Personal trainers and other strength and conditioning professionals have most likely encountered a situation where a client experiences muscle soreness following exercise. A personal trainer may possess a large percentage of clientele consisting of unhealthy and inactive individuals who would like to become healthier through exercise. With untrained individuals, muscle soreness can be experienced frequently and more severely with the initiation of an exercise program. This type of soreness is referred to as delayed onset muscle soreness (DOMS), which consists of physical pain or discomfort that can occur as soon as 24 hours after exercise, usually lasts 2 – 3 days, and can take as long as 8 – 10 days to fully subside (4).

Approximately 22 percent of the population participates in regular sustained physical activity (3). This low percentage suggests that a large portion of the population will experience this type of soreness upon becoming active; therefore, it is necessary for the strength and conditioning professional to be able to successfully minimize or avoid DOMS. In fact, client retention could be greatly impacted by an exercise professional’s ability to reduce client soreness following exercise. Understanding various methods can give these professionals an edge in dealing with hesitant participants. A number of factors must be considered when deciding on a treatment for DOMS: the methods that are currently available, the accessibility of those methods, and the feasibility of their use. The purpose of this article is to compare and contrast popular methods used to reduce soreness that are feasible for most clients.

### CAFFEINE

Performance benefits demonstrated with caffeine ingestion may lead one to believe that muscle damage after exercise may be more profound with caffeine supplementation. It has been shown that despite caffeine ingestion increasing maximal heart rate, oxygen uptake, and time to exhaustion, cellular oxidative damage remained unaltered (11). This implies that taking caffeine as an ergogenic aid should not exacerbate soreness. Additionally, caffeine ingestion may have beneficial effects such as improved performance while not compromising workouts performed on consecutive days. Most studies have utilized 5 mg/kg of bodyweight, which is approximately the equivalent of two cups of coffee (6,10).

The timing, however, may be the major determinant of caffeine’s effectiveness on successfully attenuating soreness. When the relative dosage is consumed over long periods, it may not have the same level of impact (10). Most successful interventions have participants consuming their entire dosage prior to exercise (6,9). Caffeine has also been shown to reduce DOMS after both upper body and lower body resistance exercise effectively (6,9). This research also shows that in addition to lower ratings of exertion during exercise, caffeine can also reduce recovery time (5). Therefore, caffeine could be a viable option for the strength and conditioning professional to prescribe to individuals prior to exercise.
CRYOTHERAPY
Cold water immersion, or whole body cryotherapy, has commonly been used by collegiate athletes to help aid recovery for consecutive exercise sessions. Only recently has this modality become more commonly used by recreational exercisers as well. There seems to be some contradicting evidence on the effectiveness of cryotherapy. The duration is a major contributing factor to cryotherapy’s effectiveness or ineffectiveness. Short immersions of 1 – 3 min may not have a profound effect, whereas research that utilizes immersions for 3 min, with a 10-min post-recovery resting period, has shown benefits (14,17). Longer bouts of 10 min may be more beneficial in attenuating muscle soreness (13,20). Although the evidence appears to support sustained immersion, intermittent immersion between 6 – 18 min, with 1-min intervals has been shown to be beneficial, with no dose response relationship (21). Although the research suggests a benefit to cryotherapy, an individual’s tolerance to cold and possible risks for individuals with peripheral vascular issues should be discussed prior to implementation.

BRANCHED-CHAIN AMINO ACIDS
Branched-chain amino acids (BCAA) have been widely taken by exercise enthusiasts and prescribed by nutrition experts. Although the research has not been definitive, most studies demonstrate positive outcomes. Claims of increasing muscle protein synthesis and helping to prevent muscle breakdown have been associated with BCAA supplementation (16). Studies have shown that taking a dosage before and after exercise may have a greater impact on attenuating soreness (15,18). However, if supplementation immediately after exercise is the only option, there may be a slight reduction of soreness (22). In another study, similar results were shown when taking a leucine and carbohydrate supplemental beverage after anaerobic exercise (19). BCAAs can be easily implemented into an individual’s diet, which may make them a viable option to help attenuate DOMS.

AEROBIC EXERCISE
Out of the aforementioned methods, aerobic exercise may be the easiest method to implement for the strength and conditioning professional. Aerobic exercise is a vital part of most workout regimens. Moreover, aerobic exercise done prior to, rather than after, resistance exercise appears to be more beneficial (2,8,12). Performing cardio prior to exercise could be effective when performed as one continuous exercise that lasts for 10 – 20 min (8,12). Another option is to incorporate an “active rest” between resistance exercise sets. This is done by completing each set of resistance exercise immediately followed by a short duration of cardiovascular exercise. One study using this method was able to eliminate DOMS by the fourth week of training completely (7).

PRACTICAL APPLICATION
Experiencing DOMS may come as a surprise to most inactive individuals, and it may even cause them to question their motivation. This effect on motivation may even lead to an individual preferring to remain inactive, and thus, negatively affecting a personal trainer’s business. For personal trainers, having the ability to reduce a client’s muscle soreness effectively is imperative. Having the ability and knowledge to implement a specific protocol to reduce a client’s soreness may greatly reduce the number of clients deciding to cease exercise due to DOMS. Soreness can also negatively affect a client’s workout performance and session frequency, either of which could ultimately lead to goals not being attained. This knowledge and ability can affect a personal trainer’s business by increasing client retention and satisfaction.

CONCLUSION
Attenuating DOMS can have a substantial impact on a personal trainer’s business and overall client satisfaction. For successful reduction in soreness, an understanding of the methodology of a preferred method is essential. Caffeine ingestion may be effective with the consumption of 5 mg/kg of bodyweight before and/or after exercise. Despite the contradiction in the research for cryotherapy, it appears that immersion of 10 or more minutes or 6 – 18 min of intermittent submersion are the most successful protocols for reducing DOMS. In regards to BCAA supplementation, there appears to be benefits for ingesting BCAAs before and after exercise. Whether used prior to resistance exercise or during active rest between sets, aerobic exercise also appears to be a viable method to decrease DOMS. Personal trainers should have a conversation with each client to determine which method, if any, would work best for them.
ATTENUATING DELAYED ONSET MUSCLE SORENESS IN UNTRAINED INDIVIDUALS

REFERENCES

ABOUT THE AUTHOR
Michael Randone owns a personal training company in Omaha, NE called Randone Wellness, LLC. He has nearly a decade of personal training experience through multiple organizations. Randone has earned several accreditations such as the Certified Strength and Conditioning Specialist® (CSCS®) certification through the National Strength and Conditioning Association (NSCA). He earned a Master’s degree in Exercise Science from the University of Nebraska-Omaha. While attending graduate school, Randone earned a grant to conduct research on lactate mechanics in addition to an academic scholarship.
<table>
<thead>
<tr>
<th>METHOD</th>
<th>PARTICIPANT</th>
<th>TIMING</th>
<th>DOSAGE</th>
<th>RESULT</th>
<th>RESOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caffeine</strong></td>
<td>F/LC</td>
<td>24 and 48 hr post</td>
<td>5 mg/kg</td>
<td>↓</td>
<td>Maridakis (2007)</td>
</tr>
<tr>
<td></td>
<td>M/LC</td>
<td>1 hr prior</td>
<td>5 mg/kg</td>
<td>↓</td>
<td>Hurley (2013)</td>
</tr>
<tr>
<td><strong>Cryotherapy</strong></td>
<td>R</td>
<td>15-min emersion</td>
<td>8 – 10°C</td>
<td>↓</td>
<td>Vaile (2007)</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>3-min emersion</td>
<td>-10/-60/-110°C</td>
<td>↓</td>
<td>Pournot (2011)</td>
</tr>
<tr>
<td><strong>BCAA</strong></td>
<td>M</td>
<td>2 weeks pre; 3 days post; 3x day</td>
<td>3.2g BCAA</td>
<td>↓</td>
<td>Ra (2013)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>After anaerobic exercise</td>
<td>2g Taurine</td>
<td>↔</td>
<td>Watanabe (2007)</td>
</tr>
<tr>
<td><strong>Aerobic</strong></td>
<td>M + F</td>
<td>20 min</td>
<td>60 – 70% HRmax</td>
<td>Pre</td>
<td>Olsen (2012)</td>
</tr>
<tr>
<td></td>
<td>M + F</td>
<td>10 min</td>
<td>4.5 – 5 kph; 3º</td>
<td>Pre</td>
<td>Law (2007)</td>
</tr>
</tbody>
</table>

*M=male participants; F=female participants; R=recreationally trained; T=trained individuals; LC=low caffeine consumers; ↓=Demonstrated a significant decrease in DOMS; ↔=Demonstrated no significant reduction in DOMS