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FROM THE EDITORS

We consider it an extremely sad state of affairs that scientific research in the sports sciences does not reach coaches and athletes in an efficient and understandable manner. Though it is our intent to provide you with the latest findings and translate them into the kind of English you can actually understand, groundbreaking research from years past has likely eluded you. We will therefore go back from time to time to present you with these classic findings as well in hopes that applying them will help you set personal records you never thought possible.

Dan Wagman & James Krieger

STATEMENT OF PURPOSE

Journal of Pure Power holds the contributions of scientific research in all sports sciences in the highest regard. Scientific contributions in exercise physiology, sport psychology, sports medicine, biomechanics, anatomy, sports nutrition, and other fields constitute the backbone of athletic excellence. It is the mission of *Journal of Pure Power* to translate such research into a user-friendly format for the sole purpose of educating coaches, athletes, and sports professionals about the latest developments in the sports sciences with specific emphasis on application for maximized sports performance.

NOTICE

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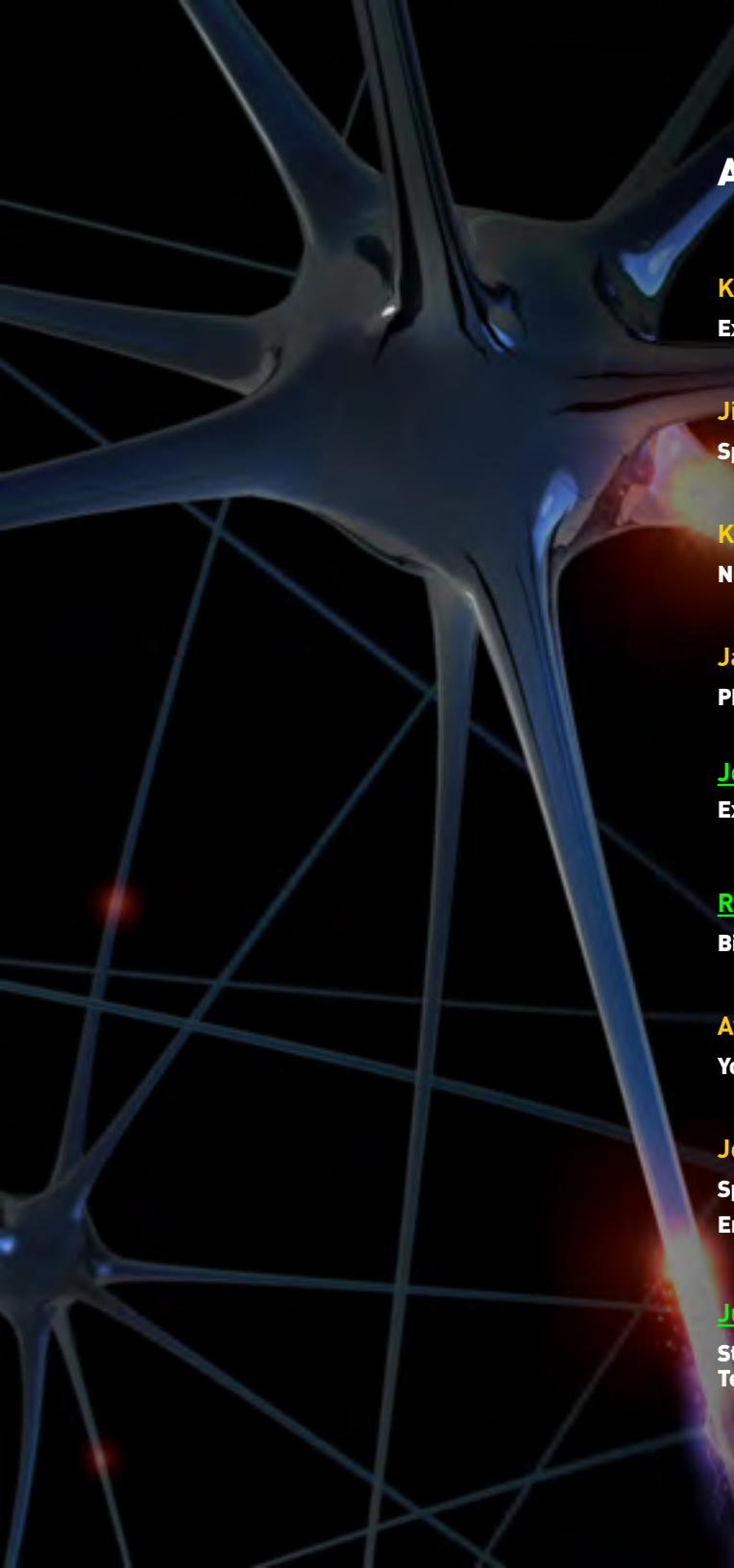

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SQUAT VS. DEADLIFT

New research investigates what cross-over effects there may be between these lifts

In powerlifting circles and beyond, you hear often that the squat and deadlift are similar. In fact, some athletes and coaches claim that the only difference is that in the squat the barbell is on your back while in the deadlift it is in your hands. As a consequence, many athletes limit their training in an effort not to overtrain. The belief is that since these lifts are so similar, using many of the same muscle groups and joint actions, training both exercises equally could lead to overtraining. So many powerlifters and other athletes only train the deadlift once every two weeks or so, claiming that because the lift is so similar to the squat, they need that extra rest. Unfortunately, this thinking is based only on conjecture because to date there has been no research looking specifically at the similarities, or differences, that may exist in these lifts. And as you are well aware from reading *JOPP*, just because something seems sensible does not mean it is correct. For that very reason, researchers from Kennesaw State University and the University of West Georgia set out to clarify what cross-over effects may, or may not, exist in the squat and deadlift.

If you think the squat and deadlift are similar exercises, you need to rethink the issue. Start by reading this research review.

Original Research

Hales, M., et al. Kinematic analysis of the powerlifting style squat and the conventional deadlift during competition: Is there a cross-over effect between lifts? *Journal of Strength and Conditioning Research* 23(9):2574-2580, 2009.

Power Key: squat, deadlift, biomechanics, comparisons, sticking point

NEED POWER?

In the words of the research team, "Surprisingly, the controversy of whether deadlifts should be substituted with squat exercises during training continues to resonate throughout the powerlifting community." They go on to highlight that "Numerous coaches and competitors mistakenly continue to substitute various squat exercises into their training programs in place of the deadlift in hopes of miraculous performance improvements in the deadlift." This concept, however, reflects relatively simplistic thinking based on the involvement of muscle groups and mechanical aspects of the lifts; they do tend to look similar—from a simplistic vantage point. And to be fair, under lighter loads, such as the early part of a training cycle, the similarities can be great. However, once you start pushing the weights and once you stand on the competition platform, those perceived similarities can disappear. But to what extent they disappear can be difficult to discern with the naked eye. With sophisticated motion analysis instruments, however, the differences become clear.

When you look at a conventional deadlift, where you grab the barbell outside of your legs, with feet placed about shoulder width apart, you can discern two distinct lifting techniques as described in several older research projects. In one style, usually seen when lighter weights are lifted, the barbell will move off the ground at the same time as your knees and hips will extend. However, when the weight approaches your maximal capabilities, what tends to happen is that your body will move before the barbell will. This might not be visible to the naked eye, but motion analysis equipment can highlight this clearly. With this in mind, and in an attempt to compare the squat with the deadlift, you need to have some commonality specific to each lift. That commonality is the sticking point, the region at which upward movement of the barbell is momentarily decreased or stopped. This is a particularly important point in each lift because unless you can successfully continue lifting the barbell through the sticking point, you will fail at the lift. But by isolating the sticking point and identifying whatever biomechanical constraints exist at that point in the lift, you can address issues specific to your lifting technique.

The subjects who participated in this research were 25 of the competitors in a regional powerlifting competition that also served as a national qualifier.

Testing Commonality

Put in the most succinct way possible, the research team wanted to find out whether there is a biomechanical relationship between the squat and the conventional deadlift. One of the complaints laypersons tend to have about research is that what you learn in the laboratory has little practical application. Though that is representative of a layperson's lack of understanding regarding scientific inquiry, in some instances it is nevertheless best to conduct research in the field. Because among competitive powerlifters you will generally see different lifting strategies, the scientists from the current study felt it best to conduct their research in a competition setting. That way, the findings would

apply to what you would generally see in a competitive powerlifter. In addition, as the research team put it, "An all-out effort in competition as lifters attempt to set personal or state/national records is very difficult to replicate in a laboratory."

The researchers chose to investigate the conventional-style deadlift, as opposed to the sumo-style deadlift, where the stance is spread out wide and the bar is gripped between the legs, for two main reasons: (1) overall, fewer lifters tend to use the sumo-style deadlift, and (2) most sumo-style deadlifters do not perform the squat with the same sort of wide stance seen in their deadlift; in other words, the difference between the typical squat stance and sumo stance is much greater than that between the squat stance and conventional-style deadlift stance. With these issues in mind, the subjects in this study used a foot placement of approximate shoulder width for both the squat and deadlift.

The subjects who participated in this research were 25 of the competitors in a regional powerlifting competition that also served as a national qualifier. In an effort to employ and quantify a three-dimensional analysis of the squat and deadlift, four synchronized video cameras were used, which were interfaced with a computer and positioned so that they would not interfere with the judges and spotters. Six body landmarks were used so that the software could analyze biomechanical differences. In addition, hand and bar contact points were included in the deadlift analysis so that bar velocity could be accurately assessed. Since the barbell was assumed to be fixed at the shoulder during the squat, the shoulder joint markers were used to assess bar motion in that lift. For the deadlift, three stages were identified: lift-off, passing the knees, and lift completion or lockout (the researchers did not identify the stages of the squat). The maximum amount of weight a subject lifted in each lift was used for analysis.

That commonality is the sticking point, the region at which upward movement of the bar-bell is momentarily decreased or stopped.

For purposes of analysis, absolute and relative angles were calculated geometrically and via three-dimensional analysis for the bar, shoulder, hip, knee, and ankle. Since the researchers found that during maximal lifts in the deadlift certain body segments ascended before lift-off, an "ascent phase" was defined as well. Each of the kinematic variables was assessed at three different points: P1 was the start of the ascent phase; P2 the first point where bar momentum began to diminish, the sticking point; and P3 the first point of pronounced acceleration after P2. Data analysis showed a significant difference for the squat at P1 but not at P2 and P3.

Regarding trunk, hip, and knee angles, significant differences between the lifts were noted. In defining these differences more clearly, the scientists learned that the squat produced a linear relationship between hip and knee angles, "illustrating a more synergistic or simultaneous movement." The deadlift, however, showed three distinct phases defined by a dominant joint action at the knees during lift-off, the hips with the barbell at knee height, and both knees and hips during lockout.

GET POWER!

What this research found is that there are fundamental differences between the squat and deadlift that allow you to successfully address the misconception that a cross-over effect exists between these lifts. As an example, not only does the sticking point in each lift occur at different hip, knee, and ankle positions, but significantly different bar velocities were found as well. This suggests that sticking-point mechanisms are different between these two lifts, in part due to biomechanical and physiological differences affecting muscle force production.

Another difference can be best described as the singular and smooth action of joints during the squat. In the deadlift, however, three distinct stages were identified during the execution of that lift. Due to these three distinct phases of the deadlift, you could break this lift down into a lift-off, knee, and lockout phase. This in itself could have important training implications.

Another important finding in the deadlift was a significant forward trunk lean during the lift-off phase. This finding was extended to include completely different trunk postural positions during the execution of each lift. To illustrate, during the squat the lifters were able to maintain lumbar lordosis and a slightly arched but rigid spine. In the deadlift, however, the trunk was not able to maintain lumbar lordosis and the back would become rounded.

"The kinematic analysis of the squat and the conventional deadlift indicate that the individual lifts are markedly different, implying that no direct or specific cross-over effect exists between the individual lifts."

In short, and in the scientists' words, "The kinematic analysis of the squat and the conventional deadlift indicate that the individual lifts are markedly different, implying that no direct or specific cross-over effect exists between the individual lifts." In addition, certain training implications are highlighted due to these findings. As an example, the common practice of powerlifters to train the deadlift's sticking point by placing the barbell in a power rack at about knee height and to pull from there to gain strength through the sticking point would appear misguided. This, because the data obtained from this study found the barbell to start to slow down quite a bit before hitting the sticking point at around knee height. This would essentially necessitate placing the barbell perhaps about six inches below knee height in a power rack. But this brings us to another problem: body position. It is nearly impossible to replicate the exact body position at the sticking point between lifting the barbell off the ground and off pins in a power rack, regardless of bar position in the power rack. This has direct implication on the involved biomechanics and musculature. So what is the answer? Perhaps the researchers put it best by concluding that if you want to improve your deadlift, you should not rely on the squat to help you out, and that "the best way to improve the deadlift is to deadlift."