

Chronic Pain and Its Impact on Quality of Life in Adolescents and Their Families

Joke A. M. Hunfeld,¹ PhD, Christel W. Perquin,¹ MD, Hugo J. Duivenvoorden,¹ PhD, Alice A. J. M. Hazebroek-Kampschreur,² PhD, Jan Passchier,¹ PhD, Lisette W. A. van Suijlekom-Smit,³ PhD, and Johannes C. van der Wouden,¹ PhD
¹Erasmus University Rotterdam, ²Municipal Health Services Rotterdam, and ³Sophia Children's University Hospital Rotterdam

Objective: To study chronic pain not caused by somatic disease in adolescents and the effect of pain on the quality of life of the adolescents and their families.

Methods: One hundred twenty-eight youngsters (12–18 years) who had reported chronic pain kept a 3-week diary of their pain and completed a questionnaire on quality of life. Their mothers completed a questionnaire on the impact of their youngster's pain on the family.

Results: The most prevalent pains were limb pain, headache, abdominal, and back pain. The pain increased during the day, with the highest frequency around dinnertime and the highest intensity around bedtime. Girls reported more intense and more frequent pain than boys. The higher the intensity and frequency of the pain, the lower the self-reported quality of life of the female or male adolescent, especially regarding psychological functioning (e.g. feeling less at ease), physical status (a greater incidence of other somatic complaints), and functional status (more impediments to leisure and daily activities). Chronic pain also had a negative impact on family life. The mothers reported restrictions, particularly in social life, and problems dealing with the stress of the adolescent's pain.

Conclusions: Chronic pain, not caused by somatic disease, was present to a higher degree in girls; the pain increased during the day and had a negative impact on quality of life of the adolescents and the family. There is a need for future research aimed at identifying risk factors for chronic pain and pain-associated quality of life in children and adolescents.

Key words: *chronic pain; adolescents; family; quality of life.*

Chronic pain in adults is a major health problem with severe personal and economic consequences. Retrospective reports indicate that a relatively large

percentage of adult chronic headache patients report the initial onset of symptoms early in life (Solomon, Lipton, & Newman, 1992). In 3%–4% of adults with back pain, the onset is between the ages of 15 and 19 years, and onset early in life has been affirmed as predictive of chronicity (Brattberg, 1994). The fact that pain is a subjective phenome-

All correspondence should be sent to Joke A. M. Hunfeld, Department of Medical Psychology & Psychotherapy, NIHES, Erasmus University, Room Cf 308, Rotterdam, The Netherlands. E-mail: hunfeld@mpp.fgg.eur.nl.

non, and pain behavior—particularly chronic pain—is the result of the interaction of somatic (biological), personality (psychological), and environmental (sociological) factors (DeGood & Shutty, 1992), implies that learning has a role in pain (Loeser & Melzack, 1999). Investigation of chronic pain in childhood and adolescence, not restricted to headaches, may therefore provide further clues to the origins of adult pain problems and to preventive measures.

Studies on chronic pain and its relationship to quality of life in adolescents show positive relationships between pain and psychological distress, somatic complaints (Andrasik et al., 1988; Balague et al., 1995; Brattberg, 1994; Cunningham et al., 1987; Larsson, 1988), or disability (Holden, Gladstein, Trulsén, & Wall, 1994). In these studies the most investigated chronic pain types were headache (migraine, tension-type headache) and back pain.

One of the few studies using the pain diary method and a comprehensive assessment of quality of life as a consequence of pain found that, compared to healthy controls, youngsters with headache reported a significantly poorer quality of life in terms of psychological functioning and functional status (Langeveld, Koot, & Passchier, 1997).

Although most chronic pain conditions in youngsters are not life-threatening, they may constitute a considerable burden for parents. This may be attributable in part to the lack of somatic disease as the cause of pain, which may give rise to uncertainty in the parents. Several studies found parental stress in cases of chronic somatic disease (Finlay, 1998). We could find no studies on the consequences for the parents of chronic pain not caused by somatic disease.

Many studies on chronic pain used questionnaires that asked respondents to estimate their pain in retrospect over a long period (Balague et al., 1995; Brattberg, 1994; Kristjánsdóttir, 1996). Other studies defined pain, for instance, low back pain, as interference with schoolwork or leisure activities (Taimela, Kujala, Salminen, & Viljanen, 1997). The use of a diary (Hunfeld, Den Deurwaarder, Van der Wouden, Van Suijlekom-Smit, & Hazebroek-Kampschreur, 1997; Jensen & McFarland, 1993) is one strategy for enhancing the validity and reliability of pain measurement. This method requires a daily record of pain. The optimum period and frequency of diary registration with respect to compliance, on one hand, and reliability and validity, on the other, would appear to be 3 weeks (Osterhaus &

Passchier, 1992), three times daily (Jensen, Karoly & Braver, 1986).

Many studies on the impact of chronic pain have assessed separate quality of life domains, such as disability (Taimela et al., 1997), depression, or anxiety (Andrasik et al., 1988) rather than using comprehensive quality of life measures. In line with Langeveld et al. (1997), we defined quality of life as a multidimensional concept that encompasses broad domains of quality of life (e.g., physical, psychological and social functioning, and functional status) and the individual's overall satisfaction with life and health (Spilker, 1996).

In short, there is a paucity of research into pain parameters in a prospective (i.e., diary) design in a community sample of youngsters, with evaluation of the consequences for quality of life of the youngsters and the impact on the family.

Therefore, the purpose of this study was to gain knowledge on the intensity and frequency of chronic pain in adolescents, their quality of life, and the impact of chronic pain on the family, with a diary and questionnaires. We asked the following questions. What is the course of the pain during the day? What is the relationship with gender? We tested the hypothesis that the greater the pain, the poorer the quality of life of the youngsters and the greater the negative impact on the family.

Method

Participants

We used a convenience sample (Maxwell & Delaney, 1990) of adolescents with chronic pain (12–18 years) ($N = 128$) from among those who, having already given their informed consent for the current study in advance while participating in our previous prevalence study on chronic pain in a representative community sample of 5,423 Dutch children and adolescents (Perquin et al., 2000), were still willing to participate in this study. These youngsters had responded to a precoded question (“How long has the pain been present?”) by indicating “3 months or longer” (McGrath & Brigham, 1992).

For this study, we defined pain as being an unpleasant sensory and emotional experience often described as tissue damage, in the absence of actual tissue damage or somatic disease (Merksey, 1986). Adolescents with pain resulting from a diagnosed

chronic disease (rheumatic arthritis, malignancies) were excluded because the low incidence of these conditions would require a different design and the treatment of the disease and pain would be difficult to separate.

Procedure

The adolescents and their mothers, who were mostly the primary caregivers, were each mailed a pain booklet and a self-addressed envelope. The adolescents were invited to first answer the questionnaires and then to keep a diary of the intensity of their pain for 3 successive weeks. Pain was recorded three times daily: at breakfast, dinnertime, and bedtime. Although a measurement point at lunchtime would have yielded more equally distributed data across the day, we chose the dinnertime measurement point instead because the activities of the youngsters at lunchtime would likely have interfered with adequate diary keeping. We emphasized that the diary must be kept at those fixed times and must relate to the pain intensity at the time. Adolescents with more than one chronic pain location were asked to refer only to the pain that generally troubled them most. We decided to restrict the record to only one pain type, in the light of a pilot study that showed a large reduction in compliance in completing the Visual Analogue Scale three times a day for a period of 3 weeks for more than one pain location. At the end of the second week of the diary-recording period, the adolescents were mailed a chart reminding them that they had only 1 week to go. On return of the pain booklets, they received a compact disc voucher worth ten Dutch guilders (i.e., 4 euros).

The mothers were also asked to answer a questionnaire based on the chronic pain that troubled their youngster most.

Measures

Questionnaires for the Adolescent. The adolescents first completed an information form to register their age and gender, followed by the Pain List. The Pain List included questions about location, estimated frequency, intensity (Visual Analogue Scale), and history (number of years) of the pain. To assess quality of life, the adolescents answered the 71-item Quality of Life Pain-Youth (QLP-Y) questionnaire. The scale was based on the Quality of Life Headache-Youth (QLH-Y) questionnaire, developed by

Langeveld et al. (1996) and adapted for pain in general. The scale measured the impact of pain on day-to-day functioning in six domains: (1) psychological functioning (34 items), including the subscales stress, harmony, fatigue, strength, cheerfulness, optimism, and depression; (2) social functioning (12 items) with the subscales functioning at home and interactions with siblings and peers; (3) functional status (14 items) with the subscales daily living and leisure activities; and (4) physical status (9 items). Four response categories, ranging from zero to three (i.e., 0 = rarely or never; 1 = sometimes; 2 = often; 3 = very often; or 0 = not at all; 1 = a little; 2 = quite a bit; 3 = very much), were assigned to the items. In addition, the QLP-Y included two Visual Analogue Scales to measure (5) satisfaction with life and (6) health (the anchor points ranged from "completely dissatisfied" to "completely satisfied"). The reference period for answering the QLP-Y was the previous week. Mean item scores are calculated per domain. The higher the scores, the better the self-reported quality of life. The QLH-Y is reported to be reliable and valid. The scale has been found to differentiate between adolescents with headache and healthy youngsters, with the former showing significantly poorer psychological functioning and functional status (Langeveld et al., 1997).

Diary. The adolescents also completed a 3-week pain diary. The diary consisted of Visual Analogue Scales (VAS) for assessing the intensity and frequency of the pain. The VAS was a horizontal line of 100 mm with "no pain" and "the worst imaginable pain" as anchor points on the left and right ends of the line, respectively. The adolescents were asked to mark a position on the VAS that best matched the intensity of their pain at the moment they had to complete the VAS. VAS scores below 5 millimeters were coded as zero (no pain), in the light of our previous data, which showed that a score of 5 millimeters or above on the VAS indicated the presence of pain (Hunfeld et al., 1997). Jensen et al. (1986) have demonstrated that the VAS is a valid measure for the assessment of self-reported pain intensity in chronic pain patients. To obtain pain intensity scores, we first converted the VAS markings to a score from 5 to 100 by reading off each mark against a millimeter ruler. Participants with more than 25% missing VAS values in the diary were excluded from analyses based on diary data, which was the case for 17 adolescents. As a consequence, the analyses were based on diary records of 111 of the participants (87%).

Questionnaire for the Mother. To assess the impact of an adolescent with chronic pain on the family, the mother completed the 24-item Impact on Family Scale (IFS) (Stein & Jones, 1985) in a Dutch translation. The scale consists of four subscales: (1) financial burden (four items); (2) social impact or restrictions in social life (nine items); (3) personal strain (six items) experienced by the primary caregiver, for example, constant fatigue; and (4) mastery (five items) or the coping strategy employed by the parent to deal with the stress of the adolescent's pain. Four response categories, ranging from zero to three (i.e., 0 = strongly agree; 1 = agree; 2 = disagree; 3 = strongly disagree), were assigned to the Likert-format items. The reference period for answering the IFS was the present time. The total score of the IFS consists of the summation of the individual subscale scores. Each subscale score was calculated as the mean item score. The total score of the IFS consists of the average item score across all items. The lower the total score, the lower the impact of the child's pain on the family. The reliability and validity of the scale are reported to be good: it differentiated between mothers with children with single versus multiple congenital anomalies, with the latter reporting significantly more burden on the family, which was in agreement with pediatrician report (Hunfeld, Tempels, Passchier, Hazebroek, & Tibboel, 1999).

Results

Sample Characteristics

The sample consisted of 95 girls and 33 boys. The average age was 14.7 years ($SD = 1.4$ years). Ten of the girls had not yet started to menstruate; the average postmenarche period of the other 85 girls was 3.2 years ($SD = 2.2$ years, range: 0.3–9 years). The estimated average history of the pain was 3.3 years ($SD = 3.1$, range: 0.3–15 years). There were no significant differences for age and pain history by gender.

On the Pain List, 31 adolescents reported experiencing continuous pain, whereas the remaining youngsters indicated recurrent pain (i.e., pain with pain-free intervals). The average pain intensity was 32 millimeters ($SD = 14$ mm). The frequency of the pain was on average 65% ($SD = 31$), which means that the pain was present, on average, in 41 of 63 recordings. Neither intensity nor frequency devi-

ated significantly over the 3 weeks. Girls had a significantly higher intensity and frequency than boys (mean intensity: 35 mm, $SD = 13.1$ vs. 24 mm, $SD = 14.5$, $t [109] = 3.62$, $p < .001$; mean frequency: 73%, $SD = 27$ vs. 44%, $SD = 32.3$; $t [109] = 4.57$, $p < .001$). The average intensity of the pain recorded prospectively in the diary was significantly lower than the retrospective estimate of pain intensity made by the same adolescent on the Pain List in the month prior to the assessment (i.e., 32 mm in the diary vs. 55 mm on the VAS on the Pain List; $t [109] = 11.9$, $p < .001$), for both boys and girls. Ten percent of the sample reported a pain intensity of 50 millimeters or more on the VAS (diary) and 68% reported a pain frequency of 50% or more records of pain during the diary registration period.

The most frequently reported pain locations were limbs (34%) (mean intensity: 30 mm, $SD = 14$; mean frequency: 65%, $SD = 35$) and head (26%) (mean intensity: 28 mm, $SD = 12$; mean frequency: 57%, $SD = 29$). Other common pain locations were the abdomen (16%) (mean intensity: 33 mm, $SD = 14$; mean frequency: 53%, $SD = 32$) and back (15%) (mean intensity: 37 mm, $SD = 16$; mean frequency: 84%, $SD = 20$), but these were seldom present in boys, whether in those with single or multiple pains.

Compared with the representative community sample of the Dutch population (Perquin et al., 2000), our group had somewhat higher pain intensity (its average corresponded with the 62nd percentile of the prevalence study); on the average they had more frequent pain (more than once a week vs. once a week) and the group contained fewer boys (22% versus 32%) than the previous sample.

Course of the Pain During the Day

The first question on the course of the pain during the day was analyzed with repeated measures of analyses of variance (ANOVAs), with the mean intensities and frequencies (i.e., percentage of recordings with pain) of the pain as dependent variables, the time of measurement (i.e., breakfast, dinnertime, and bedtime) as within-subject factors, and gender as between-subject factor. The ANOVAs with gender and time were restricted to head and limbs, as headache and limb pain were present in a sufficient number of boys ($n \geq 5$) and girls ($n \geq 5$). We found an interaction effect between gender and time of day, $F(2, 120) = 6.96$, $p = .001$, with the highest intensity of pain near bedtime in girls (Fig-

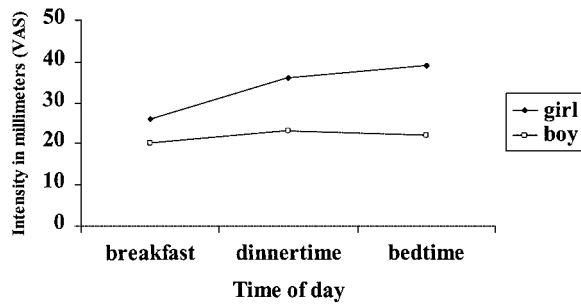


Figure 1. Pain intensity: Course during the day for girls and boys with headache or limb pain.

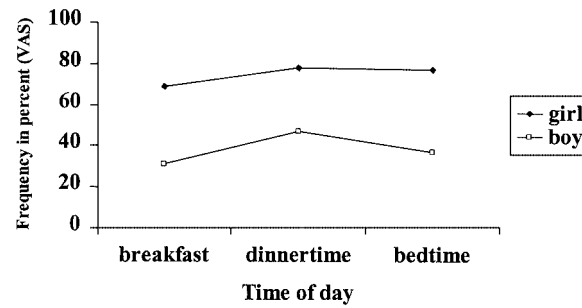


Figure 2. Pain frequency: Course during the day for girls and boys with headache or limb pain.

Table 1. Mean Values of Quality of Life and Impact on Family Resources

Quality of life/ impact on family	Limb pain <i>M (SD)</i> (<i>n</i> = 34)	Head pain <i>M (SD)</i> (<i>n</i> = 44)	Abdom. pain <i>M (SD)</i> (<i>n</i> = 21)	Back pain <i>M (SD)</i> (<i>n</i> = 19)
QLP-Y ^a domains				
Psychological	2.2 (.44)	1.9 (.44)	2.0 (.46)	1.8 (.41)
Social	1.8 (.49)	1.7 (.48)	1.9 (.46)	1.8 (.45)
Functional status	2.5 (.41)	2.2 (.72)	2.5 (.34)	2.4 (.33)
Somatic	2.4 (.45)	2.1 (.51)	2.2 (.56)	2.2 (.24)
Satisfaction (VAS)				
With life	59 mm (26)	53 mm (27)	59 mm (22)	57 mm (21)
With health	64 mm (26)	60 mm (23)	62 mm (27)	56 mm (22)
IFS ^b				
Financial burden	.48 (.58)	.28 (.44)	.45 (.58)	.30 (.59)
Social impact	.40 (.41)	.39 (.42)	.36 (.46)	.29 (.61)
Personal strain	.59 (.52)	.55 (.57)	.46 (.49)	.37 (.64)
Mastery	1.6 (.76)	1.7 (.85)	1.5 (.57)	1.9 (.70)
Total burden	.70 (.26)	.67 (.27)	.63 (.36)	.61 (.43)

The most frequently reported pain locations are mentioned.
^aThe higher the score, the higher the quality of life.
^bThe higher the score, the higher the impact on the family.

ure 1). In addition, ANOVAs showed a main effect of time on frequency of pain, $F(2, 130) = 15.15$, $p < .001$, with the highest frequency near dinnertime in both boys and girls (Figure 2). Because more frequent and intense pain in girls could be attributable to menstrual pain, reflected in menstrual headache, we also conducted statistical analyses including only boys and girls with limb pain. Again, repeated ANOVA measures showed gender differences similar to those for headache and limb pain, including the interaction time.

The Impact of Chronic Pain on Quality of Life

Table I presents the means of the quality of life domains for each pain location. To address the hy-

pothesis on the relationship between intensity and frequency of pain and impact on quality of life of the adolescent, we first tested the location of pain, gender, and age variables as determinants with Kruskal Wallis's and Pearson's correlations. If a given variable had an association with a significance level of $p < 0.10$ with both the independent and dependent variables, the variable was included as a covariant in the regression analysis. Linear regression analyses were used to relate the average intensity and frequency of the pain and the possible covariants (as independent variables) with the quality of life measures (as dependent variables).

Because Pearson's correlations revealed that the potential confounder "gender" was significantly associated with both higher intensity ($r = -.32$, $p < .001$) and frequency ($r = -.40$, $p < .001$) of pain

Table II. Linear Regression Analyses of the Pain Parameters (Intensity and Frequency) for the Adolescent's Quality of Life

QLP-Y	R	R ²	β		r partial		t	
			Intensity	Frequency	Intensity	Frequency	Intensity	Frequency
Psychological functioning ^a	.46****	.17****	-.26*	-.18	.23*	-.15	-2.4*	-1.5
Stress	.42****	.18****	.17	.19	.15	.16	1.5	1.7
Harmony	.41****	.17****	-.30	-.15	-.26**	-.13	-2.7**	-1.3
Fatigue	.34***	.12***	.21	.12	.18	.10	1.9	1.1
Strength/vitality	.37***	.14***	-.22	-.12	-.19	-.10	-2.0	-1.0
Cheerfulness/humor	.33	.11	-.13	-.19	-.11	-.16	-1.1	-1.7
Optimism	.20	.04	-.19	.06	-.15	-.05	-1.6	.51
Depression	.33**	.11**	.13	.20	.12	.17	1.2	1.7
Social functioning ^a	.21	.05	.13	-.07	.11	-.06	1.1	-.58
Functioning at home	.10	.01	-.09	.05	-.08	.04	-.79	.41
Interaction with siblings	.18	.03	.18	-.05	.15	-.04	1.5	-.38
Interaction with peers	.27*	.07*	.09	-.20	.08	-.16	.78	-1.6
Functional status ^a	.39****	.15****	-.21	-.23	-.19	-.19*	-1.9	-2.0*
Pain impact on daily living	.27*	.07*	.16	.12	.14	.10	1.4	1.0
Pain impact on leisure activities	.43****	.18****	.21	.29**	.18	.25**	1.9	2.6**
Physical status ^a	.33**	.11**	-.06	-.22	-.05	-.18	-.53	-1.9
Satisfaction with life (VAS) ^a	.32	.10	-.06	-.31**	-.05	-.25**	-.55	-2.6**
Satisfaction with health (VAS) ^a	.25	.06	-.24	-.09	-.20	-.08	-1.9	-.07

^aThese are scores on QLP-Y domains.

* $p < .05$.

** $p < .01$.

*** $p < .005$.

**** $p < .001$.

and lower psychological functioning ($r = .28$, $p = .004$) and physical status ($r = .22$, $p = .02$) in girls, gender was included as a covariant in the linear regression analyses. The other potential confounders, pain location and age, did not show significant associations with either the independent or the dependent variables. Gender differences disappeared when gender, intensity, and frequency of pain entered simultaneously into the linear regression analyses for quality of life. The regression analyses revealed significant predictive values of the intensity and frequency of pain in the same direction (see Table II). The more the pain, the poorer the psychological functioning (including most subscales), physical, and functional status. In addition, youngsters with more pain reported being significantly less satisfied with life in general and their own health. Following Cohen's criteria (Cohen, 1987), we found a substantial effect (explaining $>13.8\%$ of the variance) for the relationship between pain and the domains of psychological functioning and functional status. Moderate effects (5.9%–13.8% explained variance) were found for the relationship between pain and the domains of physical status and satisfaction with life in general and health.

One-way ANOVA showed that pain intensity of 50 mm or more or pain frequency of 50% or more during the pain registration period was associated with a significant decrease in quality of life. Compared to adolescents with less pain (<50 mm pain intensity and $<50\%$ recordings with pain), the adolescents with more pain reported that they "often" (i.e., Likert-type scoring) had problems with day-to-day functioning and indicated that they "often" felt depressed.

The unique contribution of pain to the prediction showed that the average *intensity* of pain had the strongest predictive value for psychological functioning.

The Impact of Chronic Pain on the Family

Table I presents the means of the impact of chronic pain on the family. The potential confounders, gender, pain location, and age, showed no significant associations with either the independent or the dependent variables. Therefore, regression analyses included only intensity and frequency of pain (independent variables) and the impact on family measures (dependent variables).

Table III. Linear Regression Analyses of the Pain Parameters (Intensity and Frequency) for Impact on Family

Impact on family (IFS)	R		β		r partial		t	
	Intensity	Frequency	Intensity	Frequency	Intensity	Frequency	Intensity	Frequency
Total burden score	.13	.02	.15	-.09	.13	-.08	1.3	-.78
Financial burden ^a	.23	.05	.22	.02	.18	.02	1.8	.17
Social impact ^a	.25*	.06	.30**	-.15	.25*	-.13	2.6**	-1.3
Personal strain ^a	.16	.0	.19	-.05	.16	-.04	1.6	-.44
Mastery/coping ^a	.26*	.07*	-.29*	.06	-.24*	.05	-2.4*	.47

^aThese are domains.

* $p < .05$.

** $p < .01$.

Mother's Perception of the Impact of Chronic Pain on the Family. Chronic pain had a significant impact on the family, according to the mother. Linear regression analyses showed predictive values of pain for social functioning and mastery (see Table III). Mothers of families with an adolescent, either boy or girl, who showed a relatively large amount of pain, reported more restrictions in social life and problems dealing with the adolescent's pain than mothers of adolescents with less severe chronic pain (a medium effect according to Cohen). Analysis of the partial effect showed that this effect could be attributed mainly to the intensity of the pain.

Discussion

This study assessed pain parameters in adolescents with chronic pain and their relationship with quality of life in adolescents and their families.

In the 3-week diaries, the youngsters reported an average pain intensity that was significantly lower than the retrospectively estimated pain intensity using the Pain List. We believe that this discrepancy vouches for the superior validity of the diary method as compared to the questionnaire method for the assessment of chronic pain. The questionnaire method could lead more easily to errors in recalling the average intensity of the pain, which is likely to have been overestimated because more intense pain is more easily remembered (Zonneveld, McGrath, Reid, & Sorbi, 1997).

Our study showed an overrepresentation of girls, which is confirmed by other adolescent studies on chronic pain. In addition, girls showed more intense and more frequent pain than boys. These gender differences may be explained by findings from experimental studies in adults showing greater stimulus thresholds (i.e., lower *nociception* or per-

ceived intensity of pain) and greater pain tolerance in male subjects (Walker & Carmody, 1998) and a greater ability to discriminate for experimentally delivered somatic stimuli, less somatic stimulus tolerance (Berkley, 1997), and a greater tendency to report negative affect in female subjects (Pennebaker, 1994).

These factors, combined with the common end-of-day fatigue, may also explain the increase in pain during the day, which was most pronounced in girls. Studying the ontogeny of pain perception in girls and boys before, during, and after puberty may help address some of the gaps in knowledge that now exist in our understanding of pain conditions in men and women.

Our findings confirmed our hypothesis on the inverse relationship between pain and quality of life. Chronic pain had a strong negative impact on quality of life (QLP-Y). Although the QLP-Y has so far no norms on clinically relevant differences in quality of life, the effects indicate perceptible differences in quality of life (Cohen, 1987). Other researchers support our findings, in that they observed a positive relationship between pain and psychological distress or disability (Andrasik et al., 1988; Balague et al., 1995; Brattberg, 1994; Cunningham et al., 1987; Larsson, 1988). Interview studies could shed more light on the associated background. The impact of pain on social functioning seemed to be less than on the other domains of quality of life for the adolescents. This may be connected with the fact that the scale was found to be less reliable and valid than the scales representing the other domains of quality of life. Langeveld et al. (1996) found that two of the three social functioning subscales did not discriminate between headache sufferers and the headache-free control subjects. In addition, it may be connected with the content of the items of this domain with the em-

phasis on seeking social support and not so much on social competence or withdrawal.

Again, our findings confirmed our hypothesis that chronic pain had an impact not only on the adolescent but, according to the mothers, also on family life. However, as expected, the negative impact of chronic pain on the family was less than that of a child with severe congenital anomalies (Hunfeld et al., 1999) or a chronic illness (Stein et al., 1985).

This is one of the few studies using a diary for the assessment of chronic pain to increase the validity of the assessment. However, a drawback was that the diary could be kept properly only before and after school hours. Future research should address the problem of monitoring by using, for instance, computerized diaries, or encouragement by telephone, to assess the effects of different settings (i.e., school vs. home) on pain. Another drawback of our study was that only single pains were assessed. We opted for this because diary keeping for multiple pains simultaneously appeared infeasible and likely to reduce compliance. However, we think it would be worthwhile to tackle these problems and focus on multiple pain types in future studies.

A drawback of our study from the point of view of generalizability of the results may be the selection bias based on the recruitment process. The recruitment was dependent on the willingness to participate in a time-consuming diary and questionnaire study. However, we believe the selection bias to be small because the differences in pain intensity and frequency between the prevalence sample on the questionnaire and our sample appeared to be rather small.

Finally, we should mention the correlational nature of the study. So far, there is inadequate evidence to substantiate the view that depression and anxiety *precede* and generate pain and psychological distress or disability in the majority of chronic pain sufferers, particularly in adolescents. Based on their findings, Cunningham et al. (1987) argue that the personality and behavioral characteristics (i.e., anx-

iety, depression, poor social competence, social withdrawal, unhappiness, unpopularity, inattentiveness, and poor adaptive functioning) of childhood migraine may be the *result* of the recurrent chronic pain episodes rather than their cause. Prospective studies, which start before the onset of chronic pain, are needed to focus more clearly on questions related to causality. In addition, interviews to assess the extent of the interference of the pain with daily activities are needed.

An important theoretical notion of the study is that, regardless of the pain location, the specific pain parameter, that is, intensity or frequency, may determine the quality of life of the adolescent and his or her family, at least in this community sample of adolescents with chronic pain. Hence, a classification of chronic pain without a clear somatic cause in terms of these parameters is at least as important as in terms of locations.

Regarding the practical implication, our study showed that the pain does not completely explain the variance in quality of life. Both medical treatment, focused on reducing pain intensity and frequency, and nonmedical interventions, focused on adaptive pain coping of both parent and adolescent, might therefore be fruitful for enhancing quality of life.

Acknowledgments

This study forms part of a research project funded by the Netherlands Organization for Scientific Research (Program Chronic Diseases, subprogram Pain), grant no. 940.31.038 and the Pain Knowledge Center, Erasmus University Rotterdam. We thank Fedor Baart and Fabienne Griens for their assistance with the statistical analyses.

Received April 28, 1999; revisions received October 8, 1999, February 8, 2000, and May 20, 2000; accepted June 12, 2000

References

- Andrasik, F., Kabela, E., Quinn, S., Attanasio, V., Blanchard, E. B., & Rosenblum, E. L. (1988). Psychological functioning of children who have recurrent migraine. *Pain, 34*, 43–52.
- Balague, F., Skovron, M. L., Nordin, M., Dutoit, G., Pol, L. R., & Waldburger, M. (1995). Low back pain in school children: A study of familial and psychological factors. *Spine, 20*, 1265–1270.
- Berkley, K. J. (1997). Sex differences in pain. *Behavioral and Brain Sciences, 20*, 435–513.

- Brattberg, G. (1994). The incidence of back pain and headache among Swedish schoolchildren. *Quality of Life Research*, 3, S27–S31.
- Cohen, J. (1987). *Statistical power for the behavioral sciences*. New York: Academic Press.
- Cunningham, S. J., McGrath, P. J., Ferguson, H. B., Humphreys, P., D'Astous, J., Latter, J., Goodman, J. T., & Firestone, P. (1987). Personality and behavioural characteristics in pediatric migraine. *Headache*, 27, 16–20.
- DeGood, D. E., & Shutty, M. S. (1992). Assessment of pain beliefs, coping and self-efficacy. In: D. C. Turk & R. Melzack (Eds.), *Handbook of pain assessment* (pp. 214–234). New York: Guilford.
- Finlay, A. Y. (1998). Quality of life assessments in dermatology. *Seminars in Cutaneous Medicine and Surgery*, 17, 291–296.
- Holden, E. W., Gladstein, J., Trulsen, M., & Wall, B. (1994). Chronic daily headache in children and adolescents. *Headache*, 34, 508–514.
- Hunfeld, J. A. M., Den Deurwaarder, E. S., Van der Wouden, J. C., Van Suijlekom-Smit, L. W. A., & Hazebroek-Kampschreur, A. A. J. M. (1997). Measuring chronic pain in children, An exploration. *Perceptual and Motor Skills*, 84, 1176–1178.
- Hunfeld, J. A. M., Tempels, A., Passchier, J., Hazebroek, F. W. J., & Tibboel, D. (1999). Brief report: Parental burden and grief one year after the birth of a child with a congenital anomaly. *Journal of Pediatric Psychology*, 24, 515–520.
- Jensen, M. P., Karoly, P., & Braver, S. (1986). The measurement of clinical pain intensity: A comparison of six methods. *Pain*, 27, 117–126.
- Jensen, M. P., & McFarland, C. A. (1993). Increasing the validity of pain intensity measurement in chronic pain patients. *Pain*, 55, 195–203.
- Kristjánisdóttir, G. (1996). Prevalence of self-reported back pain in school children: A study of sociodemographic differences. *European Journal of Pediatrics*, 155, 984–986.
- Langeveld, J. H., Koot, H. M., Loonen, M. C. B., Hazebroek-Kampschreur, A. A. J. M., & Passchier, J. (1996). A quality of life instrument for adolescents with chronic headaches. *Cephalalgia*, 16, 183–196.
- Langeveld, J. H., Koot, H. M., & Passchier, J. (1997). Headache intensity and quality of life in adolescents. How are changes in headache intensity in adolescents related to changes in experienced quality of life? *Headache*, 37, 37–42.
- Larsson, B. (1988). The role of psychological, health-behaviour, and medical factors in adolescent headache. *Developmental Medicine and Child Neurology*, 30, 616–625.
- Loeser, J. D., & Melzack, R. (1999). Pain: An overview. *Lancet*, 353, 1607–1609.
- Maxwell, S. E., & Delaney, H. D. (1990). *Designing experiments and analyzing data: A model comparison perspective*. Pacific Grove, CA: Brooks/Cole.
- McGrath, P. A., & Brigham, M. C. (1992). Assessment of pain in children and adolescents. In D. C. Turk & R. Melzack (Eds.), *Handbook of pain assessment* (pp. 295–314). New York: Oxford.
- Merksey, H. (1986). Classification of chronic pain: Descriptions of chronic pain syndromes and definition of pain terms. *Pain*, 3, 217.
- Osterhaus, S. O. L., & Passchier, J. (1992). The optimal length of headache recording in juvenile migraine patients. *Cephalalgia*, 12, 297–299.
- Pennebaker, J. W. (1994). Psychological bases of symptom reporting: Perceptual and emotional aspects of chemical sensitivity. *Toxicology & Industrial Health*, 10, 497–511.
- Perquin, C. W., Hazebroek-Kampschreur, A. A. J. M., Hunfeld, J. A. M., Bohnen, A. M., van Suijlekom-Smit, L. W. A., Passchier, J., & van der Wouden, J. C. (2000). Pain in children and adolescents: A common experience. *Pain*, 87, 51–58.
- Solomon, S., Lipton, R. B., & Newman, L. C. (1992). Clinical features of chronic daily headache. *Headache*, 32, 325–329.
- Spilker, B. (1996). *Quality of life and pharmacoeconomics in clinical trials* (2nd ed.). Philadelphia: Lippincott-Raven.
- Stein, R. E. K., & Jones Jessop, D. (1985). *Tables documenting the psychometric properties of a measure of the impact of chronic illness on a family*. New York: Albert Einstein College of Medicine, Yeshiva University.
- Taimela, S., Kujala, U. M., Salminen, J. J., & Viljanen, T. (1997). The prevalence of low back pain among children and adolescents. A nation-wide, cohort-based questionnaire survey in Finland. *Spine*, 22, 1132–1136.
- Walker, J. S., & Carmody, J. J. (1998). Experimental pain in healthy human subjects: Gender differences in nociception and in response to ibuprofen. *Anesthesia Analgesia*, 86, 1257–1262.
- Zonneveld, L. N. L., McGrath, P. J., Reid, G. J., & Sorbi, M. J. (1997). Accuracy of children's pain memories. *Pain*, 71, 297–302.

