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Developing Imagery Ability Effectively: A Guide to Layered Stimulus Response Training

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Abstract

The ability to generate and control images is an important factor in determining the effectiveness of imagery interventions. Despite evidence that imagery ability improves with practice, until recently few established ways for its development existed. This paper describes the application of layered stimulus response training (LSRT; Williams, Cooley, & Cumming, 2013), a technique based on Lang's (1977) bioinformational theory. We explain LSRT, why it works, and how it can be evaluated with a detailed case study. We also offer variations to LSRT for overcoming common imagery problems experienced by clients.

Keywords: imagery, imagery ability, interventions, bioinformational theory

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A Guide to Layered Stimulus Response Training

"*The game will throw up many different scenarios but I am as prepared in my own head for them as I can be. If you have realistically imagined situations, you feel better prepared and less fearful of the unexpected"* – Jonny Wilkinson (2006, p. 49)

Imagery is one of the most important techniques within an athlete's mental toolbox, whether it is used to understand how a skill should be performed, rehearse possible outcomes of different competitive situations, or experience what it will feel like to achieve one's dream goals. These are just some examples of the different images that athletes might generate as part of training or competition. When used effectively, imagery can lead to improved learning and performance, either directly by enhancing skills and strategies, or indirectly via achieving an optimal mental state such as developing self-confidence and regulating anxiety and other emotions (for a recent review, see Cumming & Williams, 2013).

The extent to which athletes benefit from their imagery will depend on how well they can image. Everyone has the ability to generate and control images, but this capacity varies from individual to individual. Although termed an 'ability' and partially inherited, imagery is considered to be a collection of skills that can be improved with practice and experience (Cumming & Williams, 2012). Athletes who find it easier to generate clear and vivid images will gain more from using this mental technique. Research shows that better imagery ability is associated with superior performance and wellbeing, including greater confidence and self-efficacy, lower cognitive anxiety, and a tendency to view stressful situations as a challenge more than a threat (Cumming & Williams, 2012; Williams & Cumming, 2015).

By contrast, poor imagery ability will potentially hamper an athlete's progression. In the authors' own experience, athletes who find it more difficult to image typically report one of two main problems: (a) being unable to generate and maintain the desired image; and/or

(b) being unable to eliminate or control undesirable images. Desirable images are those that facilitate cognitive, behavioural, and affective outcomes, whereas undesirable images can debilitate these same outcomes (Short et al., 2002). As a consequence of their poor imagery abilities, these athletes might be less likely to use imagery or use it ineffectively, and therefore miss out on the many benefits.

Sport psychology practitioners support athletes' imagery use by writing guided imagery scripts and providing instructions on how to image effectively (Williams, Cooley, Newell, Weibull, & Cumming, 2013). Other aids to imaging include observing live or videotaped performances, making small gestures, receiving biofeedback, and flotation rest (Holmes & Collins, 2001; Morris, Spittle, & Watt, 2005). In general, however, there is a prevailing assumption that individuals simply improve their imagery skills by doing more imagery. Like any physical skill, however, we think that the nature of the practice is important. Surprisingly, there are few established ways to improve an athlete's ability to image despite its importance and wide application within sport.

The current paper aims to rectify this gap by introducing a practical and effective imagery technique based on bioinformational theory (Lang, 1977) and response training (Lang, Kozak, Miller, Levin, & McLean, 1980) called layered stimulus response training (LSRT; Williams, Cooley, & Cumming, 2013). Henceforth, we use the term "client" because LSRT can also be used with exercisers, dancers, as well as in clinical populations. We explain LSRT and its supporting evidence, how it works, and how it can be evaluated. A case study is used to illustrate this technique before we offer variations to LSRT for overcoming aforementioned problems experienced by clients when engaging in imagery.

What is LSRT?

The aim of LSRT is to help individuals more easily generate and control their imagery experience by adding different elements of the image in progressive layers. An element can be stimulus, response, or meaning information, which are the same types of propositional information used to store images in long-term memory (Lang, 1977, 1979). According to Lang's bioinformational theory (1977, 1979), behaviour can be modified by revising and strengthening the response and meaning propositions linked to a stimulus situation. Stimulus information consists of sensory details of the situation being imaged, response information describes the person's emotional and physiological response to the situation, and meaning information explains how the response to the stimulus is interpreted by the person (for examples, see Figure 1). Breaking down an image into these different elements and gradually bringing them together in layers results in a richer and more detailed image that is easier to generate and control. Each layer of the process thus represents cycles of image, reflect, and develop (Figure 2).

Image. Typically guided by a practitioner, clients begin LSRT by generating a simple image of a targeted situation. The scenario is drawn from their own personal experience, so that it can be readily recalled from memory (e.g., a golfer imaging himself driving off the tee or lining up a putt). Before imaging the scene, clients are asked to verbally describe it in as much detail as possible (e.g., where, when, what). The scene is then imaged until it naturally comes to an end (e.g., the shot is taken) or for a specific period, such as in the case of continuous tasks (e.g., 30 seconds of walking). If found to be helpful, we encourage clients to close their eyes and then generate the image as clearly and vividly as possible.

Reflect. After they indicate the image is completed, we ask clients to rate their image using a form provided (see evaluating imagery experiences below). In subsequent reflections, the image is again rated and evaluated with comparisons made to the initial rating

to help clients notice improvements. They are also guided to reflect on the content and characteristics of their imagery use (e.g., visual perspective, agency, angle, speed, duration; for a detailed description of imagery characteristics see Cumming & Williams, 2012). The main goal of the initial reflection is to break down the image into discrete components and identify which elements of the image were particularly easy or vivid to generate. In our experience, this is usually stimulus information (e.g., details of the surroundings). For individuals who are less experienced with using imagery and/or find it difficult to generate images, it is rare for them to provide details of response and meaning propositions.

Development. Following the reflection, we suggest that clients either remain with the current image (i.e., re-image) or develop it further by adding/modifying the image's content and/or characteristics (i.e., develop a new layer). Image development typically occurs when a new element is added as a layer to the previously imaged scene. The client then images the scene as clearly and as vividly as possible while focusing on the new element. It is important to note that within applied practice, this image development is not solely focused on content but also on how the imagery is performed. Similar to Davies (2015), we have noted that characteristics of the clients' imagery use will change over the layers (e.g., switch between visual perspectives). It is also not unusual for the content to evolve into becoming more relevant to the situation (e.g., non-relevant but initially easy to image stimulus information is gradually replaced with more relevant response information).

Does LSRT Work?

There is evidence to support LSRT as a more effective way for improving imagery ability than imagery rehearsal alone (Williams, Cooley, & Cumming, 2013). In a four day movement imagery intervention to improve golf putting performance, Williams, Cooley, and Cumming (2013) found that individuals receiving LSRT improved their visual and kinesthetic imagery ability of both specific (i.e., golf putting images) and general (i.e.,

movement) images. Although individuals conducting imagery rehearsal alone did show some improvements, the LSRT group improved on the most indicators. Moreover, without any corresponding physical practice, only LSRT led to improvements in actual golf putting performance.

More recently, Weibull and colleagues applied LSRT to women who wanted to increase their physical activity levels using a guided imagery intervention (Weibull, Cumming, Cooley, Williams, & Burns, 2014). They used a single session of LSRT to help participants improve their ability to image stimulus and response information related to going for a walk. Although the aim was not to test the effectiveness of LSRT, participants in this study reported significantly greater ease of imaging following the exercise, demonstrating the immediate effects LSRT can have on an individual's imagery ability.

Why Use LSRT?

Although LSRT has mostly been employed in research settings (e.g., Cumming et al., 2007; Weibull et al., 2014; Williams, Cooley, & Cumming, 2013), it has been used in applied practice by our group and more recently by other practitioners (e.g., Davies, 2015). This technique is specifically designed to benefit those who have difficulty in imaging, but anyone can use it to improve their imagery skills. By focusing on each component of the image, clients can sharpen the clarity and richness of detail in their images. As an image becomes more vivid, it will more likely resemble the actual experience and in turn, be more effective for enhancing performance and wellbeing.

LSRT will also help clients to generate greater control over their imagery. It does this by explicitly encouraging a focus on four distinct but related imagery processes: (a) generation, (b) inspection, (c) transformation, and (d) maintenance (Kosslyn, 1995). Image generation improves because the client is better able to draw from different types of information in long-term memory or visual cues to form the images; that is, a range of

stimulus and response information. Through conversing with the practitioner, attention is drawn to the inspection and transformation processes. Reflecting on the image improves the client's ability to scan the image and interpret whether it depicts the intended scene (image inspection), as well as improve how to alter details of the scene (image transformation) to make it more vivid and realistic. Finally, image maintenance improves because the client is better able to direct mental effort to retaining the information over the necessary period of time. Due to the complexities involved, it is unlikely that imagery rehearsal alone would tap these processes for improvement as systematically or effectively as LSRT.

By asking clients to reflect on each image, we think that LSRT also helps individuals to become more aware of their imagery experience and develop metaimagery skills (i.e., beliefs about the nature and/or regulation of an individual's own imagery skills; MacIntyre & Moran, 2010). These preferences can include, but are not limited to, the modalities involved (e.g., visual, kinesthetic, gustatory, tactile, and olfactory), the viewpoint adopted during imagery (e.g., first person perspective vs. third person perspective), the author or agent of the behaviour being imaged (e.g., the client imaging themselves or someone else performing the behaviour), and the speed of the image (e.g., slow motion vs. real time). LSRT is a technique that also encourages clients to explore alternative yet relevant senses as well as other types of physiological and emotional responses not previously included in their imagery. It follows, therefore, that exposing clients to different ways of imaging may lead to greater flexibility in how they use imagery, thereby increasing the potential benefits from this technique. According to Cumming and Williams (2013), imagery benefits will be maximized when individuals are aware of the reasons why they are imaging and what content will best help them to achieve their aims. By using LSRT, clients may become better able to manipulate the content and characteristics of their imagery use to achieve better affective, behavioural, and cognitive outcomes.

Moreover, LSRT can be used to alter the meaning of an imaged scenario, which may help clients to manage their debilitative images. For a gymnast who keeps replaying an image of herself falling off the beam, LSRT may help her to gain control of the image and/or change its content by gradually adjusting the stimulus, response, and/or meaning propositions. Similarly, Davies (2015) described using LSRT with an equestrian rider who experienced unhelpful thoughts, feelings, and physiological responses when imaging jumping over hard fences from a first person perspective. In this case, LSRT initially helped the rider to generate an image of jumping over an easier fence from a third person perspective, before eventually changing to a first person perspective. The content evolved until the rider could mentally experience successfully jumping over harder fences. In this case, LSRT was not just used to enhance the client's ability to generate a particular image, but to change the meaning of the situation by paying careful attention to the response and meaning propositions elicited in the different layers.

Evaluating the Imagery Experience.

The client's progress with LSRT can be easily evaluated to provide ongoing feedback. A simple, but informative approach, is to ask clients to rate the vividness and clarity of their imagery experience on a scale (1= *no image at all, only thinking of the scenario*, and 5 = a *perfectly clear and vivid image*). Scales can be used to rate other dimensions of imagery ability (e.g., ease, controllability). By noting these values down, progress is easily charted. It is not unusual, however, to see scores decrease slightly as more layers are added. We view this as an indication for clients to remain with the current layer until they have returned to their previously higher rating. As a more objective way of providing feedback (also see Cumming & Williams, 2012), heart rate monitors can be used to help clients become more aware of changes to physiological responses during their imagery. Similarly, the imaged scene can be timed to provide feedback on image duration.

LSRT Example

The client. To illustrate how LSRT can be used in applied practice, we use the example of 16-year-old female endurance cyclist, whom we have named Ella. She had no previous experience working with a sport psychology practitioner and had been recently dropped by the national talent development squad following a series of poor performances. Ella was now seeking support to get her performance back on track by attending regular sessions, with each hour-long session scheduled 2 to 3 weeks apart over a 6 month period. Homework was always suggested between sessions to encourage Ella to continuously practice and implement the different techniques discussed.

Ella identified in an initial session that her imagery skills were an area for improvement. The imagery was also an opportunity to work towards her goal of having a stronger focus on her own performance, and further develop her ability to reflect. Ella found it very easy to be distracted by other cyclists and this often led to symptoms she associated with anxiety in both training and performance situations. In the fifth session, the practitioner introduced Ella to LSRT and this technique was developed over two sessions with the majority of time focused on practice and reflection. Imagery was also revisited in later sessions as part of her preparation for specific training events and races, and reminders were provided about the response propositions Ella found useful to include in her imagery. She began to use imagery more regularly, for example, to preview her performance as part of her newly developed pre-race routine.

The initial scene. To begin the exercise, Ella chose to image her weekly ride with her local cycling club, a route she had been cycling since the age of 10 years. When she initially imaged the scene, she rated it as 4 for vividness on a 5-point scale. She described the image as mostly containing visual information, that she experienced from a first person perspective (e.g., moving along the road), as well as some kinesthetic sensations (e.g., feeling

a tingle in her legs when "digging in" through difficult sections of the route). Ella also noted that the focus of her attention was unlike her normal experience because she was mostly focused on herself and only somewhat on the other riders. After reimaging the scene by just focusing on the visual details of the road (stimulus information), she felt it would become more realistic if she incorporated emotions and additional kinesthetic sensations (response information), as well as the normal sounds she associated with her ride (stimulus information).

Layer 1 (sounds). For this layer and subsequent ones, the practitioner prompted Ella with the question "How would you like to develop your image further to make it more vivid and realistic?" In response, Ella decided first to focus on adding relevant sounds (e.g., the sound of her breathing, background talking, changing of gears on a hill) (stimulus information). Although she found this stimulus information initially hard to include as an additional layer, the sounds helped to make the scene feel more real and led her to rate vividness again as a 4. When reflecting on the image, she identified the sound of her breathing as the easiest to image, whereas both the background conversations between other cyclists and the gear change were the most difficult to image sounds. She decided to stay with this layer, and narrow the sounds to those most relevant to her own performance (i.e., the sound of her breathing and changing gears). She found it much easier to focus on fewer sounds when reimaging the scene and rated it as 4.2.

Layer 2 (touch). The practitioner pointed out the improvement in Ella's vividness rating and asked Ella if she would like to develop the image further. Ella decided to add the tactile sensation of her hands gripping the handlebars of her bike (stimulus information). In this second layer, she experienced a strong feeling of the handlebars and could hear the sound of her breathing, however the sight of the road disappeared. Because her vividness rating lowered to 3.7, the practitioner suggested that she remain with this layer as homework

between sessions. Between session 5 and 6, Ella was asked to image the second layer several times each day.

Layer 3 (thoughts). At the start of the next session, Ella reported that she had experienced improvements in her image by doing the homework and found it much easier to combine details of what she was seeing, feeling, and hearing. To develop the image further, she added the positive thought of "be calm" (meaning information) in reply to prompts from the practitioner as to how she would interpret this stimulus information. When the new information was added, she again found that a detail from the previous layer disappeared (in this case, the sound). Her vividness rating lowered to 2.5 and the practitioner again suggested staying with this layer until it was more vivid and clear. After a few practice attempts, Ella's vividness rating rose to 3.9 and the next layer was added.

Layer 4 (kinesthetic). Ella's fourth layer focused on the sensations of her legs burning and the hurt growing from riding hard on the hill part of the route (response information). Her vividness rating of 3.7 led her to reflect that although the scene was becoming more realistic, it was harder to combine all of the details. After some further discussion, the practitioner suggested that she narrow her focus to fewer details so that her attentional style more closely matched the real life situation (see PETTLEP model; Holmes & Collins, 2001). This led Ella to select and refine what she considered to be the most important elements of her image: (a) the sight of the wheels in front of her, (b) the feel of her legs burning and hurting, and (c) the thought of staying calm and positive. After reimaging the scene, Ella commented that this had been the most realistic image so far and rated its vividness as 4.5.

Follow-up. Ella carried on using this final image as part of her mental preparation for her road training and began to modify it for use in track events. The exercise also helped Ella to realise that she was capable of staying focused on her own performance, as well as

improve her ability to generate, inspect, transform, and maintain images in her mind. By rehearsing this attentional state during her imagery, Ella felt more in control of her thoughts, feelings, and physiological responses and her performances soon began to improve.

Variations of LSRT

LSRT is a flexible technique that provides practitioners with a structure to follow when introducing imagery to their clients, but can also be easily adapted. We have used it for individuals, pairs (e.g., ballroom dance couples), and groups (e.g., football teams). Having more than one individual involved provides the opportunity for clients to learn from each other's imagery experiences as well as often providing deep insights into how each person experiences the same situation differently. LSRT can also be the first step towards developing a personalised imagery script for a client (for advice on script development, see Williams, Cooley, Newell, et al., 2013).

Drawing from the broader imagery literature, practitioners can combine LSRT with other frameworks for enhancing imagery's effectiveness such as Holmes and Collins' (2001) PETTLEP model. To maximise the effectiveness of imagery interventions, this model suggests that seven elements are considered: Physical, Environment, Task, Timing, Learning, Emotion, and Perspective (for advice on implementing PETTLEP, see Wakefield & Smith, 2012). For example, asking a distance runner to stand up while wearing his shoes ('Physical' element) helped him to better incorporate tactile sensations into a layer (response information). We have also used video clips of past performances to help clients identify key details of the scene ('Environment' element) and provide a template for imaging the initial scene (Williams, Cumming, & Edwards, 2011).

Conclusions

Despite imagery being referred to as "the central pillar of applied sport psychology" (Morris et al., 2005, p. 344) and research demonstrating that it is possible to improve one's

ability to generate and control images (Cumming & Williams, 2012), until now there has been very little advice available to practitioners for how this can be effectively done. LSRT is a theory based technique with a growing evidence base to support its use with both athletes and exercisers. Although it does provide the practitioner with clear principles and a structure to follow, it can be easily customised to meet individual client needs. We take a client led approach to LSRT placing them at the centre of the LSRT process, empowering them to manage what and how they image. The practitioner guides the client to reflect on what details might be missing from their image or could be changed to help it be more realistic. By supporting the client in deciding for themselves how the image can be improved, they will feel more confident in their ability to independently continue using imagery outside of the sessions. For imagery to become a well-developed skill within the client's mental toolbox, they should ideally be able to implement it within a range of situations and customise its content to suit arising needs. By improving their ability to generate more vivid and controllable facilitative images, promoting greater awareness of the imagery process, and encouraging greater flexibility in how imagery is used, LSRT will also likely lead to more effective imagery for a range of outcomes including performance, confidence, and anxiety regulation.

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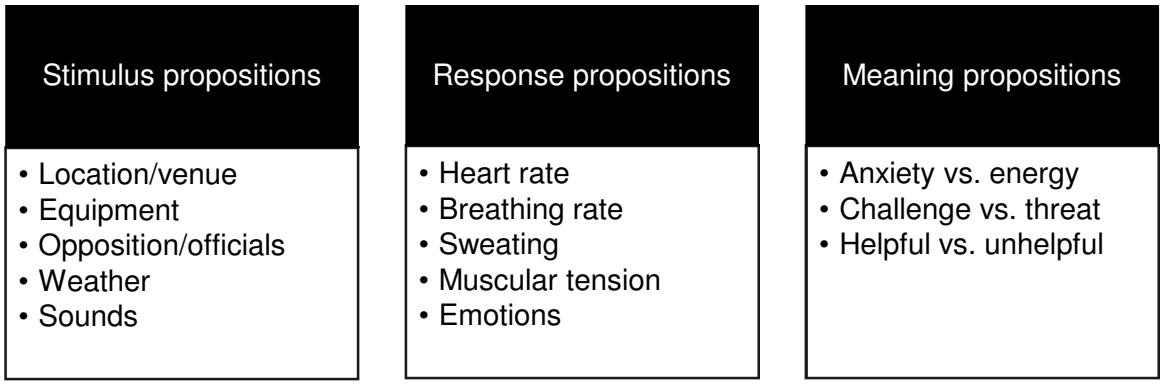

Figure 1. Examples of stimulus, response, and meaning propositions.

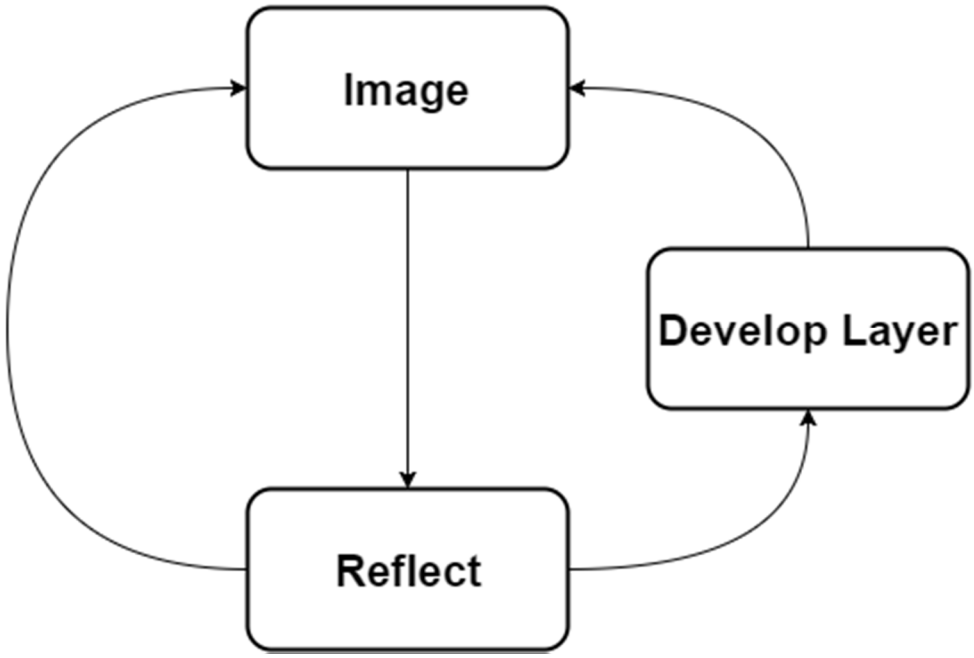

Figure 2. Process of layered stimulus response training (LSRT).