Perceived Migraine Triggers

Understanding trigger perception can improve management.

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Most adults who experience migraine believe that there is at least one factor or exposure that can induce or trigger their headache attacks. Many different factors have been postulated to trigger migraine attacks, with a recent review finding that approximately 420 different headache triggers have been studied over a 60-year period. Although empirical evidence to support the potency of any single one of these triggers is limited, individuals espouse a substantial heterogeneity in their headache trigger perceptions. Perceiving a factor as a precipitant of headache often leads to some behavior change in response to that factor (eg, avoidance), so such perceptions have enormous consequences for a person. In response to their attacks, individuals may develop a headache trigger belief system to achieve a sense of control over the attacks while enhancing their beliefs that they are able to cope with unpredictable pain or disability. Given the importance of headache trigger perceptions for an individual's adjustment to headaches, the assessment of these perceptions is an important step in understanding how an individual manages attacks. Once identified, a patient's headache belief system can be discussed with the goal of assisting the person in evaluating how to better cope with attacks and his or her perceived causes.

Definition of Migraine Triggers

Migraine attacks are very prevalent, affecting 14.2% of United States adults.[1] Most of these adults believe that there is at least one factor that induces or triggers their headache attacks. Although different individuals could intend different meanings with the term *headache trigger*, this term could refer to the actual causes of a migraine, or it could be more broadly applied to those influences that precipitate an attack.[2] This expansive definition allows for any factor that is temporally associated with the development of a migraine attack to be classified as a headache trigger.

Many elements of headache triggers are worthy of consideration by practicing clinicians. In this review, we primarily focus on the perception of headache triggers from the point of view of individuals who experience migraine headaches. We first review the long list of factors that are commonly believed to be headache triggers, then the objective evidence for these triggers actually causing headaches. Finally, we address the importance of trigger perceptions along with their clinical management. Understanding migraine trigger perceptions in the context of their role in enhancing coping can allow clinicians to better aid their patients experiencing migraine.

Commonly Perceived Triggers

Many factors are thought to be headache triggers. A comprehensive meta-analysis of headache trigger survey studies identified 85 articles published from 1958 to 2015 involving 27,122 participants.[3] This synthesis yielded 420 unique triggers that were studied during that time span. Among the participants in these studies, approximately four-fifths, or 86%, of the individuals reported experiencing at least one headache trigger. The goal of the meta-analysis was to estimate the prevalence of population beliefs of these headache triggers by aggregating them into one of several categories (eg, activity/exertion, alcohol, sleep, stress). The figure on the next page displays the prevalence rates for each of these categories. Overall, stress was the most commonly endorsed headache trigger, followed by sleep and several environmental factors, such as weather and visual stimuli. The authors found very large amounts of heterogeneity even within the same categories.

Headache trigger frequency (ie, how often is this trigger encountered?) and potency (ie, how likely is exposure to lead to a headache?) are two other areas in which there is heterogeneity across individuals. Not only does a great deal of variability surround what individuals consider to be a migraine trigger, but there is variability in perceptions of the perceived strength of each individual trigger. A recent

study examined data collected from a laboratory assessment task that measured the association strength, encounter frequency, and influences on these trigger beliefs and perceptions.[4] The perceived potency of each trigger for causing a headache varied greatly from person to person. For example, two people may endorse fluctuating weather conditions as a trigger. However, person A may find that 75% of the time this leads to a migraine, whereas person B will only experience a migraine 30% of the time. All 33 common triggers studied showed substantial interindividual variability on the association strength and encounter perceptions. In essence, even when two participants agreed on the presence of a specific trigger, they differed considerably on how often they believed this trigger instigated a headache. Despite the great degree of heterogeneity observed in these perceptions, several notable patterns emerged. Stress was reported to have a frequency of encounter of 15 days out of a 30-day month with beliefs that exposure to stress induced a headache 75% of the time. This evidence supports the lingering hypothesis that stress may be a leading trigger in the lives of patients with headache. Nevertheless, there is an extensive level of heterogeneity remaining in perceived encounter frequency, making this topic a stepping stone in the comprehension of triggers in patients with headache.

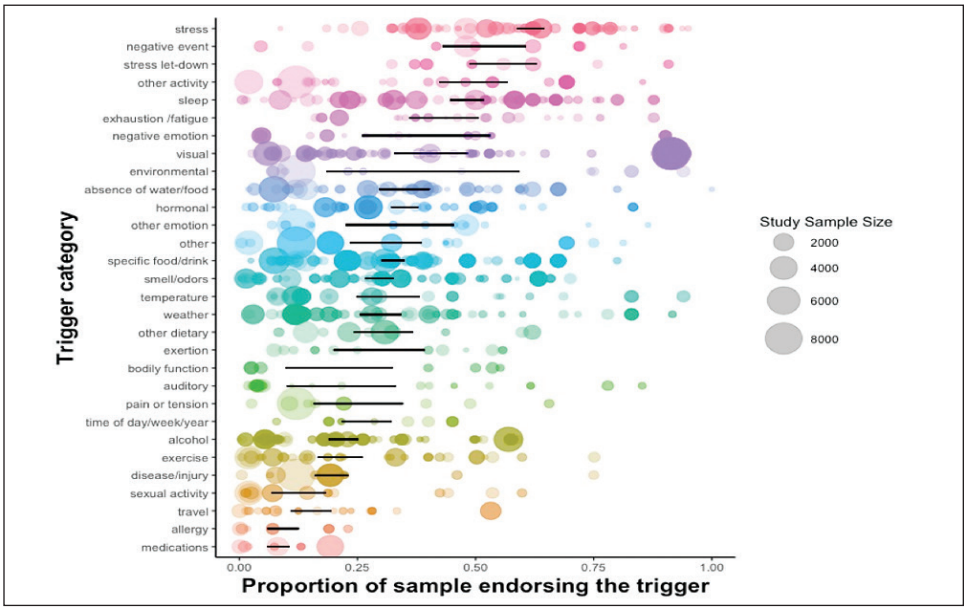

Figure. The heterogeneity of trigger beliefs across 30 headache trigger categories can be seen by the degree of variability within each trigger category (row). The x-axis displays the proportion of individuals from each study who endorsed a trigger from that category. Each circle represents a different study (n = 85 studies) with a radius proportional to the sample size in that study (n = 27,122 total participants). Stress was the most popularly endorsed trigger, and medications were the least endorsed trigger category. Published with permission from Pellegrino et al. (2017).[3]

Evidence for Commonly Perceived Triggers

There is a lack of scientific evidence regarding precise mechanisms of headache onset, which stems from variability in trigger factors and obstacles to establishing causality.[3,5] Consequently, most available literature gives insight into beliefs of trigger effects in individuals rather than the actual pathophysiology, but even this evidence in support of perceived triggers is limited.

Laboratory studies offer randomization and exclusion of confounding variables, yet lack applicability to daily life.[6] For example, infusion with exogenous substances such as prostaglandin I2 reliably triggers migraine in an experimental setting, but the potential clinical correlates are unclear.[7] More traditionally encountered triggers, such as motion sickness and strong odors, have also been simulated in the laboratory and associated with headache onset.[8,9] Several studies conducted by Martin and colleagues[10-12] have focused on one of the most widely perceived triggers—stress—and its interaction with other factors. Although negative affect stimulated by a stressor, hunger, and aversive noise elevated headache intensity, findings on their association and physiologic mechanisms were inconclusive.[10,11] There is clinical relevance in the same team's findings of decreased sensitization to triggers by means of increased exposure to them, yet application of this claim is complicated by discrepancy between apparent stress level induced by tasks in the laboratory and that encountered in daily life.[12] As a result, the removal of associated factors that may work together to trigger headache and the design's inherent distance from the natural realm make it difficult to ground laboratory studies in a real-world context.

Thus, the randomized controlled trial conducted outside the laboratory may be considered the gold standard in headache research as it randomizes variables by altering trigger encounters while observing headache activity in the naturalistic setting of daily life. However, the existing studies—which have mainly been directed toward dietary triggers—are scarce, and the results have produced conflicting

findings among researchers. For example, whereas one double-blind study concluded that chocolate is indeed a trigger,[13] another found the opposite.[14] A focus on more specific compounds may be prudent. This was the aim of a study that concluded that dietary tyramine, a substance found naturally in chocolate and red wine, is not a precipitant of migraine, although its possible interplay with several other factors in headache has yet to be examined.[15] An individualized approach used in investigating the effect of diet restriction determined by immunoglobulin G antibodies against food antigens reported decreased headache count when certain "migraine-causing" foods were eliminated, but the number of attacks was also lower than baseline when subjects followed the provocation diet, which included these foods.[16] Therefore, although it is believed that such randomization as seen in these examples would lend more causal arguments, it is difficult to draw conclusions from these studies, and further investigation of this nature is needed.

More commonly encountered in headache trigger research are observational studies in which trigger exposures vary naturally and perceived effects are self-reported. While allowing extensive data collection for use in testing multiple hypotheses, the best these studies can do is demonstrate associations rather than establish causal relationships.[6] Many well-designed observational studies have made use of diaries, notably the PAMINA study, which involved 90 days of comprehensive paper diary entries from 327 migraineurs and analysis of a wide variety of factors.[17] Significant findings included the association of migraine with preceding muscle tension in the neck, psychological tension, tiredness, and most prominently, menstruation. Increasing availability of smartphone technology has spurred a trend of similar studies using accurate reports through prospective diary methods,[18] yielding congruent results. The most frequently reported triggers across studies using these methods include fatigue, sensory sensitivity (ie, photophobia and phonophobia), negative affect, specific foods, menstruation, and yawning.[18-21] These findings are particularly relevant in their potential to forecast headaches within individuals and point to means of preventive treatment. For example, one study associated nighttime snacking with reduced odds of headache occurrence, supporting the regulation of eating habits as a viable mode of headache management.[22] Nevertheless, subjects' belief systems still play a role in methods of self-report: although weather is a popularly perceived trigger among the public,[21] an assessment of the relationship between headache and several weather variables demonstrated that more patients think weather is a trigger than is actually the case.[23]

There is some evidential support for headache triggers, but it is narrow and obscured by several factors. The current number of randomized controlled trials with a design within the realm of real-world circumstance is low, and while observational studies give a wealth of insight into trigger beliefs, they cannot establish causality. This lack of high-quality data compromises the ability of clinicians to give patients clear advice on how to deal with triggers so as to avoid headache onset. Instead, we are left with individual perception.

Importance of Perception

Perception plays a key role in the experience of headache triggers. As the Thomas Theorem posits, a person's perception of his or her circumstances powers his or her reaction to that situation.[24] This is especially pertinent to those attempting to understand the function of potential triggers in eliciting headache attacks. Perceiving a factor as a headache precipitant often leads to some behavior change in response to that factor. For example, people who perceive bright lights as triggering their headaches may avoid situations with bright lighting. Such responses to perceived triggers can provide the individual with a sense of control over the attacks but may also limit his or her scope of activity.

A trigger belief system serves a psychological function of providing a sense of safety and control over headache attacks. A person's locus of control can be described as the level of influence he or she is able to exert over an event.[25] A more internal locus of control exists in situations where a person perceives an event to be under his or her control, whereas events not under a person's control have an external locus of control. Better outcomes have been seen in patients with headache who report higher internal control.[26] These patients feel that they, rather than outside influences, have more control over their headache experiences. Headache-specific self-efficacy also contributes to a person's sense of confidence in avoiding headaches.[27,28] Patients with headache who report higher self-efficacy report higher quality of life,[29] and increased self-efficacy may also protect against the impact of stress on headache activity.[30] The development of a trigger belief system provides a framework for control over headache attacks. If people with headache believe they understand the factors that trigger attacks, they can control their exposure to these factors. Through this self-developed system, they are able to establish an internal locus of control and increase self-efficacy. Although these trigger perceptions are not necessarily based on empirical evidence, they serve a psychological purpose to the person.

On the other hand, the development of a trigger belief system may limit a person's behavior to the extent that it negatively affects life; avoiding perceived triggers in an attempt to prevent headaches may cause an individual to needlessly miss out on enjoyable activities.[31-33] For example,

a person may put forth so much effort to avoid strong odors that he or she is not able to attend social events or, perhaps, to work. Such self-imposed disability can prevent individuals from living full lives and may even inconvenience them or their close acquaintances in a manner equal to or more severe than a headache attack. In these cases, it is difficult to determine whether trigger perceptions and belief systems are a burden rather than an aid. Those who experience headache could benefit from carefully weighing the consequences of the belief systems they have developed.

Using trigger perceptions to develop belief systems for headache prevention can be beneficial in headache management. Establishing a framework for control allows people with headache to feel empowered in their lives, with such belief systems providing a sense of calm in experiences that would otherwise seem chaotic. However, caution should be practiced to ensure that these headache management structures do not impose needless disability on their adherents. Careful consideration of the benefits and drawbacks of trigger-based headache prevention designs should be practiced by both headache clinicians and those who experience headache.

Clinical Management of Perceptions

Given the importance of headache trigger perceptions for an individual's adjustment to headaches, the assessment of these perceptions is an important step in understanding the headache experience. The vast heterogeneity of beliefs across individuals, in terms of which triggers are thought to be important, the perceived strength of these triggers, and how often these triggers are encountered requires a careful assessment process. Although long checklists of triggers are often used for speedy assessment, it is recommended that clinicians use open-ended questioning (eg, "What things have you found trigger your headaches?") for more nuanced evaluation. Such open-ended questioning is associated with fewer responses than checklists,[3] encouraging individuals to discuss more sophisticated views of their causal systems (eg, "I can usually eat pizza, but pizza on Friday nights gives me a headache"). Once trigger factors have been identified, it is equally important to inquire how an individual has responded to these beliefs and the advantages these beliefs have in adaptation to headache or their role in causing further disability.

Through the course of careful assessment, clinicians may learn that their patients have headache trigger beliefs that disrupt their lives yet are unlikely to result in reduced headache risk. A common example is the avoidance of a favorite food that preceded a migraine attack once but produced inconsistent effects at other exposures. Should this trigger belief be discouraged or refuted? This question is difficult to answer, given the lack of definitive evidence for the potency of any single trigger in causing a headache. Considering the potential importance of locus of control and self-efficacy perceptions, individuals might differ in response to confrontation of their beliefs. The rich literature on the benefits of careful confrontation of beliefs thought to be irrational in anxiety disorders, depressive disorders, and stress management may be useful in these cases. In many instances, examining whether adhering to these beliefs (and resultant behaviors) is distressing or dysfunctional for the individual may provide the best guide for the need for intervention.

Until recently, individuals who had migraine headaches were encouraged to uniformly avoid the things that they, or the general medical community, perceived to be common triggers.[34] Martin and colleagues[31-33] have successfully challenged this view by introducing the notion of learning to cope with triggers. This strategy conceptualizes the management of perceived triggers using approach/engagement/exposure strategies. Such an approach recognizes that strict avoidance of perceived triggers can lead to increased anxiety and dysfunction surrounding triggers and that these beliefs can often be modified through careful exposure and experimentation with the feared trigger. A recent trial preliminarily supports this approach as an efficacious way to reduce headache frequency and medication use.[34] Clinicians who wish to pursue trigger management strategies for their patients are encouraged to consult with behavioral therapists to foster a treatment program that meets the needs of their particular patient.

Conclusions

Although empirical evidence is limited, trigger perceptions are important in the experience and management of headache. Those who experience headache commonly develop belief systems that, once understood, can be used to improve treatment and quality of life. Much remains to be learned, but the existing knowledge has substantial potential for enhancing care. ■

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