

# Factors Associated With Migraine-Related Quality of Life and Disability in Adolescents: A Preliminary Investigation

Gregg A. Tkachuk, PhD; Constance K. Cottrell, PhD; Jessica S. Gibson, MS;  
Francis J. O'Donnell, DO; Kenneth A. Holroyd, PhD

**Objectives.**—This study examined factors associated with impaired quality of life and functioning in a sample of treatment-seeking adolescent migraineurs.

**Subjects.**—The 37 participants were 51.4% female, and averaged 14.3 years of age and 4.1 migraines per month for the previous 36 months.

**Procedure.**—The Migraine-Specific Quality of Life Questionnaire, questionnaire items inquiring about missed activities, and headache diary recordings of missed and impaired activity time served as dependent measures. Variables studied were age; gender; migraine frequency, duration, and severity; presence of nausea, photophobia, or phonophobia; and number of visits to an emergency department in the previous year.

**Results.**—Three hierarchical forward regressions and one logistic regression, controlling for age and gender, revealed that the presence of nausea and at least one emergency department visit predicted poorer quality of life and a greater number of missed activities in these adolescent migraineurs. The presence of migraine-related missed activity hours from headache diaries was predicted by being male, having higher combined photophobia and phonophobia sensitivity scores, as well as more frequent and severe migraines. Greater impairment was predicted by having longer average duration attacks.

**Conclusions.**—These preliminary findings suggest that the continued development of effective treatment approaches to alleviate pain, suffering, and disability in adolescent migraineurs is required. In particular, evidence for the impact of nausea and sensitivities suggests that they may be important targets for treatment. As well, adolescent migraineurs with a history of a visit to an emergency department in the previous year likely experience greater individual and family distress, more disability, and poorer quality of life that require thoughtful, comprehensive treatment to prevent the development of more severe headache difficulties.

**Key words:** adolescent migraine, quality of life, disability

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In the United States, approximately 7% of female and 5% of male adolescents (aged 12 to 17 years) experience migraine.<sup>1</sup> It has been established that, in adults, migraine impairs functioning and overall quality of life.<sup>2-5</sup> Relatively little information is available,

however, on the impact of migraine on quality of life in adolescents.

Using the Quality of Life Headache in Youth Questionnaire (QLH-Y), Langeveld et al demonstrated that Dutch adolescents between 12 and 18 years of age with headache experienced more stress and fatigue, and poorer mood than adolescents who did not experience headache.<sup>6</sup> Weekly ratings further indicated that headaches had a negative impact on the adolescents' everyday activities and leisure time. These differences in quality of life were replicated in Italian adolescents.<sup>7</sup> In a third study, Langeveld and colleagues found that as migraines became more frequent and severe (as indicated by a weekly migraine

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From the Department of Psychology, Ohio University, Athens (Drs. Tkachuk, Cottrell, and Holroyd and Ms. Gibson) and Headache Treatment and Research and OrthoNeuro, Westerville, Ohio (Dr. O'Donnell).

Address all correspondence to Dr. Gregg Tkachuk, Headache Treatment and Research, 70 South Cleveland Avenue, Westerville, OH 43081.

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index), their negative impact on daily activities, fatigue, happiness, and mood increased, and the adolescents reported less satisfaction with their health and with their life on the QLH-Y.<sup>8</sup>

To our knowledge, no studies have attempted to identify migraine variables that are associated with impaired functioning and quality of life in adolescents. This study examined the relationships among demographic and migraine characteristics (eg, associated symptoms, frequency, severity, duration, and emergency department visits) and quality of life and disability in adolescents.

## METHODS

**Subjects.**—Adolescents, aged 12 to 17 years, with migraine were recruited from the general population in Columbus, Ohio and surrounding suburban areas. Consent for participation was obtained in writing from a parent or legal guardian of each participant. Each adolescent also provided written informed consent. The Investigational Review Board at Ohio University approved this study.

For the majority of participants, parents or legal guardians of adolescent migraineurs responded to announcements or advertisements for a clinical trial evaluating drug and nondrug therapies for adolescent migraine. Other participants were referred to the study by community physicians. The initial evaluation and subsequent treatment sessions took place at a headache research center that exclusively studies community research volunteers, housed within the specialty practice clinic of the fourth author (F.J.O.). Adolescents were required to receive an International Headache Society diagnosis of migraine (1.1 migraine without aura or 1.2 migraine with aura) and for migraine to be their primary presenting problem at each of 2 assessments: a neurologic evaluation by the project neurologist and an independent structured diagnostic interview conducted by a second staff member. The sample consisted of 37 participants: 51.4% female, 95% white, averaging 14.3 years of age, and experiencing on average 4.1 migraines per month during the previous 36 months.

**Evaluation.**—*Headache Characteristics.*—Headache history, medical history, and a detailed descrip-

tion of headaches were collected in a 1-hour structured interview. Participants' reports of symptoms (location, quality, aggravation by activity, nausea, vomiting, photophobia, phonophobia, and aura), as well as the number of migraines typically experienced each month, duration (in hours), severity (1, mild; 2, moderate; 3, severe), and chronicity (in months) was assessed during this evaluation. The photophobia and phonophobia sensitivity variables were combined into a single index variable for later analysis (0, not present; 1, at least one present; 2, both present).

*Migraine-Related Visits to an Emergency Department.*—Participants were asked to recall the number of migraine-related emergency department visits in the previous year. This variable was highly skewed and several transformations were attempted without satisfactory improvement. To compensate, the data were dichotomized to distinguish between participants who had reported at least one visit related to migraine from those who had not reported any.

*Quality of Life.*—Participants completed the Migraine-Specific Quality of Life Questionnaire ([MSQ] Version 2.1); a 14-item measure that assesses the impact of migraine on quality of life.<sup>9</sup> The MSQ yields 3 factorally-derived subscales: the role-restrictive dimension consists of 7 items, which assess the degree to which migraine limits the performance of normal activities; the role-preventive dimension consists of 4 items that assess the degree to which migraine interrupts the performance of normal activities; and the emotional function dimension consists of 3 items measuring the emotional impact of migraine. The total score ranges from 14 to 84 with lower scores reflecting greater impairment in quality of life.

*Migraine-Related Missed Activities.*—Participants were asked to recall their number of missed school days, extracurricular activities, and social activities during the previous 3 months. These were summed to form a composite index. Because this variable was highly skewed, a square root transformation was performed to normalize the data.

*Headache Diary.*—Participants were asked to complete headache diaries for 28 days with information about migraine frequency, duration, and pain severity; missed activity hours (defined as hours of

missed school, work, extracurricular, or social activities); and impaired activity hours (defined as hours of school, work, extracurricular, or social activities completed at less than 50% proficiency). The migraine frequency variable was highly skewed and attempts at transformation failed to normalize the data. Thus, this variable was recoded as a categorical variable (1, 1 to 2 migraines; 2, 3 to 4 migraines; 3, 5 or more migraines).

Missed activity hours were summed for each participant. Because this variable was highly skewed, primarily due to 13 (35%) of 37 participants reporting no missed activity hours, several transformations were attempted without satisfactory improvement. To compensate, the data were dichotomized to distinguish participants who had recorded any amount of missed activity time associated with migraine from those who had not recorded any.

Impaired activity hours as recorded in the headache diaries were also summed. For this variable, only 3 (8%) of 37 participants recorded no impaired activity hours. These data were also substantially skewed, however, and a square root transformation was performed to normalize the variable. Migraine-related characteristics of the sample are displayed in Table 1.

**Statistical Analyses.**—Questionnaire responses and headache diary data were used in correlational and multiple regression analyses. The associated symptom variable, aggravated by activity, was removed from further analyses because it was redundant with the other predictors. Correlations between the remaining independent variables were generally small enough (ie,  $r < 0.40$ ) to allow these variables to be included in the subsequent linear and logistic regression analyses.

## RESULTS

**Zero-Order Correlations.**—As shown in Table 2, presence of migraine-related nausea and at least one migraine-related visit to an emergency department in the previous year were significantly associated with poorer quality of life and greater recalled missed activities. Greater combined phonophobia and photophobia sensitivity scores and higher average pain severity ratings were significantly associated with the presence

**Table 1.—Reported and Diary-Recorded Migraine Characteristics\***

Characteristic	Study Group (N = 37)
Nausea, %	
Yes	78.4
No	21.6
Photophobia and/or phonophobia, %	
Both	75.7
Either	21.6
Neither	2.7
Migraine frequency, mean (SD) <sup>†</sup>	3.54 (1.89)
Median	3.0
No. per month, %	
1-2	43.2
3-4	29.7
≥5	27.0
Duration, mean (SD), h <sup>†</sup>	7.59 (3.65)
Severity, mean (SD) <sup>†,‡</sup>	2.45 (0.46)
Migraine-related ED visit, %	
Yes	16.2
No	83.8
MSQ score, mean (SD) <sup>§</sup>	57.05 (13.20)
Missed activities index, mean (SD) <sup>  </sup>	8.38 (9.74)
Median	6.0
Missed activity hours, mean (SD) <sup>†</sup>	6.99 (9.85)
Median	4.0
Yes, %	64.9
No, %	35.1
Impaired activity hours, mean (SD) <sup>†</sup>	7.83 (7.89)
Median	6.0

\*ED indicates emergency department; MSQ, Migraine-Specific Quality of Life Questionnaire.

<sup>†</sup>Diary recorded. Diaries were kept for 28 days.

<sup>‡</sup>Severity ratings were 1, mild; 2, moderate; 3, severe.

<sup>§</sup>Total score for the MSQ ranges from 14 to 84 with lower scores reflecting greater impairment in quality of life.

<sup>||</sup>Sum of missed school days, extracurricular activities, and social activities during previous 3 months.

of missed activity time. Longer average migraine duration was the only variable associated with greater impaired activity time.

**Multiple Regressions.**—Four (3 linear and 1 binary logistic) multiple hierarchical regressions were conducted to examine the relationship between demographic variables (gender and age) and migraine characteristics and migraine-specific quality of life, reported missed activities, diary-recorded missed activity hours, and diary-recorded impaired activity hours.

**Table 2.—Zero-Order Correlations Between Demographic and Headache-Related Variables and Dependent Measures (N = 37)\***

	Gender	Age	Nausea	Phonophobia Photophobia Sensitivities	Frequency	Duration	Severity	ED Visit
Quality of life	0.295 <sup>†</sup> P = .038	-0.098 P = .282	-0.477 <sup>‡</sup> P = .001	0.031 P = .427	-0.128 P = .225	-0.002 P = .495	0.018 P = .457	-0.452 <sup>§</sup> P = .002
Missed activities	0.099 P = .281	0.300 <sup>†</sup> P = .036	0.464 <sup>§</sup> P = .002	0.081 P = .316	0.035 P = .419	0.233 P = .083	0.218 P = .097	0.530 <sup>‡</sup> P = .000
Missed activity hours	0.150 P = .188	0.222 P = .094	0.026 P = .439	0.394 <sup>§</sup> P = .008	0.130 P = .221	0.236 P = .079	0.354 <sup>†</sup> P = .016	0.170 P = .157
Impaired activity hours	0.012 P = .472	0.000 P = .499	0.148 P = .191	0.026 P = .440	0.137 P = .210	0.516 <sup>‡</sup> P = .001	0.095 P = .289	0.265 P = .057

\*ED indicates emergency department.

<sup>†</sup>P = .05.

<sup>‡</sup>P = .001.

<sup>§</sup>P = .01.

*Migraine-Specific Quality of Life.*—A hierarchical forward multiple regression was conducted to predict quality-of-life scores from migraine-related variables (see Table 3). In this analysis, the presence of nausea during migraine and at least one migraine-related visit to an emergency department during the previous 12 months predicted significantly poorer quality-of-life scores.

*Migraine-Related Missed Activities.*—In the best fitting hierarchical forward regression model, older adolescents and those of male gender exhibited a

higher number of missed activities during the previous 3 months than their younger and female counterparts (see Table 3). As in the quality-of-life analysis, the presence of nausea and at least one emergency department visit also predicted a greater number of recalled missed activities during the previous 3 months.

*Diary-Recorded Missed Activity Hours.*—A hierarchical logistic regression revealed that being male, experiencing more frequent and severe migraines, and greater combined photophobia and phonophobia sensitivity scores during migraine, all increased the

**Table 3.—Hierarchical Forward Multiple Regression Analyses Predicting Migraine-Specific Quality of Life and Missed Activities (N = 37)\***

Dependent Variable	Model F	P	R <sup>2</sup>	R <sup>2</sup> Change	df	Predictors	β	t	P	Partial r
Quality of life	5.128 <sup>†</sup>	.003	0.314	0.095	4, 32	Age	.005	0.036	.971	0.006
						Gender	.209	1.405	.170	0.241
						ED visit	-.379	2.629 <sup>‡</sup>	.013	-0.421
						Nausea	-.332	2.230 <sup>‡</sup>	.033	-0.367
Missed activities	9.117 <sup>§</sup>	.000	0.474	0.133	4, 32	Age	.308	2.445 <sup>‡</sup>	.020	0.397
						Gender	.289	2.219 <sup>‡</sup>	.034	0.365
						Nausea	.452	3.468 <sup>†</sup>	.002	0.523
						ED visit	.381	3.021 <sup>†</sup>	.005	0.471

\*ED indicates emergency department.

<sup>†</sup>P = .01.

<sup>‡</sup>P = .05.

<sup>§</sup>P = .001.

**Table 4.—Logistic Regression Predicting Headache Diary-Recorded Missed Activity Hours**

Dependent Variable	$\chi^2$	<i>P</i>	−2 Log Likelihood	<i>df</i>	Predictors	$\beta$	SE	Wald	<i>df</i>	<i>P</i>	Odds Ratio
Missed activity hours	20.412*	.001	27.561	5	Age	.402	0.344	1.364	1	.243	1.495
					Gender	3.215	1.481	4.711	1	.030	24.892†
					Severity	4.195	1.708	6.032	1	.014	66.350†
					Frequency	1.987	0.906	4.808	1	.028	7.295†
					Sensitivities	2.749	1.288	4.554	1	.033	15.629†

\**P* = .001.†*P* = .05.

likelihood of recording migraine-related missed activity time (see Table 4).

*Diary-Recorded Impairment Hours.*—A hierarchical forward regression revealed that the only variable associated with recorded impairment hours was average migraine duration, with longer migraines associated with greater impairment (see Table 5).

## COMMENTS

We conducted a preliminary investigation to identify demographic and migraine-related predictors of quality of life, disability, and impairment in a volunteer research sample of adolescent migraineurs. Several findings emerged that are worthy of future study. Regarding demographic predictors, increasing age was significantly related to greater reported disability. This finding suggests that not only does migraine become more disabling with age, but also that early diagnosis and treatment may be especially crucial to the prevention of more severe headache problems in the fu-

ture. Also, it was noteworthy that differences between male and female adolescents were found in this sample, whereby males both reported a greater number of missed activities due to migraine and had a significantly greater likelihood of recording missed activity time on the headache diary than females. This indicates that gender differences exist in the symptom reporting patterns and coping styles of adolescents that warrant further investigation.

Perhaps the most striking findings were that the presence of migraine-associated nausea was an important predictor of both poorer migraine-specific quality of life and a greater number of reported missed activities, and that photophobia and phonophobia were associated with an increased likelihood of recording missed activity time on headache diaries. These findings, if they are replicated, have potential implications for treatment. If nausea could be successfully treated (possibly with antiemetic medication early in a migraine episode), it is possible that many adolescents

**Table 5.—Hierarchical Forward Multiple Regression Predicting Headache Diary-Recorded Impaired Activity Hours (N = 37)**

Dependent Variable	Model F	<i>P</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> Change	<i>df</i>	Predictors	$\beta$	<i>t</i>	<i>P</i>	Partial <i>r</i>
Impaired activity hours	4.531*	.009	0.227	0.292	3, 33	Age	−.147	−0.945	.351	−0.162
						Gender	−.120	−0.773	.445	−0.133
						Duration	.568	3.686†	.001	0.540

\**P* = .01.†*P* = .001.

would respond to analgesic medication without the need for more aggressive treatment. Similarly, if adolescents could be educated to identify associated symptoms early in the migraine episode, they might be able to initiate more timely treatment with nonpharmacologic strategies or medication that could reduce not only the severity and duration of the attack, but also related disability or impairment.

Equally interesting was the finding that at least one emergency department visit in the previous year was significantly associated with poorer quality of life and greater reported disability. This somewhat unexpected finding suggests that history of emergency department visits may be a predictor of greater adolescent and family distress and indicate that more thoughtful, comprehensive treatment is required in order to prevent the development of chronic and refractory headache conditions in later adolescence or adulthood. Alternatively, the observed associations between an emergency department visit and both poorer quality of life and reported disability could be unique to this sample or explained by other unmeasured variables such as familial emergency department utilization patterns, socioeconomic status, and access to primary health care.

Although greater migraine frequency and average severity were associated with a greater likelihood of experiencing disability, and longer average duration was associated with increased impairment on the headache diary, it was somewhat unexpected that these headache variables did not predict quality of life or reported disability. A possible explanation could be that adolescents completed the measures inquiring about previous events during the clinic visit, but kept a daily diary for the subsequent 1-month period. Thus, the periods assessed by retrospective report (from 3 months to 1 year before their clinic visit) and by daily diaries (1 month following the clinic visit) did not correspond. Moreover, reports of quality of life and disability may be more sensitive to week-to-week fluctuations in headache frequency, duration, and severity in adolescents than in adults. In fact, presumably stable characteristics of the migraine attack, such as presence or absence of associated symptoms, even when assessed by retrospective report, did predict subsequent disability recorded in daily diaries.

One of the main goals of this study was to identify variables for further study. In this sample of adolescent migraineurs, age, gender, migraine-associated symptoms (ie, nausea, as well as photophobia and phonophobia sensitivities), emergency department visits, and migraine frequency, average severity, and average duration all emerged as possible candidates for future models that predict the impact of adolescent migraine on disability and quality of life. These findings are preliminary, however; further study with a larger sample will be required to determine if these relationships generalize to the larger population of adolescent migraineurs.

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