Development of the Acute Medication Self-Efficacy Scale for Headache

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Elizabeth K. Seng
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This dissertation titled
Development of the Acute Medication Self-Efficacy Scale for Headache

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Abstract

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Development of the Acute Medication Self-Efficacy Scale for Headache

Director of Dissertation: Kenneth A. Holroyd

Little research has examined optimal use of acute medications essential to manage disorders characterized by acute episodes, such as headache disorders. Social Cognitive Theory suggests that self-efficacy for optimal use of acute headache medication, or confidence in one's ability to use acute medications optimally, is key to cultivating these behaviors. This project aimed to identify the behaviors and barriers associated with optimal use of acute headache medication and develop a measure of Acute Medication Self-Efficacy for Headache (AMSE-H).

In Study 1, qualitative interviews [people with headache (n = 21) and health care providers (n = 15)] identified 8 behaviors required for optimal use of acute headache medication and 10 barriers to these behaviors. 14 preliminary AMSE-H items were developed.

In Study 2, 35 people with migraine completed the 14 preliminary items for the AMSE-H. The final 7 AMSE-H items were selected to ensure diversity of content and moderate relationships between each scale item overall self-efficacy for optimal use of acute headache medication, the total score, and other scale items.

In Study 3, 161 migraine sufferers were recruited after completing studies during which participants recorded acute headache medication use in a daily dairy and completed validity measures. Upon recruitment into the current study (1-15 months after
completion of the previous studies), participants completed the AMSE-H and additional validity measures.

An exploratory principal components factor analysis identified two factors: cross-episode and episode-specific. The internal consistency was adequate ($\alpha = .80$) but test-retest reliability was low ($r = .66, p < .001$). The AMSE-H demonstrated significant relationships in the expected directions with all validity measures administered concurrently with the AMSE-H (the Headache Management Self-Efficacy and measures of perceived access to medication and acute medication outcome expectancies), but failed to demonstrate significant relationships with validity measures administered prior to the AMSE-H (the Headache Specific Locus of Control and daily diary measures of acute medication use). Thus, the current study provided only limited evidence for the reliability and validity of the AMSE-H.

Approved: _____________________________________________________________

Kenneth A. Holroyd

Professor Emeritus of Psychology
Acknowledgements

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</table>
Medication Adherence

Medication adherence has been identified as the Achilles heel of drug therapy. Medication effectiveness is partially a product of medication adherence, or the extent to which a patient performs the medication-taking behaviors required to optimize the effectiveness of a particular type medication for an illness (Burkhart & Sabate, 2003; Katic, Krause, Tepper, Hu, & Bigal, 2010). Across chronic diseases, a large literature suggests that only 50-75% of patients perform the medication use behaviors required to optimally manage disease (DiMatteo, 2004; Dunbar-Jacob, Erlen, Schlenk, Ryan, Sereika, & Doswell, 2000). This research has primarily examined consistent use of fixed-schedule medications to manage chronic disease, such as antihypertensive, antiretroviral, and antipsychotic medications (see Table 1).

<table>
<thead>
<tr>
<th>Medication Type</th>
<th>Example Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Medication</td>
<td>Pain medication for headaches</td>
</tr>
<tr>
<td></td>
<td>Migraine-specific medication</td>
</tr>
<tr>
<td></td>
<td>Rescue inhalers for asthma</td>
</tr>
<tr>
<td></td>
<td>Epinephrine for an allergic reaction</td>
</tr>
<tr>
<td></td>
<td>Glucose for hypoglycemic events in diabetes</td>
</tr>
<tr>
<td></td>
<td>Benzodiazepine for panic disorder</td>
</tr>
<tr>
<td>Fixed-Schedule Medication</td>
<td>Highly active antiretroviral medication</td>
</tr>
<tr>
<td></td>
<td>Antihypertensive medication</td>
</tr>
<tr>
<td></td>
<td>Oral hypoglycemic medication</td>
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<tr>
<td></td>
<td>Antibiotic medication</td>
</tr>
<tr>
<td></td>
<td>Antidepressant medication</td>
</tr>
<tr>
<td></td>
<td>Antipsychotic medication</td>
</tr>
</tbody>
</table>
**Figure 1.** Decision-Making Regarding Acute Headache Medication Use Over the Course of a Migraine Episode. Adapted from the Behavioral Migraine Management treatment manual, (Holroyd, et al., 2000).

Optimal use of acute medication, or medication used as needed to treat episodic disorders (see **Table 1**), often requires more complicated decisions and sequences of behaviors than does optimal use of fixed-schedule medication (Peters, Abu-Saad, Vydelingum, Dowson, & Murphy, 2003). For example, a person using acute medication to manage migraine must make decisions regarding the benefits, costs, and timing of acute headache medication use based on moment-to-moment evaluation of symptoms progressing over several phases of a migraine episode (**Figure 1**; adapted from the Behavioral Migraine Management treatment manual, (Holroyd, Cottrell, & Echelberger-McCune, 2000). Thus, performance of behaviors required for optimal use of acute
medication may be more challenging and more problematic than consistent use of fixed-schedule medication.

Table 2.
*Diagnostic Criteria for Migraine and Tension-Type Headache*

<table>
<thead>
<tr>
<th>Headache Disorder</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine</td>
<td>Moderate to intense head pain</td>
</tr>
<tr>
<td></td>
<td>Unilateral</td>
</tr>
<tr>
<td></td>
<td>Pulsing in quality</td>
</tr>
<tr>
<td></td>
<td>Photophobia and phonophobia</td>
</tr>
<tr>
<td></td>
<td>Nausea</td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
</tr>
<tr>
<td></td>
<td>Exacerbated by physical activity</td>
</tr>
<tr>
<td></td>
<td>Can be accompanied by aura</td>
</tr>
<tr>
<td>Tension-Type Headache</td>
<td>Mild to moderate head pain</td>
</tr>
<tr>
<td></td>
<td>Bilateral</td>
</tr>
<tr>
<td></td>
<td>Pressing/Tightening in quality</td>
</tr>
<tr>
<td></td>
<td>Not exacerbated by physical activity</td>
</tr>
</tbody>
</table>

*Note.* Diagnostic criteria from the International Classification of Headache Disorders: 2nd edition (Headache Classification Subcommittee of the International Headache Society, 2004).

**Adherence with Acute Headache Medications**

Migraine and tension-type headache (Table 2) have been the primary focus of research examining the behaviors required for optimal use of acute medications. Pain medications are non-specific acute medications used to treat pain of all types. Migraine-specific acute medications act on the neurological mechanisms distinctly involved in migraine headache (Diamond, Bigal, Silberstein, Loder, Reed, & Lipton, 2007). Triptans are the most frequently prescribed migraine-specific acute medication in headache clinics (Malik, Hopkins, Young, & Silberstein, 2006; Silberstein, 2000). Adjunctive acute
medications may also be used to treat symptoms associated with migraine, such as anti-emetic medications to treat nausea (see Appendix A for further description of acute headache medications).

The limited available literature has identified three problems with optimal use of acute headache medication (see Appendix B for further review of available literature on optimal use of acute headache medication). Between 40-85% of patients do not optimally time their use of acute headache medication. These estimates have been assessed through single-headache diaries and retrospective surveys (Cady, Farmer, Beach, & Tarrasch, 2008; Foley, Cady, Martin, Adelman, Diamond, Bell, et al., 2005; Gallagher & Kunkel, 2003; Malik, et al., 2006; Packard & O'Connell, 1986). Patients may also choose less effective types of medication when a more effective type of medication is available (e.g., using a non-specific pain medication rather than a migraine-specific medication to treat a severe migraine). This has been assessed with a daily headache diary and a retrospective survey (Holroyd, Cordingley, Pingel, Jerome, Theofanous, Jackson, et al., 1989; Malik et al., 2006). Additionally, approximately 4% of people with headache fail to limit use of acute headache medications to avoid medication overuse headache, a phenomenon in which headaches increase in frequency and severity with frequent use of acute headache medications. Failure to limit use of acute headache medication has been assessed through retrospective surveys (Ottervanger, Valkenburg, Grobbee, Pingel, Theofanous, Jackson, et al., 1996; Packard & O'Connell, 1986).

Qualitative studies can provide comprehensive information about behaviors required for optimal use of acute headache medication, and barriers to engaging in those
behaviors. This information is prerequisite to developing more targeted assessments and interventions for people experiencing difficulty performing a behavior required for optimal use of acute headache medication.

**Self-Efficacy**

Social cognitive theory and the wider behavioral literature suggest that self-efficacy is likely to be a key and proximal determinant of performing the behaviors required for optimal use of acute headache medications (Bandura, 1977; Bandura, 1997; Marks, Allegrante, & Lorig, 2005; Miller & Rollnick, 1991). Bandura (1997) postulates that that self-efficacy influences performance of behavior through its impact on cognitive, emotional, and physiological responses. For optimal use of acute headache medication, this could include persistence in coping with barriers to the performance of behaviors required for optimal use of acute medications (cognitive), increased optimism in the face of set-backs (emotional), and decreased anxiety when making decisions regarding acute headache medication use (physiological). Thus, assessment of self-efficacy for optimal use of acute headache medication, and intervening when self-efficacy is low for particular behaviors, could improve management of headaches with acute medications.

Assessment of self-efficacy for optimal medication use has focused solely on fixed-schedule medications. Several limitations to these measures have been identified. The majority of measures of self-efficacy for consistent use of fixed-schedule medication have utilized single (or very few) items (Brus, van de Laar, Taal, Rasker, & Wiegman, 1999; Johnson, Catz, Remien, Rotheram-Borus, Morin, Charlebois, et al., 2003; Kalichman, Cain, Fuhrel, Eaton, Di Fonzo, & Ertl, 2005; Rudy, Murphy, Harris, Muenz,
& Ellen, 2009; Safren et al., 2001). Although a few multiple-item measures for assessing self-efficacy for the consistent use of fixed-schedule medications are available, these focus primarily on barriers to consistent use, such as busyness, feeling ill, or a lack of reminders (Cameron, Ross, Clayman, Bergeron, Federman, Bailey, et al., 2010; Erlen, Cha, Kim, Caruthers, & Sereika, 2010; Johnson, Neilands, Dilworth, Morin, Remien, & Chesney, 2007; Kalichman, Cherry, & Cain, 2005; Ogedegbe, Mancuso, Allegrante, & Charlson, 2003; Resnick, Wehren, & Orwig, 2003; Risser, Jacobson, & Kripalani, 2007). Further, some questions on existing measures assess constructs related to, but distinct from, self-efficacy, such as perceived difficulty of behaviors (e.g., “It is easy for me to take my medicine on time”; Cameron et al., 2010), or perceived knowledge about disease (e.g., “Understands what HIV is doing”; Kalichman, Cherry et al., 2005), and thus are contaminated by other constructs.

Measurement of self-efficacy for optimal use of fixed-schedule medications cannot provide information about acute medications because the behaviors required to optimally use acute medications are different from, and may be experienced as more challenging than, the behaviors required to optimally use fixed-schedule medications. A measure of self-efficacy for optimal use of acute headache medication should include items assessing confidence in one’s ability to perform the multiple behaviors required for optimal use of acute headache medication, in addition to circumstances that could modify the perceived difficulty of these behaviors (Bandura, 2006).
Specific Aims

This paper will describe the development of the Acute Medication Self-Efficacy – Headache (AMSE-H) over the course of three studies. As recommended by Crocker and Algina (2006) development of this measure will be described in some detail to allow for critical evaluation of scale development techniques.

Study 1 was a qualitative examination of the behaviors required for optimal use of acute headache medication and barriers to performing these behaviors. The first aim of this study was to describe the behaviors required for optimal use of acute headache medication and barriers to performing these behaviors through qualitative interviews with two relevant groups: people with headache who had taken acute headache medications and health care providers who treat headache. The second aim of this study was to utilize the criteria of social validity (the extent to which the AMSE-H is acceptable, relevant, and useful to people with headache and health care providers who treat headache) to generate, refine, and select initial AMSE-H items, and to refine the format of the AMSE-H.

Study 2 examined AMSE-H responses in an independent sample of people with headache currently taking acute headache medications. This study aimed to select final set of AMSE-H items that demonstrated both a breadth of content and moderate interrelationships with other items. Goals included selecting items that assess distinct behaviors within the domain of self-efficacy for optimal use of acute headache medication, and including ≤10 items to enhance social validity and adoption in clinical settings.
Study 3 was a quantitative examination of the psychometric properties of the AMSE-H in a sample of people with headache currently taking acute headache medications. Specifically, this study aimed to examine the factor structure of the AMSE-H, and to provide initial information regarding its reliability (internal consistency and test-retest reliability) and validity (relationships with theoretically relevant behavioral and psychosocial variables).
Study 1

Rationale and Aims

Little information exists regarding the behaviors required for optimal use of acute headache medication, or barriers to performing these behaviors. This study aimed to provide more comprehensive information regarding the behaviors required for optimal use of acute medications, and barriers to performing these behaviors through the use of phenomenological interviewing techniques.

Early consideration of social validity, the extent to which a measure or intervention intended for use in a clinical setting is acceptable, relevant and useful to the intended audience, is key to the success of any measure or intervention intended for use in clinical settings, such as the AMSE-H (Schwartz & Baer, 1991). Therefore, this study also aimed to generate, refine, and select AMSE-H items through an iterative interviewing process to maximize social validity with the two target audiences: people with headache and health care providers who treat headache disorders.

Methods

Item Generation

The current study utilized previous measures of similar constructs, the “armchair” method, and an iterative interview-based approach to generate and evaluate AMSE-H items. Original items were developed through evaluation of measures of self-efficacy for consistent use of fixed-schedule medications (Fernandez, Chaplin, Schoenthaler, & Ogedegbe, 2008; Ogedegbe et al., 2003; Resnick et al., 2003; Risser et al., 2007) and “armchair” methods (e.g., informal conversations with researchers and health care
providers who work with headache disorders). These items were written to reflect the Social Cognitive Theory conceptualization of self-efficacy by emphasizing confidence in one’s ability to perform multiple specific behaviors required for optimal use of acute medications and by including contextual factors that could serve as barriers to performing these behaviors (Bandura, 1997; Forsyth & Carey, 1998).

**Participants**

Data triangulation, the use of multiple data sources in qualitative research (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005), was achieved through conducting interviews with two stakeholder groups: people with headache who have experience with acute headache medication, who are the target population for the measure, and health care providers, who have expert clinical knowledge of behaviors required for optimal use of acute medications and experience with a wide range of people with headache.

Twenty-one people with headache were recruited to participate in qualitative interviews from a tertiary care setting in Columbus, Ohio ($n = 11$) and through flyers in Athens, Ohio ($n = 10$). People with headache were selected because they have experience using acute headache medications. Participants with were predominantly female (63.9%) with a mean age of 34.1 ($SD = 12.8$), which is representative of the headache patient population. 61.9% of people with headache self-reported diagnoses of both migraine and tension-type headache, 28.6% reported migraine only, and 9.5% reported tension-type headache only. Participants with headache reported an average of 9.9 ($SD = 9.4$) headache days in the past month, suffering from problematic headaches for an average of
16.5 years (SD = 15.6), and taking acute medications to treat headaches for an average of 10.2 years (SD = 9.5).

Fifteen health care providers (86.7% physicians, 13.3% nurses), predominantly male (60%), from a range of specialties (40.0% neurology, 20.0% pediatric, 6.7% primary care, 33.3% other) whose practices consisted of 5% - 100% of people with headache were recruited to participate in interviews from a headache conference in Cleveland, Ohio.

**Procedures**

The generation and refinement of AMSE-H items through interviews was an iterative process. Items generated and refined through feedback from earlier participants were further evaluated and refined through feedback from later participants.

**Phenomenological Interviews with Participants with Headache**

Participants with headache participated in individual two-part interviews that lasted approximately 30 minutes in a single sitting. Part 1 consisted of phenomenological interviewing, a form of qualitative research commonly used in the social sciences designed to elicit the experiences of individuals as they encounter similar phenomena; in this case, the phenomenon examined was managing headaches optimally using acute medication (Seidman, 2006). Phenomenological interviews consisted of open-ended questions with a single participant (Seidman, 2006). Initial interview prompts attempted to elicit each individual’s history with acute headache medications. Within these stories, the interviewer attempted to elicit details of the experience, and explored specific barriers
that influenced each participant’s execution of behaviors required for optimal use of acute headache medications.

In Part 2, the interviewer instructed participants to use a “think-aloud” method while responding to the current pool of AMSE-H items (Ericsson & Simon, 1993). Participants read each item aloud and verbalized their thought processes as they chose how to respond to each item. The interviewer noted items that were difficult to read or understand, and items that participants interpreted differently than intended. Participants also provided feedback regarding the personal relevance and perceived usefulness of each item, and were encouraged to provide suggestions for items that could be included in the scale. Participants provided written informed consent according to procedures approved by the Ohio University Human Subjects Committee. and were compensated with $20 for their participation in this study.

**Brief Interviews with Health Care Providers**

Health care providers participated in individual two-part interviews that were approximately 5 minutes in length. Part 1 was consistent with phenomenological principles designed to elicit behaviors required for optimal use of acute headache medication and contexts where health care providers observed their patients experiencing difficulty performing these behaviors. In Part 2, health care providers provided specific verbal and/or written feedback about relevance and usefulness of each item for their own practices, the usability of the scale format and scoring, and suggestions for items that could be included in the scale. Health care providers provided written informed consent according to procedures approved by the Ohio University Human Subjects Committee.
Analysis

An audit trail was established by audio-recording and transcribing all interviews (Brantlinger et al., 2005). Investigator triangulation was achieved by using multiple researchers with various levels of previous knowledge about acute headache medication use. Using a random subset of data, the first author and an advanced psychology graduate student generated independent lists of initial emerging themes. Interviews were stratified by participant group (patient or health care provider) and randomly assigned to be coded by one of two independent coders, an advanced psychology graduate student and a medical student. These themes were compared by members of the research team and discrepancies resolved by discussion. Themes were also evaluated through peer-debriefing with researchers and clinician experts in headache (Brantlinger et al., 2005). Literacy level of the AMSE-H instructions and items was evaluated using the SMOG (McLaughlin, 1969).

Results

Behaviors Required for Optimal Use of Acute Headache Medication

The phenomenological interviews described above led to the identification of 8 behaviors required for optimal use of acute headache medications (see Table 3), including 3 behaviors that occur across headache episodes, and 5 behaviors that occur within individual headache episodes (see Appendix C, which provides quotes from interview respondents that illustrate each of the 8 behaviors). Data saturation (the point at which collecting more data did not provide new behaviors or barriers) occurred prior to
the 12th interview with participants with headache, and prior to the 5th interview with health care providers. Thus there was no obvious need for additional interviews.

Table 3. 
Description of Behaviors Required for Optimal Use of Acute Headache Medication Identified in Interviews

<table>
<thead>
<tr>
<th>Acute Medication-Taking Behavior</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cross-Episode Behavior</strong></td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>Keeping acute medication available</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communicating relevant information to the health care provider</td>
</tr>
<tr>
<td><strong>Limit</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limiting the frequency of acute medication use</td>
</tr>
<tr>
<td><strong>Episode-Specific Behavior</strong></td>
<td></td>
</tr>
<tr>
<td>Distinguish</td>
<td>Recognizing the symptom profile reliably associated with different types of headaches</td>
</tr>
<tr>
<td><strong>Medication</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choosing the type/combination/dose of acute medication</td>
</tr>
<tr>
<td><strong>Timing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timing acute medication use to optimize effectiveness</td>
</tr>
<tr>
<td><strong>Alternatives</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utilizing nonpharmacological treatment options</td>
</tr>
<tr>
<td><strong>Repeat</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taking another dose of acute medication if needed</td>
</tr>
</tbody>
</table>
**Cross-Episode Medication-Taking Behaviors**

Cross-episode behaviors required for optimal use of acute headache medications occur outside of a specific headache episode, and provide the necessary foundation to perform the medication-taking behaviors that occur within specific headache episodes (see Table 3). “Available” refers to keeping acute medication available in all places a headache may occur, such as at the office, in the car, and at home. “Communication” refers to communicating relevant information with health care providers, including headache symptoms, frequency and severity, and problems related to taking acute medication, such as difficulty taking medication optimally and side effects. “Limit” refers to limiting the frequency of acute headache medication use. Health care providers reported recommending use of acute headache medication on no more than 2-4 days per week to avoid medication overuse headaches.

**Episode-Specific Medication-Taking Behaviors**

Episode-specific behaviors required for optimal use of acute headache medications are used to manage a single headache episode (see Table 3). “Distinguish” refers to correct categorization of headache type through recognition of reliable patterns of contextual cues, warning signs, and headache symptoms. Participants with headache reported using varied and idiosyncratic information to distinguish between migraine and other types of headaches, including visual and auditory symptoms, pain quality and location, gastrointestinal symptoms, affect, time of day, time during menstrual cycle, and response to certain types of medications.
“Medication” refers to taking the type and dosage of medication most likely to manage the headache optimally. “Timing” refers to taking the type of acute medication at the time during the headache episode most likely to manage the headache optimally. This behavior is particularly important for migraine-specific medications intended to abort migraines, which are often not as effective if taken very late during a migraine episode. “Alternatives” refers to the evaluation and utilization of alternative treatment options for headache symptoms, including laying down, avoiding light and sound, using relaxation techniques, eating, or drinking. Alternatives were particularly important for people with headache who reported medication overuse headache. “Repeat” refers to determining whether another dose of acute medication is appropriate, and if so, which type of medication to use. Decisions about repetition of acute headache medication depend on the progression of headache symptoms and previous behaviors used during the headache episode.

**Barriers**

Barriers are psychosocial or situational factors that inhibit performance of behaviors required for particular set of optimal use of acute headache medications. Interviews identified 10 barriers to successfully performing behaviors required for optimal use of acute headache medications (Figure 2; see Appendix C, which provides quotes from interview respondents that illustrate each of the 10 barriers).

People with headache may lack knowledge about how acute headache medication works, how to take acute headache medication optimally, or the consequences of suboptimal use. Participants reported forgetting to keep medication available, often
because of an inconsistent or hectic schedule and the need to have medication available in multiple locations. “Recognition” refers to difficulty recognizing one’s own symptom profiles associated with different types of headaches. “Severity” refers to purposefully avoiding taking an acute headache medication (particularly prescription medications, or more “powerful” migraine-specific medications) until a person with headache is sure that the headache is “bad enough.”

Figure 2. Barriers to the Behaviors Required for Optimal Use of Acute Headache Medication Identified in Interviews.

As with many types of medication, acute medications taken for headache disorder can have side effects that interfere with daily life; often, participants associated the most effective types of medication with the most disruptive side effects. People with headache
sometimes perceive acute headache medication to be *ineffective* to reduce their headache length and severity. People with headache may have *limits* in the amount of acute headache medication they can keep on-hand because of high cost (i.e., $20/pill) and restrictive monthly limits set by insurance companies (i.e., 6 pills/month) on certain types of acute headache medication, particularly migraine-specific medication.

Responsibilities associated with *role conflicts*, including being an employee, parent, spouse, or caretaker, can distract people with headache from performing optimal acute headache medication-taking behaviors. Alternately, the need to be able to function while engaging in demanding roles can encourage people with headache to overuse particularly effective acute headache medications, or underuse of acute headache medications if associated side effects are particularly severe. *Poor social influences* communicated from family, friends and coworkers, (e.g., “this medication is the best,” “taking medication at work is a sign of weakness,” or “prescription medications are unhealthy or addictive”) may influence behaviors associated with acute headache medication. Finally, some participants reported a *preference* to avoid taking prescription medication, instead preferring various herbal remedies or non-pharmacological strategies to manage their headaches.

**Scale Items and Format**

Feedback elicited through the “think-aloud” method and direct questioning of health care providers lead to the inclusion of self-efficacy examples in the scale instructions, requiring the respondent to identify acute headache medications prior to completing the self-efficacy items, and indicated a preference for a 7-point response scale
ranging from “Strongly Disagree” to “Strongly Agree,” with all items coded in the same direction (see Appendix D, which provides quotes from interview respondents to illustrate these decisions). To address social validity, items were developed and retained in the scale if either people with headache or health care professionals viewed assessment of the particular behavior or barrier as having clinical use and relevance for their experiences treating headache with acute medication. Item content and wording was also refined to enhance social validity and the ease with which participants understood item meaning.

In total, 14 AMSE-H items, including 8 behaviors associated with optimal use of acute medications, 5 barriers to engaging in these behaviors, and a single item assessing overall self-efficacy for optimal use of acute headache medication, were generated and refined (see Appendix E). The SMOG indicated that the AMSE-H instructions and items were at a 12th grade reading level. This relatively high reading level was in part due to words required to communicate medical information that should be familiar to people with headache, such as “headache” and “medication.” Additionally, patients in interviews reported that the word “confident” was a more accurate representation of the construct of self-efficacy than other words used (i.e., “sure”), as suggested by Bandura (Bandura, 2006). With these three words removed, the AMSE-H instructions and items were at an 8th grade reading level.
Study 2

Rationale and Aims

Selection of the final items of the AMSE-H required a sample of people with headache independent from samples used for item generation and refinement (Study 1) and psychometric evaluation (Study 3). Thus, Study 2 aimed to select the final items of the AMSE-H in a small, independent sample of people currently using acute medications to manage headache disorders. The final AMSE-H items were selected to be diverse in content, providing a breadth of information within the domain of self-efficacy for optimal use of acute headache medication. Items were intended to measure aspects of a single domain, and thus were selected based on relationships with a criterion item (overall self-efficacy for optimal use of acute headache medication), the total score, and interrelationships with other items remaining in the scale respectively. Additionally, to enhance acceptance in clinical settings, which requires the measure to be easy to administer and score (Stewart, 2001), we aimed to have the final length of the scale fall between 5-10 items.

Methods

Participants.

Thirty-five people currently prescribed acute medications to manage headache [100% had an ICHD-2 diagnosis of migraine from a neurologist (Headache Classification Subcommittee of the International Headache Society, 2004); 20% also reported tension-type headaches] were recruited from a tertiary care clinic in Columbus, Ohio. Participants were predominantly White (94%) and female (74%) with a mean age of 43.3 (SD = 11.5).
This is representative of the population of people with headache in terms of age and gender, although ethnic minorities were underrepresented.

**Procedures.**

Participants recruited from a specialty care clinic completed the 14 initial AMSE-H items. Participants provided written informed consent according to procedures approved by the Ohio University Human Subjects Committee and received $20 compensation.

**Analyses**

Item retention was influenced by several criteria. All decisions about item selection were made with the general goal of retaining a breadth of item content in the final scale. Items were retained if the range of responses was at least 5 (out of 7 response options for each item). Standard deviations were also examined to ensure sufficient variability in item responding. Items were also retained if they demonstrated medium to large Spearman correlation coefficients with several discrimination indices, weighted in importance from the most to least representative of the construct of self-efficacy for optimal use of acute headache medication (the item assessing overall self-efficacy for optimal use of acute headache medication, the total score, and remaining scale items, respectively). Because items were selected to maintain breadth of content, maximization of internal consistency was not a primary goal, as it could reduce the breadth of scale content and therefore the construct validity of the measure (Bandura, 2006; Nunnally & Bernstein, 1994). However, the desire for a minimum internal consistency of at least $\alpha = .80$ influenced the final number of items included in the final scale.
Results

A total of 7 items were included in the final version of the AMSE-H ($\alpha = .87$) 
(Appendix F). These items assessed confidence in performing behaviors required for 
optimal use of acute medications (4 items) and confidence in performing these behaviors 
in the presence of barriers to (2 items), as well as overall self-efficacy for optimal use of 
acute headache medication (1 item).
Study 3

**Rationale and Aims**

Study 3 aimed to provide initial information regarding the AMSE-H factor structure, measurement consistency (reliability), and the extent to which the AMSE-H measures the intended construct (validity). Psychometric examination required a sample independent from the item selection sample. The AMSE-H was expected to be associated with behaviors required for optimal use of acute headache medication, therefore the sample were recruited from recent studies that included daily diary recordings of acute medication use. In addition to the AMSE-H, measurement of theoretically relevant psychosocial constructs allowed further evaluation of validity.

**Methods**

**Participants.**

To examine the factor structure, reliability, and validity of the AMSE-H, 161 people with migraine were recruited from an ongoing study of acute migraine medication adherence (MedUse; \(n = 103\)) and a recently completed study of an online behavioral migraine treatment (MiSelf; \(n = 58\)). Participants were predominantly White (93.2%), married (67.1%) and female (62.1%) with a mean age of 41.5 (SD = 11.4) with either a high school education (5.6%) some college (26.1%), an undergraduate (39.1%) or a graduate degree (29.2%). This is representative of the population of people with migraine, although the proportion of men is slightly higher than is typically observed in samples of people with migraine. Participants recorded an average of 12.1 (SD = 6.3) headache days/30 days, 10.4 (SD = 5.3) migraine days/30 days, and an average headache
severity of 2.1 (SD = 0.4; on a scale from 1-3) during 30 days of daily headache diary recording. All participants recorded at least 2 headache days during 30 days of daily headache diary recording. 97.5% of participants recorded at least 4 headache days per 30 days (approximately 1 per week), 24.8% of participants qualified for chronic headache (≥ 15 headache days during a 30 day period), and 16.8% qualified for chronic migraine (≥ 15 headache days during a 30 day period). 96.3% reported using migraine-specific medication (91.9% triptan, 9.9% ergotamine) while recording headaches daily for a month. 66.5% met medication-overuse criteria for migraine-specific medications (≥ 9 days during a 30 day period)(Silberstein, 2000). 21.9% disagreed with the statement, “I have access to the amount of prescription acute medication I need to effectively manage my headaches.”

**Procedures.**

Procedures are briefly described in Figure 3. During both the MedUse and MiSelf studies, participants used an online recording system to complete daily headache diary entries, as well as baseline, weekly, and monthly assessments for at least one month. A recent meta-analysis provides evidence for the equivalence of online and paper administration of self-report measures (Gwaltney, Shields, & Shiffman, 2008). Contact information and consent to contact participants for future research was obtained during the course of these studies.
Figure 3. Description of the Procedures for Study 3 of the Development of the Acute Medication Self-Efficacy Scale for Headache.

<table>
<thead>
<tr>
<th>MedUse &amp; MiSelf Participants (n=161)</th>
<th>MedUse &amp; MiSelf Participants (n=161)</th>
<th>MiSelf Participants (n=58)</th>
<th>MedUse Participants (n=103)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Headache diary</td>
<td>• AMSE-H</td>
<td>• Headache Management Self-Efficacy Scale</td>
<td>• AMSE-H Re-test</td>
</tr>
<tr>
<td>• Headache-Specific Locus of Control</td>
<td>• Outcome Expectancies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Migraine-Specific Quality of Life</td>
<td>• Perceived Access to Medication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Final 30 days of MedUse and MiSelf Studies</th>
<th>&gt;1 month – 15 months</th>
<th>AMSE-H Development Study 3: Week 1</th>
<th>AMSE-H Development Study 3: Week 2</th>
</tr>
</thead>
</table>

The final month of daily diary data collected from each participant through the online recording system was utilized in the current study. The final administration of the Headache Specific Locus of Control (Martin, Holroyd, & Penzien, 1990) and the Migraine Specific Quality of Life Questionnaire (Jhingran, Osterhouse, Miller, Lee, & Kirchdoerfer, 1998) were also included in this study.

Participants were contacted to participate in the current study after completion of the MedUse or MiSelf studies. Length of time between completion of the daily diary and participation in the current study ranged from less than 1 month to 15 months (M = 5.5 months, SD = 2.8 months). All participants completed 14 initial AMSE-H items as well as brief measures of outcome expectancies for acute headache medication and perceived access to prescription acute medication (Figure 3). Participants from the MiSelf study also completed the Headache Management Self-Efficacy scale (French, Holroyd, Pinnell, Malinoski, ODonnell, & Hill, 2000), which assesses self-efficacy for migraines self-management behaviors addressed in the MiSelf treatment. Participants from the MedUse study completed a one-week re-test of the initial 14 AMSE-H items. All measures were administered online. All participants provided electronic informed consent according to
procedures approved by the Ohio University Human Subjects Committee and the participating research site. Participants recruited from the MedUse study received $15 in compensation for completing the first administration, and an additional $10 for completing the second administration. Participants recruited from the miSelf study received $20 in compensation.

**Measures.**

*Measures Administered Concurrently with the AMSE-H.*

*Headache Management Self-Efficacy.*

The Headache Management Self-Efficacy Scale (French et al., 2000) is a self-report, 25-item questionnaire that measures the extent to which a migraine sufferer has confidence in his or her ability to use behavioral self-management skills to effectively manage recurrent headaches. Only participants from the MiSelf study, which taught behavioral self-management skills, completed this measure. Items include, “I can reduce the intensity of a headache by relaxing.” Responses are coded on a 7-point Likert-type scale and range from “Strongly Disagree” to “Strongly Agree.” The Headache Management Self-Efficacy Scale has demonstrated excellent internal consistency, ($\alpha = .90$) (French et al., 2000). High scores on the Headache Management Self-Efficacy Scale have been associated with the use of positive psychological coping strategies ($r = .54$).

*Perceived Access to Medication.*

Perceived access to prescription headache medication was measured using the following item: “I have access to the amount of prescription acute medication I need to
effectively manage my headaches.” Responses were coded on a 7-point Likert-type scale, ranging from “Strongly Disagree” to “Strongly Agree.”

*Acute Medication Outcome Expectancies*

Outcome expectancies for acute headache medications were measured using two items: “Taking my acute headache medication can stop, or reduce, the pain of my headache,” and, “Taking my acute headache medication can reduce how often I get headaches.” Responses were coded on a 7-point Likert-type scale, ranging from “Strongly Disagree” to “Strongly Agree.” These items are consistent with the construct of outcome expectancies as described by Bandura (Bandura, 1997) and modeled after items in the Outcome Expectations for Osteoporosis Medication Adherence measure (Resnick et al., 2003).

*Measures Administered Prior to the AMSE-H.*

*Headache Specific Locus of Control.*

The Headache Specific Locus of Control Scale (Martin et al., 1990) is a self-report, 33-item questionnaire designed to measure people with headache’ beliefs regarding who or what primarily influences headache occurrence and course. The most proximal administration of the Headache Specific Locus of Control was chosen for this study. Two subscales examining distinct locus of control beliefs were utilized in the current study: Internal (e.g., “My actions influence whether or not I have headaches”) and Chance (e.g., “My headaches are beyond all control”). Responses were coded on a 5-point Likert type scale and range from “Strongly Disagree” to “Strongly Agree.” The Internal subscale was coded such that higher scores indicated lower internal locus of
control. Subscales have demonstrated good internal consistency ($\alpha_s = .80-.89$) (Martin et al., 1990; VandeCreek & O'Donnell, 1992) and adequate three-week test-retest reliability ($rs = .72-.78$) (Martin et al., 1990). Higher scores on the Internal subscale have been related to a preference for self-regulation treatments ($r = .21$), while higher scores on the Chance subscale have been associated with higher catastrophizing ($r = .44$) (Martin et al., 1990).

*Migraine Specific Quality of Life Questionnaire.*

The Migraine Specific Quality of Life Questionnaire (Jhingran et al., 1998) is a self-report, 16-item questionnaire designed to assess migraine-related quality of life. The most proximal administration of the Migraine Specific Quality of Life Questionnaire was chosen for this study. Three subscales comprise the Migraine Specific Quality of Life Questionnaire: Role Function-Restrictive, Role Function-Preventative, and Emotion Function. Items include “In the past 4 weeks, how often have migraines interfered with how well you dealt with family, friends, and others who are close to you?” (Role-Function-Restrictive), “In the past 4 weeks, how often have you had to cancel work or daily activities because you had a migraine?” (Role Function-Preventative), and “In the past 4 weeks how often have you felt fed up or frustrated because of your migraines?” (Emotional Function). Responses were coded on a 6-point Likert type scale ranging from “None of the time” to “All of the time”. Each subscale has demonstrated adequate reliability ($\alpha_s = .79-.85$; Jhingran et al., 1998). The subscales have demonstrated significant correlations with each other ($rs = .84-.89$; Jhingran et al., 1998).
Daily Headache Diary.

Participants completed an online daily headache diary for at least 30 days. Only the final 30 days of headache diary recordings were used in the current study. Participants recorded preventative medication use daily. Days on which a participant recorded a headache are described as headache days. Headache severity was assessed using a 1-3 (MedUse) or 1-10 (MiSelf) scale. Average headache severity was calculated by transforming the 1-10 scale into a 1-3 scale and averaging over headache days. Migraine days were coded as days on which a participant recorded a headache characterized by moderate to severe pain and at least one of the following associated symptoms were recorded: nausea, vomiting, or both photo- and phonophobia (Headache Classification Subcommittee of the International Headache Society, 2004), and days on which a participant took a migraine-specific medication.

Participants recorded acute medication use for each headache day. Although participants could record the use of a variety of types of acute medications, only migraine-specific acute medications (defined as triptans and ergots) were recorded with sufficient frequency to be used in the medication use analyses. Only participants who reported using a migraine-specific medication at least once during the 30 day diary were included in the following analyses (n = 155). Migraine-specific medication/migraine day was defined as the percentage of migraine days during which a migraine-specific medication was the first medication used to treat the migraine. No medication/migraine day was defined as the percentage of migraine days during which no acute medication was used. Non-migraine-specific medication/migraine day was defined as the percentage
of migraine days during which a pain medication (such as an aspirin-acetaminophen-caffeine combination), rather than a migraine-specific medication, was the first medication used to treat the migraine. Participants were coded as overusers of migraine-specific medication if they reported taking a triptan or ergot on more than 9 (more stringent criterion) or 13 (less stringent criterion) days/30 days (Silberstein, 2000).

**Analyses.**

**Factor Structure.**

A principal components exploratory factor analysis examined the factor structure of the final 7 items of the AMSE-H. The model retained factors with eigenvalues of one or greater. Factor structure was determined using an oblique rotation (promax) because factors were expected to be nonorthogonal (Nunnally & Bernstein, 1994).

**Reliability.**

Internal consistency was examined using Cronbach’s α. One-week test-retest reliability was examined using a Pearson correlation coefficient on data from the MedUse participants.

**Validity.**

Pearson correlation coefficients and t-tests were used to examine the relationships of the AMSE-H with other variables are theoretically related to self-efficacy for adherence with acute headache medication. Relationships between specific items and theoretically-related variables were examined because they are intended to be of equal or greater clinical value than the total score.
Measures of several theoretically relevant constructs were administered concurrently with the AMSE-H, including the Headache Management Self-Efficacy, perceived access to acute medication, and outcome expectancies for acute headache medication. Higher Headache Management Self-Efficacy scores were postulated to be associated with higher AMSE-H scores because both measures assess confidence to perform behaviors in similar domains (optimal behaviors for use of acute headache medication or nondrug headache management skills). Self-efficacy is also postulated to be domain-specific, therefore the AMSE-H, but not the Headache Management Self-Efficacy, is expected to demonstrate relationships with beliefs specific to use of acute headache medication. Self-efficacy is postulated to be negatively associated with perceived barriers to the behaviors in question, therefore higher perceived access to medication was postulated to be associated with higher self-efficacy for behaviors required for optimal use of acute headache medications. Social Cognitive Theory suggests that successful performance of behaviors required for optimal use of acute headache medication is predicted by the combination of an individual’s self-efficacy and outcome expectancy, the belief that engaging in behaviors required for optimal use of acute medications will actually influence headache symptoms (Bandura, 1997). Although an individual person with headache may have high self-efficacy and low outcome expectancies (“I could take my acute medication optimally, but that will not change my headaches”), it is more common for people with headache with high self-efficacy to also endorse high outcome expectancy beliefs (“I can take my acute medication optimally, and that can decrease my headache severity and frequency”). Thus, Social Cognitive
Theory predicts a small to moderate positive relationship between self-efficacy and outcome expectancies. Indeed, previous studies have demonstrated that higher outcome expectancies tend to be associated with higher self-efficacy for both behavioral management of chronic disease (Kakudate, Morita, Fukuhara, Sugai, Nagayama, Isogai, et al., 2011; Williams, Anderson, & Winett, 2005) and consistent use of daily medication (Erlen, Cha, Kim, Caruthers, & Sereika, 2010; Resnick et al., 2003). Relationships were expected to be positive in direction (convergent validity), but moderate in magnitude (discriminant validity).

All other validity measures were administered an average of 5.5 months (SD = 2.8 months, Range >1 – 15 months) prior to the AMSE-H, including the proportion of migraines for which participants used migraine-specific medication, medication overuse, and Headache Specific Locus of Control. Higher scores on the AMSE-H were expected to be associated with higher proportion of migraines for which participants used migraine-specific medication, and lower rates of medication overuse. As with outcome expectancies, Social Cognitive Theory postulates that self-efficacy will demonstrate small to moderate relationships with internal locus of control (the belief that one’s behaviors influence headaches) and chance locus of control (the belief that only chance or fate can influence headache), in a positive and negative direction, respectively (Bandura, 1997; Luszczynska & Schwarzer, 2005). Indeed, previous studies have demonstrated that higher internal locus of control (the belief that one’s behaviors influence headaches) and lower chance locus of control (belief that only chance or fate can influence headache), tend to be associated with higher self-efficacy for both
behavioral management of headache (French et al., 2000) and consistent use of daily medication (Lynam, Catley, Goggin, Rabinowitz, Gerkovich, & Williams, 2009).

Although relationships between the AMSE-H and these measures could provide evidence for validity of the AMSE-H, the long period of time between administration of these measures and the AMSE-H could dilute any relationship. Relationships between the AMSE-H other headache diary variables that were not necessarily expected to be associated with the AMSE-H were also examined, including headache and migraine days, headache severity, preventative medication use, and migraine-specific quality of life.

PASW 18.0 was used in all analyses.

Results

AMSE-H Descriptive Statistics.

The mean AMSE-H score was 38.9 with a standard deviation of 6.2 (possible scores ranged from 7 – 49, with higher scores indicating higher self-efficacy). The distribution of AMSE-H scores was negatively skewed, skewness = -.80, standard error = .19.

Factor Structure.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .83, indicating that sampling was adequate to perform a factor analysis. An exploratory principal components factor analysis identified two factors with eigenvalues above 1. These factors explained 63.6% of the variance in the AMSE-H. Alternate extractions (e.g., maximum likelihood) and rotations (e.g., varimax) yielded similar results. Factor loadings are presented in Table 4. Cross-Episode items (eigenvalue = 3.4) comprise the first factor, including the
general acute medication-self efficacy item, the two barriers, and the single general acute medication-taking behavior. Episode-Specific items (eigenvalue = 1.0) comprise the second factor, which includes three episode-specific behaviors. These two factors demonstrated a correlation coefficient of .52.

Table 4.  
*Factor Loading Matrix for the AMSE-H*

<table>
<thead>
<tr>
<th>Item</th>
<th>Cross-Episode</th>
<th>Episode-Specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel confident that I can…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1…tell early on, while the pain is still mild, if I am having a</td>
<td>.26</td>
<td>.85</td>
</tr>
<tr>
<td>migraine or another type of headache.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2…take my acute headache medication at the earliest sign of a</td>
<td>.61</td>
<td>.76</td>
</tr>
<tr>
<td>headache.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3…figure out which type(s) of medication to take when I have a</td>
<td>.52</td>
<td>.80</td>
</tr>
<tr>
<td>headache.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4…limit how often I take acute headache medication to avoid</td>
<td>.62</td>
<td>.25</td>
</tr>
<tr>
<td>having more headaches.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5…take acute headache medication effectively even when I have a lot</td>
<td>.70</td>
<td>.37</td>
</tr>
<tr>
<td>of responsibilities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6…take acute headache medication effectively even when my headaches</td>
<td>.88</td>
<td>.40</td>
</tr>
<tr>
<td>are very frequent.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7…take acute headache medication effectively in general.</td>
<td>.85</td>
<td>.55</td>
</tr>
</tbody>
</table>
Reliability.

Chronbach’s $\alpha = .80$, indicating that the scale demonstrated adequate internal consistency. One-week rest-retest reliability was low ($r = .66$, $p < .001$), indicating responses to AMSE-H items may vary across time.

Table 5. 
Means and Standard Deviations of Validity Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Psychosocial Measures Administered</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Concurrently with the AMSE-H</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome Expectancy – Severity</td>
<td>6.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Outcome Expectancy – Frequency</td>
<td>3.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Perceived access to acute medication</td>
<td>5.1</td>
<td>1.7</td>
</tr>
<tr>
<td>HMSE</td>
<td>108.7</td>
<td>12.9</td>
</tr>
<tr>
<td><strong>Psychosocial Measures Administered</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prior to the AMSE-H</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Care Professionals HSLC</td>
<td>30.8</td>
<td>5.6</td>
</tr>
<tr>
<td>Chance HSLC</td>
<td>34.4</td>
<td>4.8</td>
</tr>
<tr>
<td>Internal HSLC</td>
<td>36.3</td>
<td>4.7</td>
</tr>
<tr>
<td>MSQL</td>
<td>182.7</td>
<td>59.7</td>
</tr>
<tr>
<td><strong>Daily Diary Medication Use Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Administered Prior to the AMSE-H</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSM/Migraine Day</td>
<td>.80</td>
<td>.28</td>
</tr>
<tr>
<td>Non-MSM/Migraine Day</td>
<td>.13</td>
<td>.26</td>
</tr>
<tr>
<td>No Medication/Migraine Day</td>
<td>.07</td>
<td>.17</td>
</tr>
</tbody>
</table>

*Note.* Outcome expectancies and perceived access to acute medication were single-item measures with response options ranging from 1-7; HMSE = Headache Management Self-Efficacy; HSLC = Headache Specific Locus of Control; MSQL = Migraine Specific Quality of Life; MSM/Migraine Day = proportion of migraine days on which participants recorded a migraine-specific medication as the first acute medication; Non-MSM/Migraine Day = proportion of migraine days on which participants recorded a non-migraine-specific medication as the first acute medication; No Medication/Migraine Day = proportion of migraine days on which participants recorded no acute medication use.
Construct Validity.

Means and standard deviations of all other continuous variables are presented in Table 5. All correlations are presented in Tables 6-9. All validity analyses were run using both raw scores and scores squared to correct for skewness (Mean squared AMSE-H score = 1555.0, SD = 456.6, skewness = -.29, skewness standard error = .19). All correlations run with the AMSE-H scores corrected for skewness differed by less than .05 from correlations run with raw AMSE-H scores. One result that was marginally significant with the raw AMSE-H scoring (the relationship between AMSE-H and Chance Locus of Control) reached significance with corrected AMSE-H scoring, but with an increase of only .01 in the magnitude of the correlation. Because correction for skewness had only trivial effects, only results using the uncorrected scores are presented below.

Measures Administered Concurrently with the AMSE-H.

The AMSE-H demonstrated significant relationships in the expected directions with all psychosocial measure administered concurrently with the AMSE-H (Table 6). The magnitude of these correlations was small-medium, suggesting that the constructs are related but not identical. In the subset of participants (n = 58) who had participated in the MiSelf study, higher scores on the AMSE-H were associated with higher scores on the Headache Management Self-Efficacy, a measure of confidence in one’s ability to manage one’s headache using behavioral methods such as relaxation. It should be noted that higher scores on the AMSE-H were associated with expectancies that acute medication can reduce headache severity and frequency, whereas the Headache Management Self-
Efficacy was unrelated to outcome expectancies for acute headache medication. This indicates that the AMSE-H is more highly associated with other beliefs pertaining specifically to acute headache medication than a conceptually similar measure (Table 6). Higher scores on the AMSE-H were also associated with greater perceived access to medication. In addition, higher scores on the individual item, “I feel confident that I can figure out which type(s) of medication to take when I have a headache,” was associated with higher perceived access to medication \( (r = .31, p < .001) \).

Table 6.
Correlations between AMSE-H and Psychosocial Measures Administered Concurrently with the AMSE-H

<table>
<thead>
<tr>
<th>AMSE-H</th>
<th>OE Severity (n = 161)</th>
<th>OE Frequency (n = 161)</th>
<th>Perceived Access (n = 161)</th>
<th>HMSE (n = 58)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.29***</td>
<td>.22**</td>
<td>.28***</td>
<td>.28*</td>
<td></td>
</tr>
<tr>
<td>OE Severity</td>
<td>1.0</td>
<td>.01</td>
<td>.24**</td>
<td>.14</td>
</tr>
<tr>
<td>OE Frequency</td>
<td>1.0</td>
<td>.10</td>
<td>.15</td>
<td>.32*</td>
</tr>
<tr>
<td>Perceived Access</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMSE</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001; AMSE-H = Acute Medication Self-Efficacy – Headache; OE = Outcome Expectancy; HMSE = Headache Management Self-Efficacy.

**Measures Administered Prior to the AMSE-H.**

The following measures were administered an average of 5.5 months (SD = 2.8 months, Range >1 – 15 months) prior to the AMSE-H. Controlling for the amount of time that passed between administration of each of the following measures and the AMSE-H by including months between administrations as a covariate in linear regressions did not alter any of the following results.
Psychosocial Measures Administered Prior to the AMSE-H.

Higher scores on the AMSE-H were marginally associated \((p < .06)\) with lower scores on the Chance subscale (Table 7). No relationship was observed between the AMSE-H and the Internal subscale of the Headache Specific Locus of Control, the Migraine Specific Quality of Life Questionnaire total score, or any of its three subscales \((ps > .20)\).

Table 7. Correlations between AMSE-H and Psychosocial Measures Administered Prior to the AMSE-H

<table>
<thead>
<tr>
<th></th>
<th>Chance HSLC</th>
<th>Internal HSLC</th>
<th>MSLQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSE-H</td>
<td>-.15†</td>
<td>.10</td>
<td>-.08</td>
</tr>
<tr>
<td>Chance HSLC</td>
<td>1.0</td>
<td>-.69***</td>
<td>-.33***</td>
</tr>
<tr>
<td>Internal HSLC</td>
<td>1.0</td>
<td>1.0</td>
<td>.30***</td>
</tr>
<tr>
<td>MSLQ</td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

†\(p < .06, *p < .05, **p < .01, ***p < .001\); AMSE-H = Acute Medication Self-Efficacy – Headache; HSLC = Headache Specific Locus of Control; HCP = Health Care Professional; MSLQ = Migraine Specific Quality of Life.

Daily Diary Measures Administered Prior to the AMSE-H.

The AMSE-H was not associated with the proportion of migraine days on which the first acute medication used to treat a migraine was migraine-specific medication or a pain medication that was not migraine specific, or the proportion of migraine days on which no acute medication was taken (Table 8). None of the AMSE-H items pertaining to specific behaviors required for optimal use of acute headache medications (Items 1-4) was associated with any of these three daily diary measures, \(ps > .10\).
Table 8.

**Correlations between AMSE- H and Daily Diary Medication Use Measures Administered Prior to the AMSE-H**

<table>
<thead>
<tr>
<th></th>
<th>MSM/ Migraine Day</th>
<th>Non-MSM/ Migraine Day</th>
<th>No Medication/ Migraine Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSE-H</td>
<td>-.05</td>
<td>.08</td>
<td>-.03</td>
</tr>
<tr>
<td>MSM/Migraine Day</td>
<td>1.0</td>
<td>-.78***</td>
<td>-.48***</td>
</tr>
<tr>
<td>Non-MSM/Migraine Day</td>
<td>1.0</td>
<td></td>
<td>-.17*</td>
</tr>
<tr>
<td>No medication/Migraine Day</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001. AMSE-H = Acute Medication Self-Efficacy – Headache; MSM/Migraine Day = proportion of migraine days on which participants recorded a migraine-specific medication as the first acute medication; Non-MSM/Migraine Day = proportion of migraine days on which participants recorded a non-migraine-specific medication as the first acute medication; No Medication/Migraine Day = proportion of migraine days on which participants recorded no acute medication use.

Medication overuse was calculated with a stringent criterion of >9 days of migraine-specific medication use per month (Silberstein, 2000; Overuse n = 107, No Overuse n = 54) and a lenient, more typical clinical criterion of >13 days of migraine-specific medication use per month (Overuse n = 139, No Overuse n = 22). The AMSE-H was also not associated with medication overuse [>9 days t(155) = -.63, p = .53; >13 days t (155) = -.42, p = .68], nor was the item, “I feel confident that I can limit how often I take acute headache medication to avoid having more headaches,” [>9 days t(155) = -.08, p = .93; >13 days t (155) = -.84, p = .40].

The AMSE-H was not associated with headache days, migraine days, or average headache severity (Table 9). Preventative medication use was examined in participants who recorded taking preventative medication on at least one day (n = 142). The AMSE-H was not associated with preventative medication use (r = .002, p = .98).
Table 9. 
*Correlations between AMSE-H and Daily Diary Headache Measures Administered Prior to the AMSE-H*

<table>
<thead>
<tr>
<th></th>
<th>Headache Days</th>
<th>Migraine Days</th>
<th>Headache Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSE-H</td>
<td>-.02</td>
<td>-.01</td>
<td>-.06</td>
</tr>
<tr>
<td>Headache Days†</td>
<td>1.0</td>
<td>.86***</td>
<td>-.17*</td>
</tr>
<tr>
<td>Migraine Days†</td>
<td></td>
<td>1.0</td>
<td>-.17*</td>
</tr>
<tr>
<td>Headache Severity</td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001. †Headache and migraine days per 30 days; AMSE-H = Acute Medication Self-Efficacy – Headache.
Discussion

Interviews and Item Generation

Qualitative interviews identified 8 behaviors required for optimal use of acute headache medications and 10 barriers to performing these behaviors (Table 3, Figure 2). As expected, behaviors required for optimal use of medication, and barriers to performing these behaviors, proved to be more numerous and more complex than the behaviors and barriers previously identified for the use of fixed-schedule medication. Qualitative interviews revealed that monitoring multiple dynamically changing variables (e.g., symptoms, circumstances) is necessary to make in-the-moment decisions required for optimal use of acute headache medication. For example, successful limitation of the frequency of acute headache medication use requires monitoring information about dynamically changing headache symptoms and any previous use of acute headache medications. Moreover, a number of commonly occurring barriers to performance of behaviors required for optimal use of acute headache medication have the potential to disrupt the management of headaches with acute medication. For example, difficulty recognizing which type of headache is occurring can prevent individuals choosing the most effective acute medication and the most appropriate route of administration, as well as prevent the individual from timing acute medication use appropriately. This contrasts with adherence with fixed-schedule medications, which is governed by few variables that remain stable for extended periods (e.g., time of day, dose).

The behaviors and barriers revealed in qualitative interviews informed the construction of the Acute Medication Self-Efficacy (AMSE-H). The AMSE-H was
designed to assess self-efficacy, or confidence in one’s ability to perform behaviors required for optimal use of acute headache medication. Content validity, the extent to which scale items accurately reflect the intended construct, was guided by Social Cognitive Theory (Bandura, 1997). Items were intentionally framed in terms of confidence in one’s ability to perform specific behaviors required for optimal use of acute headache medications. We were careful to avoid writing items that assess related, but distinct constructs such as intent to engage in a behavior or perceived difficulty of engaging in a behavior, a problem identified with other measures of self-efficacy (Forsyth & Carey, 1998). Behavior specificity is another key characteristic of self-efficacy (Bandura, 1997, 2006), therefore multiple specific behaviors required for optimal use of acute medications were included in the AMSE-H. The AMSE-H also took into account gradations of difficulty in performing behaviors required for optimal use of acute headache medications through the use of items assessing confidence to perform these behaviors in the presence of common barriers (Bandura, 2006).

**Item Selection and Scale Format**

The AMSE-H was intended for use in clinical settings. Social validity, or the perceived acceptability, relevance, and usefulness of the measure by health care providers, requires that measures designed for use in clinical settings be easy for the health care provider to score, and for the final meaning of the score to be self-evident (Stewart, Lipton, Dowson, & Sawyer, 2001). Thus, the AMSE-H included a small number of items (7 in the final version), and a relatively small number of response
options (7 response options) that are easily interpreted (higher scores indicate higher self-efficacy).

Because the number of behaviors and barriers identified in interviews exceeded the ideal range of number of items (≤10) required for social validity of the measure, a smaller number of items were selected using several different criteria across Studies 1 and 2. In Study 1, social validity, the extent to which the measure is acceptable, relevant and useful to the intended audience, guided efforts to generate and select items during qualitative interviews. Items were included only if people with headache and health care providers perceived assessment of self-efficacy for the behavior, or self-efficacy for coping with the barrier, to be relevant to their own headache management or clinical practice, and therefore useful to assess in the AMSE-H. For example, although keeping medication available is key to optimal use of acute headache medication, most participants reported that this behavior was not particularly problematic and did not perceive assessment of self-efficacy for this behavior as adding information relevant to their headache management or clinical practice. In Study 2, items retained in the scale assessed a breadth of behaviors required for optimal use of acute headache medication and barriers to these behaviors. Individual items each exhibited a range of participant responses and were at least moderately interrelated. Seven items were included in the final scale to ensure adequate internal consistency and adequate breadth of content coverage.
**Factor Structure**

An exploratory principal components factor analysis supported a two-factor model for the AMSE-H in this study. The first factor consisted of cross-episode items (one behavior, two barriers, and the item assessing overall self-efficacy for optimal use of acute headache medication). The second factor consisted of three items that assessed episode-specific behaviors. These two factors correspond to the two categories of behaviors that emerged from the qualitative interview; however, substantial cross-loading hinders clear interpretation of these factors. The overall self-efficacy item exhibited a moderate cross-loading on the second factor. This is not surprising because an association with that item was one criterion for the inclusion of items in the scale. Additionally, two items primarily loading on Factor 2 also loaded on Factor 1. Because of cross-loading items and the small number of items available for separate factors, we would not encourage the clinical use or the interpretation of factor scores. Any use of these factors should await additional data from independent samples.

**Reliability**

The current study provided only limited evidence for the reliability of the AMSE-H. The AMSE-H demonstrated good internal consistency ($\alpha = .80$), indicating that individual scale items were related. However, the AMSE-H total score exhibited low stability, or test-retest reliability, over a one week period ($r = .66$), indicating that AMSE-H scores were not highly stable. The majority (97.5%) of participants recorded at least 4 headache days per month (approximately 1 per week). Thus it is likely that most participants experienced at least one headache during the test-retest period. The
successful (or unsuccessful) performance of behaviors required for optimal use of acute headache medications in the test-retest period would be expected to influence participants’ self-efficacy, thus altering responses on the AMSE-H during the rest-retest period.

**Validity**

The AMSE-H exhibited theoretically postulated relationships with psychosocial variables measured concurrently with the AMSE-H. Social Cognitive Theory predicts that self-efficacy for similar domains of behaviors will be related. As expected, higher AMSE-H scores were associated with higher self-efficacy for behavioral headache management skills. Further, AMSE-H scores, but not self-efficacy for behavioral headache management, were positively associated with acute headache medication outcome expectancies, expectations that acute medications are effective to reduce headache severity and frequency. This finding is consistent with the postulated domain specificity in the assessment of self-efficacy: self-efficacy measures for different behavioral domains [e.g., acute medication use and the use of behavioral (non-drug) headache management skills] are postulated to be most strongly associated with beliefs, expectancies and behaviors from the same domain. Social Cognitive Theory also postulates that higher self-efficacy will be associated with lower perceived barriers. Higher scores on the AMSE-H total, and the corresponding AMSE-H item (#3), were associated with higher perceived access to acute headache medication, and thus were negatively associated with perceived barriers to accessing appropriate acute headache medication. Therefore, confidence in one’s ability to perform optimal acute headache
medication-taking behaviors, and specifically confidence in one’s ability to select the most appropriate acute medication for their headaches, was negatively associated with perceived restrictions on access to appropriate acute (primarily migraine-specific) medications. In addition, this finding provides support for the convergent validity of the AMSE-H total score and the relevant scale item.

Measures of locus of control and optimal use of acute headache medication were administered an average of 5.5 months (SD = 2.8 months, Range >1 – 15 months) prior to the AMSE-H. Self-efficacy is postulated to be influenced by feedback about one’s successes (or failures) in performance of behaviors required for optimal use of acute headache medication. In addition, the AMSE-H demonstrated low one-week test-retest reliability in the current sample (in which 97.5% of participants recorded at least 1 headache day per week). Thus, drawing associations between self-efficacy for optimal use of acute headache medication and variables measured up to 15 months previously is problematic when the effect of successful or unsuccessful performance of behaviors required for optimal use of acute headache medications is not taken into account.

Social Cognitive Theory postulates a small to moderate positive relationship between self-efficacy and internal locus of control, and a small to moderate negative relationship between self-efficacy and chance locus of control (Bandura, 1997; Luszczynska & Schwarzer, 2005). In the present study, the negative association between the AMSE-H and chance locus of control was marginally significant (though statistically significant with correction for skewness in AMSE-H scores). No relationship was
detected between the AMSE-H and internal locus of control. Together, these results provide only weak support for the validity of the AMSE-H.

Social Cognitive Theory predicts that, in the presence of positive outcome expectancies, a high internal/low chance locus of control orientation, and few perceived barriers, higher self-efficacy for a behavior will be associated with performance of that behavior. No relationships were observed between the AMSE-H and proportion of migraine days treated with a migraine-specific medication or medication overuse. Thus, these analyses provide no support for the validity of the AMSE-H.

**Study Limitations**

**Scale Construction**

During the “think-aloud” portion of the qualitative interviews, a small number of participants demonstrated inadequate knowledge of behaviors required for optimal use of acute headache medications to provide knowledgeable responses to certain AMSE-H items. This could limit the ability of participants to respond validly to these particular AMSE-H scale items. For example, if a person with headache did not know that taking migraine-specific medications more than three days per week can lead to medication overuse headache, she might report that she has high self-efficacy for appropriately limiting her acute headache medication use to avoid medication overuse headaches, but might interpret “appropriate limitation” of acute headache medication as a significantly higher frequency of dosing than recommended. Even though prescribing physicians typically provide information about appropriate use of acute medications, it is well documented that this information does not assure full understanding of the behaviors...
required for optimal use of acute medications (Cady et al., 2008). Lack of the prerequisite information necessary for some participants to respond validly to scale items is likely a problem with virtually all self-report measures, but may only be revealed with procedures such as the “think aloud” interview used in the current study.

The qualitative interviews reached data saturation well before the final interviews with participants with headache and health care professionals. However, we cannot rule out the possibility that additional qualitative interviews would have revealed either additional optimal acute medication use behaviors or barriers or further modifications of AMSE-H scale items.

**Assessment of Reliability and Validity**

The study sample, the timing of assessments, and the available validity criteria measures proved to have more limitations than had been anticipated. The high frequency of headache days per month [24.8% of participants with 15 or more headache days per month (suggesting chronic headache)], and migraine-specific medication use [66.4% of participants using migraine-specific medication ≥ 15 days/month (suggesting medication overuse headache)] found in the current sample presents obstacles to the assessment of reliability and validity. Many participants likely experienced headaches, and thus were presented with opportunities to use acute headache medication, during the one-week test-retest reliability assessment period. Performance feedback from engaging in the relevant behavior, in this case the experiences of success or failure resulting from opportunities to use acute headache medication, is postulated to be the most powerful determinant of self-efficacy (Bandura, 1997; Miller & Rollnick, 1991). Frequent opportunities to use acute
headache medication, which are predicted to alter self-efficacy and thus AMSE-H scores, may have rendered it difficult to obtain an accurate assessment of test-retest reliability.

Some behaviors required for optimal use of acute headache medications are more challenging to perform when headaches occur very frequently (as in chronic migraine) than when headaches occur less frequently (as in episodic migraine), including optimal timing of acute medication use and limiting of acute medication use. The high prevalence of apparent medication overuse in the current sample further suggests two-thirds or more of participants may have failed to use acute (migraine-specific) medication optimally. While we would hope the AMSE-H could be used effectively with all clinical populations, all clinical populations are not equally useful for assessing the reliability and validity of this measure.

The long period of time (Mean = 5.5 months) between administration of key validity criteria (daily diary recordings of headache activity and acute medication use, and the Headache Specific Locus of Control) and the administration of the AMSE-H may have limited our ability to accurately assess the construct validity of the AMSE-H for these criteria. Neither self-efficacy, nor headache activity and accompanying acute medication use, can be expected to remain static during months of treatment. In fact, the low one-week test-retest reliability demonstrated for the AMSE-H ($r = .66$) confirms that the AMSE-H was not particularly stable even over a relatively short period of time in this sample, and is likely insufficiently stable to demonstrate relationships with criteria measured several months prior to AMSE-H administration.
The daily diary assessment of behaviors required for optimal use of acute headache medication, which were key criteria for the validity of the AMSE-H, may not have accurately assessed this construct. For example, the AMSE-H assessed confidence one is able to optimally time acute medication use early in a migraine episode. However, the daily diary did not assess the time from head pain onset to the use of acute medication. The daily diary also did not obtain information regarding the contextual information participants used to make decisions regarding acute headache medication use, such as the symptoms and early warning signs they used to self-diagnose the headache as a migraine or tension-type headache (necessary for determining the type of acute headache medication to use). This information is essential to determine whether a person with headache used available information to make the most appropriate decisions regarding the optimal use of acute headache medications.

**Future Directions**

Daily diary may not be the best methodology for assessing key behaviors required for optimal use of acute headache medications. Rather, proximal retrospective structured interviews (i.e., within 24 hours of an attack) may provide a more accurate method of assessing the performance of behaviors required for optimal use of acute headache medications. These interviews might use a procedure similar to the “think-aloud” procedure utilized in Study 1, such that people with headache verbalize their thought process regarding acute headache medication use for their most recent headache episodes. These structured interviews would provide systematic information regarding the strategies that each person with headache uses to make decisions about acute headache
medication use, providing researchers with the ability to code these strategies as optimal or suboptimal more accurately than coding decontextualized information gained from a daily headache diary. For example, a person with migraine may choose not to treat a headache with migraine-specific medication for diverse reasons, some of which represent optimal behaviors (she did not think the headache was a migraine, or she has already used migraine-specific medication on three days during the past week), others of which represent suboptimal behaviors (she misidentified her migraine as a tension-type headache, or had failed to keep migraine-specific medication available). Thus, structured interviews may permit more accurate categorization of acute headache medication use than daily diaries.

Nunnally and Bernstein have described validity as “whether the instrument is useful” (pg. 86; Nunnally & Bernstein, 1994). Thus, further examination of the validity of the AMSE-H should expand focus to include the utility of the AMSE-H by evaluating whether people with headache use acute headache medication more effectively if their health care providers use the AMSE-H to address deficiencies in self-efficacy for optimal use of acute headache medication. During Study 1 interviews, health care providers provided qualitative feedback that the scale format was relatively easy to score and interpret, and subjective impressions that final items selected would be useful in their clinical practices; however, the current study provided no empirical examination of the clinical utility of the AMSE-H. Future studies should examine whether the AMSE-H can be successfully integrated into clinical practice, and whether information provided by the AMSE-H can be used to successfully modify behaviors required for optimal use of acute


headache medication. Additionally, because we intended individual items of the AMSE-H to be used by health care providers to identify specific behaviors which headache sufferers feel efficacious or inefficacious to perform, future studies should examine relationships between individual items and the performance of the specific behaviors associated with each item.

Finally, future research should incorporate well-validated measures of theoretically relevant constructs, including self-efficacy, in the development of interventions to modify behaviors required for optimal use of acute headache medication. Qualitative interviews from the current study reinforced conclusions from previous studies (Cady et al., 2008; Foley et al., 2005; Gallagher & Kunkel, 2003; Malik et al., 2006; Ottervanger et al., 1996; Packard & O'Connell, 1986): suboptimal use of acute headache medications is prevalent, thus health care professionals need tools to identify and intervene effectively with headache patients who are not successfully performing behaviors required for optimal use of acute headache medication. In the qualitative interviews, people with headache reported engaging in many behaviors likely to result in suboptimal long-term headache management, including regularly using over-the-counter medications, dividing, chewing, crushing and snorting pills, or regularly taking pills with alcohol without consulting their health care provider. Measures of theoretically relevant psychosocial constructs, such as the AMSE-H, could provide a starting point for brief interventions targeted to modify specific problematic behaviors required for optimal use of acute headache medications.
References


Development of a pictographic visual analogue scale. *Health Education Research, 20*(1), 24-35.


Appendix A. Brief Description of Acute Headache Medications

Acute pain medications are non-specific pharmacological agents used to treat pain of all types, including headache. These include analgesics and non-steroidal anti-inflammatory medication, such as aspirin and acetaminophen. For tension-type headaches, and for migraines of mild to moderate severity, pain medications are the primary acute pharmacological agents (Hargreaves, Lines, Rapoport, Ho, & Sheftell, 2009). “Rescue medication” refers to acute pain medication used during the height of a headache attack to treat particularly severe headaches that do not respond to other acute headache medications. Corticosteroids, such as hydrocortisone, have demonstrated efficacy as rescue medications (Silberstein, 2000); opioids are also occasionally used as rescue medications (Silberstein, Lipton, & Goadsby, 2002).

Migraine-specific medications are not pain medications; rather, they act on the neurological mechanisms distinctly involved in migraine headache, such as dysregulation and sensitization of the trigeminal system and vasodilation in the meningeal layers. Migraine-specific medications are recommended for patients with severe migraines, or patients for whom non-specific acute pain medications are insufficient (Malik et al., 2006; Silberstein, 2000). Triptans, a class of serotonin agonists that selectively bind to the serotonin-1 receptors (Goadsby, Lipton, & Ferrari, 2002), are the most frequently prescribed migraine-specific acute medication in headache clinics (Malik et al., 2006; Silberstein, 2000). Triptans have demonstrated efficacy for migraine treatment in numerous randomized clinical trials (Ferrari, Goadsby, Roon, & Lipton, 2002; Hargreaves et al., 2009).
Adjunctive medications may also be used to manage headache symptoms, depending on the headache sufferer’s symptom profile. For example, dopamine antagonists are often used to treat the nausea associated with migraine, and appear to have some therapeutic value for migraine separate from their anti-emetic effects (Silberstein, 2000).
Appendix B. Brief Literature Review on Adherence with Acute Headache Medication

Research examining adherence with acute medications is limited. Available research indicates that poor adherence with acute medications is prevalent in headache disorders (Rains, Lipchik, & Penzien, 2006). One pharmacy utilization study that examined prescription filling data for 1,498 individuals who filled at least one triptan prescription, found that more than half of the participants (56.1%) purchased triptans only once within a 6-18 month period (Ifergane, Wirguin, & Shvartzman, 2006). These results indicate that a substantial proportion of migraine sufferers who are prescribed migraine-specific acute medication do not fill the prescription consistently. Although prescription filling is an imperfect measurement of adherence with acute medications, and can be influenced by a number of variables such as cost and insurance coverage, headache sufferers are unable to perform optimal acute medication-taking behaviors if they do not have the medication on-hand.

Packard and O’Connell (1986) found preliminary evidence that a substantial portion of headache sufferers may not be adherent with their acute headache medications. Interviews with 100 headache sufferers from an outpatient clinic revealed that approximately half of the participants reported engaging in suboptimal acute medication-taking behaviors, particularly overuse of analgesics ($n = 11$) (Packard & O’Connell, 1986). However, these results are limited by the use of unstructured interviews and using criteria not described in the paper to determine whether participants adhering with their acute headache medications. One large ($N = 952$) retrospective survey measured
medication overuse behaviors by examining number of migraine-specific medications (triptans) migraine sufferers reported taking in one month (Ottervanger et al., 1996). Results indicated that the majority of participants (75%) reported using triptans one to ten times per month. However, a small minority of participants (4%) reported using triptans daily, or more than ten times each week, putting them at risk for medication overuse headache. Although this study is limited by its use of retrospective self-report, this evidence indicates that medication overuse may be problematic in a small proportion of headache sufferers.

More recent studies have found that 40-50% of migraine sufferers retrospectively report delaying taking their acute migraine medication during migraine episodes (Foley et al., 2005; Gallagher & Kunkel, 2003; Malik et al., 2006). Gallagher and Kunkel (2003) surveyed 1,160 migraine-sufferers from the United States population who reported using prescription migraine medication. The survey consisted of 45 questions, completed retrospectively, regarding specific migraine medication-taking behaviors. On average, participants reported using prescription acute headache medication for half of their migraines; of these migraines, participants reported taking the medication early in the headache episode 60% of the time (Gallagher & Kunkel, 2003). Another survey study asked 109 migraine sufferers from a headache clinic to recall the medication-taking behaviors utilized during their most recent migraine episode (Malik et al., 2006). This study found that migraine-specific acute medications (triptans) were the most commonly used acute headache medications in a clinical population. However, many participants reported waiting at least one hour after the onset of migraine symptoms before taking a
triptan ($M = 1.6$ hours, $SD = 2.4$ hours), with 64.1% of participants waiting for severe
head pain prior to taking a triptan (Malik et al., 2006). Thus, a substantial proportion of
migraine sufferers report taking acute headache medications beyond the point in time
when the migraine-specific acute medication is most likely to be effective. However, the
retrospective self-report measures used in these studies are limited by inaccurate recall of
medication-taking behaviors used during past headache episodes. Additionally, these
studies primarily focus on a single medication-taking behavior, taking acute headache
medication early in the course of the headache, rather than examining a wider range of
optimal acute headache medication-taking behaviors.

One study utilized both retrospective self-report and a headache diary for a single
headache to examine adherence with acute headache medications. Foley, Cady and
Martin (2005) recruited 728 migraine sufferers from pharmacies. In response to a
retrospective survey question, approximately half of the participants reported that they
had avoided or delayed taking an acute migraine medication after experiencing initial
migraine symptoms. However, the single-headache diary (which participants completed
within 24 hours of a headache treated with a prescription acute headache medication)
indicated that only 15% of migraine sufferers recorded taking a prescription acute
migraine medication at the first signs of a migraine episode (Foley et al., 2005). Another
study examined the effect of a headache medication educational intervention on timing of
acute headache medication-taking, measured by a single-headache diary. Cady and
colleagues (2008) recruited migraine sufferers from primary care clinics and randomly
assigned participants to one of four groups: a) educational materials with nurses
reviewing the material and available for questions; b) education materials with nurses reviewing the material; c) educational materials alone; d) no educational materials.

Regardless of group assignment, most participants (46-75%, depending on group) reported taking a prescription acute migraine medication while the pain was moderate, with no significant differences among groups. Thus, delays in taking acute headache medication continue to be problematic following an intervention designed to produce optimal acute medication taking-behaviors.

The above studies are limited because they focus on a single medication-taking behavior out of multiple behaviors that constitute adherence with acute headache medication. Headache diaries that include only one headache may not necessarily yield representative data about a headache sufferer’s acute medication-taking behaviors, which can vary across headache episodes.

One study assessed optimal acute headache medication-taking behaviors using a daily diary (K. A. Holroyd et al., 1989). This study examined the effect of a self-management intervention on optimal acute medication-taking behaviors. Holroyd and colleagues (1989) randomly assigned 34 migraine sufferers to one of two groups: a) acute migraine-specific medication plus self-management training, or b) acute migraine-specific medication alone. Self-management training focused on optimizing acute headache medication-taking behaviors and consisted of one brief face-to-face session with an allied health professional and three follow-up phone calls. Ergotamine was the acute migraine-specific medication used in this study. Ergotamine is an older medication that has greater side effects than the newer triptans. The daily headache diary was taken
for one month prior to self-management training and two months following initiation of self-management training, and included questions about multiple medication-taking behaviors. The primary measurement of optimal medication-taking behavior was “consistency of use,” or the proportion of migraine headaches that participants treated with ergotamine. Insurance companies did not limit ergotamine’s availability to migraine sufferers, so consistency of migraine-specific medication use could be interpreted unambiguously as a measure of optimal medication-taking behavior.

Study results indicate that, during months two and three, participants in the self-management group (Mean proportion of headaches treated with ergotamine = .72, .71, SDs = .34, .38) used migraine-specific medication more consistently than participants in the group that received only migraine-specific medication alone (Mean proportion of headaches treated with ergotamine = .44, .38, SDs = .39, .37) (K. A. Holroyd et al., 1989). With no self-management intervention, migraine sufferers on average treated less than half of their headaches with an acute migraine-specific medication. However, a self-management intervention focused on optimizing acute headache medication-taking behaviors yielded a notable increase in the consistency of migraine-specific medication-taking behaviors. This study is unique because it examined medication-taking behaviors over time, rather than with a single headache episode. However, newer migraine-specific medications (triptans) were not available at the time of this study. The results observed with ergotamine may not generalize to triptans because insurance companies restrict access to triptans, which is a barrier to consistent use of triptans when migraines are frequent.
The limited available research suggests that adherence with acute medications is problematic for many headache sufferers, and raises the possibly that psychological interventions can modify suboptimal acute headache medication-taking behaviors. However, this literature consists of only a handful of studies, and these studies suffer from methodological limitations. Only one study used daily headache diaries collected over a period of time that is sufficiently long to provide a representative sample of medication-taking behaviors.
Appendix C. Quotes from Interview Respondents Illustrating Behaviors Required for Optimal Use of Acute Headache Medication and Barriers to these Behaviors

Cross-Episode Medication-Taking Behaviors

Cross.episode behaviors required for optimal use of acute headache medications occur outside of a specific headache episode, and are foundational for all of the medication-taking behaviors that occur within specific headache episodes.

Available

Interviews revealed that people with headache must keep acute headache medication available at all times a headache may occur (Table 3). Headache sufferers described keeping acute headache medication in multiple locations, such as at the office, in the car, and at home, and keeping acute headache medication on one’s body at all times in a pocket, purse, or backpack.

Communication

People with headache communicate relevant information with health care providers, including headache symptoms, frequency and severity, and problems related to taking acute medication, such as difficulty taking medication optimally and side effects (Table 3). Health care providers described communication as a particularly important behavior because it allows health care providers to make better prescriptive decisions and provide better education about behaviors required for optimal use of acute headache medications.
Limit

People with headache must limit the frequency with which they use acute headache medications (Table 3). Health care providers reported suggesting that their patients limit the frequency of acute headache medication use to 2-4 days per week to avoid medication overuse (or “rebound”) headaches. People with headache reported having difficulty with reducing the frequency of acute headache medication use, particularly the use of over-the-counter medications.

“I tried to down [taking Excedrin in addition to migraine-specific medications] to maybe six to eight a day. I’ve been on it for ten years. So, um yeah, when it got really bad I would chew it or uh take it with alcohol and chew it… It actually, it’s worked pretty well with the migraines but, you know, Excedrin causes a daily headache on top of it.” (Participant #11)

Additionally, people with headache may compromise the effectiveness of acute medications by further limiting acute headache medication use for other reasons, including disliking taking medication, and avoiding side effects, the expense of taking the medication, and fear of “addiction.”

“If I have a headache and if it’s a weekend, cause sometimes that’s happened a couple of times, I just, I would rather not take it because um I would rather naturally live through it.” (Participant #10)

**Episode-Specific Medication-Taking Behaviors**

Episode-specific behaviors required for optimal use of acute headache medications are used to manage a single headache episode.
**Distinguish**

The ability to distinguish between the symptom profiles associated with different types of headaches during a headache episode is foundational to other episode-specific behaviors (**Table 3**). People with headache reported being vigilant for their own distinct patterns of contextual cues, warning signs, and headache symptoms in order to correctly distinguish between different types of headache. Participants with headache reported using varied and idiosyncratic information to distinguish between migraine and other types of headaches, including visual and auditory symptoms, pain quality and location, gastrointestinal symptoms, affect, time of day, time during menstrual cycle, and response to certain types of medications.

“My migraine headaches always start in the left eye and there’s always a certain smell and a certain pain that I get. The tension headaches usually are up the back of my neck and are usually across my forehead and along my jaw.” (Participant #8)

“When I get migraines I don’t experience pain to begin with and I have weird visual symptoms that I can describe as kind of like a black and white kaleidoscope. And so when I feel that coming on I know I need to take something and then the pain will probably, if I don’t take that quick then something bad will happen.” (Participant #17)

**Medication**

If a person with headache determines that the type of headache they are experiencing warrants the use of an acute medication, they must decide which type and
dosage of medication to utilize first (Table 3). People with headache reported using personal symptom profiles and contextual cues to decide which types of medication to take.

“What I do is if it’s a real whiz-bang, really bad one in the middle of the night, which I don’t get much anymore, then I’ll do the injection. Um, typically if I’ve got a migraine um in the morning when I wake up I’ll do the pill.” (Participant #18)

**Timing**

The probability of successful headache treatment is increased by taking acute medication as the most appropriate time for that specific medication during a headache episode (Table 3). This behavior is particularly important for migraine-specific medications intended to abort migraines, which are often not as effective if taken too late during a migraine episode.

“Sometimes um I found with the [migraine-specific medications] it was a timing kind of a thing. I mean if I didn’t take that within a very short period of time of that very first sensation, if I waited too long it wouldn’t do me any good.” (Participant #14)

“You get the photosensitivity and obviously if I’m like in a public place and I’m like, oh I need to put sunglasses on and it’s not even sunny out, then I can tell. But you know, sometimes I don’t have it on me or sometimes it just kind of comes out of nowhere, you know. And if I don’t catch it in time then there’s like, it’s like
there’s a line and if I don’t get it before that then [the medication is] just like not really gonna do much for me.” (Participant #16)

**Alternatives**

People with headache evaluate other available treatment options for the particular cluster of symptoms they are experiencing during a headache episode, including non-pharmacological options such as laying down, avoiding light and sound, using relaxation techniques, eating, or drinking (Table 3). Alternatives were particularly important for people with headache who reported medication overuse headache.

“I’ve been told not to take a lot of over-the-counter medication for the headache so I’m really, I really work really carefully to decipher whether I can work through the pain on my own, be it drinking water, eating something, exercise. I think of all these other ways, like if it happens around lunch I usually you know will try to have a Coke, or try to eat something else, or I think maybe I’m hungry, or I think of everything else I can do because I’m at a point in my life where I can’t just take acute headache medication.” (Participant #8)

**Repeat**

As the headache progresses, people with headache pay attention to dynamic headache symptoms to determine whether another dose of acute medication is appropriate, and if so, which type of medication to use (Table 3). Decisions about repetition of acute headache medication depend on previous behaviors used during the headache episode. For example, the following headache sufferer described recognizing early symptoms of migraine (distinguish), taking acute headache medication early during
the episode (early) and re-evaluating ongoing symptoms to make decisions regarding additional doses of acute headache medication (repeat):

“I get really, really sensitive and um, I know that if I start getting numb in the tip of my nose, I know that it’s beginning. So I usually, what I usually do is I um, I get 100mg Imitrex and then just break it up and I take 25, 25 at first sign of the headache, hopefully that gets rid of it. [If the headache persists] usually half an hour, forty-five minutes later, I will take probably 50 or 60 mg.” (Participant #3)

**Barriers**

Barriers are psychosocial or situational factors that inhibit performance of behaviors required for optimal use of acute headache medications. Each barrier corresponds to a particular set of behaviors required for optimal use of acute headache medications (see Figure 2).

**Knowledge**

Interviews revealed a lack of knowledge about acute headache medication as a barrier to multiple behaviors required for optimal use of acute headache medications (Figure 2). Participants reported that communication with health care providers could be hindered by a lack of knowledge about relevant information to bring up during a clinical visit, including use of over-the-counter medications, changes in headache symptoms or possible side effects. Lack of knowledge about medication overuse (rebound) headaches and a lack of understanding regarding the potential for medication overuse headache with over-the-counter medications were identified as barriers to limiting acute headache medication use.
“I actually didn’t know about rebound headaches until probably about five or six years ago. So I think that that might have played a part in some of my headaches back then.” (Participant #6)

Distinguishing between migraine and other types of headaches could be hampered by a lack of knowledge about the symptoms specific to migraine and other types of headaches.

“Well, what is the difference between a migraine and a tension-type headache? A lot of the times I think they have the same symptoms…” (Participant #7)

Lack of knowledge about the appropriate use and relative benefits of various prescription and over-the-counter acute medications was a barrier to choosing an optimal acute headache medication, taking medication early during the headache episode, and deciding whether one should repeat the medication dose.

**Forgetting**

Forgetting was the primary barrier described by people with headache for keeping medication available (**Figure 2**). Although some participants with headache expressed surprise that one might fail to keep acute medication available (“To me that seems really strange that people would not take their medicine with them;” Participant #7), others reported forgetting to keep medication available because of an inconsistent or hectic schedule and the need to have medication available in multiple locations.

“I’m really good at forgetting to take medication, to this day. Um, also sometimes if I were going on, just like sleeping over at a friend’s house or something, I wouldn’t always remember to take it with me.” (Participant #15)
Recognition

Some participants reported that they had difficulty recognizing their own symptom profile for migraine (Figure 2), particularly if they did not experience an aura, hampering their ability to distinguish between migraine and other types of headache. Participants also reported that, despite having basic knowledge about symptoms of different headaches, their own symptom profiles seemed to overlap, making it more difficult to recognize the difference between migraine and other types of headache until the apex of the headache episode.

Severity

Interviews revealed that many participants purposefully avoided taking an acute headache medication (particularly prescription medications, or more “powerful” migraine-specific medications) until they were sure that the headache was “bad enough” (Figure 2). This resulted in waiting until the headache moves beyond the mild stage of pain until making a decision regarding acute medication use. This barrier also resulted in people with migraines choosing less effective over-the-counter medications rather than migraine-specific medications or other prescription medications, or choosing to use non-pharmacological strategies alone rather than in combination with acute headache medications.

“I never know when. Like part of my problem of taking it is like I’m never quite sure and like when it’s too, like the headaches bad enough to merit actually taking it.” (Participant #4)
**Side Effects**

As with many types of medication, acute medications taken for headache disorder can have side effects that interfere with daily life. Common side effects of triptans include parasthesias, warm sensations in the head, neck, chest and limbs, dizziness, flushing, and pain or stiffness in the neck (Ferrari et al., 2002). Interviews revealed that concerns about potential side effects were barriers to taking medication early and taking the most effective acute headache medication, which was also often the medication associated with the most disruptive side effects (Figure 2).

“Usually the [prescription] acute medication makes me a bit loopy so I hesitate to take it when I have classes so I usually try to just stall it with the Excedrin migraine and the other stuff.” (Participant #4)

Concerns about side effects also prevented some people with headache from repeating doses of acute headache medication necessary to alleviate head pain, or lead them to choose non-pharmacological alternatives instead of acute medication.

**Effectiveness**

The perception that one’s acute headache medication may be ineffective affects one’s choice of headache medication, can contribute to delaying taking an acute headache medication (e.g., since it is not going to work anyway), and reduces the likelihood that one will repeat a dose of the medication that is judged to be ineffective (Figure 2). People with headache also reported choosing to use non-pharmacological alternatives instead of acute medication if they had doubts about the medication’s effectiveness.
**Constraint**

People with headache may be constrained in the amount of acute headache medication they can keep on-hand because of high cost (i.e., $20/pill) and restrictive monthly limits set by insurance companies (i.e., 6 pills/month) on certain types of acute headache medication, particularly migraine-specific medication (**Figure 2**). Additionally, people with headache are often instructed by health care providers to limit acute headache medication use to avoid medication overuse headaches. Thus, people with very frequent headaches may feel that their access to acute headache medication is constrained in an attempt to limit their frequency of acute headache medication use. Fear that one might not have sufficient acute headache medication can prevent people with migraine from choosing the most effective (but most restricted) acute headache medication, taking acute headache medication at the earliest sign of a headache, or repeating doses of acute headache medication.

“I’m running out by the end of the month and that’s horrible… Sometimes I will wait too long and I think that I do that because I’m afraid of using up all the medicine” (Participant #3)

**Role Conflict**

Role responsibilities, including being an employee, parent, spouse, or caretaker, can serve as barriers to optimal acute headache medication-taking behaviors in several different ways (**Figure 2**). Busyness while engaging in a particularly demanding role can be a barrier to distinguishing between migraine and other types of headache, and being
vigilant for headache symptoms so that one can take an acute headache medication at the earliest sign of a headache.

“If I’m at work and there’s a lot going on sometimes I don’t notice it until all of a sudden there’s this blinding pain.” (Participant #12)

The need to be able to function while engaging in demanding roles (i.e., at work or while caring for children) can encourage overuse of acute headache medications, or the misuse of more “powerful” (migraine-specific) medications even when migraine symptoms warning signs are not present. On the other hand, when one’s acute headache medication is associated with side effects that could inhibit fulfillment of role responsibilities such as teaching a class, discussing a sale with a client, or taking care of one’s children, these role responsibilities may prevent a person with headache from choosing the most effective acute headache medication, taking it early during the course of the headache, or repeating a dose if necessary. A person with headache may also be unable to use non-pharmacological alternatives due to role conflicts (i.e., one cannot remove oneself from a stressful situation while caring for one’s infant).

Social

People with headache do not live in social isolation. Family members, friends and coworkers may hold assumptions about headache disorders that influence a person’s decisions regarding acute headache medication-taking (Figure 2). Interviews revealed that negative social influences, such as a friend for whom a particular over-the-counter medication was more effective than migraine-specific medications, or a boss who perceives medication-taking at work as a sign of weakness, could hamper communication
with health care professionals by minimizing the importance of the health care provider’s recommendations. Additionally, limiting the frequency of acute headache medication use can be hampered by family members who encourage very frequent use of acute headache medications or who minimize the dangers of medication overuse headache with over-the-counter medications. Participants with headache also described choosing less appropriate acute headache medications, or failing to repeat doses, due to family members or coworkers who communicate that using medications to treat headaches infers weakness, or that prescription medications are unhealthy or addictive.

“Even now at work, here I am working with other adults and they have this really archaic idea of what a migraine is. Oh it’s only just a headache, suck it up. What do you mean you’re going home? How’s come you’re in the hospital? Yeah right. They just have no understanding. And you start to feel kind of ashamed. Like am I being a baby about this.” (Participant #9)

**Preference**

Some participants reported a preference to avoid taking prescription medication (Figure 2). These participants reported using various herbal remedies or non-pharmacological strategies to manage their headaches, and holding off on acute headache medication for only the worst headaches, and then using only one dose of acute headache medication. This preference was also a communication barrier, as participants expected that talking to their health care provider about their preferences would not be fruitful.
Appendix D. Quotes from Interview Respondents Illustrating Scale Format Decisions

Elimination of Reverse-Coding

Although reverse-coded items are often included in scales to reduce the possibility of response set, negatively-worded items may measure different underlying traits than positively-worded items (Barnette, 2000; Weems, Onwuegbuzie, & Lustig, 2002). In one measure of self-efficacy, even reverse-coded items worded in a “positive” or direct manner appeared to be measuring a different construct than normally-coded items, which is problematic since both reverse- and normally-coded items purported to measure a single construct (Deemer & Minke, 1999; Guskey & Passaro, 1994). In the present study, all three people with headache who received reverse-coded items reported that they found these items confusing and asked the interviewer for clarification in how to answer the questions:

“So do I just put that I’m not sure? So I put disagree I guess? I am not sure? I don’t like the ‘nots.'” (Participant #2)

“I’m not sure? I disagree don’t I?” (Participant #3)

Regarding item response, two of the three people with headache made mistakes in scoring reverse-coded items, verbally reporting one score, but circling the corresponding opposite response option. Most concerning, one participant actually rated the reverse-coded items correctly, but incorrectly rated the normally-coded items directly following reverse-coded items.
Health care providers interviewed in the current study tended to have a negative view of reverse-coded items, reporting concerns about difficulty comprehending item content for both patients and providers. Additionally, health care providers reported that they would be less likely to compute a total score and less likely to identify problem areas if they had to take into account both the score and the item. Thus, no reverse-coded items were included in the AMSE-H.

Elimination of the term “rebound headache”

Headache sufferers must understand the questions to enhance the probability of valid responding. However, all disorders have certain terms that are disorder-specific. Although these terms may be unclear to individuals who do not suffer from the disorder in question, they are common to those who suffer from the disorder. For that reason, we balanced the needs for specificity and low health literacy while writing the items, including only those headache-specific terms that we deemed necessary to convey an item’s meaning, and that we thought most headache-sufferers would understand (e.g., migraine, nauseated).

Avoidance of medication overuse headache, or “rebound headache,” is the primary reason health care providers instruct headache sufferers to limit how often they take acute headache medications. The term “rebound headache” is used more often in clinical practice, therefore we wrote the following item: “I feel confident that I can limit how often I take acute headache medication to avoid rebound headaches.”

Unfortunately, 5 out of 8 participants were unfamiliar with the term “rebound headache” and expressed confusion about the meaning of the item.
“Avoid rebound headaches (long pause) Um, I’m not…I was under the impression that you got a rebound headache from having migraine for too long” (Participant #4)

“I’m not sure I understand a rebound headache” (Participant #9)

Another participant who was familiar with the term “rebound headache” expressed difficulty initially understanding the item because it had not been a regular part of her conversations with her health care provider.

“I have heard about rebound headaches, it’s been a long time. I don’t know that this particular doctor, who I’ve had for three years, has ever mentioned rebound headaches” (Participant #7)

Because of these difficulties with item comprehension, we chose to write a descriptive item that would avoid the assumption that headache sufferers are familiar with medication overuse, or rebound, headaches: “I feel confident that I can limit how often I take acute headache medication to avoid having more headaches.” Although some participants expressed surprise when they encountered this item, participants were able to understand the item content.

Elimination of the term “tension-type headache”

Similarly, although most headache sufferers understood the term “migraine,” not all headache sufferers were familiar with the term “tension-type headache.” 4 out of 8 headache sufferers expressed confusion when they encountered the term “tension-type headache” in the following items: “I feel confident that I can tell the difference between...
migraine and tension-type headache,” and, “I feel confident that I can tell early on, while the pain is still mild, if I am having a migraine or another type of headache.”

“Um….Tension-type headaches, is that just like, stress, or…?” (Participant #2)

“I guess I don’t know if I’ve really had tension type headaches…I have migraines and what I would consider a regular headache. So, aura with the migraines and then an every day, ok, head hurts, type.” (Participant #5)

“What is the difference other than one is caused by tension and one is caused by something else going on in your head?” (Participant #7)

Additionally, one participant suffered from cluster headaches, therefore the specificity of the previous items would not have included identification of her cluster headaches. For these reasons, the items were revised to read, “I feel confident that I can tell the difference between migraine and other types of headaches,” and, “I feel confident that I can tell early on, while the pain is still mild, if I am having a migraine or another type of headache.” Participants did not demonstrate noticeable difficulty with comprehension of this item.

Response Options

The first three participants with headache interviewed were given 7-point response scales. Although one participant used the entire range of response options, the other two participants used a range of 4-5 response options. Therefore, we attempted to use a 5-point response scale in the following interviews. However, several participants noted that they wanted to be able to respond somewhere in between “strongly agree” and
“slightly agree,” or “strongly disagree” and “slightly disagree.” For that reason, the response options are on a 7-point scale in the final version of the AMSE-H.

Two response wordings were evaluated: strongly disagree to strongly agree, and none of the time to all of the time. Some of the items referred to behaviors that are cross-episode (e.g., keeping one’s medication available), whereas others referred to episode-specific behaviors (e.g., taking one’s medication early). This lead to some confusion in interpreting the time-based response options, because some participants were unsure whether “all of the time” referred to during each headache episode, or every day. For this reason, the response options for the final version of the AMSE-H ranged from 1 (strongly disagree) to 7 (strongly agree).
Appendix E. 14 Initial Acute Medication Self-Efficacy Scale for Headache Items

Taking medication for your headache is a skill, just like anything else you learn to do. If you are learning to play baseball, you may feel very confident you can hit a single, but less confident you can hit a home run. Or, if you are learning to play the piano, you may feel confident to play a song with one hand, but less confident to play with both hands. In the same way, you may feel confident about taking medication for your headache at some times under certain circumstances, but less confident at other times and under different circumstances.

These questions ask about your confidence to take “acute” headache medication. You take acute medication when a headache happens (NOT every day to prevent headaches). What type(s) of acute headache medication do you take?

My acute medications__________________________________________________________
__________________________________________________________________________

Please circle the number that best describes how much you agree or disagree with the following statements about taking acute medication for your headaches.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. I feel confident that I can tell the difference between migraine and other types of headache.
2. I feel confident that I can tell early on, while the pain is still mild, if I am having a migraine or another type of headache.
3. I feel confident that I can take my acute headache medication at the earliest sign of a headache.
4. I feel confident that I can figure out which type(s) of medication to take when I have a headache.
5. I feel confident that I can bring up problems with my acute headache medication (e.g., side effects, medication not working) with my doctor.
6. I feel confident that I can check in with my doctor before changing the way I treat my headaches (e.g., using over the counter medication).
<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Agree</th>
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7. I feel confident that I can limit how often I take acute headache medication to avoid having more headaches.

8. I feel confident that I can tell when I need a second dose of acute headache medication.

9. I feel confident that I can notice headaches coming on when I am busy or distracted.

10. I feel confident that I can keep my acute headache medication with me at all times.

11. I feel confident that I can take acute headache medication effectively even when I have a lot of responsibilities.

12. I feel confident that I can take acute headache medication effectively even when my headaches are very frequent.

13. I feel confident that I can take my acute headache medication even when I am nauseated.

14. I feel confident that I can take acute headache medication effectively in general.
Appendix F. Acute Medication Self-Efficacy Scale for Headache, Final Version

Taking medication for your headache is a skill, just like anything else you learn to do. If you are learning to play baseball, you may feel very confident you can hit a single, but less confident you can hit a home run. Or, if you are learning to play the piano, you may feel confident to play a song with one hand, but less confident to play with both hands. In the same way, you may feel confident about taking medication for your headache at some times under certain circumstances, but less confident at other times and under different circumstances.

These questions ask about your confidence to take “acute” headache medication. You take acute medication when a headache happens (NOT every day to prevent headaches). What type(s) of acute headache medication do you take?

My acute medications
____________________________________________________________________

Please circle the number that best describes how much you agree or disagree with the following statements about taking acute medication for your headaches.

| Strongly Disagree | Disagree | Slightly Disagree | Neutral | Slightly Agree | Agree | Strongly Agree |
|-------------------|----------|-------------------|---------|               |       |                |
| 1                 | 2        | 3                 | 4       | 5             | 6     | 7               |

1. I feel confident that I can tell early on, while the pain is still mild, if I am having a **migraine** or another type of headache.

2. I feel confident that I can take my acute headache medication at the **earliest sign** of a headache.

3. I feel confident that I can figure out which **type(s)** of medication to take when I have a headache.

4. I feel confident that I can **limit** how often I take acute headache medication to avoid having more headaches.

5. I feel confident that I can take acute headache medication effectively even when I have a lot of **responsibilities**.

6. I feel confident that I can take acute headache medication effectively even when my headaches are **very frequent**.

7. I feel confident that I can take acute headache medication effectively **in general**.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |