Commentary: On the Importance of Using Prospective Diary Data in the Assessment of Recurrent Headaches, Stressors, and Health Behaviors in Children and Adolescents

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It has long been known among clinicians that certain foods (e.g., chocolate, cheese, and nuts), stroboscopic and flickering lights (TV and cinema), physical exertion and mental stress may elicit migraine attacks in children and adolescents (Barlow, 1984). In the first study of potential triggers, Vahlquist (1955) reported that most school children (87%) aged 10–12 years with migraine experienced mental stress as the prime elicitor. In a subsequent and pioneering survey of about 9,000 school children aged 7–15 years in Uppsala (99.3% of the parents responded), Bille (1962) found school work, especially related to examinations, to be the most common trigger of pronounced migraine. Since these two early studies, relationships between various types of stressors (daily hassles and negative life events) and recurrent headaches of migraine and unspecified types among children and adolescents in clinic and community samples have been examined in numerous studies. However, less is known about triggers in individuals with tension-type headaches, although these are the most common headaches in children and adolescents.

In spite of the existing and rather extensive information from previous research, our understanding of triggers in children with headaches is hampered by the use of certain study designs (i.e., cross-sectional case-control designs of headache sufferers vs. headache-free controls with between-group comparisons or the use of within-group correlations in single groups) and retrospective reports using questionnaires and interviews with children/parents and adolescents (Alfvén, Östberg, & Hjern, 2008; Karwautz et al., 1999; Kröner-Herwig, Morris, & Heinrich, 2008; Passchier & Orlebeke, 1985). Focusing specifically on potential school stressors, Passchier and Orlebeke (1985) found that about 40–50% of the 10- to 17-year olds reported that they knew what caused their headaches. The most common self-reported triggers consisted of various types of mental and school-related stressors being related to headache frequency and intensity. Similarly, in a recent Swedish study in which interviews were used to elicit information (Alfvén, Östberg, & Hjern, 2008), the authors reported school stressors such as harassment by peers, schoolwork pressure (too many tests), and disturbance in the classroom to be associated with both frequent headaches and abdominal pain. However, in a large-scale questionnaire-based survey of school children aged 9–14 years, Kröner-Herwig and her colleagues (2008) found nonsignificant relationships between school stressors and frequency of headaches. Instead, parental headaches, family stressors and having fewer friends were the strongest predictors. While Karwautz and collaborators (1999), in an extensive review of community and clinic studies, found few differences between migraine and tension-type headaches in children and adolescents in regard to psychosocial factors, parental divorce was more common and number of friends fewer among those with tension-type headaches as compared to migraine and headache-free controls. In most comparisons, the factors pertained to more longstanding risk factors such as relationships to parents, housing conditions, socio-economic status, and the presence of emotional–behavioral problems in the child. Sleep problems (Bruni et al., 1997; Kowal &
Pritchard, 1990) and stress in everyday life (Carlsson, Larsson & Mark, 1996; Larsson, 1988; Passchier & Orlebeke, 1985) as predictors of headaches were examined in only a few studies.

We applaud Connelly and colleagues for their efforts to explore the stress and health behavior triggers of primary headaches in children using a daily process evaluation that is captured using a handheld electronic diary (e-diary). Connelly and colleagues (2011) reported on the evaluation of stress and health behavior triggers in a small sample of children aged 8–17 years referred to a pediatric clinic because of frequent headaches. This sample reflects typical gender and headache type distribution with the majority of subjects being girls and subjects suffering from migraine (80%) and a smaller proportion (20%) having tension-type headaches. While no information was provided regarding impairment, the children reported an average of 4 headaches per week. In line with findings from previous research based on recall information, lack of sleep, hunger, and sleep were the most common triggers as reported by the children during baseline. The authors’ innovative use of prospective measurement of headaches and potential triggers (school, nonschool stressors, food and drink intake, sleep quantity and quality) three times a day during two weeks in an electronic computer diary (for a total of 42 observation points) is a clear advancement of previous research and provided an opportunity for conducting statistical analyses of temporal and casual relationships between new headache episodes and the included triggers. While only changes in daily average intensity levels of stressors reliably emerged as potent triggers of headaches, less than typical sleep quantity tended to predict headache occurrence. No expectancy effects were found on children’s baseline listing of common headache triggers. The prospective measurement was practical and feasible in that children typically spent approximately five minutes per day in diary recordings. The findings of daily stressors as important headache triggers support the value of psychological treatment research studies conducted over the last 25 years for children and adolescents with recurrent headaches (Sackett, 2006). In a recent updated review, Palermo and colleagues (2010) reported positive outcomes of 20 randomized controlled trials in evaluation of psychological treatment research studies conducted over the last 25 years for children and adolescents with recurrent migraine or tension-type headaches. However, all outcomes were based on statistical significance criteria (alpha values and effect sizes) including a commonly used one to indicate a clinical significant change, i.e., a 50% reduction of headache activity (Blanchard & Andrasik, 1983). While this criterion has been used as a standard criterion for almost three decades, it appears to be overly conservative. For example, Farrar, Berlin, and Strom; Farrar, Young, LaMoreaux, Werth, and Poole (2001, 2003) in studies of changes in acute and chronic pain in adults reported that a 30–33% reduction of pain on a numeric scale corresponded to a subjective evaluation of “Very much” and “Much improved.” Today such reference data based on prospective diary recordings for children with chronic pain including headaches are lacking and need to be collected to further refine the present and traditional criterion for clinical or social relevant improvement also extended from research on adult headache sufferers.

Further, given that almost all previous epidemiological surveys of headache prevalence have been based on questionnaire-based information and the rather low correspondence between diary recordings, questionnaires and interviews of children and their parents in clinical and community samples of children with recurrent headaches...
mechanisms at work in the reduction of recurrent migraine and tension-type headaches in these age groups. For example, in a study of appraisal and coping with daily stressors using prospective assessment, Walker, Smith, and Garber (2007) reported that children with recurrent abdominal pain used accommodative coping strategies (acceptance and positive reappraisal of stressors) less often than healthy children. Children with pain also appraised their coping abilities as poor. While relationships between daily stressors and headaches have been examined prospectively in the present study by Connelly and colleagues and recently by Björling (2009) in adolescent girls, further work is needed to identify particular interactions between positive coping skills and headache improvement during the course of intervention approaches aimed at teaching better management skills and alternative responses to daily stressors.

In summary, the present paper by Connelly and colleagues (2011) provide encouraging data on potential triggers of frequent headaches in a selected clinic and small sample of children and adolescents based on prospective electronic diary measurement. While the results support the notion that daily stressors are important to assess prospectively in a diary and that quantity of sleep may play a role, other factors such as food and drink intake commonly believed to trigger headaches, did not emerge as significant contributors. These latter findings also concur with conclusions in a recent review of potential triggers in adult headache sufferers (Wöber & Wöber-Bingöl, 2010). However, the findings of the small scale study by Connelly and colleagues need to be replicated in larger samples of children and adolescents primarily suffering from tension-type headaches and also including other potential triggers such as physical activity, mood, fatigue and more elaborated information on specific stressors at work in home and school settings and during leisure time. It would also be fruitful to validate their e-headache diary. The use of prospective event recordings in diaries will certainly help advance our knowledge and understanding of important triggers behind recurrent migraine and tension-type headaches in children and adolescents but also provide more solid grounds in evaluating treatment approaches focusing on coping strategies to improve headaches in these age groups.

Conflicts of interest: None declared.

References

Historically, paper headache pain diaries have been used to explore the association between triggers and headache occurrence as well as to determine the effectiveness of clinical trials of headache treatments. However, recent advances in information and communication technologies (smartphones) have resulted in the burgeoning use of electronic headache diaries. Electronic pain diaries have the advantages of maximizing participant compliance in completing pain ratings as well as the validity of those ratings since electronic diaries can be accessed from any computer or handheld device (Dale & Haegan, 2007; Stinson 2009; Stone, Shiffman, Schwartz, Broderick, & Hufford, 2003). Although electronic headache diaries are becoming more common, little is known about their components and features, psychometric properties and feasibility (compliance and acceptability). Stinson et al. (2011) have recently conducted a systematic review of headache e-diaries. A total of 21 electronic headache diaries were found, however, only 5 reported on their development and the others were used as outcome measures in randomized controlled trials or correlational studies. None of these diaries has well developed evidence of reliability and validity. However, most of them have evidence of feasibility (high compliance and acceptability). Most of the diaries were ad hoc measures developed by the study investigators with no to minimal evidence of reliability and or validity. Thus, while these technologies can help move this field forward, it behooves us to conduct future research to ensure the e-diaries being used in these studies are valid, reliable and acceptable to end-users.

Finally, while prospective diary recordings allow for more precise outcome assessment in treatment studies, their potential can also be harnessed to examine treatment process outcomes as well. For example, electronic headache diaries are valuable in the assessment of headache improvement during the course of intervention and provide valid information on decisions to stop or extend current treatment, or to add or switch over to alternate and more effective treatments. They might help us to begin to understand which treatments are most effective for whom. Furthermore, they can also be used to track and identify specific coping skills that are most effective to deal with important triggers in daily life but also potential

(Laurell, Larsson & Eeg-Olofsson, 2003; Metsähonkala, Sillanpää & Tuominen, 1997; van den Brink, Bandell-Hoekstra & Huijer Abu-Saad, 2001), there is a great need for evaluation of headache occurrence and characteristics in community populations using prospective diary recordings. The use of such assessment methods has the potential for eliciting more accurate and reliable information about headache prevalence in children and adolescents.


