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SPECIAL ISSUE

Winning the Gold in Weightlifting Using Biofeedback, Imagery, and Cognitive Change

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Jo Aita, age 46 and weighing 58 kg, set the Masters World Records and Masters Games Records for her age group in Snatch, Clean and Jerk, and Total Olympic weightlifting at the World Masters Games by lifting 71 kg in the Snatch and 86 kg in the Clean and Jerk Olympic lifts. She incorporated biofeedback and visualization training to help optimize her performance. This article summarizes and describes the protocol of breathing and electromyography feedback combined with imagery that contributed to achieving her personal best.

It was the best meet of my life.

—Jo Aita

Setting a personal best and winning the Gold is a remarkable feat. Jo Aita, age 46 and weighing 58 kg, set the Masters World Records and Masters Games Records in Snatch, Clean and Jerk, and Total Olympic weightlifting at the World Masters Games in Auckland, New Zealand, April 26, 2017. She lifted 71 kg in the Snatch and 86 kg in the Clean and Jerk Olympic lifts in the 45- to 49-year-old age group (see Figure 1).

Figure 1. Jo Aita at the World Masters Games in Auckland, New Zealand, April 26, 2017. See video of her successful lift: http://yooying.com/p/1506300323547215196

What makes this more remarkable is that her combined lifts were three kilograms more than her lifetime best in previous competition. She refuted the conventional wisdom that weightlifters peak in their mid- to late twenties. There is hope for improvement as aging may not mean we have to decline.

There are many factors that contributed to Jo's achievement—and probably many more that we are not aware of. Genetics, diligent training, and superb coaching at Max's Gym in Oakland as a member of Team Juggernauts were all factors in Jo's success. In the past 3 years, Jo also incorporated biofeedback and visualization training to help optimize her performance. This report summarizes how breathing and electromyography (EMG) feedback combined with imagery may have contributed to achieving her personal best.[1] As Jo stated, "I recommend this to everyone and all my athletes."

Session Components

Jo's training included 30 sessions of biofeedback, transforming internal language, and visualization training. She started the training program in September 2014 to reduce anxiety and improve performance. The components of the training are listed sequentially; however, training did not occur sequentially. The elements were dynamically interwoven throughout the many sessions and augmented with homework practices, as well as storytelling about other people achieving success using similar approaches. Descriptions of the major components follow.

[1]We purposely use the word "may" because this is a case report, not a controlled study. Coaches, sport psychologists, or anyone who has had contact with an athlete who does extremely well usually claim that their suggestions were the magic ingredient. However, success could be synchronicity and not due to the actual skills taught. It may be due to unidentified factors or covert factors embedded in the coaching or teaching, such as transforming hope and belief.

Breathing and Heart Rate Variability

Jo mastered effortless slow diaphragmatic breathing in which the abdomen expanded during inhalation and constricted during exhalation. The respiration feedback and training were recorded with BioGraph Infinity (Thought Technology, Ltd, Montreal, Canada) respiration sensors and were recorded from the abdomen and upper chest.

Her homework included monitoring situations where she held her breath and then used this awareness to begin breathing. She also practiced slower breathing with a Stress Eraser™ to increase heart rate variability. Practicing these allowed her to become centered and regenerate more quickly. As she stated, "It helped me . . . when I am anxious to calm down." Throughout the training, the focus was to use breathing to rapidly regenerate after exertion—especially after training.

Relaxation with EMG

Jo learned to be aware of her shoulder muscles with EMG feedback in order to regenerate and learn to sense minimal trapezius muscle tension, which she could use to identify her emotional reactivity (Peper, Booiman, Lin, & Shaffer, 2014). When she became aware of muscle tension, she learned to soften her emotional reactivity. To support regeneration, she also learned to relax her muscles quickly after muscle contractions.

Cognition Affects Performance

Jo experienced how cognitions affect performance. This was initially demonstrated by an arm resistance test. In this experiential practice, Jo extended her arm and attempted to resist the downward pressure applied to her wrist while she recalled either a hopeless, helpless, powerless, or defeated memory, or an empowered positive memory (for a detailed description see Gorter & Peper, 2011, pp 186–188). When she recalled the powerless memory, she was significantly weaker than when she recalled the empowering memory. This experience demonstrated to her the power of her thoughts.

Rewriting Failure

Each time Jo failed in her performance and she would think, "I should not have done that" or "I was doubtful or nervous during competition," she learned to shift her focus to:

a. Accept what happened by acknowledging she did the best she could have done under the circumstances.
b. Explore how she could have done it differently and imagine herself doing it in the new optimum way.
c. Use the trigger of the beginning thought of failure or defeat to evoke the new empowering memory, thus interrupting the chained behavior.

The underlying concepts are that what we mentally rehearse is what we may become, and that our thoughts affect performance—which Jo had previously experienced by the arm resistance test. If you keep thinking about a defeat, you are training the physiological pattern of defeat.

This practice of transforming self-defeating thoughts into empowering thoughts can be applied to all phases of one's life, and it was continued throughout Jo's training sessions. The focus was to acknowledge and realize that whatever she did, it was the only thing she could have done because she did not yet have the skills to do it differently. She would then create a new strategy of mental rehearsal that led to a positive outcome (for a detailed description of this practice see Peper, Harvey, Lin, & Duvvuri, 2014).

Is Imagery Rehearsal Somatically Connected?

It is our bias that imagery rehearsal is useful if the body responds in a similar pattern when the person imagines the task as it would occur during an actual activity (Hall, 2001; Peper, Nemoto, Lin, & Harvey, 2015). The concurrent physiological activity would indicate that the person is experientially involved in the task and not just observing as a witness/second party.

Jo's performance is weightlifting, and this would involve major muscle activity. Surface EMG was recorded from muscles that would be activated during the actual performance of the task to identify if they would be activated during mental rehearsal. The muscle activity during mental rehearsal is usually at a much smaller amplitude than what occurs during actual physical performance; however, it should follow a similar timing sequence. In our experience, there are three responses:

a. Muscle activity in the appropriate muscles is in the same timing as in an actual performance. This implies that mental rehearsal is actually training the motor pattern and facilitating performance. Thus, continue practicing with mental rehearsal.
b. Muscle activity in the appropriate muscles is not generally in the same timing sequence as in the actual performance. This may mean that the person was performing too slow or was skipping sequences in the mental rehearsal, and thus mental training may not be useful. The person needs to master and exhibit the same muscle pattern during mental rehearsal as during actual performance of the task.

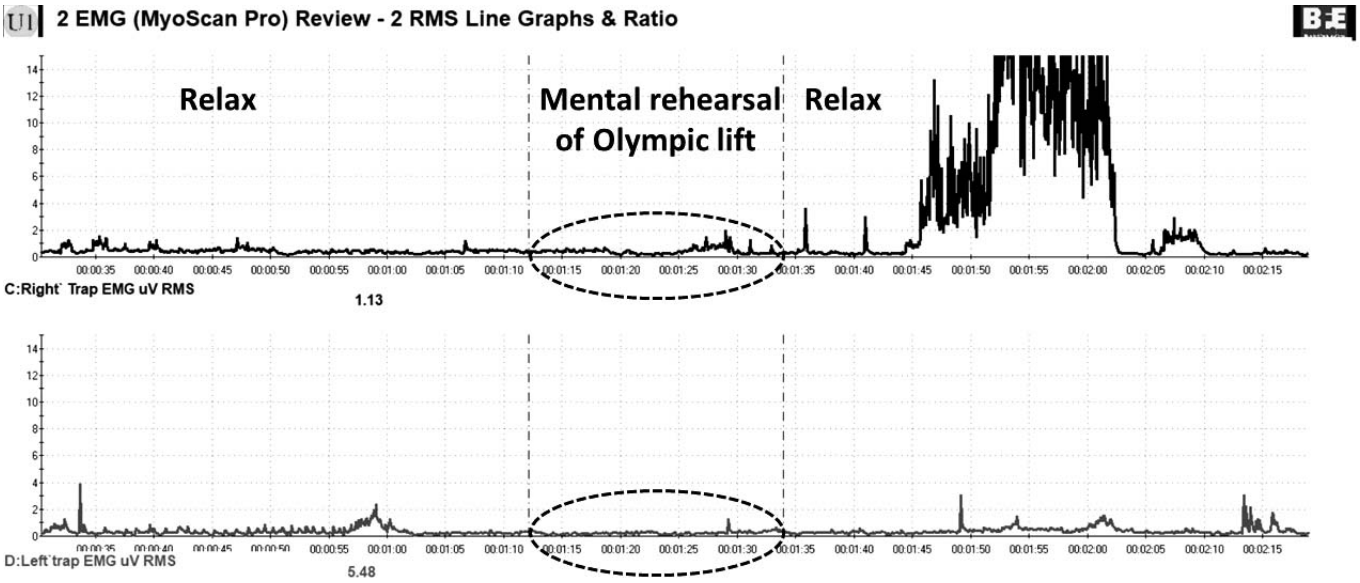

Figure 2. Left and right upper trapezius EMG showed no increase in activity while Jo Aita mentally imaged performing her lift. After she relaxed, she moved her shoulder as indicated by the increase in EMG activity.

c. There is no muscle activity, or inappropriate muscle activity, during the mental rehearsal. This implies that during mental rehearsal there is no motor pattern training and the approach would not be useful unless the person learned to activate appropriate motor activity. It is possible that some people who have experienced past traumas may have coped by shutting off feelings and sensations in their bodies.

When Jo Aita initially practiced mental rehearsal while being monitored with surface EMG recorded with Myoscan Pro sensors (filter set narrow 100–200 Hz, BioGraph Infinity), from the right and left upper trapezius muscles, there was no corresponding muscle activity, as shown in Figure 2. The increased EMG shown on the top line in the figure occurred when she moved her arm and shoulder after she had relaxed. Although she imaged, she did not feel/experience the lifting. The training focused on reconnecting imagery and body experience.

Integrating Imagery and Body Experience

After identifying that imagery did not elicit concurrent muscle activity, the training focused on developing the imagery–muscle connection. The training consisted of monitoring EMG during practice and practicing imagery.

Monitoring EMG during practice. We monitored EMG activity from Jo's right and left quadriceps and right and left upper trapezius muscles, and had her simulate her actually lifting in practice and competition by going through the complete sequence, which included standing and waiting until her name was called, chalking her hands, performing a ritual activity to be ready to lift the weights, lifting the weights, and releasing them. The pattern is shown in Figure 3.

Practicing imagery. Jo practiced by going through the same procedure and purposely slightly activating the movements that were necessary to lift the weight. As she stated, "I learned to do mental rehearsal in a more structured way and visualized the total sequence from chalking up to doing all six lifts." This was monitored by the EMG to see that EMG activation of the muscles occurred. This was repeated numerous times until the activation occurred in imagery as shown in Figure 4.[2] Jo then reported that imagery was a real experience.

Training Mental Rehearsal and Imagery (Cumming, Hall, & Shambrook, 2004)

The major components of the mental rehearsal for peak performance focused on performing perfectly, visualizing lifting more weight easily than is actually lifted in the gym, performing in the gym as she would while competing, practicing performing when interruptions occurred, and punching the weight through the ceiling.

[2] Be aware that when people learn to reconnect with their body, or learn slow diaphragmatic breathing, and allow the lower abdomen to relax and expand, it is possible that past traumatic memories could be released. This release is a healthy process and we usually adapt an Autogenic Therapy/Training perspective by which the person accepts, allows discharge, and continues with the task at hand.

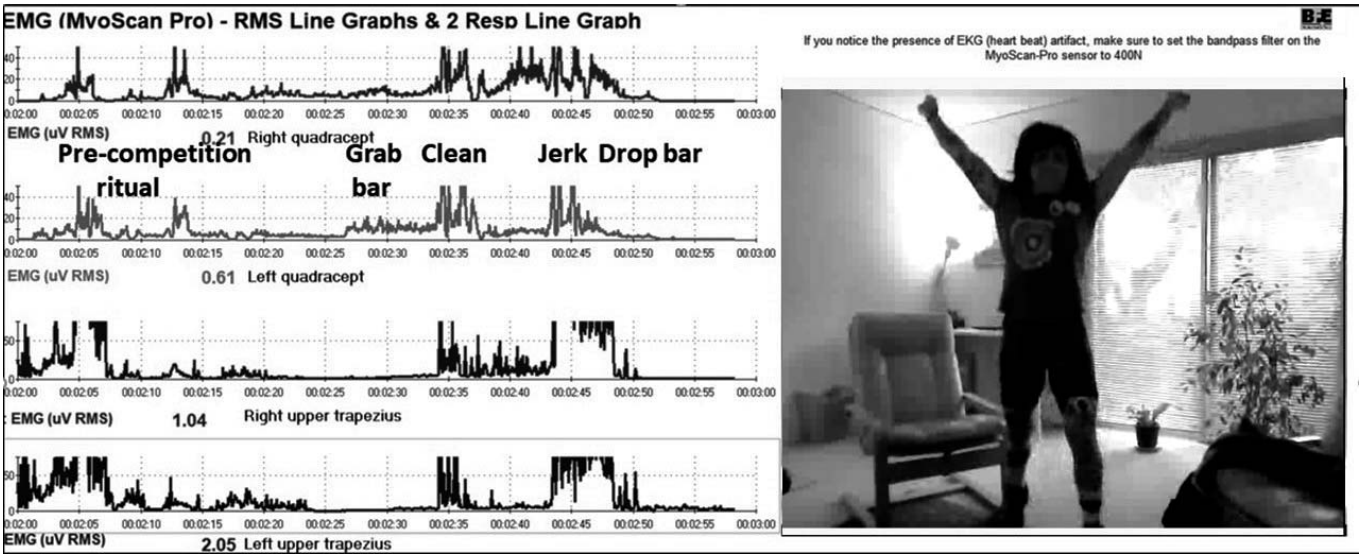

Figure 3. Simulating the actual Clean and Jerk lift (lifting the weights to the chest is labeled Clean, and punching upward is labeled Jerk).

Performing perfectly. During the day, Jo would mentally rehearse lifting perfectly. In addition, as part of her readiness routine, she would image performing the lift perfectly.

Practicing. Jo practiced recovery and being centered when interruptions would occur. For example, when she was asked to role play the competition and waiting for the judge to give the signal to start, I delayed giving her the signal to begin and told her the weights had to be adjusted because they had misloaded the bar. This way there would be no novelty during actual competition. This concept of coping with the unexpected was illustrated by Michael Phelps swimming the 200-meter butterfly in the 2012 Beijing Olympics when his goggles filled up with water when he dove in. Michael still won his 10th gold medal even though he swam the last lap of the race blind (Fanning, 2012). He could do this because numerous times in the past his coach had purposely trained Michael to swim with leaking googles or totally in the dark.

Imagining lifting more. The concept of feeling/imagining yourself performing more than you can do at this moment creates the possibility for improvement because the limits of imagination may limit the experience/performance. Jo imagined lifting 10 kg more than she ever had before. She reported that "this was incredibly helpful last year in competition when I needed to lift more than I had done

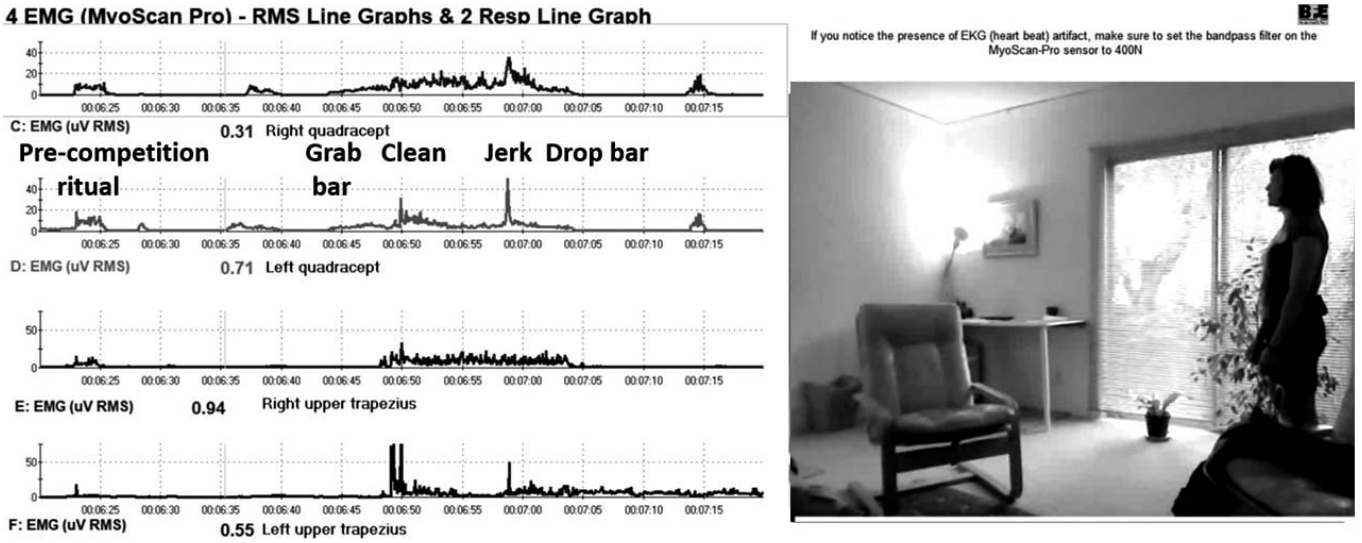

Figure 4. EMG activity during mental rehearsal.

before to qualify for the American Open, so I had mentally done it so often, then I just did it and made the qualifying lift."

Extending beyond the endpoint of performance. Jo was instructed to feel her arms extending way up into the ceiling. Extending beyond your mental boundary allows more power because the body tends to stop at the boundary. For example, by imagining the finish line at 110 meters or more when you're running 100 meters, you continue to run at maximum speed through the finish. If you focus on the actual finish line, you often slow down before reaching it. We used this concept with young male gymnasts to be able to do the iron cross for the first time by thinking of their arms being an iron beam and extending through the rings into the wall. In the case of lifting, you want to feel yourself punching the weight through the ceiling instead of just driving it upward. This portion of the lift when punching up into the ceiling is called the Jerk. This concept is demonstrated by the following Aikido exercise of the iron arm.

Two people pair up and face each other. One stretches his arm straight out and rests the wrist and back of the palm on the shoulder of his partner. The partner puts both hands on the elbow and then pulls down, trying to bend the elbow while her partner is trying to resist the downward force and keep the arms straight, as shown in Figure 5. Then the partners relax, and repeat the same exercise, except the person now imagines that his arm is like a metal bar extending from the shoulder out through his hand into the wall. Once the person is imaging this, then the partner again attempts to bend the arm.

In almost all cases, when the person imagines the arm extending like an iron bar into the wall, it is much stronger and much more difficult to bend. Jo integrated this felt imagery into her lifting during practice and she experienced increased strength while imagining/feeling the iron bar and reported that she had the "best jerks in my life."

Discussion

Achieving a new world and personal record at age 46 in the master's competition is a remarkable tribute to the athlete's dedication and coaching. Although I may think I contributed, and hopefully what I taught was beneficial, in the end it is the athlete herself who has to perform in the competition—she alone stands on the platform to lift the weights. When I asked whether the biofeedback visualization training was useful, Jo emphatically said, "Yes, and I would recommend this approach and training to everyone!" Watch the in-depth interview with Jo Aita in which she describes her experience of integrating imagery techniques and biofeedback to enhance performance recorded on May 26, 2017 (https://peperperspective.files.wordpress.com/2017/06/jo-aita-interview.mp4).

Figure 5. Testing the effect of imagery on resisting downward pull at the elbow with wrist facing palm up.

So why could a 46-year-old woman lift 3 kg more than at any other time during her competitive career of Olympic lifting? It gives hope that loss of strength that commonly occurs as we age may be due less to aging than to learned disuse, injuries, and lack of recovery. The most important factors are personal motivation and hope—you want to perform your best and know/believe that it is possible (Wilson & Peper, 2011). As Jo stated, "It helped for me to focus on doing my personal best. . . . I love Olympic lifting, I like taking care of my body, and I like feeling strong." Finally, Jo is a recent athlete in her sport. She started lifting when she was 33 and competed one year later. She then took time out to give birth to her son and in a couple of months came back and continued to become stronger. As she stated, "I always wanted to get stronger no matter what my age was."

From a performance perspective, it is interesting that she lifted more than ever before. Would it be possible that she is similar to many performers who achieve maximum performance after about 10 to 15 years of dedicated training? As she gets older, she improves her skills and increases the efficiency of her muscles and neural connections. Is it possible that loss of performance as we age is due less to aging than to loss of motivation after putting in years of practice, competition, and having achieved your goal?

Acknowledgments

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Adapted from the blog, https://peperperspective.com/2017/06/12/winning-the-gold-in-weight-lifting-using-biofeedback-imagery-and-cognitive-change/

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