li>- Pain other than headache</li> <li>- Other somatic complaints</li> <li>- Parental headache</li> </ul>
Non-significant variables	<ul style="list-style-type: none"> <li>- Gender</li> <li>- Anger out</li> <li>- Anxiety/depression</li> <li>- Sleep disturbance</li> <li>- Time spent on homework</li> <li>- Amount of free time</li> <li>- Time spent on TV / video</li> <li>- Life events</li> </ul>	<ul style="list-style-type: none"> <li>- Age</li> <li>- Gender</li> </ul>	<ul style="list-style-type: none"> <li>- Sleep disturbance</li> <li>- School stress</li> <li>- Parental other somatic complaints</li> </ul>

The control variables, age and gender, were significantly associated with weekly headache in the specificity model. The odds ratios indicated that an increase in age of one year was associated with a 25% higher likelihood of having weekly headache rather than other chronic illness and that the likelihood of having weekly headache (as opposed to other chronic illness) was 79% higher among girls than among boys. It should be noted, however, that gender gained entry into the specificity model by virtue of being a control variable, not because it fulfilled the significance criterion: Gender only approached significance in the aggregate model for weekly headache. Despite this limitation, age and gender are understood as being specific to weekly headache. The data from the three other specificity studies is not comparable regarding age and gender, as none of the samples were population-based, two employed samples of consecutive patients (Powers et al., 2003; Smith et al., 2003) and in the other subjects were matched for age and gender (Engström, 1992).

Pain other than headache and other somatic complaints were significantly associated with weekly headache in the specificity model. The odds ratios indicated that an increase in non-headache pain was associated with a 45% higher likelihood of having weekly headache, and a similar increase in other somatic symptoms was associated with a 69% higher likelihood of having weekly headache as opposed to chronic illness. Thus pain other than headache and other somatic complaints can be considered specific correlates of weekly headache. Unfortunately, these variables have not been examined separately in other specificity studies. Instead, somatic symptoms scales that encompassed both pains and other somatic symptoms have been employed.

For example, Engström (1992) found male children and adolescents with weekly tension-type headache to score significantly higher on a somatic symptoms scale than those with chronic illness (IBD or diabetes), and healthy controls. Females, on the other hand, scored significantly higher on the scale than children and adolescents with diabetes and



healthy controls, but did not differ significantly from those with IBD. As the analyses were conducted separately for girls and boys, it remains unclear, whether analyses over all subjects would identify somatic symptoms as a correlate specific to weekly headache or as an unspecific correlate of weekly headache and IBD.

Smith et al. (2003) also investigated somatic symptoms in their specificity study. They found somatization to be more pronounced among children with chronic fatigue syndrome fulfilling the criteria of the Center for Disease Control and Prevention (CDC-CFS) than among those with migraine and idiopathic chronic fatigue syndrome (I-CFS). However, these results do not lend themselves to integration for a number of reasons. First, it cannot be ruled out that the instrument used to measure somatization was biased toward CFS, as it included a number of symptoms which are defining for chronic fatigue (e.g., low in energy, weakness in body parts, dizziness, muscle weakness). Thus the correlation may merely be attributable to the illness fulfilling its own criteria. In order to avoid this problem all items related to the investigated illnesses would have to be eliminated prior to analysis. Second, migraine frequency was not taken into account in the study. Therefore, it cannot be ruled out that the result is ascribable to the juxtapositioning of children and adolescents with (seldom) attacks of migraine and those with persistent chronic fatigue.

Parental headache is the last of the variables found to be significantly associated with weekly headache in the specificity model. The odds ratio indicated that children of parents with a history of headache were 91% more likely to have weekly headache as opposed to other chronic illness. Thus parental headache is a specific correlate of weekly headache. Unfortunately, none of the other specificity studies has investigated this variable to date. Nevertheless, results from a study comparing children with recurrent headache to those with recurrent abdominal and back pain can be seen as corroborating the specificity: Grøholt et al. (2003) found that when parental pains and other complaints were looked at in combination with pains and complaints of their children only the concordant pains remained significantly associated with one another, i.e., parental headache with child headache, parental abdominal pain with child abdominal pain, and parental back pain with child back pain. These and the findings of the present study suggest that genetic factors may play a role in child's headache experience. Parental role modeling may also contribute to the relation between parental and child pain.

The focus of attention will now be turned to those variables that did not reach significance in the specificity model, namely sleep disturbance, school stress, and other parental somatic complaints. In order to determine what this means, it is necessary to reiterate the results of the aggregate models for weekly headache and chronic illness:

Sleep disturbance gained entry into the specificity model due to its significance in the aggregate model for *chronic illness*. However, in the single-predictor specificity analysis it was paradoxically associated with weekly headache, rather than chronic illness (OR = 1.24), only to become non-significant in the full specificity model. The question arises, why sleep disturbance lost its significance in the full specificity model. One possible explanation is its intercorrelation with other variables in the model (anxiety/depression:  $r=.308$ , pain other than headache:  $r=.334$ , other somatic complaints:  $r=.383$ ; see Appendix E). As none of the other specificity studies examined sleeping disturbances as a separate variable, they cannot help

to clarify this issue. Altogether, sleep disturbance can be regarded as an unspecific correlate of chronic illness (including weekly headache) on the basis of the relevance of the variable to chronic illness in the full aggregate model and the lack of significant association with one of the health outcome in the full specificity model. Further research appears necessary, however, in order to disentangle the interrelated variables.

School stress gained entry into the specificity model due to its significance in the aggregate model for *both* weekly headache and chronic illness. In other words, children and adolescents with weekly headache or other chronic illness experienced significantly more school stress than their healthy counterparts. In the first step of the specificity analysis, the single-predictor model, school stress was significantly associated with weekly headache (OR = 1.51). However, in the full specificity model, school stress did not attain significance. Therefore, on the basis of the full specificity and the preceding aggregate models, school stress can be regarded as an unspecific correlate of chronic illness (including weekly headache).

School stress, as it was measured in the present research, was a composite measure that included being academically over- or under-challenged, getting teased or bullied, being alone or isolated, being afraid of school, and negative school climate. Thus the variable can best be understood as a measure of negative school climate. In the study by Powers et al (2003) children with migraine reported significantly lower school functioning (paying attention in class, forgetting things, keeping up with schoolwork, school absence because ill, school absence due to doctor appointments or hospitalization) than those with cancer or rheumatic conditions. A further specificity study (Engström, 1992) indicated that children with weekly headache did not differ from those with IBD or diabetes, or healthy children on a school scale tapping academic achievement (school performance in comparison to others, repeating a grade, having learning or other difficulties in school). Though these specificity studies have also looked at school variables, they focused on other school-related aspects (not negative school climate). It is, therefore, not possible to integrate the results.

The variable parental other somatic complaints gained entry into in the specificity model due to its significance in the aggregate model for *chronic illness*. However, parental other somatic complaints remained non-significant in both specificity analyses (single-predictor model, full model). This could be interpreted as indicating that the variable is an unspecific correlate of chronic illness (including headache). However, parental other somatic complaints were only significantly associated with weekly headache in the single-predictor model. The variable did not reach significance in the full domain model analysis (weekly headache vs. good health) and was therefore excluded from the aggregate model for weekly headache. Therefore, no clear-cut interpretation emerges. Unfortunately, none of the other specificity studies looked at parental variables, so they offer no further insights.

In sum, a number of variables were identified as being *specific to weekly headache*: Age, pain other than headache, other somatic complaints, and parental headache not only differentiated children with weekly headache from those with other chronic illness but also from their healthy counterparts. In addition, female gender turned out to be more common among children with weekly headache than children with other chronic illnesses.

## 5.5 Summary and Future Directions

The present research followed two main objectives, namely to identify the correlates of weekly headache and to determine their specificity. To achieve the first aim a wide range of variables was determined relevant for the present research on the basis of a comprehensive review of the literature on pediatric headache. In total, nine different variable domains and 42 individual variables were selected for inclusion in the parental questionnaire. Survey materials were sent out to 8,800 households with a child between 7 and 14 years of age in Lower Saxony. Valid questionnaires were returned from 5,474 of these households. On the basis of this data children and adolescents with weekly headache were compared to those in good health. Several steps of comparison were made, including analyses of single-predictor models, full domain models, and the aggregate model for weekly headache.

The variables examined in the present research explained 26% of the variance differentiating children with weekly headache from those in good health. This is an acceptable amount, as it lies within the range of explained variance that has been reported in the literature. Nevertheless, over two-thirds of variance remains unaccounted for. This is a clear sign that some contributing variables have not yet found inclusion in multivariate models of weekly headache. As not all variables that have demonstrated a significant association with weekly headache (in single-predictor models or their equivalents) have been investigated in multivariate models, it is possible that the systematic inclusion of these variables could increase the total explained variance. This calls for more widespread use of multivariate analyses. Of course, it is also additionally possible that other variables exist whose association with weekly headache has not yet been postulated, let alone investigated.

Of the investigated variables, age and gender accounted for 6.5% of the variance differentiating between children with weekly headache and their healthy counterparts. This was to be expected as these variables have demonstrated their relevance to headache in prior research. Substantial further variance was explained by child health variables (pain other than headache, other somatic symptoms), child psychological variables (in particular anxiety/depression, and sleep disturbance), and to a lesser degree by school variables (in particular negative school climate) and parental health variables (in particular parental headache, and parental non-headache pain). Thus, the present study corroborated previous findings in establishing gender as a confirmed correlate of weekly headache, and anxiety/depression, non-headache pain, negative school climate, parental headache, and parental non-headache pain as tentative correlates thereof.

A number of further variables were examined with regard to weekly headache in the present research for the first time. Some of these variables reached significance in the single-predictor analyses and are therefore potential candidate variables for future research. Of these, five particularly warrant inclusion, as evidence of their relevance has been reported in studies on headache in general: Other somatic complaints, negative family environment, weekly family conflict, time spent on TV / video, and parental other somatic complaints.

Noteworthy is also that three of the four variables, which maintained their significance in the multivariate analysis of the full aggregate model for weekly headache (pain other than headache, other somatic complaints, and parental headache), are somatic or biological in

nature. In addition, the control variable gender (a further biological variable) approached significance in the present study. These findings point to the importance of research addressing the biological underpinnings of (weekly) headache. Several projects within the German Headache Consortium are active in this line of research.

It is, however, possible that non-headache pain, other somatic symptoms, and parental headache are not exclusively biological in nature. For example, non-headache pain and other somatic symptoms could be due to an increased susceptibility for physical symptoms or to the psychological process of somatic amplification. Similarly, the association between parental headache and child's headache may indicate a genetic contribution, or alternatively observational learning from a parental role model. It is also possible that a combination of biological and psychological mechanisms is relevant to these variables. It is essential that these issues be addressed in future research, as knowledge of their nature is the prerequisite for development of tailored prevention and intervention strategies.

With respect to the second objective, broad specificity was selected as the type of specificity to be addressed. Indeed, this has been suggested to be the appropriate starting point when beginning with specificity research in a given area. As a consequence, the comparison group for weekly headache had to be the higher-order category to which it belonged, namely chronic illness. In order to achieve this second objective an intermediary step was necessary, in which children with chronic illness (excluding weekly headache) were compared to their healthy counterparts, thus determining the correlates of chronic illness. Finally, the specificity of the identified correlates (of either weekly headache or chronic illness) was established by comparing children and adolescents with weekly headache to those with chronic illness.

In the specificity analysis a number of variables were identified as being specific to weekly headache, namely, age, pain other than headache, other somatic complaints, and parental headache. In addition, female gender was also found to be more common among children with weekly headache than among those with other chronic illness. Since the analysis addressed broad specificity children with weekly headache were compared to a heterogeneous group of children and adolescents with diverse chronic illnesses. Some limitations regarding the heterogeneous comparison group in the present study have been pointed out (e.g., unequal representation of the different illnesses, potential leveling out of effects through aggregation). Therefore, confirmation of the results through further studies addressing broad specificity would be worthwhile, perhaps with a more balanced illness representation in the comparison group. At the same time, conduction of narrow specificity studies could yield useful complementary knowledge regarding patterns of correlates and their specificity among the individual chronic illnesses.

All of the analyses presented here were based on cross-sectional data. Therefore, they only allow for the identification of correlates. It was not possible to determine whether the variables were risk factors for weekly headache as the temporal sequence of the variables relative to occurrence of weekly headache was not assessed. For example, it is possible that school stress and depression are consequences of having weekly headache rather than being causally related to the development of the pain disorder. Longitudinal studies and prospective analyses are needed in order to identify causal relations, as these

take temporal sequence into account. Fortunately, the Children, Adolescents & Headache Study was conceptualized as a longitudinal study with the capability and explicit purpose of determining risk factors for headache and weekly headache in the future.

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## **7. APPENDIX**

- A** ICHD-II Criteria for Migraine Without Aura, Migraine With Aura, and Tension-Type Headache
- B** Material from the Children, Adolescents & Headache Study (i.e., Prenotice letter, Cover Letter, Parent Questionnaire, Postcard)
- C** Descriptive Data Regarding the Children and Adolescents Not Fulfilling the Criteria for the Three Outcome Groups of Interest
- D** Correlation Matrix and VIFs for the Full Domain Models (Weekly Headache vs. Good Health, Chronic Illness vs. Good Health)
- E** Correlation Matrix and VIFs for the Aggregate Models (Weekly Headache vs. Good Health, Chronic Illness vs. Good Health) and the Specificity Model (Weekly Headache vs. Chronic Illness)



## Appendix A

### ICHD-II Criteria

(Headache Classification Committee of the International Headache Society, 2004)

#### 1.1 Migraine without aura

- A. At least 5 attacks fulfilling criteria B-D
- B. Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)<sup>1</sup>
- C. Headache has at least two of the following characteristics
  - 1. unilateral location<sup>2,3</sup>
  - 2. pulsating quality
  - 3. moderate or severe pain intensity
  - 4. aggravation by or causing avoidance of routine physical activity (eg, walking or climbing stairs)
- D. During headache at least one of the following
  - 1. nausea and/or vomiting
  - 2. photophobia and phonophobia<sup>4</sup>
- E. Not attributed to another disorder

#### 1.2 Migraine with aura

- A. At least 2 attacks fulfilling criterion B
- B. Migraine aura fulfilling criteria B and C for one of the subforms 1.2.1-1.2.6  
[Typical aura with migraine headache most common, subform 1.2.1, shown below]
- B. Aura consisting of at least one of the following but no motor weakness:
  - 1. fully reversible visual symptoms including positive features (eg, flickering lights, spots or lines) and/or negative features (ie, loss of vision)
  - 2. fully reversible sensory symptoms including positive features (ie, pins and needles) and/or negative features (ie, numbness)
  - 3. fully reversible dysphasic speech disturbance
- C. At least two of the following:
  - 1. homonymous visual symptoms and/or unilateral sensory symptoms
  - 2. at least one aura symptom develops gradually over  $\geq 5$  minutes and/or different aura symptoms occur in succession over  $\geq 5$  minutes
  - 3. each symptom lasts  $\geq 5$  and  $< 60$  minutes
- D. Headache fulfilling criteria B-D for 1.1 *Migraine without aura* begins during the aura or follow aura within 60 minutes
- C. Not attributed to another disorder

**2 Tension-type headache**

- A. At least 10 episodes fulfilling criteria B-D
- B. Headache lasting from 30 minutes to 7 days
- C. Headache has at least two of the following characteristics
  1. bilateral location
  2. pressing/tightening (non-pulsating) quality
  3. mild or moderate intensity
  4. not aggravated by routine physical activity such as walking or climbing stairs
- D. Both of the following
  1. no nausea or vomiting (anorexia may occur)
  2. no more than one of photophobia or phonophobia
- E. Not attributed to another disorder

## **Appendix B**

- B1** Prenotice letter
- B2** Cover Letter
- B3** Parent Questionnaire
- B4** Postcard (Thank You / Reminder)



**Georg-August-Universität Göttingen**

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APPENDIX

Göttingen, {Tag}.{Monat}.03

An  
Familie {Nachnamen}  
{Straße} {Hausnummer}

{PLZ} {Ort}

Sehr geehrte Familie {Nachnamen},

in einigen Tagen werden Sie Post erhalten, in der Sie gebeten werden, an einer Befragung teilzunehmen. Diese Befragung ist Teil des Forschungsprojektes "Kinder, Jugendliche & Kopfschmerz", kurz KIJUKO. Sie wird von der Universität Göttingen durchgeführt und vom Bundesministerium für Bildung und Forschung gefördert.

Ziel des Projektes ist es, Informationen über die Gesundheit von Kindern und Jugendlichen in Deutschland zu gewinnen. Ihre Angaben helfen uns, Bedingungen zu erkennen, die einen Einfluss auf die Gesundheit nehmen.

Wir schreiben Ihnen schon heute, weil wir bei früheren Untersuchungen die Erfahrung gemacht haben, dass viele Leute lieber im Vorfeld einer solchen Befragung informiert werden möchten.

Wir wären Ihnen sehr dankbar, wenn Sie durch Ihre freundliche Teilnahme diese Forschung möglich machen würden.

Mit freundlichen Grüßen  
Ihre

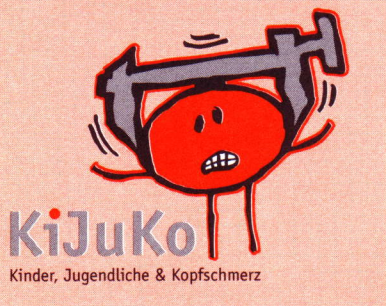
Prof. Dr. Birgit Kröner-Herwig

P.S. Unter allen Teilnehmern dieser Befragung werden wir interessante Sachpreise verlosen.  
Weitere Informationen erhalten Sie zusammen mit den Fragebögen.

GEFÖRDERT VOM



Bundesministerium  
für Bildung  
und Forschung



## Georg-August-Universität Göttingen

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APPENDIX

Göttingen, {Tag}.{Monat}.03

Sehr geehrte Familie {Nachnamen},

wir möchten Sie um die Teilnahme an unserer Fragebogenuntersuchung bitten. Sie sind zusammen mit 8800 anderen Familien aus Niedersachsen zufällig ausgewählt worden. Da unsere Befragung im öffentlichen Interesse liegt - es geht um die Gesundheit unserer Kinder - sind die Einwohnermeldeämter berechtigt, Adressen von Familien mit Kindern zur Verfügung zu stellen. Die Befragung wird von der Universität Göttingen durchgeführt und vom Bundesministerium für Bildung und Forschung gefördert.

Wir untersuchen den gesundheitlichen Zustand und die spezifischen Lebensbedingungen von Kindern und Jugendlichen. Diese Untersuchung ist notwendig, um die Bedingungen herauszufinden, die zu gesundheitlichen Problemen - insbesondere zu Kopfschmerzen - führen können. Die Studie bildet die Grundlage für die Entwicklung gezielter Programme zur Vorbeugung von gesundheitlichen Problemen. Es ist wichtig, dass Sie den beiliegenden Fragebogen zu Ihrer/Ihrem {Alter des Kindes}-jährigen Tochter/Sohn {Vornamen des Kindes} ausfüllen, auch wenn sie/er keine gesundheitlichen Probleme hat. Nur durch einen Vergleich von beschwerdefreien Kindern und Kindern mit gesundheitlichen Problemen ist es möglich, Ansätze zur Vorbeugung abzuleiten.

Damit die Studie aussagekräftig ist und wirkungsvolle Präventionsprogramme konzipiert werden können, ist es unbedingt notwendig, Daten über einen längeren Zeitraum hinweg zu erheben. Wir werden Sie daher in einem Jahr wieder kontaktieren und um Ihre erneute Teilnahme bitten.

Für die gesamte Untersuchung garantieren wir Ihre Anonymität: Ihre Adressdaten werden nur für die Kontaktaufnahme verwendet. Die Ergebnisse der Befragung werden ausschließlich in anonymisierter Form, d.h. ohne Namen und Anschrift berichtet. Das bedeutet, niemand kann aus den Ergebnissen erkennen, von welcher Familie die Angaben gemacht worden sind.

Die Teilnahme an dieser Untersuchung ist natürlich freiwillig. Sie helfen uns aber sehr, wenn Sie sich 30 - 45 Minuten Zeit nehmen, um den Fragebogen auszufüllen.

Als Dankeschön für die Rücksendung Ihres Fragebogens nehmen Sie automatisch an einer Verlosung teil. Es gibt eine Mini-HiFi-Anlage und diverse Gutscheine für Bücher, CDs, DVDs und Kinokarten zu gewinnen.

Für Ihre Bereitschaft an dieser Befragung teilzunehmen, möchten wir uns im Voraus bei Ihnen bedanken. Wenn Sie Fragen oder Anmerkungen haben, können Sie sich jederzeit an uns wenden.

Mit freundlichen Grüßen  
Ihre

Prof. Dr. Birgit Kröner-Herwig



GEFÖRDERT VOM

Bundesministerium  
für Bildung  
und Forschung



**KiJuKo**

Kinder, Jugendliche & Kopfschmerz

# ELTERNFRAGEBOGEN

Studie zur Gesundheit und  
zum Kopfschmerz von  
Kindern und Jugendlichen



Bundesministerium  
für Bildung  
und Forschung

Liebe Eltern,

Ihre Mitarbeit ist uns wichtig, um mehr über den gesundheitlichen Zustand von Kindern und Jugendlichen zu erfahren. Deshalb haben wir eine Menge Fragen an Sie über Ihr Kind und Ihre Familie.

Falls Sie mehrere Kinder haben, beziehen Sie sich bitte nur auf das im beiliegenden Brief genannte Kind. Wir möchten Sie daran erinnern, dass Sie und Ihr Kind die Fragebögen unabhängig voneinander beantworten, ohne sich miteinander abzustimmen.

Manche Kinder leben nicht mit ihren beiden leiblichen Eltern zusammen. Viele Fragen betreffen den Vater oder die Mutter oder beide Eltern, damit meinen wir die Personen, die mit dem Kind in einem Haushalt leben. Mit der Bezeichnung "Mutter" oder "Vater" sind auch diejenigen gemeint, die diese Rolle einnehmen, z. B. die Lebenspartnerin des Vaters, der Stiefvater o. a..

- Bitte beantworten Sie alle Fragen vollständig!
- Kreuzen Sie bitte bei jeder Frage eine Antwort an. Bei Fragen, die auf Ihr Kind oder Sie nicht zutreffen, kreuzen Sie bitte "Nein" an. Nur so können wir sicher sein, dass es auf Ihr Kind oder Sie nicht zutrifft!
- Wenn Ihnen eine Antwort schwer fällt, so versuchen Sie bitte dennoch, sich zu entscheiden!
- Überspringen Sie eine Frage nur, wenn für Sie der Hinweis gilt:  
 ➔ Gehen Sie zu Frage ... !

Die Ergebnisse der Befragung werden ausschließlich in anonymisierter Form, d.h. ohne Namen und Anschrift ausgewertet und dargestellt. Niemand kann feststellen, wer welche Angaben gemacht hat.

Wenn Sie Fragen haben, können Sie sich jederzeit an uns wenden.

### **KIJUKO-Team**

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 Institut für Psychologie (Abteilung 7)  
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 37073 Göttingen

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## Persönliche Angaben zu Ihnen und Ihrem Kind

1. **Bei wem lebt Ihr Kind hauptsächlich? (Hier bitte nur ein Kreuz machen!)**

- Leiblichen Eltern
- Leiblicher Mutter und ihrem Partner
- Leiblichem Vater und seiner Partnerin
- Leiblicher Mutter
- Leiblichem Vater
- Adoptiveltern / Pflegeeltern
- Großeltern oder anderen Verwandten
- In einem Heim

2. **Geburtsdatum Ihres Kindes**

|\_|\_| Tag |\_|\_| Monat |\_|\_|\_|\_| Jahr

3. **Wer beantwortet diesen Fragebogen?**

- Mutter
- Vater
- Mutter und Vater
- Adoptiveltern / Pflegeeltern
- Großeltern oder andere Verwandte
- Betreuer/in

4. **Wie viele leibliche Geschwister hat Ihr Kind? (Gemeint sind auch Halbgeschwister.)**

- Es ist ein Einzelkind.
- Es hat |\_|\_| leibliche ältere Geschwister.
- Es hat |\_|\_| leibliche jüngere Geschwister.
- Es hat |\_|\_| leibliche gleichaltrige Geschwister (Zwilling, Mehrlinge).

5. **Mit wie vielen älteren und jüngeren Geschwistern lebt Ihr Kind zusammen? (Gemeint sind in diesem Fall auch Halbgeschwister, Adoptivgeschwister und angeheiratete Geschwister.)**

- Mein Kind lebt mit keinen Geschwistern zusammen.
- Mein Kind lebt mit |\_|\_| älteren Geschwistern zusammen.
- Mein Kind lebt mit |\_|\_| jüngeren Geschwistern zusammen.
- Mein Kind lebt mit |\_|\_| gleichaltrigen Geschwistern zusammen.



## Gesundheit Ihres Kindes

6. **Wie groß ist Ihr Kind?**

Mein Kind ist |\_|\_|\_| cm groß.

7. **Wie viel wiegt Ihr Kind?**

Mein Kind wiegt |\_|\_|\_| kg.

8. **Wie würden Sie die Gesundheit Ihres Kindes im Allgemeinen beschreiben?**

Sehr gut	Gut	Mittel- mäßig	Schlecht	Sehr schlecht
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. **Bitte geben Sie das Geschlecht Ihres Kindes an!**

Männlich

Weiblich



**Wenn Ihr Kind ein Mädchen ist, in welchem Alter hat die Regelblutung begonnen?**

Mit |\_|\_| Jahren

Sie hat noch keine Regelblutung.

10. **Leidet Ihr Kind an folgenden chronischen körperlichen Erkrankungen? Wenn Ihr Kind nicht an einer der aufgeführten Erkrankungen leidet, kreuzen Sie bitte "Nein" an!**

	Ja	Nein
Asthma	<input type="checkbox"/>	<input type="checkbox"/>
Neurodermitis / atopische Erkrankung	<input type="checkbox"/>	<input type="checkbox"/>
Allergien	<input type="checkbox"/>	<input type="checkbox"/>
Epilepsie	<input type="checkbox"/>	<input type="checkbox"/>
Angeborener Herzfehler	<input type="checkbox"/>	<input type="checkbox"/>
Chronisch entzündliche Darmerkrankungen	<input type="checkbox"/>	<input type="checkbox"/>
Chronische Nierenerkrankung	<input type="checkbox"/>	<input type="checkbox"/>
Muskelerkrankungen	<input type="checkbox"/>	<input type="checkbox"/>
Rheuma	<input type="checkbox"/>	<input type="checkbox"/>
Diabetes	<input type="checkbox"/>	<input type="checkbox"/>
Andere	<input type="checkbox"/>	<input type="checkbox"/>



Wenn Ihr Kind an keiner dieser Störungen leidet, ➔ **weiter mit Frage 13!**

11. **Wie stark ist Ihr Kind durch die schwerste dieser Erkrankungen beeinträchtigt?**

□	□	□	□	□	□	□	□	□	□	□
0	1	2	3	4	5	6	7	8	9	10
Gar nicht beeinträchtigt					Völlig beeinträchtigt, d.h. kann an <u>keinen</u> üblichen Aktivitäten teilnehmen					

12. **Befindet sich Ihr Kind aufgrund der Erkrankung/en in regelmäßiger ärztlicher Behandlung?** Nein Ja13. **Leidet Ihr Kind an folgenden Störungen bzw. Beeinträchtigungen? Wenn Ihr Kind nicht an einer der aufgeführten Beeinträchtigungen leidet, kreuzen Sie bitte "Nein" an!**

	Ja	Nein
Entwicklungsverzögerungen oder geistige Behinderung	<input type="checkbox"/>	<input type="checkbox"/>
Hörprobleme oder Taubheit	<input type="checkbox"/>	<input type="checkbox"/>
Sprachstörungen	<input type="checkbox"/>	<input type="checkbox"/>
Schwere Sehstörung oder Blindheit	<input type="checkbox"/>	<input type="checkbox"/>



Wenn Ihr Kind  
an keiner dieser  
Störungen  
leidet, ➡ **weiter**  
mit Frage 15!

14. **Wie stark ist Ihr Kind durch die schwerste dieser Störungen beeinträchtigt?**

□	□	□	□	□	□	□	□	□	□	□
0	1	2	3	4	5	6	7	8	9	10
Gar nicht beeinträchtigt					Völlig beeinträchtigt, d.h. kann an <u>keinen</u> üblichen Aktivitäten teilnehmen					

15. **Wie häufig kam es in den letzten 3 Monaten vor, dass Ihr Kind unter den folgenden Beschwerden litt? (Wenn Ihr Kind die genannte Beschwerde nicht hat, kreuzen Sie bitte "Nie" an!)**

	Nie	Selten	Manchmal	Oft	Sehr oft (mindestens 1mal pro Woche)	Weiß nicht
Bauchschmerzen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appetitlosigkeit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schwindel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schlafstörungen (beim Ein- oder Durchschlafen)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Verstopfung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Übelkeit oder Erbrechen (ohne dass Kopfschmerzen vorlagen)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reiseübelkeit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Müdigkeit / Schläppheit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rückenschmerzen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Einnässen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. **Befindet sich Ihr Kind wegen dieser Beschwerden in Behandlung?**

Nein

Ja

17. **Nimmt Ihr Kind zurzeit regelmäßig Medikamente ein? (Medikamente zur Behandlung von Kopfschmerzen hier bitte nicht nennen, da sie gesondert erfragt werden!)**

Nein

Ja

18. **Wie viele Nächte war Ihr Kind in den letzten 12 Monaten zur stationären Behandlung in einem Krankenhaus?**

Ungefähr |\_|\_| Nächte

Keine Nacht

19. **In den folgenden Aussagen geht es um die allgemeine Gesundheit Ihres Kindes. Bitte schätzen Sie ein, inwieweit jede dieser Aussagen auf Ihr Kind zutrifft!**

	Trifft überhaupt nicht zu	Trifft eher nicht zu	Trifft teilweise zu	Trifft eher zu	Trifft ganz zu
Mein Kind scheint etwas leichter als andere Kinder krank zu werden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mein Kind ist im Allgemeinen gesund.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. **Hat Ihr Kind in den letzten 6 Monaten über Kopfschmerzen berichtet?**

- Nein ➔ weiter mit Frage 51!  
 Ja  
 Weiß nicht ➔ weiter mit Frage 51!

### Kopfschmerzen Ihres Kindes

21. **In welchem Alter hatte Ihr Kind zum ersten Mal Kopfschmerzen?**

Mit |\_|\_| Jahren

- Weiß nicht

22. **Was trifft auf Ihr Kind zu? Mein Kind hatte in den letzten 6 Monaten Kopfschmerzen...**

- Mindestens 1mal in der Woche

↪ Mein Kind hatte ungefähr |\_|mal in der Woche Kopfschmerzen.

- Mindestens 1mal im Monat, aber weniger als 1mal in der Woche

↪ Mein Kind hatte ungefähr |\_|mal im Monat Kopfschmerzen.

- Weniger als 1mal im Monat

↪ Mein Kind hatte ungefähr |\_|mal in den letzten 6 Monaten Kopfschmerzen.

23. **Wie lange hielten die Kopfschmerzen durchschnittlich an?**

- Bis zu 1 Stunde  
 1-2 Stunden  
 2-4 Stunden  
 4 Stunden bis zu einem Tag  
 Länger als einen Tag  
 2 Tage und länger  
 Weiß nicht

24. **Wie stark waren die Kopfschmerzen Ihres Kindes im Durchschnitt? Bitte versuchen Sie, es nach Ihrem Eindruck einzuschätzen!**

□	□	□	□	□	□	□	□	□	□	□
0	1	2	3	4	5	6	7	8	9	10
Kein Schmerz										Schlimmster vorstellbarer Schmerz

Schmerzintensität lässt sich nicht angeben

25. **Wo treten die Schmerzen auf? (Hier sind mehrere Antworten möglich.)**

- Im Schläfenbereich  
 Im Stirnbereich  
 Am Hinterkopf  
 Am ganzen Kopf  
 Auf einer Seite des Kopfes  
 Weiß nicht

26. **Treten folgende Symptome im Vorfeld der Kopfschmerzen Ihres Kindes auf?**

	Ja	Nein	Weiß nicht
Sehstörungen (z.B. Linien, Blitze, Einschränkung des Blickfeldes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sprachstörungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lähmungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Empfindungsstörungen (z.B. Kribbeln, Taubheit)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. **Treten folgende Symptome zusammen mit den Kopfschmerzen Ihres Kindes auf?**

	Ja	Nein	Weiß nicht
Übelkeit oder Erbrechen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lichtempfindlichkeit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geräuschempfindlichkeit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Verstärkung der Schmerzen bei Bewegung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. **Wie beschreibt Ihr Kind im Allgemeinen die Schmerzempfindung?**

- Dumpf oder drückend  
 Pulsierend oder pochend  
 Weiß nicht

29. **Welche Faktoren lösen Ihrer Meinung nach bei Ihrem Kind Kopfschmerzen aus? (Wenn Sie den Eindruck haben, dass ein Faktor keinen Kopfschmerz auslöst, kreuzen Sie bitte "Nie" an!)**

	Nie	Selten	Manchmal	Oft	Immer	Weiß nicht
Geistige Anstrengung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schulische Belastung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ärger in der Schule / in der Familie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Müdigkeit / Schlafmangel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unregelmäßige Mahlzeiten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Erkältungskrankheiten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wetterveränderung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Besondere Lichtverhältnisse (z.B. starkes Sonnenlicht)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lärm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Genuss bestimmter Nahrungsmittel (z.B. Käse, Schokolade, Zitrusfrüchte)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lange Fahrten im Auto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Langes Fernsehen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spielen / Arbeiten am Computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Für Mädchen: Regelblutung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. **Kreuzen Sie bitte an, welcher Satz mehr für Sie zutrifft!**

- Ich kann mir meistens erklären, weshalb mein Kind Kopfschmerzen bekommt.  
 Ich kann mir meistens nicht erklären, weshalb mein Kind Kopfschmerzen bekommt.

Die folgenden Fragen (31-36) beziehen sich auf die letzten 3 Monate. Bitte versuchen Sie, sich an diesen Zeitraum zu erinnern! Falls Sie sich im Einzelfall nicht genau erinnern können, geben Sie Ihre bestmögliche Schätzung an!

31. **An wie vielen Tagen hatte Ihr Kind Kopfschmerzen?**

An |\_|\_| Tagen

32. **An wie vielen Tagen hat Ihr Kind in den letzten drei Monaten ganze Schultage wegen Kopfschmerzen versäumt?**

An |\_|\_| Tage

Es hat an keinem Tag gefehlt.

33. **An wie vielen Tagen hat Ihr Kind in den letzten drei Monaten einzelne Schulstunden wegen Kopfschmerzen versäumt? (Bitte nicht die ganzen Tage, die in der vorherigen Frage gezählt wurden, hinzuzählen!)**

An |\_|\_| Tagen

Es hat keine Schulstunden versäumt.

34. **An wie vielen Tagen war Ihr Kind in den letzten drei Monaten nur halb so leistungsfähig wie sonst in der Schule wegen Kopfschmerzen? (Bitte nicht die Tage, die in den beiden vorherigen Fragen gezählt wurden, hinzuzählen!)**

An |\_|\_| Tagen

Weiß nicht

35. **An wie vielen Tagen war Ihr Kind nicht in der Lage, Aufgaben zu Hause (z.B. Hausaufgaben, Zimmer aufräumen, zu Hause helfen) wegen Kopfschmerzen zu erledigen?**

An |\_|\_| Tagen

Es hat an allen Tagen trotz Kopfschmerzen die Aufgaben zu Hause erledigt.

36. **An wie vielen Tagen war Ihr Kind nicht in der Lage, an anderen Aktivitäten (z.B. Spielen, Sport, ins Kino gehen) wegen Kopfschmerzen teilzunehmen?**

An |\_|\_| Tagen

Es hat an allen Tagen trotz Kopfschmerzen an Aktivitäten teilgenommen.

37. **An wie vielen Tagen hat Ihr Kind an diesen Aktivitäten teilgenommen, war aber nur halb so leistungsfähig wie sonst? (Bitte nicht die Tage, die in der vorherigen Frage gezählt wurden, hinzuzählen!)**

An |\_|\_| Tagen

Weiß nicht

38. **Wenn Ihr Kind Kopfschmerzen hat, kann es dann das Folgende noch machen?**

	Nie	Selten	Manchmal	Oft	Immer
Es kann lebhafte Spiele spielen (z. B. Fangen und Fußball).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es kann Computerspiele spielen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es kann fernsehen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es kann Bücher oder Comics lesen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es ist gezwungen, sich hinzulegen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

39. **Was hilft Ihrem Kind, wenn es Kopfschmerzen hat?**

	Nie	Selten	Manchmal	Oft	Immer	Macht Kind nicht
Sich hinzulegen / Schlafen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stirn zu kühlen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Abdunkeln des Zimmers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ablenkung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entspannung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Einnahme von Medikamenten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spaziergang an der frischen Luft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

40. **Machen Sie sich Sorgen über die Kopfschmerzen Ihres Kindes?**

Nie	Selten	Manchmal	Oft	Immer
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

41. **Waren Sie schon einmal mit Ihrem Kind wegen seiner Kopfschmerzen beim Arzt?**

- Nein → weiter mit Frage 46!  
 Ja

42. **Haben Sie verschiedene Ärzte aufgesucht?**

- Nein  
 Ja



Wenn ja, wie viele? |\_|\_|



43. **Welche Ärzte haben Sie aufgesucht? (Hier sind mehrere Antworten möglich.)**

- Hausarzt  
 Kinderarzt  
 Neurologe  
 Augenarzt  
 Homöopath  
 Andere

44. **Welcher Befund bzw. welche Diagnose wurde Ihnen mitgeteilt? (Hier sind mehrere Antworten möglich.)**

- Keine Diagnose  
 Spannungskopfschmerz  
 Migräne  
 Weiß nicht

45. **Ist der Kopfschmerz – nach Ansicht des Arztes – rückführbar auf eine der folgenden Ursachen?**

	Ja	Nein	Weiß nicht
Unfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Erkrankung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wachstum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

46. **Nimmt Ihr Kind Medikamente ein, um Kopfschmerz vorzubeugen?**

- Nein ➔ weiter mit Frage 48!  
 Betablocker (z.B. Beloc<sup>®</sup>, Dociton<sup>®</sup>)  
 Kalziumantagonisten (z.B. Sibelium<sup>®</sup>)  
 Nicht-steriodale Serotoninagonisten (z.B. DET-MS<sup>®</sup>)  
 Andere

47. **Wie häufig nimmt Ihr Kind die Medikamente, um Kopfschmerzen vorzubeugen?**

- | Nie                      | Selten                   | Manchmal                 | Oft                      | Immer                    |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

48. **Nimmt Ihr Kind Medikamente ein, um bestehende Kopfschmerzen zu lindern bzw. zu beseitigen?**

- Nein ➔ weiter mit Frage 50!
- Acetylsalicylsäure (z.B. Aspirin<sup>®</sup>, ASS<sup>®</sup>)
- Paracetamol (z.B. Ben-u-ron<sup>®</sup>)
- Triptane (z.B. Imigran<sup>®</sup>, Asco-Top<sup>®</sup>, Maxalt<sup>®</sup>)
- Ergotamine (z.B. Ergo-Kranit<sup>®</sup>, ergo sanol<sup>®</sup>)
- Kombinationspräparate (z.B. Thomapyrin<sup>®</sup>)
- Anti-Übelkeitspräparate (z.B. Motilium<sup>®</sup>, Paspertin<sup>®</sup>)
- Andere

49. **Wie häufig nimmt Ihr Kind Medikamente, um beginnende oder bestehende Kopfschmerzen zu lindern bzw. zu beseitigen?**

- | Nie                      | Selten                   | Manchmal                 | Oft                      | Immer                    |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

50. **Die folgenden Fragen beziehen sich darauf, was Sie in den letzten 6 Monaten getan haben, wenn Ihr Kind Kopfschmerzen hatte!**

	Nie	Selten	Manchmal	Oft	Immer
Wie oft haben Sie Ihr Kind zu Hause gelassen, anstatt es zur Schule zu schicken, wenn es Kopfschmerzen hatte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie oft haben Sie Ihrem Kind regelmäßige häusliche Pflichten (wie Müll 'rausbringen oder das Zimmer aufzuräumen) erlassen, wenn es Kopfschmerzen hatte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie oft haben Sie mehr Zeit mit Ihrem Kind verbracht, wenn es Kopfschmerzen hatte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie oft haben Sie Ihr Kind umsorgt oder verwöhnt, wenn es Kopfschmerzen hatte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie oft haben Sie Ihrem Kind spezielle Privilegien eingeräumt oder es Dinge tun lassen, die es sonst nicht tun darf, wenn es Kopfschmerzen hatte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie oft sind Sie selbst zu Hause geblieben oder früher von der Arbeit zurückgekommen (bzw. wenn Sie nicht berufstätig sind, wie oft sind Sie zu Hause geblieben statt Erledigungen zu machen), wenn Ihr Kind Kopfschmerzen hatte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Kopfschmerzen in der Familie

### 51. Bitte geben Sie an, inwieweit Sie den folgenden Aussagen zustimmen!

	Stimme überhaupt nicht zu	Stimme eher nicht zu	Stimme teilweise zu	Stimme eher zu	Stimme ganz zu
Kopfschmerzen haben vorwiegend eine psychische Ursache.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kopfschmerzen haben vorwiegend eine körperliche Ursache.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei Kopfschmerzen sollte man Medikamente einnehmen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei Kopfschmerzen sollte man immer den Arzt aufsuchen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 52. Leiden Sie an Kopfschmerzen?

Nein ➔ weiter zu Frage 55!

Ja

### 53. Welcher Art sind Ihre Kopfschmerzen?

	Ja	Nein
Migräne-Kopfschmerz (anfallartige Kopfschmerzen mit Übelkeit, Erbrechen, heftigem Schmerz, Licht-/Geräuschempfindlichkeit)	<input type="checkbox"/>	<input type="checkbox"/>
Spannungskopfschmerz (drückender/ziehender Schmerz, beidseitig auftretend)	<input type="checkbox"/>	<input type="checkbox"/>
Anderer Kopfschmerz	<input type="checkbox"/>	<input type="checkbox"/>

### 54. Was trifft auf Sie zu? Ich hatte in den letzten 6 Monaten Kopfschmerzen...

Mindestens 1mal in der Woche  
↳ nämlich ungefähr |\_|mal in der Woche.

Mindestens 1mal im Monat, aber weniger als 1mal in der Woche  
↳ nämlich ungefähr |\_|mal im Monat.

Weniger als 1mal im Monat  
↳ nämlich ungefähr |\_|mal in den letzten 6 Monaten.

### 55. Leidet Ihr Partner / Ihre Partnerin an Kopfschmerzen?

Ich habe keinen Partner / keine Partnerin ➔ weiter zu Frage 58!

Nein ➔ weiter zu Frage 58!

Ja

56. **Welcher Art sind seine / ihre Kopfschmerzen?**

	Ja	Nein
Migräne-Kopfschmerz (anfallartige Kopfschmerzen mit Übelkeit, Erbrechen, heftigem Schmerz, Licht-/Geräuschempfindlichkeit)	<input type="checkbox"/>	<input type="checkbox"/>
Spannungskopfschmerz (drückender/ziehender Schmerz, beidseitig auftretend)	<input type="checkbox"/>	<input type="checkbox"/>
Anderer Kopfschmerz	<input type="checkbox"/>	<input type="checkbox"/>

57. **Was trifft auf Ihren Partner bzw. Ihre Partnerin zu? Er bzw. sie hatte in den letzten 6 Monaten Kopfschmerzen...**

- Mindestens 1mal in der Woche  
 ↳ nämlich ungefähr |\_|mal in der Woche
- Mindestens 1mal im Monat, aber weniger als 1mal in der Woche  
 ↳ nämlich ungefähr |\_|mal im Monat
- Weniger als 1mal im Monat  
 ↳ nämlich ungefähr |\_|mal in den letzten 6 Monaten
- Weiß nicht

58. **Wie viele Geschwister Ihres Kindes leiden öfter an Kopfschmerzen?**

- |\_|\_| Geschwister
- Mein Kind hat keine Geschwister.

### Ihre Gesundheit und die Ihrer Familie

59. **Wie oft waren Sie persönlich in den letzten 3 Monaten...**

	Nie	Selten	Manch- mal	Oft	Immer
...sehr nervös und angespannt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...niedergeschlagen, so dass Sie nichts aufmuntern konnte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...ruhig und gelassen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...entmutigt und traurig?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...glücklich und zufrieden?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

60. **Wie oft haben Sie sich in den letzten 3 Monaten Sorgen gemacht...**

	Nie	Selten	Manchmal	Oft	Immer
...über Ihren Arbeitsplatz?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...über die Gesundheit Ihrer Familie?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...über Probleme in der Familie?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

61. **Inwieweit treffen die folgenden Aussagen auf Sie zu?**

	Trifft überhaupt nicht zu	Trifft eher nicht zu	Trifft teilweise zu	Trifft eher zu	Trifft ganz zu
Ich war schon immer jemand, der sich viele Sorgen macht.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Über irgendetwas mache ich mir immer Sorgen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meine Sorgen wachsen mir über den Kopf.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich scheine etwas leichter als andere krank zu werden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich bin im Allgemeinen gesund.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

62. **Waren Sie in den letzten 6 Monaten beim Arzt?**

- Nein  
 Ja ➔ Wie oft? |\_|\_|mal

63. **Wie häufig leiden Sie unter folgenden Beschwerden?**

	Nie	Selten	Manchmal	Oft	Immer
Schmerzen (z.B. Rücken, Gelenke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bauchschmerzen / Magen-Darm-Beschwerden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma / Allergien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schilddrüsenfehlfunktion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schlafstörungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Herz- / Kreislaufbeschwerden / Bluthochdruck	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ängste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depressive Verstimmung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

64. **Wenn Sie an diesen oder anderen Beschwerden oder Schmerzen leiden...**

	Nie	Selten	Manch- mal	Oft	Immer
... sagen Sie gemeinsame Unternehmungen mit FreundInnen oder der Familie ab?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...gehen Sie nicht zur Arbeit oder lassen Sie die Hausarbeit liegen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...nimmt die Familie Rücksicht auf Sie?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...erhalten Sie Hilfe von anderen Familienmitgliedern bei Pflichten im Haushalt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

65. **Nehmen Sie regelmäßig Medikamente ein?**

- Nein  
 Ja

66. **Bitte schätzen Sie ein, inwieweit jede dieser Aussagen auf Sie zutrifft!**

	Trifft überhaupt nicht zu	Trifft eher nicht zu	Trifft teilweise zu	Trifft eher zu	Trifft ganz zu
Wenn ich Beschwerden habe, suche ich für gewöhnlich einen Arzt auf.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenn ich Beschwerden habe, weiß ich, dass ich mir selbst helfen kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich verdanke es meinem Schicksal, wenn meine Beschwerden wieder verschwinden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenn ich Beschwerden habe, frage ich andere um Rat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenn es das Schicksal so will, dann bekomme ich körperliche Beschwerden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es liegt an mir, wenn meine Beschwerden nachlassen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

67. **War Ihr Partner / Ihre Partnerin in den letzten 6 Monaten beim Arzt?**

- Ich habe keinen Partner / keine Partnerin ➔ weiter zu Frage 70!  
 Nein ➔ weiter zu Frage 70!  
 Ja ➔ Wie oft? |\_|\_| mal  
 Weiß nicht

68. **Wie häufig leidet Ihr Partner / Ihre Partnerin unter folgenden Beschwerden?**

	Nie	Selten	Manchmal	Oft	Immer	Weiß nicht
Schmerzen (z.B. Rücken, Gelenke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bauchschmerzen / Magen-Darm-Beschwerden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma / Allergien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schilddrüsenfehlfunktion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schlafstörungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Herz- / Kreislaufbeschwerden / Bluthochdruck	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ängste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depressive Verstimmung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

69. **Nimmt Ihr Partner/ Ihre Partnerin regelmäßig Medikamente ein?**

- Nein  
 Ja  
 Weiß nicht

### Familiäre Situation

70. **Bitte geben Sie an, wie häufig Folgendes für Ihre Familie zutrifft!**

	Nie	Selten	Manchmal	Oft	Immer
Haben Sie in Ihrer Familie Zeit füreinander?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sind Sie zufrieden mit Ihren gemeinsamen Aktivitäten?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reden Sie in Ihrer Familie über Ihre Sorgen und Probleme?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

71. **Wenn es in Ihrer Familie zu Konflikten kommt, wie läuft das bei Ihnen ab?**

	Nie	Selten	Manchmal	Oft	Immer
Wir versuchen das Problem zu lösen, indem wir darüber reden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wir streiten lautstark miteinander.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenn wir darüber streiten, kann es schon einmal dazu kommen, dass "die Tassen fliegen".	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

72. **Wie häufig kam es in den letzten 3 Monaten durchschnittlich zum Streit?**

- Täglich  
 Mehrmals pro Woche  
 Ungefähr 1x pro Woche  
 Seltener  
 Nie

## Schule

73. **Auf was für eine Schule geht Ihr Kind?**

- Grundschule  
 Orientierungsstufe  
 Hauptschule  
 Realschule  
 Gymnasium  
 Gesamtschule  
 Sonderschule  
 Waldorfschule

74. **Welche Schulklasse besucht Ihr Kind?**

Es besucht zurzeit die |\_|\_|. Klasse

75. **Hat Ihr Kind schon einmal eine Klasse wiederholt?**

- Nein  
 Ja, einmal  
 Ja, zwei-/ mehrmals

76. **Wird die Schulleistung Ihres Kindes benotet?**

- Nein  
 Ja



**Wenn ja, wie ist die Schulleistung Ihres Kindes im letzten Halbjahr gewesen?  
 Bitte geben Sie die Durchschnittsnoten Ihres Kindes in den folgenden  
 Fächern an:**

Lesen, Deutsch	_
Sachkunde, Geschichte, Sozialkunde, Erdkunde	_
Rechnen, Mathematik	_
Biologie, Chemie, Physik	_
Fremdsprachen	_



77. **Wie viel Zeit ungefähr braucht Ihr Kind täglich für seine Hausaufgaben?**

- Bis zu 1 Stunde  
 1 - 2 Stunden  
 2 - 3 Stunden  
 Mehr als 3 Stunden

78. **Hat Ihr Kind zurzeit Lernschwierigkeiten oder andere Probleme in der Schule?**

- Nein  
 Ja  
 Weiß nicht

79. **Haben sich die Leistungen im Vergleich zum letzten Zeugnis deutlich verschlechtert (um mehr als eine Note)?**

- Nein  
 Ja

80. **Ist die Versetzung gefährdet?**

- Nein  
 Ja

81. **Wie häufig trifft Folgendes auf Ihr Kind zu?**

	Nie	Selten	Manch- mal	Oft	Immer	Weiß nicht
Wie häufig hat sich Ihr Kind im letzten Jahr über die Schule beklagt, insbesondere über das Klima in der Schule?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie häufig haben Sie den Eindruck, dass Ihr Kind unter dem Leistungsstress leidet (derart, dass die Anforderungen in der Schule für Ihr Kind schwierig zu erfüllen sind)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie häufig wird Ihr Kind in der Schule von Mitschülern geärgert oder gequält?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie häufig ist Ihr Kind in der Schule isoliert oder alleine?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie häufig hat Ihr Kind Angst vor der Schule oder vor bestimmten Lehrern?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wie häufig haben Sie den Eindruck, dass Ihr Kind sich in der Schule langweilt, weil es sich unterfordert fühlt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

82. **Wie häufig treffen folgende Aussagen auf Ihr Kind zu?**

	Nie	Selten	Manchmal	Oft	Immer	Weiß nicht
Wenn meinem Kind etwas nicht glückt, ist es sehr enttäuscht.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenn eine Sache nicht klappt, wird es schnell ungeduldig.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenn es keinen Erfolg hat, ist es sehr schnell entmutigt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Freizeit

83. **Wie häufig führte Ihr Kind in den letzten 6 Monaten folgende Aktivitäten für mindestens 20 Minuten außerhalb der Schule aus?**

	Weniger als 1mal pro Woche	1-2mal pro Woche	3-5mal pro Woche	Mehr als 5mal pro Woche	Übt mein Kind nicht aus
Radfahren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ballspiele (Volleyball, Fußball o.ä.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schwimmen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tennis, Tischtennis, Federball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gymnastik	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leichtathletik	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Im Freien laufen, klettern, spielen o. ä.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tanzen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reiten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inliner oder Skateboard fahren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lesen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Malen, zeichnen, basteln	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Musik hören	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Musizieren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

84. **Wie häufig hat Ihr Kind Zeit zum Spielen bzw. Zeit für sich?**

Nie	Selten	Manch- mal	Oft	Immer	Weiß nicht
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

85. **Wie viele gute Freunde und Freundinnen hat Ihr Kind? (Geschwister bitte nicht mitzählen!)**

- Keinen Freund bzw. keine Freundin
- Einen Freund bzw. eine Freundin
- Mehrere, nämlich ungefähr |\_|\_| Freunde und Freundinnen insgesamt
- Weiß nicht

86. **An wie vielen Tagen in den letzten 2 Wochen hat Ihr Kind etwas mit seinen Freunden außerhalb der Schulstunden unternommen? (Auch wenn es bei Ihrem Kind sehr unterschiedlich ist, versuchen Sie bitte, eine Durchschnittszahl anzugeben!)**

- |\_|\_| Tage in der Woche
- Weiß nicht

87. **Wie lange beschäftigt Ihr Kind sich mit folgenden Dingen durchschnittlich pro Tag? (Bitte kreuzen Sie an, was am ehesten zutrifft!)**

	Gar nicht	Weniger als 30 Min.	Ungefähr 30-60 Min.	Ungefähr 1-2 Std.	Ungefähr 3-4 Std.	Mehr als 4 Stunden
Fernsehen und Videofilme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer, Internet, Game Boy und PlayStation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Umgang Ihres Kindes mit Belastungen

### 88. Was passiert, wenn Ihr Kind in der Schule unter Druck gerät oder von anderen Kindern unter Druck gesetzt wird?

	Nie	Selten	Manch- mal	Oft	Immer	Weiß nicht
Es möchte sich am liebsten krank stellen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seine Gedanken kreisen nur noch um diese Sache.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es denkt, es hat sowieso keinen Zweck mehr.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es nörgelt an allem herum.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es möchte am liebsten im Bett bleiben.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meinem Kind geht diese Situation immer wieder durch den Kopf.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meinem Kind kommt alles sinnlos vor, was es tut.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mein Kind bekommt schlechte Laune.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 89. Wie reagiert Ihr Kind, wenn es sich ärgert bzw. von anderen geärgert wird?

	Nie	Selten	Manch- mal	Oft	Immer	Weiß nicht
Es fährt aus der Haut.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es empfindet Groll, redet aber mit niemandem darüber.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es kontrolliert seinen Ärger.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es platzt laut heraus, so dass andere seinen Ärger zu spüren bekommen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nach außen bewahrt es Haltung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es kocht innerlich, zeigt es aber nicht.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Stimmung und Verhalten

### 90. Bitte geben Sie an, inwieweit diese Aussagen auf Sie zutreffen!

	Trifft überhaupt nicht zu	Trifft eher nicht zu	Trifft teilweise zu	Trifft eher zu	Trifft genau zu
Ich mache mir mehr Sorgen um mein Kind als andere Eltern.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich bin sehr besorgt um mein Kind und verbiete ihm vieles aus Angst, dass ihm etwas passieren könnte.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich ermahne mein Kind häufig, vorsichtig zu sein.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 91. Bitte geben Sie an, wie häufig folgende Gefühle bei Ihrem Kind in den letzten 3 Monaten vorgekommen sind!

	Nie	Selten	Manch- mal	Oft	Immer	Weiß nicht
Es hatte das Gefühl oder beklagte sich, dass niemand es liebt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es hatte zu starke Schuldgefühle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es war nervös oder angespannt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es wachte manchmal nachts auf und hatte Angst.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es war misstrauisch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es machte sich zu viele Sorgen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es hatte Alpträume.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es fühlte sich wertlos oder unterlegen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es war zu furchtsam oder zu ängstlich.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es hatte Angst, Dinge falsch zu machen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es war unglücklich, traurig oder niedergeschlagen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

92. **Bitte geben Sie an, wie häufig folgende Verhaltensweisen bei Ihrem Kind in den letzten 3 Monaten vorgekommen sind!**

	Nie	Selten	Manchmal	Oft	Immer	Weiß nicht
Es bedrohte andere.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es konnte nicht still sitzen, war unruhig oder überaktiv.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es war gemein zu anderen oder schüchterte sie ein.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es konnte sich nicht konzentrieren, konnte nicht lange aufpassen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es griff andere körperlich an.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es war impulsiv oder handelte, ohne zu überlegen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Wichtige Ereignisse für Ihr Kind und die Familie

93. **War Ihr Kind in den letzten 5 Jahren in einem Heim oder in einem Internat?**  
 Nein  
 Ja
94. **Hat Ihr Kind in den letzten 5 Jahren einen außergewöhnlichen Schulwechsel (nicht Regelwechsel von der Grundschule zur Orientierungsstufe oder zur weiterführenden Schule) gehabt?**  
 Nein  
 Ja
95. **Hat sich Ihr Kind in den letzten 5 Jahren von einer wichtigen Bezugsperson trennen müssen (z.B. durch Tod, Umzug, Scheidung)?**  
 Nein  
 Ja
96. **Sind in den letzten 5 Jahren neue Personen in die Familie aufgenommen worden (z.B. Geburt eines Geschwisters, neuer Lebenspartner)?**  
 Nein  
 Ja

97. **Leidet jemand aus Ihrer Familie an einer chronischen körperlichen Erkrankung, die ihn erheblich beeinträchtigt? (Bitte hier nicht das Kind nennen, auf das sich der Fragebogen im Wesentlichen bezieht!)**  
 Nein  
 Ja
98. **Gab es in den letzten 5 Jahren schwere Unfälle innerhalb Ihrer Familie?**  
 Nein  
 Ja
99. **Gibt es in Ihrer Familie eine hohe finanzielle Belastung?**  
 Nein  
 Ja
100. **Gibt es einen Pflegefall, der in der Familie versorgt wird?**  
 Nein  
 Ja

## Soziodemographie

**Zur Erinnerung: Mit der Rubrik "Mutter" oder "Vater" sind hier auch diejenigen Personen gemeint, die für Ihr Kind diese Funktion übernehmen.**

101. **Welchen Schulabschluss haben Sie? (Nennen Sie nur den höchsten Abschluss. Bitte für beide Elternteile angeben!)**

	Mutter	Vater
Hauptschulabschluss / Volksschulabschluss	<input type="checkbox"/>	<input type="checkbox"/>
Realschulabschluss (Mittlere Reife)	<input type="checkbox"/>	<input type="checkbox"/>
Abschluss Polytechnische Oberschule 10. Klasse (vor 1965: 8.Klasse)	<input type="checkbox"/>	<input type="checkbox"/>
Fachhochschulreife (Abschluss einer Fachoberschule)	<input type="checkbox"/>	<input type="checkbox"/>
Abitur, allgemeine oder fachgebundene Hochschulreife (Gymnasium bzw. EOS)	<input type="checkbox"/>	<input type="checkbox"/>
Anderer Schulabschluss	<input type="checkbox"/>	<input type="checkbox"/>
Schule beendet ohne Abschluss	<input type="checkbox"/>	<input type="checkbox"/>
(Noch) keinen Schulabschluss	<input type="checkbox"/>	<input type="checkbox"/>

102. **Haben Sie eine abgeschlossene Berufsausbildung? Wenn ja, welche? (Nennen Sie bitte nur den höchsten Abschluss. Bitte für beide Elternteile angeben!)**

	Mutter	Vater
Lehre (beruflich-betriebliche Ausbildung)	<input type="checkbox"/>	<input type="checkbox"/>
Berufsschule, Handelsschule (beruflich-schulische Ausbildung)	<input type="checkbox"/>	<input type="checkbox"/>
Fachschule (z. B. Meister-Technikerschule, Berufs- oder Fachakademie)	<input type="checkbox"/>	<input type="checkbox"/>
Fachhochschule, Ingenieurschule	<input type="checkbox"/>	<input type="checkbox"/>
Universität, Hochschule	<input type="checkbox"/>	<input type="checkbox"/>
Anderer Ausbildungsabschluss	<input type="checkbox"/>	<input type="checkbox"/>
Kein beruflicher Abschluss (und auch nicht in der Ausbildung)	<input type="checkbox"/>	<input type="checkbox"/>
Noch in beruflicher Ausbildung (Auszubildender, Student)	<input type="checkbox"/>	<input type="checkbox"/>

103. **Welche der folgenden Angaben zur Berufstätigkeit trifft auf Sie zu? (Bitte für beide Elternteile jeweils nur eine Berufstätigkeit angeben!)**

	Mutter	Vater
Zurzeit ...		
...nicht berufstätig (Rentner, Student, usw.)	<input type="checkbox"/>	<input type="checkbox"/>
...arbeitslos	<input type="checkbox"/>	<input type="checkbox"/>
...vorübergehende Freistellung (z. B. Erziehungsurlaub)	<input type="checkbox"/>	<input type="checkbox"/>
...Teilzeit oder stundenweise berufstätig	<input type="checkbox"/>	<input type="checkbox"/>
...voll berufstätig	<input type="checkbox"/>	<input type="checkbox"/>
...Auszubildender (z. B. Lehrling)	<input type="checkbox"/>	<input type="checkbox"/>



104. **In welcher beruflichen Stellung sind Sie hauptsächlich derzeit beschäftigt? Wenn Sie nicht mehr berufstätig sind, nennen Sie bitte die berufliche Stellung, die Sie zuletzt innehatten! (Bitte für beide Elternteile angeben!)**

	Mutter	Vater
<b>Arbeiter</b>		
Ungelernter Arbeiter	<input type="checkbox"/>	<input type="checkbox"/>
Angelernter Arbeiter (Teilqualifizierung)	<input type="checkbox"/>	<input type="checkbox"/>
Gelernter Arbeiter und Facharbeiter	<input type="checkbox"/>	<input type="checkbox"/>
Vorarbeiter, Kolonnenführer, Meister, Polier, Brigadier	<input type="checkbox"/>	<input type="checkbox"/>
<b>Selbstständiger (einschließlich mithelfender Familienangehöriger)</b>		
Selbstständiger Landwirt / Genossenschaftsbauer	<input type="checkbox"/>	<input type="checkbox"/>
Selbstständiger Akademiker, freier Beruf	<input type="checkbox"/>	<input type="checkbox"/>
Sonstiger Selbstständiger mit bis zu 9 Mitarbeitern	<input type="checkbox"/>	<input type="checkbox"/>
Sonstiger Selbstständiger mit 10 und mehr Mitarbeitern	<input type="checkbox"/>	<input type="checkbox"/>
Mithelfender Familienangehöriger	<input type="checkbox"/>	<input type="checkbox"/>
<b>Angestellter</b>		
Industrie- und Werkmeister im Angestelltenverhältnis	<input type="checkbox"/>	<input type="checkbox"/>
Angestellter mit einfacher Tätigkeit (z. B. Verkäufer, Kontorist, Stenotypist)	<input type="checkbox"/>	<input type="checkbox"/>
Angestellter mit qualifizierter Tätigkeit (z. B. Sachbearbeiter, Buchhalter, technischer Zeichner)	<input type="checkbox"/>	<input type="checkbox"/>
Angestellter mit hochqualifizierter Tätigkeit oder Leitungsfunktion (z. B. wissenschaftlicher Mitarbeiter, Prokurist, Abteilungsleiter)	<input type="checkbox"/>	<input type="checkbox"/>
Angestellter mit umfassenden Führungsaufgaben (z. B. Direktor, Geschäftsführer, Vorstand)	<input type="checkbox"/>	<input type="checkbox"/>

➔ Fortsetzung nächste Seite

	Mutter	Vater
<b>Beamter (einschließlich Richter, Berufssoldat)</b>		
Einfacher Dienst	<input type="checkbox"/>	<input type="checkbox"/>
Mittlerer Dienst	<input type="checkbox"/>	<input type="checkbox"/>
Gehobener Dienst	<input type="checkbox"/>	<input type="checkbox"/>
Höherer Dienst	<input type="checkbox"/>	<input type="checkbox"/>
<b>Sonstige</b>		
(z. B. Auszubildender, Schüler, Student, Wehrpflichtiger, Zivildienstleistender, Praktikant)	<input type="checkbox"/>	<input type="checkbox"/>
Hausfrau / Hausmann	<input type="checkbox"/>	<input type="checkbox"/>

105. **Wie hoch ist das durchschnittliche monatliche Haushaltseinkommen, d.h. das Nettoeinkommen, das alle Haushaltsmitglieder zusammen nach Abzug von Steuern und Sozialabgaben haben? (Einschließlich Erziehungsgeld und Kindergeld)**

- Unter 500 €
- 500 bis unter 750 €
- 750 bis unter 1000 €
- 1000 bis unter 1250 €
- 1250 bis unter 1500 €
- 1500 bis unter 1750 €
- 1750 bis unter 2000 €
- 2000 bis unter 2250 €
- 2250 bis unter 2500 €
- 2500 bis unter 3000 €
- 3000 bis unter 4000 €
- 4000 bis unter 5000 €
- 5000 € und mehr

**Lebensbedingungen**

106. **Wie groß ist Ihre Wohnung?**

Ungefähr |\_|\_|\_|m<sup>2</sup>

107. **Wie viele Räume einschließlich Küche (ohne Bad) bewohnen Sie?**

|\_| Räume

108. **Wie viele Personen leben insgesamt in Ihrem Haushalt?**

|\_| Personen

109. **Hat Ihr Kind ein eigenes Zimmer?**

Ja

Nein

110. **Wie viele Stunden am Tag ist Ihr Kind allein zu Hause?**

Ungefähr |\_| Stunden

111. **Von wem wird Ihr Kind nach der Schule hauptsächlich betreut? (Hier bitte nur ein Kreuz machen!)**

Von Mutter oder Vater (bzw. Partnerin oder Partner)

Von anderen Familienangehörigen (z.B. Großeltern, Geschwistern)

Besucht Hort, Kindertagesstätte, Schülerladen

Von anderen Personen außerhalb der Familie

**Bitte prüfen Sie Ihre Angaben noch einmal auf Vollständigkeit!**

**Vielen Dank für die Beantwortung der Fragen!**

Die Fragen 1, 3-5, 8, 18, 101-105, 111 sind mit freundlicher Genehmigung des Robert-Koch-Institutes Berlin dem Fragebogen Kinder-Jugend-Gesundheit21.de entnommen.

**Impressum**

**Herausgeber:** Abteilung Klinische Psychologie und Psychotherapie, Georg-Elias-Müller-Institut für Psychologie, Georg-August-Universität Göttingen, Goßlerstr. 14, 37073 Göttingen

**Umschlaggestaltung:** Judy Flemming (Grafikdesignerin)

**Druck:** Pachnicke Druck, Güterbahnhofstr. 9, 37073 Göttingen

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## Appendix C

### Absolute and relative frequency of impairment or disability in 5,474 children and adolescents (all valid data sets)

	Female (n=2706)	Male (n=2768)	Total (n=5474)
Impairment or disability	140 (5.2%)	243 (8.8%)	383 (7.0%)
Delayed development or mental retardation	57 (2.1%)	99 (3.6%)	156 (2.8%)
Hearing impairment or deafness	39 (1.4%)	65 (2.3%)	104 (1.9%)
Communication disorder	59 (2.2%)	98 (3.5%)	157 (2.9%)
Vision impairment or blindness	25 (0.9%)	39 (1.4%)	64 (1.2%)

### Absolute and relative frequency of child's headache in 4,869 children and adolescents without impairment or disability

	Female (n=2471)	Male (n=2398)	Total (n=4869)
No headache	1109 (44.9%)	1160 (48.4%)	2269 (46.6%)
Seldom headache	702 (28.4%)	731 (30.5%)	1433 (29.4%)
Monthly headache	444 (18.0%)	381 (15.9%)	825 (16.9%)
Weekly headache	195 (7.9%)	112 (4.7%)	307 (6.3%)

### Absolute and relative frequency of chronic illness in 78 children and adolescents with comorbid chronic headache and chronic illness

	Female (n=44)	Male (n=34)	Total (n=78)
Asthma	13 (29.5%)	12 (35.3%)	25 (32.1%)
Atopic dermatitis	22 (50.0%)	12 (35.3%)	34 (43.6%)
Epilepsy	2 (4.5%)	-	2 (2.6%)
Congenital heart disease	2 (4.5%)	3 (8.8%)	5 (6.4%)
Chronic inflammatory bowel disease	-	-	-
Chronic kidney disease	2 (4.5%)	-	2 (2.6%)
Muscle diseases	1 (2.3%)	2 (5.9%)	3 (3.8%)
Juvenile rheumatoid arthritis	1 (2.3%)	1 (2.9%)	2 (2.6%)
Diabetes	-	-	-
Other	13 (29.5%)	10 (29.4%)	23 (29.5%)

## Appendix D

### Pearson correlations for control variables

	Gender
Age	-.004

### VIFs for control variables

	VIF
Age	1.000
Gender	1.000

### Spearman-Rho correlations for sociodemographic variables

	Gender	Education level	Occupational prestige	Household net income	Social class	Household crowding index
Age	-.004	-.037	-.006	.049	-.013	-.037
Gender		.024	.026	.025	.022	-.017
Education level			.628	.494	.599	-.182
Occupational prestige				.602	.682	-.265
Household net income					.621	-.225
Social class						-.169

### VIFs for sociodemographic variables

	VIF	VIF
Age	1.010	1.002
Gender	1.001	1.001
Education level	1.699	
Occupational prestige	2.023	
Household net income	1.624	
Social class		1.027
Household crowding index	1.082	1.029

**Pearson correlations for psychological variables**

	Gender	Passive avoidance	Rumination	Resignation	Aggression	Anger-in	Anger-out	Anger control	Anxiety/depression	Hyperactivity	Aggressive behavior	Sleep disturbance
Age	-.004	.088	.032	.086	.059	-.077	.156	.161	.026	-.119	-.084	.004
Gender		.014	.072	-.050	-.007	-.034	-.050	-.002	.040	-.201	-.179	.020
Passive avoidance			.406	.496	.390	.177	.216	-.099	.404	.198	.166	.207
Rumination				.471	.486	.206	.196	-.069	.449	.182	.095	.203
Resignation					.490	.229	.243	-.142	.548	.321	.222	.188
Aggression						.421	.168	-.284	.459	.351	.291	.198
Anger-in							-.196	-.552	.260	.397	.357	.112
Anger-out								.326	.248	.027	.011	.095
Anger control									-.152	-.335	-.262	-.067
Anxiety/depression										.437	.331	.310
Hyperactivity											.444	.206
Aggressive behavior												.128



**Variance inflation factors for psychological variables**

	VIF
Age	1.073
Gender	1.117
Passive avoidance	1.471
Rumination	1.556
Resignation	1.853
Aggression	1.815
Anger-in	1.805
Anger-out	1.345
Anger control	1.688
Anxiety/depression	1.974
Hyperactivity	1.675
Aggressive behavior	1.408
Sleep disturbance	1.133

**Pearson correlations for health variables**

	Gender	Pain other than headache	Other somatic complaints
Age	-.004	.150	.103
Gender		.160	.067
Pain other than headache			.529

**Variance inflation factors for health variables**

	VIF
Age	1.023
Gender	1.027
Pain other than headache	1.428
Other somatic complaints	1.382

**Pearson correlations for family variables**

	Gender	Number of parents	Number of children	Negative family environment	Negative conflict solving strategies	Weekly family conflict
Age	-.004	-.030	-.003	.051	.002	-.020
Gender		-.005	.003	.001	.011	-.001
Number of parents in household			.104	-.081	-.054	-.126
Number of children in household				.044	.015	.039
Negative family environment					.488	.285
Negative conflict solving strategies						.447

**Variance inflation factors for family variables**

	VIF
Age	1.004
Gender	1.000
Number of parents in household	1.032
Number of children in household	1.016
Negative family environment	1.328
Negative conflict solving strategies	1.526
Weekly family conflict	1.280

**Spearman-Rho correlations for school variables**

	Gender	Index of school difficulties	Time spent on homework	School stress	Reaction to failure
Age	-.004	.150	.229	.072	-.094
Gender		-.053	.081	-.038	-.112
Index of school difficulties			.147	.331	.255
Time spent on homework				.123	.036
School stress					.359

**Variance inflation factors for school variables**

	VIF
Age	1.087
Gender	1.021
Index of school difficulties	1.206
Time spent on homework	1.084
School stress	1.273
Reaction to failure	1.216

**Pearson correlations for leisure variables**

	Gender	Physical activities	Recreational activities	Amount of free time	Time spent on TV / video	Time spent on game console / PC	Amount of friends
Age	-.004	-.197	-.172	-.095	.252	.316	.106
Gender		-.005	.359	-.051	-.048	-.372	.053
Physical activities			.227	.062	-.099	-.084	.058
Recreational activities				-.024	-.236	-.237	.017
Amount of free time					.137	.066	.039
Time spent on TV / video						.333	.049
Time spent on game console / PC							.027

**Variance inflation factors for leisure variables**

	VIF
Age	1.246
Gender	1.348
Physical activities	1.109
Recreational activities	1.295
Amount of free time	1.046
Time spent on TV / video	1.232
Time spent on game console / PC	1.458
Amount of friends	1.024

**Pearson correlations for life events**

	Gender	Index of life events
Age	-.004	-.028
Gender		-.021

**Variance inflation factors for life events**

	VIF
Age	1.001
Gender	1.000
Index of life events	1.001

**Pearson correlations for parental psychological variables**

	Gender	Anxiety / depression	Anxieties	Depressed mood	Habitual worry	Sleep dis- turbances
Age	-.004	.000	.016	-.008	.014	.041
Gender		-.010	-.025	-.027	-.022	-.020
Anxiety / depression			.522	.615	.576	.406
Anxieties				.668	.522	.418
Depressed mood					.494	.408
Habitual worry						.350

**Pearson correlations for parental psychological variables**

	Gender	Anxiety / depression (index)	Habitual worry	Sleep dis- turbances
Age	-.004	.003	.015	.042
Gender		-.016	-.022	-.020
Anxiety / depression (index)			.624	.462
Habitual worry				.350

**Variance inflation factors for parental psychological variables**

	VIF	VIF
Age	1.003	1.002
Gender	1.001	1.001
Anxiety / depression	1.961	
Anxieties	2.045	
Depressed mood	2.232	
Anxiety / depression (index)		1.862
Habitual worry	1.697	1.672
Sleep disturbances <sup>d</sup>	1.312	1.286

**Pearson correlations for parental health variables**

	Gender	General health	Doctor appointments	Headache	Pain other than headache	Other somatic complaints	Regular medication
Age	-.004	.006	.034	.035	.024	.069	.010
Gender		.019	-.022	.011	-.011	-.014	-.011
General health			-.334	-.273	-.330	-.230	-.147
Doctor appointments				.243	.227	.268	.109
Headache					.239	.127	.199
Pain other than headache						.420	.171
Other somatic complaints							.071

**Variance inflation factors for parental health variables**

	VIF
Age	1.007
Gender	1.001
General health	1.251
Doctor appointments	1.202
Headache	1.156
Pain other than headache	1.351
Other somatic complaints	1.267
Regular medication	1.062

## Appendix E

## Spearman-Rho correlations for aggregate model for weekly headache vs. good health

	Gender	Parental headache	Anger-out	Anxiety / depression	Sleep disturbance	Pain other than headache	Other somatic complaints	Time spent on homework	School stress	Index of life events	Amount of free time	Time spent on TV / Video
Age	-.004	.011	-.081	.023	.017	.123	.093	.229	.072	-.049	-.095	.252
Gender		-.011	-.035	.052	.029	.166	.078	.081	-.038	-.017	-.051	-.048
Parental headache			.065	.134	.127	.153	.171	.016	.070	.106	.024	.048
Anger-out				.273	.108	.096	.118	-.021	.226	.074	-.038	-.039
Anxiety / depression					.308	.308	.356	.114	.501	.212	-.168	-.004
Sleep disturbance						.334	.383	.048	.231	.118	-.050	-.001
Pain other than headache							.532	.113	.250	.135	-.059	.081
Other somatic complaints								.093	.287	.142	-.069	.027
Time spent on homework									.123	.003	-.159	.080
School stress										.163	-.102	.027
Index of life events											.017	.060
Amount of free time												.137

**Variance inflation factors for aggregate model for weekly headache vs. good health**

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	VIF
Age	1.164
Gender	1.060
Parental headache	1.046
Anger-out	1.113
Anxiety / depression	1.537
Sleep disturbance	1.200
Pain other than headache	1.481
Other somatic complaints	1.501
Time spent on homework	1.111
School stress	1.404
Index of life events	1.089
Amount of free time	1.081
Time spent on TV / Video	1.098

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**Spearman-Rho correlations for aggregate model for chronic illness vs. good health**

	Gender	Sleep disturbance	School stress	Parental other somatic complaints
Age	-.004	.017	.072	.016
Gender		.029	-.038	-.005
Sleep disturbance			.231	.160
School stress				.149

**Variance inflation factors for aggregate model for chronic illness vs. good health**

	VIF
Age	1.005
Gender	1.005
Sleep disturbance	1.061
School stress	1.070
Parental other somatic complaints	1.038

**Pearson correlations for specificity model**

	Gender	Sleep disturbance	Pain other than headache	Other somatic complaints	School stress	Parental headache	Parental other somatic complaints
Age	-.004	.004	.150	.102	.057	.011	.024
Gender		.020	.160	.067	-.047	-.011	-.011
Sleep disturbance			.319	.379	.231	.125	.152
Pain other than headache				.529	.246	.150	.161
Other somatic complaints					.281	.161	.203
School stress						.066	.150
Parental headache							.171

**Variance inflation factors for specificity model**

	VIF
Age	1.020
Gender	1.044
Sleep disturbance	1.165
Pain other than headache	1.457
Other somatic complaints	1.491
School stress	1.128
Parental headache	1.049
Parental other somatic complaints	1.072

## **ACKNOWLEDGEMENT**

The Children, Adolescents & Headache Study was made possible through funding from the German Ministry of Research and Education (01EM0521).

## CURRICULUM VITAE

### Personal information

Name: Lisette Morris  
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1996 - 1998 Student assistant in the Department of Clinical Psychology and Psychotherapy of the Georg-August-University in Göttingen  
1994 – 1998 Student assistant in the Department of Methodology and Psychology of Action of the Georg-August-University in Göttingen  
1995 – 1996 Student assistant in the Department of Social Psychology and Communication of the Georg-August-University in Göttingen

### Education

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