The Use of Biofeedback in the Remission of Pre-Competition Sickness in Athletes: Breathing your way to success

Author Note

Louise Ellis, School of Human and Health Sciences, Division of Health and Wellbeing, University of Huddersfield.

Correspondence concerning this article should be address to Louise Ellis, School of Human and Health Sciences, Division of Health and Wellbeing, University of Huddersfield, University of Huddersfield | Queensgate | Huddersfield | HD1 3DH. United Kingdom. Telephone 441484473470. E-mail: l.ellis@hud.ac.uk

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Pre-competition sickness, nausea, and gastrointestinal problems are somatic symptoms experienced by a number of elite athletes and performance artists (Lederman, 1999). Whilst there are some very famous and indeed successful athletes who experience heightened anxiety and pre-competition sickness, there are others who find the consequences of pre-competition sickness disruptive and overbearing. Causes of pre-competition sickness have been attributed to changes in psycho-physiological states, such as changes in cognitive thought processes, breathing patterns, and increased adrenaline.

One technology gaining increasing momentum in sport psychology is the application of biofeedback training. Biofeedback modalities have, for example, been effective in applied psycho-physiology to improve breathing (Gilbert, 2005) and reduce panic attacks (Meuret, Wilhem, & Roth, 2001), and in sport psychology to improve imagery (Oishi, Kasai, & Maeshima, 2000) and manage competitive stress (Lagos, Vaschillo, Vaschillo, Lehrer, Bates, & Pandina, 2008). Biofeedback is a process of monitoring physiological responses, such as muscle tension, galvanic skin response, heart rate, respiration rate, body temperature, and electrical activity of the brain – known as neurofeedback . Biofeedback is an effective, objective, and evidence-based approach and can facilitate athlete understanding and self-regulation of psycho-physiological responses.

The following case study presents a five-phase biofeedback protocol utilizing a Pursed Lip Breathing technique (PLB) to assist in the remission of pre-competition sickness. A combination of biofeedback training, cognitive behavioral therapy, and specific transfer of techniques to training and performance were associated with a remission of symptoms, in particular pre-competition sickness.

Background Information

The client presented is a 14-year-old female lacrosse player in the England Lacrosse Centre of Excellence Academy (Centex). The Centex program was formed in January 2004 as a talent identification pathway to benefit players who aspired and had the potential to represent England on the under 19 women's lacrosse team. Initially, the client and her parents consulted a Doctor (General Practitioner – GP) regarding anxiety and sickness before competition. Upon ruling out medical issues, the GP suggested they seek advice from a sport psychologist, which led to the client contacting the author. A conversation was conducted with the client and her parent over the telephone to obtain demographic information and to establish the main reason(s) for initial contact. Consistent with many athletes the performer had superficial knowledge of sport psychology, yet expressed a keen interest in the area. In the initial telephone consultation and subsequent needs analysis, the client presented with a recent (1 year) history of cognitive worry, somatic symptoms of shallow breathing, and pre-competition sickness.

The symptoms had manifested further since selection for the Centex Squad, and consequently had now transferred into her pre-competitive state in school matches. The Centex squad training sessions included physical, mental, tactical, fitness, match play, and individual and group feedback. As a consequence of perceiving such evaluations with lack of control and heightened concern, the client struggled to regulate her anxiety. She reported her cognitive worry increased the night before, and she endured unmanageable symptoms of nausea and sickness in the morning of squad training; consequently, she was unable to eat breakfast. The client had also previously consulted a nutritionist to assist. She felt these symptoms were affecting her performance, energy levels, and enjoyment in the build up to squad training. She also reported not being entirely

comfortable with her breathing, especially during match play conditions, and would particularly struggle in the early part of a match.

I drew the client's attention to the fact that I had worked with international lacrosse players at senior level and athletes with pre-competition sickness associated with anxiety before. However, in order to maintain the utmost integrity toward the client and my own service provision I also informed the client that should I feel she would be best served by another sport psychologist after the first meeting then I would point her in the right direction and recommend her to an appropriate colleague.

The client expressed a keen interest to meet thus a formal face-to-face meeting was arranged to conduct a 'needs analysis' and assess the client's psychological strengths and areas for development. After discussion, she advised her parents she would feel more comfortable having the consultations at her home, this way her mother could be present should she require any further support or clarification. In total, the client engaged in six weekly sessions of biofeedback and cognitive training.

Description of the Case

The case study presents a five-phase biofeedback protocol utilizing PLB to assist in the remission of pre-competition sickness. The PLB technique has predominantly been utilized in advanced psycho-physiology with patients with "advanced COPD (Chronic Obtrusive Pulmonary Disease) who hyperinflate their lungs during attack of bronchospasm, panic, or exercise, and as an adjunctive measure in patients undergoing exercise rehabilitation or of respiratory muscle training" (Berkow & Fletcher, 1992, p. 632). Less attention has been paid to the technique in the sport psychology literature, although a wealth of breathing and stress management strategies have been widely used. Gevirtz and Schwartz (2003) called for the PLB technique to be utilized with other conditions, and suggested the use of oxygen or feedback instruments. In their

comprehensive review, they could find no research on the use of PLB with patients other than those with COPD.

The biofeedback protocol presented in this case study, consisted of five main phases: (1) Pre-intervention baseline assessment; (2) Introduction to the PLB technique; (3) PLB - non-visual biofeedback; (4) PLB – visual biofeedback; and (5) Post-intervention baseline assessment. A respiration sensor, which measures the relative expansion of the abdomen or thorax during inhalation and exhalation was utilized. In this protocol, it was worn over a cotton based top to reduce static and artefacts, and placed over the client's abdomen. Whilst some biofeedback and neurofeedback technologies are suited to lab-based settings only, the biofeedback training technology utilized in this study is suited to transportation and use in mobile settings, providing basic protocols and good practice are followed to reduce artefacts.

Five-phase biofeedback protocol utilizing PLB

The first phase of the biofeedback protocol involved obtaining a two-minute baseline respiration rate assessment to determine the client's average respiration rate. Obtaining an accurate baseline assessment was essential in order to compare the baseline assessment to phases three and four using the PLB technique. In *phase two***,** the practice phase of the protocol was conducted for one minute. It is important to note that breathing incorrectly, in particular over breathing for more than one minute can cause cutaneous and peripheral blood circulation to be reduced, and can have other undesirable physiological symptoms, such as tingling in the fingers and lips, reduced sensory perception, balance, dizziness, and vision (Gilbert, 2005). Therefore, one minute practice phases were introduced initially to reduce the potential side effects of incorrect breathing.

Two-minute PLB measurement and training protocols were carefully selected in phases three and four in order to provide the client sufficient time to obtain a rhythm of

using the PLB technique in each phase. This *third phase* required the athlete to practice the PLB technique with no visual feedback from the biofeedback screen. Non-visual biofeedback training was utilized initially to avoid potentially distracting the client away from performing and feeling the correct PLB technique. In *phase four*, the client was required to conduct further two minutes of PLB using visual biofeedback. The final stage, *phase five*, consisted of a two-minute post-intervention baseline assessment. The program for this client consisted of six biofeedback sessions using varied "time use" of PLB. To elaborate, the use of two minute breathing blocks may not always be appropriate for an athlete in the actual build up to competition, therefore a discussion on appropriate and intuitive "time use" by the athlete was conducted. Furthermore, practice and transfer from sitting, standing, and walking conditions were varied from sessions one to six; the aim being to facilitate greater adherence and smoother transference into performance and training. The client also kept a daily breathing log over the six weeks.

Theoretical Framework / Philosophy

Over the course of my career, I have continued to develop my knowledge on therapeutic approaches to move overall service provision to an eclectic-integrative approach where I am able to draw upon specific skills from a number of different approaches in order to maximize benefit for the client. The American Psychological Association approved biofeedback training course I undertook in the USA in 2009 has proved a very welcome addition to my service delivery. It is a clear, evidenced, and objectively based method and has facilitated further understanding of the relationship between physiological and cognitive processes. Recognizing boundaries and competence in this area are essential, therefore, acting with integrity and honesty are central to my service provision.

Historically, and since supervised experience in 1998, my service delivery has emanated from: (1) extensive consultancy experience with professional and non-professional athletes; (2) peer mentoring; (3) attendance at conferences and workshops; (4) previous successful sport psychology programs reported in the literature from a variety of sport disciplines; (5) prominent frameworks, and (6) a humanistic athlete–centered approach based on counseling rather than just on mental skills. Whilst some of these therapeutic approaches are more clinically based, I feel it is important to gain a holistic understanding of such approaches in order to make confident referrals as and when required.

Over the last ten years I have integrated the spiritual and transcendent aspects of the human experience within my framework. A number of applied sport psychologists have also emphasized the importance of including the spiritual dimensions in their consultancy (e.g., Watson & Nesti, 2005). Professionals in the field of spiritual psychology acknowledge that the mind, body, and the spirit all work together, therefore, they must be studied together. Transpersonal psychology encourages a spiritual, holistic perspective of physical and mental health that is not necessarily integrated by humanistic psychology alone, it can address spiritual development, altered states of consciousness, and peak performance experiences for example. Whilst I have employed both client centered and consultant led approaches combined with cognitive-behavioral theory in this case, the use of biofeedback has enabled further understanding of the interaction of the mind and body. In other cases, however, where spiritual dimensions and practices have been explored (e.g. meditation), sensitivity is required around this topic, and thus I ensure this is predominantly athlete-driven.

Needs Assessment

During the time lapse of two weeks from initial telephone contact to the first formal meeting I: (1) engaged in peer reviewed and scientific reading on applied psycho-physiology and biofeedback case studies relating to anxiety (e.g. Faager, Stahle, & Larsen, 2008; Gevirtz & Schwartz, 2003); (2) reflected on and reviewed previous successful consultancy and protocols I had conducted with athletes with pre-competitive sickness and anxiety in professional football, gymnastics, and swimming; and (3) drew upon knowledge obtained during biofeedback courses. Personal aims, procedures, and objectives for the first meeting were to: (1) outline my service philosophy and what the client and her parents could expect; (2) dispel any myths about sport psychology and clarify the role of biofeedback, in particular the use of biofeedback in my practice would assist the client with performance related issues, and would not be used as a form medical diagnosis; (3) establish a trusting, positive relationship and learn about the individual's current performances; and (4) assess and obtain further understanding of the client's psychological strengths and areas for development.

Drawing upon successful procedures with other client groups and previous consultancies, a multimodal assessment of needs was used, applying a combination of interviewing techniques, biofeedback assessment / training, and behavioral analysis. The first meeting was conducted at the client's home. A semi-structured interview approach (Patton, 2002) was employed which would establish whether the program would also focus on performance enhancement, mental skills, or counselling in addition to biofeedback training. Open-ended questions focused on previous successful performances, experiences, and thought processes the client was having at the present time, and client self-reflection and description of her breathing patterns in the build up to competition. Indirect behavioral analysis and observation of the client's breathing

patterns in the session proved very useful, in particular viewing the client's breathing whilst she was describing and demonstrating her breathing patterns. I also used a combination of empathetic and reflective responses; this enabled the client to elaborate and also kept conversation open and flexible rather than rigid. I was also aware that being unconditional, friendly, knowledgeable, and flexible are all important assets (Partington & Orlick, 1987). These methods were adhered to in subsequent meetings.

Intervention

Based on the information obtained in the multimodal assessments, it was agreed that the overall objectives of the support were to: (1) improve the client's anxiety management, in particular manage cognitive worry which manifested the night before and in the morning; (2) alleviate and reduce pre-competition somatic anxiety symptoms, such as sickness; (3) improve the client's attentional focus, specifically the client was experiencing heightened 'internal negative focus', focusing upon the symptoms and feelings in the body upon awakening in the morning, thus also further eliciting anxiety of the mind. Therefore, during the course of the six-week program, five steps were taken to implement the intervention: (1) Education (verbal and written) to assist with adherence. In order for adherence to take place with any intervention the conscious mind must understand and be convinced that change can take place; (2) Individualization (e.g. client and consultant led); (3) Practice; (4) Implementation (i.e., integration into lifestyle, training, performance); and (5) Follow-up monitoring and reflection during each phase of the biofeedback intervention. The typical protocols for each session included written documents, scripts, and tangible evidence in the form of biofeedback data.

Following the needs analysis and adhering to the stages above, the client was provided with a PLB technique more commonly used in applied psycho-physiology. The five-phase biofeedback protocol I had developed and utilized successfully with other

athletes formed part of the first session and the subsequent five sessions. The PLB technique in this case study emphasized diaphragmatic breathing. It has been well documented that elite performers have found performance routines, thought control strategies, and emotional control strategies (e.g. imagery, physical relaxation, breathing control) beneficial in controlling anxiety. Research has also shown that breathing techniques can reduce muscular tension in the chest, shoulders, and jaw area (Cox, 1998) and create a general feeling of calmness and relaxation. Therefore, it was felt that the use of the PLB technique via the five-phase biofeedback protocol, combined with cognitive behavioral therapy would: (1) assist with her anxiety management, thus would also provide her with an additional internal focus rather than focusing on thoughts and situations beyond her control; and (2) assist with the remission of excessive shallow breathing to a more productive diaphragmatic breathing pattern. In summary, this PLB breathing technique was psychophysiological, in that it would help to regulate the mind and body by decreasing the client's somatic response and improve internal focus.

To address the client's cognitive anxiety, the client was also provided with an Automatic Thought Monitoring Form (which I adapted) (Greenberger & Padesky, 1995) to monitor thoughts over the forthcoming week (during and outside normal training). The client was informed that the benefits of this approach were to identify how the client was communicating with herself and establish the type of situations that evoked these thoughts. Therefore, providing the client with this initial task would enable me to help the client operate deeper, at cause level not just effect. The client was also told that in the short term this was a "catch 22", because over the course of the week she was actually being asked to pay attention to the type of thoughts and situations, however, in the longer term this would help to find out the causes and would enable further and timely cognitive interventions to be provided.

Ongoing informal and formal feedback was collated during each phase of consultation and helped to develop an effective and trusting relationship with the client. Obtaining feedback on a regular basis enabled monitoring of adherence strategies to be assessed and where applicable enabled refinement and adjustments to be made. This was achieved through monitoring and re-monitoring questioning and behavioral observation. Formal feedback was obtained using an adapted version of The Consultant Evaluation Form (Partington & Orlick, 1987) and has been well documented as a useful tool for evaluation. Vealey (1988) has identified the importance of multiple criterion measures in addition to performance, specifically, other behaviors and cognitions are also important for evaluation, such as persistence, satisfaction, effort, and enjoyment. Thus, informal feedback was obtained through discussions with the client and her parents and answering client questions.

The performer received the PLB technique very well, in the first session the client's respiration rate decreased in the two PLB biofeedback training conditions when compared with the pre-intervention baseline assessment. Moreover, the client's post-intervention respiration rate was lower than in the pre-intervention baseline assessment. This was a result of the effectiveness of PLB emphasizing diaphragmatic breathing. The first real test of this was toward the end of the second week when the client attended a Centex squad. The client was very diligent and followed the PLB technique the night before, upon awakening, and in smaller cycles in the build up to competition. This was the first time the client was free from pre-competition sickness in over a year. Whilst the client at this phase still had some cognitive worry, she attributed the PLB technique to assisting with the remission of the pre-competition sickness. In subsequent sessions, combined with cognitive interventions we worked on the client improving her thought process and gradually introducing breakfast to help with energy levels.

Reflection

The importance of "reflective practice" for future "effective practice" and professional development has been well documented (e.g. Anderson, Knowles, & Gilbourne, 2004; Cropley, Hanton, Miles, & Niven, 2010). Being self-critical and analytical is an essential part of my practice, and whilst general evaluations can obtain rich information, they cannot replace the importance of 'in-action' (i.e., while doing something) and 'on-action' (i.e., after having done something) reflective practice (Schön, 1983).

The mutli-modal approach which I adopted in the first consultancy session in this case study produced valuable results and thus enabled me to provide the client with an initial intervention in the later part of the first session. Specifically, the client was taken through the five-phase biofeedback protocol and a plan was devised for the application of PLB. I am a supporter of Cox's (1998) notion that on completion of the first consultancy session, it is important, where possible, to give the performer some form of action. Cox, (1998) has argued that this is similar to patients visiting their GP's surgery, "who will expect some tangible form of remedy for their concerns" (p.132). It is important to note that whilst I support Cox's philosophy above, I am also greatly aware of Hardy, Jones, and Gould's (1996) seven valuable points, one of which postulates that ''being able to recognize that at the time doing nothing is also the best intervention'' (p.293). During **in-action** reflection I felt confident in my decision to provide the client the five-phase protocol. Obtaining rich information from the client in advance of the first meeting in part, facilitated this.

Engaging in *on-action* reflective practice in previous consultations with other athletes also enabled phase two to be firmly embedded into the five-phase biofeedback protocol used in this case study. To expand on this, whilst chatting to a rather inquisitive

professional footballer with pre-competition sickness I answered one of his questions whilst attaching the biofeedback modality to him. In my haste, I inadvertently discussed the PLB technique before taking his basal respiration rate. Having overserved the client's breathing style throughout the session I quickly noticed he was manipulating his breathing pattern in the PLB format. *In-action*, I quickly had to interrupt the basal assessment and 'hold my hands up' that it was remiss of me to discuss the technique first as I could see he was beginning to breathe in that manner. This would impact upon his baseline assessment. We then restarted the baseline assessment with further clarification on my part. *On-action* reflection subsequently enabled phases one and two to be more clearly defined, and thus assisted in similar education and training phases with the client in this case study.

After every meeting with the client, I continued to make regular notes. Personal reflection on the whole process of service delivery has allowed my personal practices and perceptions to be challenged. Thus, it has empowered me to make specific changes to future programs to increase their effectiveness. Reflective practice for effective future practice is an essential ingredient for professional development, and sharing good practice in our field.

Suggested Readings

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Review Questions

1. When conducting a baseline assessment, what information would you provide and what information might you withhold from the client at this stage and why?
2. When introducing breathing techniques to an athlete for the first time, how long should you spend in the practice phase and why?
3. What changes might you expect to see from pre-baseline to the practice phase that you may also see in the intervention phase?
4. What are artefacts in biofeedback, and what steps would you take to prevent the risk of artefacts?
5. What are biofeedback modalities? What modality might you use for a client you have been working with and why?

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