Comparison of Isolated Lumbar Extension Strength in Competitive and Noncompetitive Powerlifters, and Recreationally Trained Men

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Abstract

Androulakis-Korakakis, P, Gentil, P, Fisher, JP, and Steele, J. Comparison of isolated lumbar extension strength in competitive and noncompetitive powerlifters, and recreationally trained men. *J Strength Cond Res* XX(X): 000–000, 2018—Low-back strength has been shown to significantly impact performance in a plethora of sports. Aside from its effect on sport performance, low-back strength is strongly associated with low-back pain. A sport that heavily involves the lower-back musculature is powerlifting. This study looked to compare isolated lumbar extension (ILEX) strength in competitive and noncompetitive powerlifters, and recreationally trained men. Thirteen competitive powerlifters (CPL group; 31.9 ± 7.6 years; 173.4 ± 5.5 cm; 91.75 ± 18.7 kg), 10 noncompetitive powerlifters (NCPL group; 24 ± 3.5 years; 179 ± 4.8 cm; 92.39 ± 15.73 kg), and 36 recreationally trained men (RECT group; 24.9 ± 6.5 years; 178.5 ± 5.2 cm; 81.6 ± 10.0 kg) were tested for ILEX. Isolated lumbar extension strength was measured at every 12° throughout participant's full range of motion (ROM) and expressed as the following: "strength index (SI)" calculated as the area under a torque curve from multiple angle testing, average torque produced across each joint angle (AVG), and maximum torque produced at a single angle (MAX). Deadlift and squat strength were measured using 1 repetition maximum for the competitive and noncompetitive powerlifters. The following powerlifting characteristics were recorded for the competitive and noncompetitive powerlifters: primary deadlift stance, primary squat bar position, use of belt, use of performance-enhancing drugs, and use of exercises to target the lower-back musculature. Significant between-group effects were found for participant characteristics (age, stature, body mass, and ROM). However, analysis of covariance with participant characteristics as covariates found no significant between-group effects for SI ($p = 0.824$), AVG ($p = 0.757$), or MAX ($p = 0.572$). In conclusion, this study suggests that powerlifting training likely has little impact on conditioning of the lumbar extensors.

Key Words powerlifting, resistance training, low back

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Introduction

It is commonplace for strength and conditioning coaches and exercise professionals to use traditional powerlifting exercises such as the squat and deadlift within their training, and often with a view to increasing lumbar extension strength (13). Indeed, the squat exercise is shown to place great stress on the lumbar musculature (2) and shows considerable activation of the lumbar muscles when measured using electromyography (EMG (11,23)). Because the squat exercise shows a strong relationship to athletic performance such as sprint speed ($r = 0.71–0.94$) and vertical jump ($r = 0.78$ (21)), it is not a surprise that this exercise is fundamental to most strength and conditioning programs.

However, Fisher et al. (7) reported that after a 10-week intervention, trained men performing the Romanian deadlift (RDL) exercise showed no increase in isolated lumbar extension (ILEX) strength, despite significant increases to their RDL 1 repetition maximum (1RM). By contrast, a group training using ILEX showed significant increases in ILEX strength and in RDL 1RM. Low-back strength is evidenced to impact performance across a variety of sports (including golf, weightlifting, powerlifting, soccer, ballet, etc. (14)). Furthermore, because deconditioning of the lumbar extensor musculature seems closely related to low-back pain (20), it might be important for competitive athletes and coaches who are looking to maximize performance and minimize risk of injury to consider lumbar extension strength. As such, it is important to elucidate the relationship between exercises, such as the squat and deadlift, and ILEX strength.

Athletes competing in the sport of powerlifting represent a unique population group whose aim is to develop maximal strength in the back squat, deadlift, and bench press exercises. Powerlifters often use derivatives of the 3 powerlifts to address movement-specific weaknesses and exercises to specifically target the lower-back musculature (e.g., good mornings, trunk extensions, etc). Most powerlifters use a stiff weightlifting belt to perform a breathing technique called the Valsalva maneuver, which allows them to increase intra-abdominal pressure by pushing against the belt with their abdominal muscles. Using a stiff belt for squats and deadlifts has been shown to increase strength and increase activation in different muscle groups (lumbar erectors, quadriceps, etc) (12). It is important to note that powerlifters perform the squat with 2 different techniques: "high bar" and "low bar." The 2 different squat techniques are concerned with the placement of the bar on the back. The "high-bar" squat requires the lifter to place the bar centered across the shoulders, whereas the "low-bar" squat requires the lifter to place the bar further down on the back across the spine of the scapula (22). Most competitive powerlifters use the "low-bar" squat as their main primary squat technique because of its influence on squat kinematics and kinetics, which allows them to be more efficient in lifting a load (8). Studies investigating the "low-bar" squat have noted that the forward tilt of the torso, because of the lower placement of the bar on the back, increases the forces in the lumbar muscles and ligaments (8). Powerlifters perform the deadlift with 2 different stances: conventional and sumo. The main difference between conventional and sumo deadlifts is that the feet are positioned further apart and pointed out in the sumo stance, whereas the arms are placed between the knees for the sumo stance and outside the knees for the conventional stance. Furthermore, EMG data also show that many of the typical deadlift variations performed by powerlifters (e.g., conventional, sumo, or Romanian) all involve considerable, and similar, EMG amplitudes in the lumbar musculature (6,11).

However, there are several limitations to using and interpreting EMG data as discussed by De Luca (4) who explained that, among other things, EMG signals often include readings from synergist muscles. Furthermore, EMG data do not enable inference that an adaptive response is likely to occur (10). As such, it might be more prudent to consider population groups who have excelled in these exercises. Both squat and deadlift exercises heavily recruit the posterior chain and are often trained with high load, large volume, and, in some cases, with very high frequency (21). As such, if the squat and deadlift exercises produce a meaningful training effect in ILEX strength, it would be most evident in a cross-sectional comparison including this population group. Therefore, the aim of this study was to investigate ILEX strength in competitive and noncompetitive powerlifters, in addition to a recreationally resistance-trained population.

Methods

Experimental Approach to the Problem

A cross-sectional, between-group comparative design was used. To compare ILEX strength in competitive and noncompetitive powerlifters, in addition to recreationally trained men, all participants underwent ILEX strength testing. All noncompetitive powerlifters underwent 1RM testing for the squat and the deadlift as did competitive powerlifters, unless they had competed at an official powerlifting competition up to 3 weeks before the week of ILEX strength testing where this was used as their 1RM instead. Participants took part in 2 ILEX testing sessions: a familiarization session and a strength testing session. A plethora of training variables (primary deadlift stance, primary bar placement for the squat, use of specific exercises to target the lower-back musculature, etc) were recorded for the competitive and noncompetitive powerlifters.

Subjects

Approval by the relevant ethics committee at the researcher's institution was initially obtained (Health, Exercise, and Sport Science Ethics Committee Id No. 769, Southampton Solent University). After this, a total of 52 men (mean $\pm$ *SD*: 26$\pm$7 years old) with at least 2 years of resistance training experience, either identifying as being "powerlifting style training" or merely "recreational resistance training," were recruited. Those participants performing "powerlifting style training" also reported whether they competed in powerlifting meets and if so at what level. The differentiation between competitive and noncompetitive powerlifters was made because competitive powerlifters tend to deviate less from the powerlifts (the squat, the bench press, and the deadlift) and often train them and their derivatives throughout the whole duration of their macrocycle. Noncompetitive powerlifters may often train the powerlifts with less volume or for less amount of time throughout a macrocycle because they are not required to optimize their performance for competition.

Ten noncompetitive powerlifters (NCPL group) and 13 competitive powerlifters (CPL group) were recruited through word of mouth by one of the study's researchers who is a competitive powerlifter. The CPL group's competitive experience varied; most participants had competed at a national level ($n = 6$), some at the divisional level ($n = 4$), and a few at the international level ($n = 3$; i.e., IPF/GPA Greek/British nationals & GPA/IPF worlds).

Thirty-six recreationally trained men (RECT group) were recruited through an advertisement within a university environment that requested participants who were not suffering from any low-back pain. Before participation, all participants received a participant information sheet describing the procedures to be completed and were asked to provide signed informed consent. These participants were part of a previous investigation (7).

Procedures

Testing: Isolated Lumbar Extension Strength Testing. Participants were seated in the ILEX device (Lumbar Extension Machine; MedX Corporation, Ocala, FL, USA). The ILEX device uses restraints to limit unwanted pelvic involvement in an upright position with their thighs at an angle of 15° to the seat in the testing (Figure 1), in addition to a counterweight to neutralize the effects of gravitational forces on the head, torso, and upper extremities. The setup and testing using the ILEX device have been described in detail previously (5). In brief, range of motion (ROM) was established by placing the participants in full extension and full flexion. Participants then completed a slow, controlled dynamic warm-up lasting approximately 1 minute and then a practice isometric test at 50% of perceived maximal effort at 3 angles (full flexion, mid-ROM, and full extension), before finally completing a maximal voluntary isometric effort at 5–7 angles throughout their full ROM (0, 12, 24, 36, 48, 60, and 72°). Participants were asked to build up maximal effort over 2–3 seconds and to maintain that effort for a further 2–3 seconds. Between each effort, a 10-second rest period was provided where participants were rocked gently back and forth through their ROM. Isolated lumbar extension torque measurements show very high test and retest reliability for both asymptomatic participants and patients with low-back pain (9,15).

Testing: Powerlifting Strength Testing. The competitive powerlifters who had competed in an official unequipped (RAW) powerlifting competition up to 3 weeks away from the ILEX strength testing session were excluded from the squat and deadlift 1RM testing. Their latest unequipped competition lifts were used as their 1RM results. All other powerlifters, competitive and noncompetitive, were required to take part in 2 different 1RM testing sessions. The first testing session tested the participants' 1RM for the squat, and the second session tested the participants' 1RM for the deadlift. Initially, the participants prepared for the 1RM attempt by following a warm-up protocol. They started by performing 5–10 repetitions with an empty bar for 2 sets, 5 repetitions at 30% and 50% of their most recent 1RM, followed by 3 repetitions at 70% and 80%. Each participant was then given 3 attempts to perform a maximal lift with approximately 3–5 minutes of rest in between to allow for adequate recovery. The 2 sessions were 48 hours apart to allow for proper fatigue management.

Powerlifting Characteristics. Competitive and noncompetitive powerlifters were required to give information on the following powerlifting characteristics during their ILEX strength testing session: primary squat bar position, primary deadlift stance, use of belt during working sets for the squat and deadlift, use of performance-enhancing drugs (PEDs) in the past 2 years, and whether they used specific exercises to target the lower-back musculature (LBex) in the past 3 years.

Statistical Analyses

Analysis was conducted using JASP (version 0.8.2; Amsterdam, Netherlands). Descriptive statistics (mean values and *SDs*) were derived for demographic data and strength variables. Strength was examined as a strength index (SI), calculated as the area under the strength curve using the trapezoidal method thus incorporating strength at all tested angles, in addition to the average of all angles tested (AVG), and the maximum torque produced at a single angle (MAX). Dependent strength variables met assumptions of normality of distributions when examined using a Shapiro-Wilk test. A 1-way analysis of variance (ANOVA) test was used to examine between-group effects for participant characteristics including age, stature, body mass, and ROM. An independent *t*-test was used to examine between-group differences for the NCPL and CPL groups for powerlifting strength (squat and deadlift 1RM). Powerlifting characteristics (primary squat bar position, primary deadlift stance, belt use, PED use, and use of specific exercises to target the lower-back musculature) were examined using a chi-squared test and presented in a contingency table. A 1-way analysis of covariance (ANCOVA) test was used to examine between-group effects for ILEX strength (SI, AVG, and MAX) with the participants' height, weight, age, and ROM as covariates. Assumptions of linear relationships and homogeneity of regression slopes were confirmed visually. Age was included as a covariate because it is known to significantly impact on muscular strength; body mass was also included as

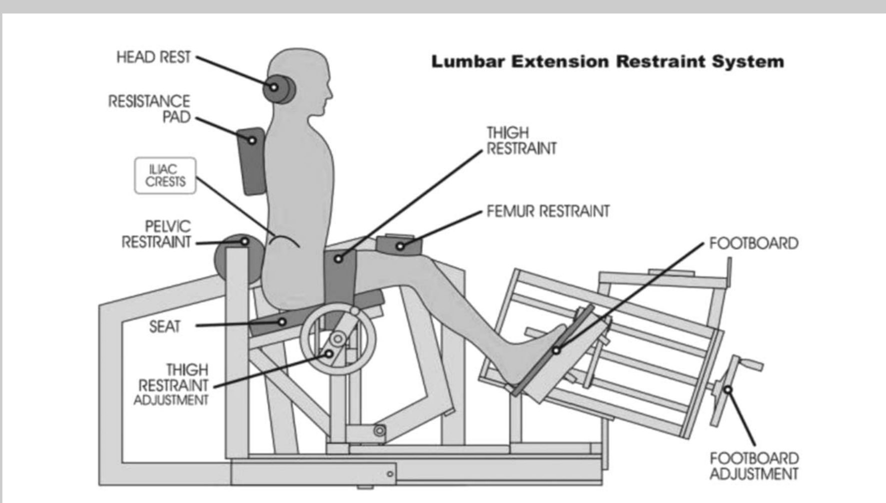

Figure 1. MedX lumbar extension machine restrain system.

TABLE 1. Participant characteristics.*

Characteristics	NCPL (n = 10)	CPL (n = 13)	RECT (n = 36)	p
Age (y)	24 ± 3.5	31.9 ± 7.6	25 ± 6.5	0.003
Stature (cm)	179.2 ± 4.8	173.4 ± 5.5	178 ± 5	0.008
Body mass (kg)	92.39 ± 15.73	91.75 ± 18.7	81.6 ± 10	0.003
Range of motion (degrees)	64.80 ± 8.5	61.85 ± 8.2	71.33 ± 2.7	0.001

*Results are mean ± *SD*.
NCPL = noncompetitive powerlifters; CPL = competitive powerlifters; RECT = recreationally trained men.

a covariate because it can have a significant effect on strength and muscle mass; and height was included as a covariate because differences in moment arms resulting from it may impact the torque. Range of motion was included as a covariate because it has a significant effect on the SI and AVG values. A 1-way ANCOVA test was used to examine between-group effects for the NCPL and CPL groups for ILEX strength (SI, AVG, and MAX) with the participants' squat 1RM, deadlift 1RM, PED use, primary squat bar position, primary deadlift stance, belt use, and use of exercises to target the lower-back musculature as covariates. Post hoc Tukey's honest significant difference (HSD) was used to compare between groups, where any significant between-group effects were observed. Significance was set at an α of 0.05.

RESULTS

Participant Characteristics

Participant characteristics are shown in Table 1. A 1-way ANOVA test revealed a significant between-group effect for age ($F_{(2,56)} = 6.475$, $p = 0.003$). Post hoc Tukey's HSD revealed a significant difference for age between the NCPL and CPL groups ($p = 0.015$), and between the RECT and CPL groups ($p = 0.003$). There was no significant difference for age between the NCPL and RECT groups ($p = 0.950$).

A 1-way ANOVA test revealed a significant between-group effect for stature ($F_{(2,56)} = 5.316$, $p = 0.008$). Post hoc Tukey's HSD revealed a significant difference for stature between the NCPL and CPL groups ($p = 0.027$), and between the RECT and CPL groups ($p = 0.009$). There was no significant difference for stature between the NCPL and RECT groups ($p = 0.934$).

A 1-way ANOVA test revealed a significant between-group effect for body mass ($F_{(2,56)} = 4.274$, $p = 0.003$). Post hoc Tukey's HSD revealed a significant difference for body mass between the NCPL and RECT groups ($p = 0.069$), and between the CPL and RECT groups ($p = 0.057$). There was no significant difference for body mass between the CPL and NCPL groups ($p = 0.993$).

A 1-way ANOVA test revealed a significant between-group effect for ROM ($F_{(2,56)} = 15.96$, $p = 0.001$). Post hoc Tukey's HSD revealed a significant difference for ROM between the NCPL and RECT groups ($p = 0.005$), and between the CPL and RECT groups ($p = 0.001$). There was no significant difference for ROM between the CPL and NCPL groups ($p = 0.420$).

TABLE 2. Powerlifting characteristics.*

	Group				
PL Characteristics	NCPL (n = 10)	CPL (n = 13)	χ^2	p	df
Deadlift stance					
Conventional	7	9			
Sumo	3	4			
Chi-square tests			0.002	0.968	1
Squat bar position					
Low bar	6	10			
High bar	4	3			
Chi-square tests			0.765	0.382	1
Belt					
Use a belt	4	12			
Do not use a belt	6	1			
Chi-square tests			7.304	0.007	1
PED					
Use PED	3	1			
Do not use PED	7	12			
Chi-square tests			1.958	0.162	1
Lower-back exercises (LBex)					
Use LBex	4	11			
Do not use LBex	6	2			
Chi-square tests			4.960	0.026	1

*NCPL = noncompetitive powerlifters; CPL = competitive powerlifters; PED = performance-enhancing drug.

Powerlifting Characteristics

Powerlifting characteristics are shown in Table 2. A chi-square test revealed no significant difference for deadlift stance between the NCPL (70% conventional

Table 3. Powerlifting strength.*†

Characteristic	NCPL ($n = 10$)	CPL ($n = 13$)	p
Squat 1RM (kg)	177 ± 14	215 ± 12	0.051
Deadlift 1RM (kg)	204 ± 12	232 ± 11	0.108

*NCPL = noncompetitive powerlifters; CPL = competitive powerlifters; RM = repetition maximum.
†Results are marginal mean ± *SE*.

and 30% sumo) and CPL groups (69.3% conventional and 30.7% sumo), (χ^2 [1, $n = 23$] = 0.002, $p = 0.968$). A chi-square test revealed no significant difference for squat bar position between the NCPL (60% low bar and 40% high bar) and CPL groups (77% low bar and 23% high bar), (χ^2 [1, $n = 23$] = 0.765, $p = 0.382$). A chi-square test revealed no significant difference for PED use between the NCPL (30% used PED and 70% did not use PED) and CPL groups (8% used PED and 92% did not use PED), (χ^2 [1, $n = 23$] = 1.958, $p = 0.162$). A chi-square test revealed a significant difference for belt use between the CPL (40% used a belt and 60% did not use a belt) and NCPL groups (92% used a belt and 8% did not use a belt), (χ^2 [1, $n = 23$] = 7.304, $p = 0.007$). A chi-square test revealed a significant difference between the NCPL (40% used LBex and 60% did not use LBex) and CPL groups for use of LBex (85% used LBex and 15% did not use LBex), (χ^2 [1, $n = 23$] = 4.960, $p = 0.026$).

Powerlifting Strength

Powerlifting strength values are shown in Table 3. An independent *t*-test revealed no significant difference for squat 1RM between the CPL and NCPL groups (t(21) = −2.068, $p = 0.051$). An independent *t*-test revealed no significant difference for deadlift 1RM between the CPL and NCPL groups (t(21) = −1.68, $p = 0.108$).

Isolated Lumbar Extension Strength

Isolated lumbar extension strength variables are shown in Table 4. A 1-way ANCOVA test revealed no statistically significant between-group effects for SI, AVG, and MAX values ($F_{(2,52)} = 0.195$, $p = 0.824$; $F_{(2,52)} = 0.280$, $p = 0.757$; and $F_{(2,52)} = 0.564$, $p = 0.572$, respectively) when controlling for height, age, stature, mass, and ROM as covariates. The covariate that had a statistically significant effect on SI, AVG, and MAX was mass ($F_{(1,52)} = 23$, $p = 0.001$; $F_{(1,52)} = 30$, $p = 0.001$; and $F_{(1,52)} = 65$, $p = 0.001$, respectively). Height ($F_{(1,52)} = 4.150$, $p = 0.047$) had a significant effect on MAX but no statistically significant effect on SI and AVG ($F_{(1,52)} = 0.042$, $p = 0838$ and $F_{(1,52)} = 0.235$, $p = 0.630$, respectively). Age did not have a statistically significant effect on SI, AVG, and MAX ($F_{(1,52)} = 3.064$, $p = 0.086$; $F_{(1,52)} = 2.472$, $p = 0.122$; and $F_{(1,52)} = 0.702$, $p = 0.406$, respectively). Range of motion had a significant effect on SI ($F_{(1,52)} = 10.313$, $p = 0.002$) but no significant effect on AVG and MAX ($F_{(1,52)} = 0.390$, $p = 0.535$ and $F_{(1,52)} = 0.739$, $p = 0.394$, respectively).

A 1-way ANCOVA test revealed no statistically significant group effects between the NCPL and CPL groups for SI, AVG, and MAX ($F_{(1,14)} = 0.163$, $p = 0.0.693$; $F_{(1,14)} = 1.616$, $p = 0.224$; and $F_{(1,14)} = 0.983$, $p = 0.338$, respectively) when controlling for belt use, PED use, use of LBex, primary deadlift stance, primary squat bar position, squat 1RM, and deadlift 1RM. The covariate that had a statistically significant effect on SI, AVG, and MAX for the NCPL and CPL groups was deadlift 1RM ($F_{(1,14)} = 13.5$, $p = 0.003$; $F_{(1,14)} = 16$, $p = 0.001$; and $F_{(1,14)} = 4.73$, $p = 0.047$, respectively). Belt use, PED use, use of LBex, primary deadlift stance, primary squat bar position, and squat 1RM did not have a statistically significant effect on SI ($F_{(1,14)} = 0.199$, $p = 0.663$; $F_{(1,14)} = 0.621$, $p = 0.444$; $F_{(1,14)} = 0.020$, $p = 0.889$; $F_{(1,14)} = 0.040$, $p = 0.843$; $F_{(1,14)} = 0.292$, $p = 0.597$; and $F_{(1,14)} = 3.618$, $p = 0.078$, respectively), AVG ($F_{(1,14)} = 0.824$, $p = 0.379$; $F_{(1,14)} = 0.213$, $p = 0.652$; $F_{(1,14)} = 0.055$, $p = 0.818$; $F_{(1,14)} = 0.666$, $p = 0.428$; $F_{(1,14)} = 0.220$, $p = 0.646$; and $F_{(1,14)} = 0.512$, $p = 0.486$, respectively), and MAX ($F_{(1,14)} = 0.045$, $p = 0.835$; $F_{(1,14)} = 0.001$, $p = 0.971$; $F_{(1,14)} = 0.036$, $p = 0.853$; $F_{(1,14)} = 2.006$, $p = 0.179$; $F_{(1,14)} = 0.366$, $p = 0.555$; and $F_{(1,14)} = 0.359$, $p = 0.558$, respectively).

Table 4. ILEX strength.*

ILEX strength measure	NCPL	CPL	RECT	p
Strength index (N·m)	22,864 ± 1,478.9	22,850 ± 1,559.4	23,801 ± 836.7	0.824
Average torque (N·m)	345.8 ± 21.09	344.9 ± 22.24	361.6 ± 11.93	0.757
Max torque (N·m)	472.8 ± 24.17	451.7 ± 25.49	485.6 ± 13.67	0.572

*Results are marginal mean ± *SE*.
ILEX = isolated lumbar extension; NCPL = noncompetitive powerlifters; CPL = competitive powerlifters; RECT = recreationally trained men.

Discussion

This study investigated ILEX strength in competitive and noncompetitive powerlifters, as well as recreationally trained men. There were no significant differences in ILEX strength among either group of powerlifters or recreationally trained men, despite the differences in habitual previous training. An interesting finding is that both competitive and noncompetitive powerlifters were significantly heavier than the recreationally trained participants. When comparing ILEX strength in the 3 groups, the only covariate that had a significant effect on ILEX strength was body mass, which suggests that the powerlifting groups were actually relatively weaker than the recreationally trained participants, considering that they both had significantly greater body mass.

The results of this study are supported by previous research from Fisher et al. (7), who found that progressively training the RDL did not increase ILEX strength, despite increasing 1RM RDL strength. The absence of a pelvic restraint may explain why the powerlifters' ILEX strength values were no greater than that of recreationally trained men. The absence of a pelvic restraint may also explain why the competitive powerlifters' ILEX strength values were no different than the noncompetitive powerlifters, despite using exercises that are designed to target the lower-back musculature. The deadlift 1RM strength of the powerlifters showed to have significant effect on the SI, AVG, and MAX values for the powerlifting groups, but because there was no difference between the powerlifter groups and the recreationally trained participants, it was probably as a result of stronger individuals being able to score higher on the ILEX strength test. Previous research has suggested that it is necessary for the pelvis to be stabilized in order for the lumbar extensors to be effectively activated and thus properly strengthened (5,17,18). Powerlifters often perform the deadlift and squat (as well as their derivatives) that are known to elicit significant EMG amplitudes in the lumbar extensors (3,6,11) with high frequency, volume, and load (21); however, this does not seem to improve ILEX strength. If the powerlifts significantly contributed to ILEX strength, it would be expected for competitive and noncompetitive powerlifters to have significantly higher SI, AVG, and MAX values than recreationally trained men. Indeed, it might also be expected that ILEX strength would be higher in powerlifters, particularly those who are competitive, if ILEX was a key determinant of powerlifting performance. Neither seems to be the case.

Despite the fact that powerlifters evidently do not exhibit greater ILEX strength than recreationally trained men, something that might question its importance for powerlifting performance, previous data have shown that ILEX training can increase RDL 1RM strength. The RDL is not specifically used in powerlifting, although it is sometimes used as an accessory lift in training; yet, it may be beneficial for future research to investigate the effect of ILEX training on powerlifting performance. Powerlifters could potentially benefit from ILEX training both in terms of performance and in the form of injury prevention. Lower-back injuries are common among powerlifters (1,16), and ILEX training is an effective tool in strengthening the lumbar extensors and potentially preventing lower-back injuries (1,20). Future research could focus on investigating the effect of adding ILEX training to the training of powerlifters because it could potentially have great implications for improving powerlifting performance and possibly preventing injury. It would be useful to see whether adding ILEX training to a powerlifting program would yield greater increases in deadlift and squat strength than just training the squat and deadlift. Future research could also attempt to compare ILEX strength between powerlifters and strongman competitors to further examine whether ILEX strength can be improved without a restrained pelvis.

The data of this study support existing data on ILEX strength demonstrating the need for pelvic restraint to effectively condition the lumbar extensors (19). However, evidently some unrestrained approaches may have the potential to impact the lumbar extensors. Edinborough et al. (5) found that a single set of kettlebell swings was able to effectively fatigue the lumbar extensors regardless of pelvic restraint. Investigating the relationship between free-weight exercises such as the kettlebell, or indeed powerlifting style training, and ILEX strength would be useful in finding more cost-effective and accessible solutions for conditioning the lumbar extensors.

The limitations of this study should be noted. First, this study was cross-sectional in design, partly because of the difficulty in recruiting competitive powerlifters to participate in a training intervention study. Often, competitive populations are reluctant to forgo their existing training in lieu of performing that prescribed by investigators in a study. Furthermore, although the RECT group was free from low-back pain, this was not an exclusion criterion for the CPL and NCPL groups as doing so would have considerably affected the ability to recruit these populations. No participants in the CPL and NCPL groups were suffering from current low-back injuries; yet, the lack of differences may have been impacted by previous lumbar injuries in the CPL and NCPL groups. Finally, CPL and NCPL participants were significantly heavier and had a smaller ROM than the RECT participants. This may have impacted strength comparisons particularly because a reduced ROM will impact calculation of the SI (area under the torque curve). Descriptively, SI was lowest in the NCPL and CPL groups; yet, AVG and MAX values were higher. Despite these differences though, when controlled for as covariates, there were still no significant differences among the 3 groups for any strength measure. Another limitation that must be noted is that powerlifting participants were not asked to provide the specific exercises they used to target the lower-back musculature. Despite the absence of differences in ILEX strength between the NCPL and CPL groups, it would have been insightful to know which exercises powerlifters used to target the lower-back musculature.

In conclusion, the present data show that ILEX strength does not differ between competitive and noncompetitive powerlifters, and recreationally trained men. This suggests that powerlifting style training likely does not impact on ILEX strength, despite the use of multijoint exercises that heavily involve the posterior chain musculature. This also suggests that ILEX strength may have little importance for powerlifting performance. However, future work should use training interventions to both examine the impact of powerlifting style training on ILEX strength, as well as the effects of increasing ILEX strength on powerlifting performance.

Practical Applications

There is currently little evidence showing that progressively increasing strength in the powerlifts, especially the squat and deadlift, will increase lumbar extensor strength. Furthermore, research suggests that most forms of training that do not restrain the pelvis likely are suboptimal for conditioning the lumbar extensors. As such, although effective in developing strength in the specific lifts, coaches and exercise professionals should at present not prescribe nor promote the squat and deadlift, as well as their derivatives, as effective exercises to strengthen the lumbar extensors. It is unclear the exact impact that specifically training the lumbar extensors has on powerlifting performance itself. However, if a goal is to specifically target and attempt to strengthen the lumbar extensors, powerlifters may benefit from including specific ILEX training. Powerlifters may also benefit from including kettlebell swings to their training, but further research is required to properly understand the effect kettlebell swings may have on lumbar extensor strength.

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