

## SPECIAL ISSUE

# Educational Model for Self-Healing: Eliminating a Chronic Migraine with Electromyography, Autogenic Training, Posture, and Mindfulness

Erik Peper, PhD, BCB, Brandy Miceli, and Richard Harvey, PhD

San Francisco State University, San Francisco, CA

Keywords: headache, autogenic training, electromyography, posture, mindfulness

*An educational approach is often different from a clinical treatment approach to promote healing. Using an educational approach, 80% of university students who are enrolled in a holistic health course report that both acute and chronic disorders can be ameliorated or eliminated when they engage in daily self-practice of autogenic training, biofeedback self-regulation practices, and/or somatic posture awareness. This process of reducing health problems is illustrated by a case report of a 20-year-old female student who experienced three migraines per week for the past 6 years. After practicing self-regulation and body awareness techniques such as autogenic training, surface electromyography–assisted muscle awareness, diaphragmatic breathing, and postural changes, the frequency of her headaches decreased to zero. Being mindful without judgment and continuously interrupting her “chained behavior” patterns were major components for improving health. At 20-month follow-up, the student continued to be headache free. This type of integrated self-healing educational approach is recommended for students, patients, and anyone who wants to create lasting health changes.*

---

*I have had headaches for 6 years; at first they occurred almost every day. When I got put on an antidepressant, they slowed to about three times a week (sometimes more) and continued this way until I learned relaxation techniques. I am 20 years old and now headache free. Everyone should have this educational opportunity to heal themselves.*

—Melinda, a 20-year-old female student

---

### Background

According to the World Health Organization (2012), 47% of the adult population reported having had at least one

headache within the previous year, with 7.4% reporting headaches at least 10 days per month. Female college students reported about twice as many migraine headaches (21% prevalence rate) that were more frequent, more painful, and of longer duration than those of males (11% prevalence rate; Andrasik, Holroyd, & Abell, 1979; Castillo, Muñoz, Guitera, & Pascual, 1999; Wang et al., 2016). Although analgesic medications are commonly prescribed for treatment, self-regulation strategies and stress management can often reduce headache incidence. For example, Nestoriuc, Martin, Rief, and Andrasik (2008) reported in their meta-analysis of 94 studies that electromyographic and temperature biofeedback training were effective treatments with medium to large effect sizes for adult migraine and tension-type headaches. Treatment effects remained stable over an average follow-up period of 14 months.

A useful approach to headache prevention includes identifying triggers that precede the onset of a headache. Once the precursors are identified, self-regulation skills can then be used to interrupt the precursor behavior. For example, Peper, Lin, et al. (2014) suggested that increased awareness of an initial trigger as well as replacing an illness-promoting behavior with a health-promoting behavior resulted in improved health outcomes. These “awareness and replacement” health-promoting strategies that were taught to San Francisco State University students included progressive muscle relaxation, autogenic phrases, slower breathing, changing posture, transforming internal language, and self-healing imagery (Peper, Gibney, & Holt, 2002). When students systematically applied these self-awareness techniques to address a self-selected illness or health behavior (e.g., eczema, diet, exercise, insomnia, or migraine headaches), 80% reported significant improvement in their health during that semester (Peper, Lin, et al., 2014; Tseng, Abili, Peper, & Harvey, 2016).

In many cases, the benefits lasted beyond the semester. Numerous students reported remarkable outcomes at follow-up many months after the class had ended. The major reason was that they had mastered the self-regulation skills and continued to implement these skills into their daily lives. The educational model used in holistic health courses is based on an approach different from the clinical/treatment model. This article will describe the differences between the educational and clinical approaches to training and describes the use of the educational model in a case example.

## Educational Versus Clinical/Treatment Approach

*I am a student and I **have** an illness (most of me is healthy and only part of me is sick).*

—Education approach

*I am a patient and I **am** sick (all of me is sick).*

—Illness treatment approach

In most clinical settings, clients/patients are there because they have a problem to treat and some patients simply want their symptoms to be “fixed” by others, rather than learning possible skills to self-regulate and “fix” themselves. In an educational setting, students identify and address various health issues because of a class requirement. For the most part, students define themselves as healthy and want to learn skills to optimize their health. They do not see themselves as defective—they are just learning a new skill. Patients may perceive themselves as defective, in need of being treated and cured by others. Students typically perceive themselves as basically healthy and becoming more competent. As a result, they are more willing to engage in exploratory practices, such as those involved in the class assignment—with an attitude of “let’s see what happens”—in contrast to viewing behavior change as a chore or task to be endured. Possibly the same process can be done with patients by inviting them to explore options, to experiment with possibilities, and to consider setbacks as opportunities for learning instead of failures.

The focus of the classroom-based homework is on learning new health-promoting skills and using these skills many times during the day. This is similar to learning how to play a musical instrument or improving sport performance—both require commitment to learning by incremental gains (Wilson & Peper, 2011). As the students meet weekly in small groups to share their experiences, they receive active feedback from peers. As a result, students have

an opportunity to observe that they are not so different from other students. In contrast, most patients typically have only themselves as a reference for health behaviors and experiences. Patients tend to see and experience only themselves and therefore have more difficulty in developing a relativistic third-person (outside) perspective.

Some of the speculative concepts underlying the differences between the educational and the clinical approach are shown in Table 1.

An educational approach to healing avoids the stigma associated with seeking treatment and having to define oneself as sick (defective). The focus of an educational approach is on mastering skills while developing a mental attitude of mindfulness and accepting that healing takes time and can be gradual. The educational approach therefore avoids a sense of resignation and negative self-judgments. As a result of an extended time perspective and self-monitoring during the semester-long class, students become aware of their internal self-talk. They are encouraged, through lecture and classmate feedback, to develop an attitude of acceptance and to substitute positive statements. Thus, when they observe self-critical statements such as “I should not have done that,” “I cannot do this,” “The acne is horrible and everyone will see it,” they accept that whatever they did was the only thing they could have done at that moment. Then, they focus on how they could do it differently in the future. They then substitute alternative empowering phrases such as, “I have not yet taken the time to learn,” or “At this moment, my skin has acne and there are things I can do to reduce my acne.”

The cognitive restructuring aspect of this (classroom) educational approach involves encouraging the student to accept that whatever he or she may have done behaviorally that was potentially harmful or suboptimal was the only thing she or he could have done at that time. Accepting what happened without judgment and, recognizing that his or her action was chosen because he or she did not yet have the appropriate awareness or self-regulation skills, is an essential aspect of the educational approach to healing (Peper, Harvey, Lin, & Duvvuri, 2014).

During the semester, students become more mindful of their health behavior patterns and gradually better able to interrupt their previously conditioned patterns by substituting a healthier behavior. The students are encouraged to have a mental attitude of passive attention and are instructed to perform the stress management skill without expectation of success. The initial practices consist primarily of progressive muscle relaxation, slower breathing, and autogenic training (AT) with the following focus:

Table 1. Comparison of an educational versus clinical/treatment approach	
Educational Approach	Clinic/Treatment Approach
Focuses on growth and learning	Focuses on remediation
Focuses on what is right	Focuses on what is wrong
Focuses on what people can do for themselves	Focuses on how the therapist can help patients
Assumes students as being competent	Implies patients are damaged and incompetent
Students defined as being competent to master the skills	Patients defined as requiring others to help them
Encourages active participation in the healing process	Assumes passive participation in the healing process
Students keep logs and write integrative and reflective papers, which encourage insight and awareness	Patients usually do not keep logs nor are asked to reflect at the end of treatment to see which factors contributed to success
Students meet in small groups, develop social support and perspective	Patients meet only with practitioners and stay isolated
Students experience an increased sense of mastery and empowerment	Patients experience no change or possibly a decrease in sense of mastery
Students develop skills and become equal or better than the instructor	Patients are healed, but therapist is always seen as more competent than patient
Students can become colleagues and friends with their teachers	Patients cannot become friends of the therapist and thus are always distanced

- Performing a prescribed body-focused activity, such as tightening a muscle in progressive relaxation, attending to the movement of the abdomen during slow breathing, or repeating autogenic phrases or other meditative/prayer phrase(s) with passive attention
- Attending passively to the area of the body or phrase without any judgments
- If attention wanders, with thoughts such as, “When is it over,” or “I am hungry,” or “I’m distracted by an area of discomfort,” the students bring their attention back to the body part or the phrase without judgment while continuing to passively attend to the task.
- If there is too much struggle in focusing attention because of so called “monkey mind,”<sup>1</sup> practices are shortened, and then gradually increased in frequency and duration. If students are stressed or continue to experience “busy brain/monkey minds,” they often benefit by first engaging in vigorous physical exercise prior to the relaxation or meditative practices. After having done the intense physical activity, the body is

tired and relaxed, and the mind is usually much more quiet.

- Students generalize these skills both in extended time periods and in very short sessions during the day, as described in the following case example.

**Case Example: Elimination of Chronic Migraines**

Melinda, a 20-year-old female student, experienced four to five chronic migraines per week since age 14. A neurologist had prescribed several medications including Imitrex (used to treat migraines) and Topamax (used to prevent seizures as well as migraine headaches), although they were ineffective in treating her migraines. Nortriptyline (a tricyclic antidepressant) and Excedrin Migraine (which contains caffeine, aspirin, and acetaminophen) reduced the frequency of symptoms to three times per week.

*Method*

*Overview.* Melinda was enrolled in a university biofeedback class that focused on learning self-regulation and biofeedback skills (Khazan, 2013; Peper, Tylova, Gibney, Harvey, & Combatalade, 2008). All of the students were taught the fundamentals of biofeedback and practiced AT every day during the semester (Luthe, 1979; Luthe & Schultz, 1969;

<sup>1</sup> *Monkey mind* is a Buddhist term referring to restless, confused, and uncontrollable thoughts. *Busy brain* is a comparable concept, frequently used in neurofeedback and cognitive therapy circles to refer to ruminative, hyperactive cognitions, frequently correlated with excessive cortical activity in the high beta range (20–28 Hz).



**Figure 1.** Electrode placement location used for trapezius muscle awareness training.

Peper & Williams, 1980). During the first week of learning AT, students practiced at least three times a day using the autogenic phrase, “My right arm is heavy,” while passively attending to their arm. If their attention wandered, they were encouraged to bring their attention back to the autogenic phrase without judgment. Each week, another autogenic phrase was added, for example, “My neck and shoulders are heavy.” Students could practice these phrases while doing other activities throughout the day, such as data entry, studying, or washing dishes. Finally, students shared with their classmates what they experienced while practicing AT. The focus was to learn to be in the present moment without judgment or comparison. For example, instead of reporting, “It was better/worse than last time,” they were asked to describe exactly what they experienced at that time such as, “I felt tingling in my left finger, I felt hungry and sad.”

In the class, students also practiced with surface electromyography (SEMG) feedback to identify the presence of shoulder muscle overexertion (dysponesis<sup>2</sup>), as well as awareness of minimum muscle tension. Additional practices included hand warming, awareness of thoracic and diaphragmatic breathing, and other biofeedback or somatic awareness approaches. In parallel with awareness of physical sensations, students practiced behavioral awareness such as alternating between a slouching body posture (associated with feeling self-critical and powerless) and an

<sup>2</sup> Whatmore and Kohli (1968) used the concept of dysponesis to describe misplaced effort, for example, muscle activation that does not functionally contribute to the current activity or movement. Dysponesis frequently contributes to functional disorders and can be reversed by retraining.

erect body posture (associated with feeling powerful and in control). Psychological awareness was focused on transforming negative thoughts and self-judgments to positive empowering thoughts (Harvey & Peper, 2011; Peper, Booiman, Lin, & Shaffer, 2014; Peper, Nemoto, Lin, & Harvey, 2015). Taken together, students systematically increased awareness of physical, behavioral, and psychological aspects of their reactions to stress.

*Equipment.* Physiological signals were recorded with a Thought Technology Procomp Plus Infinity running Biograph Infinity 6.1 software. SEMG was recorded with two SEMG MyoScan-Pro™ sensors (bandpass filter 100–200 Hz). The specific SEMG training procedures were derived from laboratory practice described in the book *Biofeedback Mastery* (Peper et al., 2008). Triode electrodes were placed on the subject’s midtrapezius muscles, as shown in Figure 1.

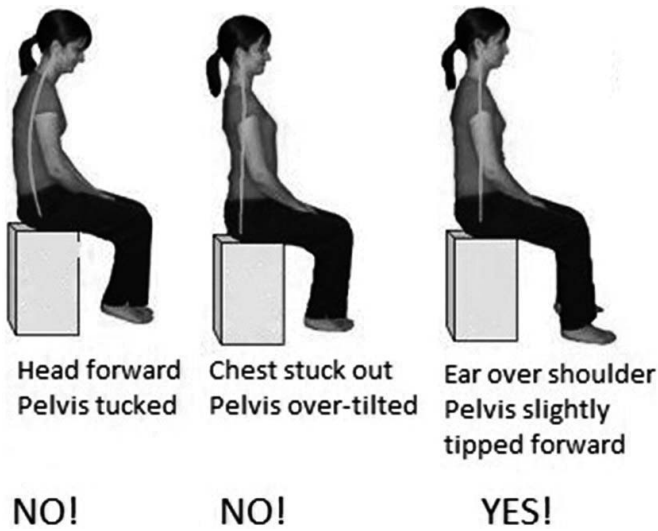
#### *Procedure for SEMG Assessment and Generalization Training*

During the SEMG awareness training, Melinda was asked to close her eyes, relax as much as possible, and slow down her breath. With each breath, she was asked to relax even more, letting go of any and all tension in her body.

*Assessment.* After 2 minutes of recording a baseline, Melinda was asked to raise her shoulders to the level where she noticed minimum muscle tension for 5 seconds and then relax. This was repeated five times.

*Initial SEMG training.* While receiving visual SEMG feedback recorded from the right and left trapezius muscles, Melinda was asked to relax for 2 minutes and then asked to increase the SEMG muscle tension by about 50% of the average minimum SEMG level perceived in the baseline and then relax. The tensing and relaxing of the shoulders was repeated numerous times. The training continued as she practiced raising and lowering shoulder muscle tension until she could sense a lower level of muscle tension.

*Generalized training.* At home and at school, each time Melinda felt her shoulders tightening, she was instructed to relax and release the tension in her shoulders, practicing AT with the phrase “my neck and shoulders are heavy.” In addition, whenever she felt her body beginning to slouch or noticed a negative self-critical thought arising in her mind, she was to shift her body to an upright empowered posture and substitute positive thoughts to reduce her cortisol level and increase access to positive thoughts (Carney, Cuddy, & Yap, 2010; Cuddy, 2012; Tsai, Peper, & Lin, 2016). Postural feedback was also given by Melinda’s instructor. Every time



**Figure 2.** Erect posture to assume whenever the person becomes aware of collapsed posture. Reproduced from: [http://4.bp.blogspot.com/-F3cqz4TR13w/Tv4DFa4RYdI/AAAAAAAAAF8/BLI9BXi\\_dFU/s1600/sit+good+posture.jpg](http://4.bp.blogspot.com/-F3cqz4TR13w/Tv4DFa4RYdI/AAAAAAAAAF8/BLI9BXi_dFU/s1600/sit+good+posture.jpg)

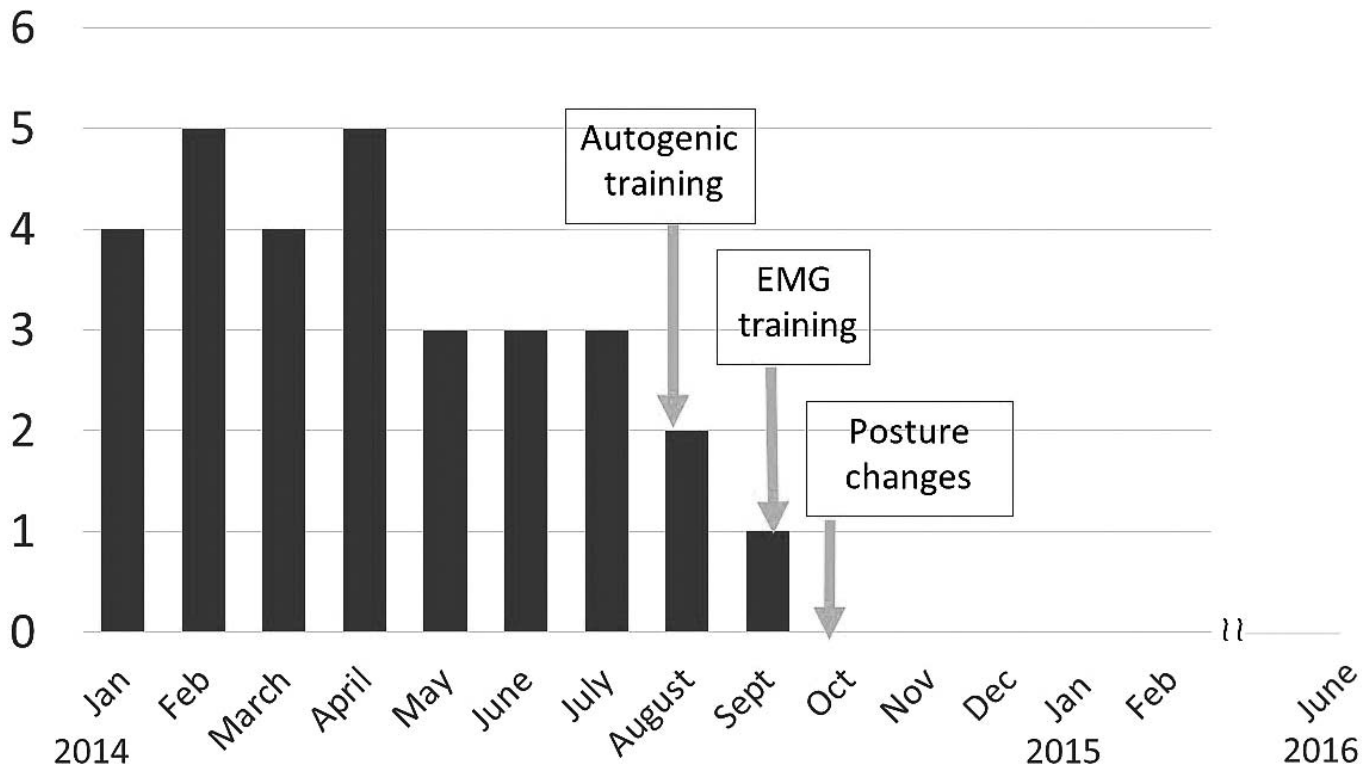
the instructor noticed her slouching in class or the hallway, he visually changed his own posture to remind her to be erect. She would then sit in an erect posture, as shown in Figure 2.

The minimum muscle tension level at which Melinda expressed awareness (without receiving feedback) was measured 5 months later, to assess her skill in recognizing shoulder muscle awareness. Throughout the study and follow-up period, Melinda recorded the occurrence of migraines.

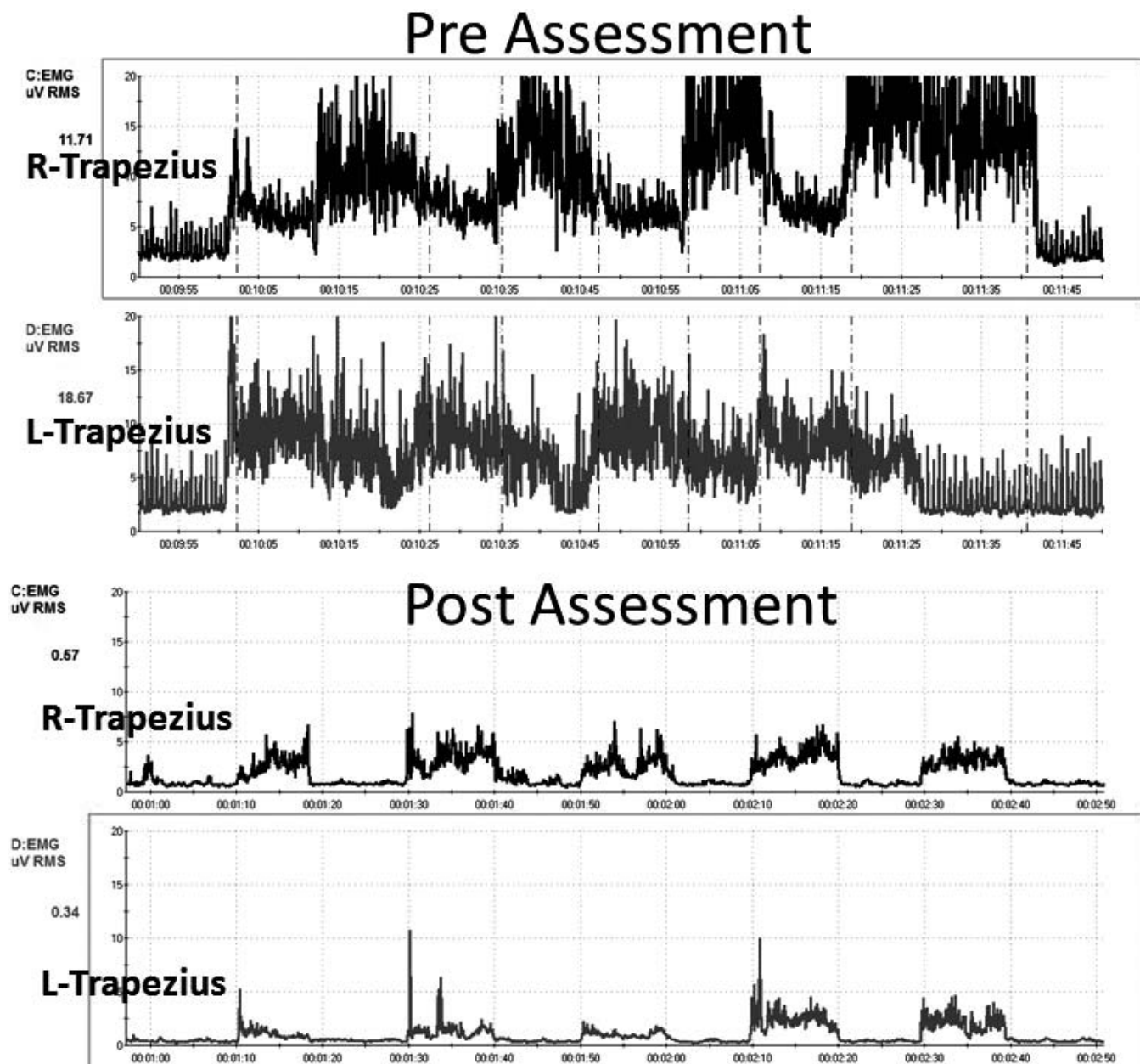
**Results**

Melinda’s headaches reduced from between three and five per week before enrolling in the class to zero following the course, as shown in Figure 3. Headache frequency decreased to two headaches per week after she began AT and decreased to zero after she learned effective awareness of minimum tension levels and learned to shift her posture from slouching to erect and relaxed. In addition, she reported feeling empowered and mentally clear, and her acne cleared up. All medications were eliminated.

**Number of Migraines per week**



**Figure 3.** Frequency of migraine and the implementation of self-practices.



**Figure 4.** Comparison of awareness of minimal midtrapezius muscle tension.

Melinda learned during the informal training to recognize a significantly lower level of minimum shoulder muscle tension. Her threshold for awareness of muscle tension decreased from about 15  $\mu\text{V}$  to about 4  $\mu\text{V}$  at postassessment, as shown in Figure 4.

At the 18-month follow-up, she continued to be headache free.

### Discussion

This self-healing approach facilitated a change in subjective awareness of physical sensations, encouraged gener-

alizing the skills, and helped develop a mindfulness attitude during the day. Melinda was surprised by her initial lack of awareness of muscle tension—she “felt” relaxed even though her muscles were tense. During two classroom training sessions, she increased her awareness of the chain of behaviors that lead to an increase in shoulder muscle tension and postural collapse. Whenever she felt herself tensing her shoulders, she changed her posture and said her autogenic phrases, which relaxed her shoulders.

At the same time, whenever Melinda became aware of her self-critical thoughts or of physical sensations associated with tension and collapsed posture, she interrupted this behavior by substituting positive thoughts and changing her posture. Not only did her headaches disappear, but her facial skin also improved. Her improvement in facial skin quality is similar to the reports by other students whose acne disappeared when they (a) transformed their internal language to a less self-critical one (e.g., changing, “I am not good enough, I cannot do this” to saying “I am capable, I can do what is important to me”), (b) implemented stress reductions techniques, and (c) changed their posture from slouching to being erect (Tseng et al., 2016).

In summary, the major factors that contributed to her success were the following:

- Becoming aware of muscle tension through the SEMG feedback. Melinda realized that she had tension when she thought she was relaxed.
- Keeping detailed logs and developing a third-person perspective by analyzing her own data and writing a report, a process that encouraged acceptance of self, thereby allowing Melinda to become less judgmental.
- Acquiring a new belief that she could learn to overcome her headaches, facilitated by class lecture and verbal feedback from the instructor.
- Taking active control by becoming aware of the initial negative thoughts or sensations and interrupting the escalating chain of negative thoughts and sensations by shifting the attention to positive empowering thoughts and sensations—a process that integrated mindfulness, acceptance, and action. Thus, transforming judgmental thoughts into accepting and positive thoughts.
- Becoming more aware throughout the day, at school and at home, of initial triggers related to body collapse and muscle tension, then changing her body posture and relaxing her shoulders. This awareness was initially developed because the instructor continuously gave feedback whenever she started to slouch in class or when he saw her slouching in the hallways.
- Practicing many, many times during the day. Namely, increasing her ongoing mindfulness of posture, neck, and shoulder tension and of negative internal dialogue without judgment.

Ongoing awareness with mindfulness and continuously interrupting the chain of behaviors that culminated in a headache (neck and shoulder tightness, negative self-judgment, and collapsed posture) appeared to eliminate

the headache. It included learning awareness and mindfulness without judgment (e.g., the posture change was observed and she substituted an empowered posture and positive self-statement). As Melinda stated,

---

*The combined autogenic biofeedback awareness and skill with the changes in posture helped me remarkably. It improved my self-esteem, empowerment, reduced stress, and even improved the quality of my skin. It proves the concept that health is a whole system between mind, body, and spirit. When I listen carefully and act on it, my overall well-being is exceptionally improved.*

---

## References

- Andrasik, F., Holroyd, K. A., & Abell, T. (1979). Prevalence of headache within a college student population: A preliminary analysis. *Headache: The Journal of Head and Face Pain*, 19, 384–387. doi:10.1111/j.1526-4610.1979.hed1907384.x
- Castillo, J., Muñoz, P., Guitera, V., & Pascual, J. (1999). Epidemiology of chronic daily headache in the general population. *Headache: The Journal of Head and Face Pain*, 39, 190–196.
- Carney, D. R., Cuddy, A. J., & Yap, A. J. (2010). Power posing brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science*, 21, 1363–1368.
- Cuddy, A. (2012). Your body language shapes who you are. *Technology, Entertainment, and Design (TED) Talk*. Retrieved from [http://www.ted.com/talks/amy\\_cuddy\\_your\\_body\\_language\\_shapes\\_who\\_you\\_are](http://www.ted.com/talks/amy_cuddy_your_body_language_shapes_who_you_are)
- Harvey, E., & Peper, E. (2011). I thought I was relaxed: The use of SEMG biofeedback for training awareness and control. In W. A. Edmonds & G. Tenenbaum (Eds.), *Case studies in applied psychophysiology: Neurofeedback and biofeedback treatments for advances in human performance* (pp. 144–159). West Sussex, UK: Wiley-Blackwell.
- Khazan, I. Z. (2013). *Handbook of biofeedback—A step-by-step guide for training and practice with mindfulness*. Malden, MA: Wiley-Blackwell.
- Luthe, W. (1979). About the methods of autogenic therapy. In E. Peper, S. Ancoli, & M. Quinn, *Mind/body integration* (pp. 167–186). New York: Springer.
- Luthe, W., & Schultz, J.H. (1969). *Autogenic therapy (Vols. 1-6)*. New York: Grune and Stratton.
- Nestoriuc, Y., Martin, A., Rief, W., & Andrasik, F. (2008). Biofeedback treatment for headache disorders: A comprehensive efficacy review. *Applied Psychophysiology and Biofeedback*, 33, 125–140.
- Peper, E., Booiman, A., Lin, I-M., & Shaffer, F. (2014). Making the unaware aware: Surface electromyography to unmask tension and teach awareness. *Biofeedback*, 42(1), 16–23.
- Peper, E., Gibney, K.H. & Holt, C. (2002). *Make health happen: Training yourself to create wellness*. Dubuque, IA: Kendall-Hunt.

- Peper, E., Harvey, R., Lin, I-M, & Duvvuri, P. (2014). Increase productivity, decrease procrastination and increase energy. *Biofeedback*, 42(2), 82–87.
- Peper, E., Lin, I.-M., Harvey, R., Gilbert, M., Gubbala, P., Ratkovich, A., & Fletcher, F. (2014). Transforming chained behaviors: Case studies of overcoming smoking, eczema and hair pulling (trichotillomania). *Biofeedback*, 42(4), 154–160.
- Peper, E., Nemoto, S., Lin, I.-M., & Harvey, R. (2015). Seeing is believing: Biofeedback a tool to enhance motivation for cognitive therapy. *Biofeedback*, 43(4), 168–172. doi:10.5298/1081-5937-43.4.03
- Peper, E., Tylova, H., Gibney, K.H., Harvey, R., & Combatalade, D. (2008). *Biofeedback mastery: An experiential teaching and self-training manual*. Wheat Ridge, CO: Association for Applied Psychophysiology and Biofeedback.
- Peper, E., & Williams, E. A. (1980). Autogenic therapy. In: A. C. Hastings, J. Fadiman, & J. S. Gordon (Eds.), *Health for the whole person* (pp. 131–137). Boulder, CO: Westview Press.
- Tsai, H. Y., Peper, E., & Lin, I. M. (2016). EEG patterns under positive/negative body postures and emotion recall tasks. *NeuroRegulation*, 3(1), 23–27.
- Tseng, C., Abili, R., Peper, E., & Harvey, R. (2016, March). *Reducing acne-stress and an integrated self-healing approach*. Poster presented at the 47th Annual Meeting of the Association for Applied Psychophysiology and Biofeedback, Seattle, WA.
- Wang, X., Zhou, H. B., Sun, J. M., Xing, Y. H., Zhu, Y. L., & Zhao, Y. S. (2016). The prevalence of migraine in university students: A systematic review and meta-analysis. *European Journal of Neurology*, 23, 464–475. doi:10.1111/ene.12784
- Whatmore, G. B., & Kohli, D. R. (1968). Dysponesis: A neurophysiology factor in functional disorders. *Behavioral Science*, 13, 102–124. doi:10.1002/bs.3830130203
- Wilson, V.E., & Peper, E. (2011). Athletes are different: Factors that differentiate biofeedback/neurofeedback for sport versus clinical practice. *Biofeedback*, 39(1), 27–30.
- World Health Organization. (2012). *Headache disorders fact sheet No. 277*. Retrieved August 13, 2015, from <http://www.who.int/mediacentre/factsheets/fs277/en/>



Erik Peper



Brandy Miceli



Richard Harvey

Correspondence: Erik Peper, PhD, Institute for Holistic Health Studies, Department of Health Education, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132, email: [epeper@sfsu.edu](mailto:epeper@sfsu.edu); Web: [www.biofeedbackhealth.org](http://www.biofeedbackhealth.org); blog: [www.peperperspective.com](http://www.peperperspective.com).