

Music On, Movement On:
Conditioning and Dancers' Muscle Memory
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Throughout my dance life (from studio recitals to company concerts), I have had people come to me after performances and ask, “How do you remember all of those moves?” At first I did not know how to respond as I could not explain my memorization process, but later I learned about muscle memory, a motor form of learning, and it started to make sense. Solway (2007) addresses the concept of muscle memory by explaining that most dancers first learn the choreography, then add layers of detail and color, and finally “absorb the work so completely that its elements literally become automatic, leaving the dancer's brain free to focus on the moment-by-moment nuances of the performance” (para. 4). This happens for me, as well; and now, when anxious beginning dance students ask me how they will ever “remember all of those moves”, I tell them not to worry, because if they work hard they will eventually develop muscle memory. Muscle memory can seem almost magical in that, while you may cognitively forget the choreography of a particular dance (especially due to a time lapse in practicing it), when the music is turned on for that dance, your body seems to remember the choreography and it comes back to you. This phenomenon makes even more sense to me now in relation to principles of behaviorism. I can especially see theoretical connections between muscle memory and certain ideas (stimulus-response, repetition, and transfer) from Pavlov's classical conditioning and Guthrie's contiguous conditioning theories, and plan to apply this understanding to help my dance students fully utilize the power of muscle memory.

Stimulus-Response

When learning choreography in class, dance students are first expected to respond to cues given by the instructor, both verbal and physical, to learn and then think about the steps as they

go through them. They then begin connecting the movements with the selected music, and practicing for performance. When the dancers are finally onstage, the music is the only stimulus present to cue their movements.

Classical Conditioning

Though dancing choreographed movement is not considered an involuntary action like the salivation of Pavlov's dogs, I still see a connection between dancers' muscle memory for specific pieces of choreography and the classical conditioning theory. Stankovich (2007) agrees: "Muscle memory is built upon the theory of classical conditioning, an approach to human learning that relies on stimulus-response contingencies" (para. 2). When making this connection, the unconditioned stimulus (UCS) would be thinking about the steps (initially caused by the instructor's cues), which would cause the unconditioned response (UCR) of specific movement. This same response will occur when the conditioned stimulus (CS) of music is introduced along with UCS. When muscle memory is developed after repeated practice, dancers will not need to think about the steps anymore, as the CS of music results in the now conditioned response (CR) of specific movement. This muscle memory conditioning is especially noticeable after a lapse of time in which the CR presumably extinguishes—what Pavlov calls "spontaneous recovery" (Schunk, 2012, p. 79).

Sloan (2007), a ballet dancer, explains:

It's amazing how your boss can say, "So-and-so is out... I need someone for the first movement of Brahms-Schoenberg Quartet tonight. You did it at some point over the years...Do you remember any of it?" And at first you try to think of the steps, and you think. "No I definitely have no recollection of a single step in the entire piece." But then you hear the music, and it's all right there, like magic. (para. 6)

Contiguous Conditioning

Guthrie also believed that “learning occurs through pairing of stimulus and response” (Schunk, 2012, p. 84), and thought key behaviors to be acts and movements, which likewise reflect dancers’ muscle memory. Dancers execute many small movements which then become combined/choreographed into more complex movements (acts) which result in a dance piece to be performed (outcome). Guthrie explains his idea of contiguity of stimuli and responses: “A combination of stimuli which has accomplished a movement will on its recurrence tend to be followed by that movement” (as cited in Schunk, 2012, p. 84). Upon hearing the music for a specific dance, dancers who have developed muscle memory for that piece will initiate the movement of that choreography. This does not necessarily mean movement on a full out level, but sometimes on a much smaller scale. The retired 93 year-old ballet dancer, Frederic Franklin, attested to this when watching a pas de deux he had performed in the past. He said, “It’s all in here, when I’m watching them, I can feel my muscles doing it” (as cited in Sloan, 2007, para. 6).

Repetition and Transfer

In order for most dancers to get the movement into their bodies (i.e., muscle memory), repeated practice is necessary. This is why regular class attendance and rehearsals are important before performing. Dress rehearsals (onstage run-throughs mocking the actual performance) are especially helpful, as they promote transfer from studio to stage.

Classical Conditioning

In Pavlov’s experiments, repetition was important for successful conditioning, as well. He believed that “conditioning is an automatic process that occurs with repeated CS-UCS pairing and that repeated nonpairing extinguish the CR” (Schunk, 2012, p. 81). Different from these beliefs, though, dancers (and humans in general) may experience conditioning more quickly, and

are cognitively aware of the CS-UCS link. Some dance students are able to pick up choreography and be able to successfully perform it much more rapidly than others. In addition to physically practicing, another method I have used to help dance students prepare for performance is visualization. To do this, dancers simply listen to the music with eyes closed, and imagine themselves performing perfectly onstage. This is beneficial for a couple reasons. First, it assists with developing muscle memory and transferring it into a new environment. When you cannot physically be on the stage, it is a simple way to simulate that environment, and even just imagining movements can activate dancers' muscles and help with motor learning. Stankovich (2007) agrees about the benefit of visualization on conditioning: "Developing muscle memory can happen through live instruction as well as through independent-imagery exercises" (para. 5). Another benefit of a dancer's visualization of a positive onstage performance is that it can help reduce anxieties related to stage fright, as seen in the behaviorist idea of emotional conditioning (Schunk, 2012).

Contiguous Conditioning

Guthrie did not believe that the strength of stimulus-response pairing was tied to frequency, but did believe that "[r]epetition of a situation adds movements, combines movements into acts, and establishes the act under different environmental conditions" (Schunk, 2012, p. 85). This idea can be applied to the dance process described earlier consisting of class and practices (adding and combining movements) to dress rehearsals and performance (different environment of the stage). Guthrie suggested practicing behaviors "in the exact situation in which they will be called for" (Schunk, 2012, p. 85) so as to produce transfer. This reconfirms my belief in the importance of rehearsing on the stage before the performance. A dress rehearsal is especially helpful as it also synthesizes the lights, costumes, and general atmosphere of the upcoming performance.

Conclusion

Now that I have an understanding of muscle memory in terms of the behaviorist theories of classical and contiguous conditioning, I can go into more detail about muscle memory with my dance students so that they can realize its full potential when they are faced with learning specific pieces of choreography to perform. While behaviorism does not address the mental processes that are involved in learning a dance, even in the phenomenon of muscle memory, the theories of classical and contiguous conditioning with their focus on environmental events give me several strategies to utilize when teaching. For example, to create a strong stimulus-response pairing between the music and movement, we will focus on paying close attention to the music, matching specific movements to sections, and repeatedly practicing the choreography with the music. This, along with incorporating visualization exercises and stressing the importance of dress rehearsals, will further develop students' muscle memory and allow for transfer of conditioning from classroom to stage. Then, when the dancers are onstage and the music comes on, it will be easier for them to "remember all those moves".

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