

# WEIGHING THE OPTIONS: CONVERSATIONS ON THE USE OF PERFORMANCE ENHANCING GEAR IN POWERLIFTING

*Dominic Gray Morais, Ben Pollack, and Jan Todd*

*Trinity University, San Antonio, Texas & The University of Texas at Austin*

The subject of supportive gear in powerlifting has been controversial from the earliest days in the sport. While our article “Shifting Gear,” also in this issue, provides an historical overview of the use of powerlifting gear, we came to believe as we were working on it that including the voices of active and retired powerlifters would broaden our understanding of this debate. Accordingly, we interviewed a number of individuals with different backgrounds in the sport in order to explore their attitudes and experiences with gear. Our hope is that their thoughts on this important topic will help readers develop a more nuanced understanding of the issue, and that even those well-versed in the sport may find a fresh perspective.<sup>1</sup> This essay is not intended to provide an unequivocal answer, or “solution” to the “gear debate.” Our hope, however, is that it enriches the previous piece by providing more perspectives, and demonstrates the complexity of the issue for active lifters.



Kim Beckwith, who teaches at The University of Texas at Austin, is a USAPL national referee, was named USAPL collegiate coach of the year in 2014, and won three “best lifter” titles at three consecutive national collegiate championships during her undergraduate years. She also promotes the Longhorn Open Powerlifting contest each November, and is not fond of powerlifting gear. From the perspective of a powerlifting meet director and a national-level referee, Beckwith believes that over the years gear has increased the potential for harm to lifters. As she explained, when competitors wear a bench press shirt the margin for error when completing the lift nar-

rows significantly. The bench press shirt dictates the path — or “groove” — the bar must follow as it descends to the chest and then ascends during the effort to complete the lift. Therefore, because bench shirts are constructed in such a way that they can catapult the bar toward the lifter’s face, the lifter may lose control of the bar as it moves out of this narrowed path. Because of this Beckwith — as a referee, coach, and as a meet director — worries “that the shirts are dangerous. I know they help, but unless technique is perfect, a lot of people lose lifts and lose control of the bar because they can’t move their arms freely.”<sup>2</sup>

Beckwith now “empathizes with older lifters,” she went on to say, who often “qualified their own lifting records by mentioning they were completed when lifters did not wear squat suits or bench shirts.” Early in her career, Beckwith explained, she did not fully understand what they were talking about. However, now that some of her own former records pale in comparison to modern lifts done with the newer, “improved” forms of gear, she better appreciates their justifications. Said Beckwith, “nowadays the equipment does a lot of the lifting for you and the older I get the more I understand this.”<sup>3</sup> As the longtime coach of the Longhorn Powerlifting Team at the University of Texas, Beckwith works primarily with athletes who use gear, as the USAPL Collegiate Nationals only recently decided to offer a raw division. Said Beckwith, “I understand that these questions relate to the inclusion of technology in sport and that there are ethical issues here. But for me, as a coach, I wish they’d disallow all gear, move back to one set of records, and have only one kind of powerlifting. It would be a lot less expensive for students who want to get involved and I also think it would be more fun. Putting on a bench shirt for a woman lifter is no fun at all — no matter what she

Correspondence to: Dr. Jan Todd, NEZ 5.700, Dept. of Kinesiology & Health Education, H. J. Lutchter Stark Center, University of Texas at Austin, 78712.  
Email: jan@starkcenter.org.

benches when wearing it.”<sup>4</sup>

Nine-time world powerlifting champion Larry Pacifico believes that the use of gear may have negatively affected powerlifting’s popularity as well. During the 1970s and 1980s powerlifting meets were often televised, Pacifico explained, but “once the bench press shirts and all this stuff became part of the rules, the networks just dropped it like crazy. They thought it was silly.” In response, Pacifico, who did color commentary for several nationally-televised powerlifting contests in the late 1970s and early 1980s, said he called NBC and talked to Bryant Gumbel as well as Bob Costas in hopes of changing their minds. They wouldn’t budge, and told him that the sport had changed too much and that with the shirts and supportive equipment, it was almost like pro-wrestling.<sup>5</sup>

Strength coach and former powerlifter Kevin Yoxall, currently serving as vice-president of the Collegiate Strength and Conditioning Coaches Association, is also opposed to the use of gear.<sup>6</sup> Yoxall began competing in powerlifting in college during the early 1980s and continued into the mid-1990s, achieving regional and state honors. Yoxall had an epiphany regarding gear, he explained, when he saw three-time 242-pound world champion Doug Young bench press a world record 600 pounds in just a T-shirt. Yoxall said, “After watching Big Doug, I swore never to wear a bench shirt.”<sup>7</sup> However, like many involved in the Iron Game, Yoxall went on to admit that he can see both sides of the issue. “If I had continued to compete and it got to the point where I was going to the meets and I was paying an entry fee and I was walking away with nothing because I wasn’t winning, yeah, I may have [used a bench shirt],” he continued, reminding his interviewer that the desire to set records and win contests “is what drives competitors” in powerlifting — and other sports — and can lead to new technological innovations.

Yoxall stated, “The idea of supportive gear started innocently enough in terms of helping the lifter out.” In talking about his own experiences, he added, “I’ve pulled [squat suit] straps up on others where I was literally standing on top of a bench or a chair using needle nose pliers to grip them.” However, he continued, “I never got to that point. But [my suits] did get tighter and tighter ... and they were getting increasingly more and more uncomfortable. I can remember finishing my last squat attempt, and I might have been happy if I PR’d, but the only thing on my mind was, ‘I need to get this SOB

off.’”<sup>8</sup>

Yoxall also discussed his strategy regarding suits when prepping for a meet. He explained, “The majority of my training cycles would begin with just a belt and then I would begin to add wraps as I got heavier and deeper in the cycle. I generally didn’t wear my suits until about the last three weeks of my training cycle, and I remember it being a great confidence builder in knowing you could handle heavy weights.” Yoxall then explained that new suits have changed this type of strategy. He said, “The way I understand it now, with some of these suits you have to spend the entire time training in them because they change the way you squat. You’ve really got to be well versed in a certain groove to wear a certain suit. I’ve heard stories about how guys wear a certain amount of plies [layers] early in their training cycle and then they get to the heavier ply later on.”<sup>9</sup>

Even though he recognizes that he was aided in the performance of his lifts, Yoxall, like most lifters who have used any level of gear, acknowledged the effort he put into his training. “I’m still proud of those lifts because there was a lot of training that went into producing those lifts. Now did supportive gear aid in that? Well, hell yeah, it did. But I was still also the guy in the gym working out. There were things about it that helped, but I know I was still working my ass off too.”<sup>10</sup>

Yoxall, who no longer competes, said, “as far as having an opinion about it, to me it’s like football equipment ... my only thought has always been, ‘Where does it all end?’ When is it almost to the point where the support gear is so supportive, that it takes over and the lifter is not actually doing it?” Yoxall then added, “All that being said, all these guys that can squat over 1000 pounds, they are damn strong. But when does it come to a point where somebody is more or less operating a forklift, so to speak?”<sup>11</sup> It is interesting to note that Yoxall went on to say that if he ever competed again in powerlifting, he would compete raw.

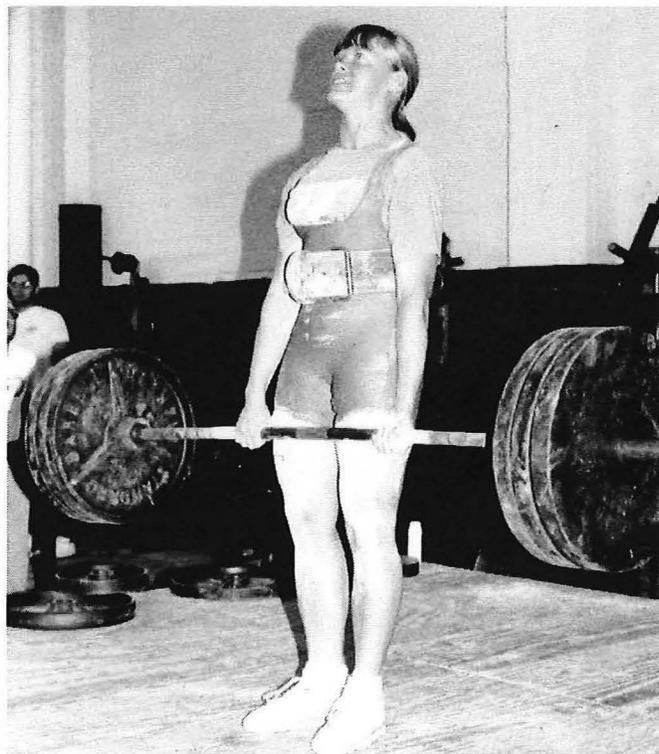
Jill Mills, regarded by many as one of the strongest women in history for having won the 2001 and 2002 World’s Strongest Woman Contests and setting numerous world records in powerlifting, touched on many of the same points as Yoxall. She started competing in powerlifting in 1995, but chose to use supportive equipment in her early meets because no raw divisions existed. “Back then ... *Powerlifting USA* came out with rankings, and when I would see my numbers, they wouldn’t ever say, ‘This was done raw.’ There was no

division in the rankings, so my numbers would be under someone else's, even though I knew I was stronger."<sup>12</sup> Mills, who has competed and set records both with and without supportive equipment, backed her assertion, becoming the 181-pound raw national champion of the American Powerlifting Federation (APF) in 1998 and 1999, and the 165-pound raw national champion in 2003. But the question remains unanswered for many athletes who compete exclusively in equipped divisions.

Mills made the decision to use gear to be competitive, but lamented some of its effects. "I think [equipment] takes a lot of fun out of it," she said. "People stress about it until the last minute. Are they going to be able to touch [their chests with the bar] in their bench shirt? Are they going to be able to hit parallel in their squat? It's nerve-racking... You have this equipment, you're worried about getting it on, how it's going to fit – it really complicates the situation."<sup>13</sup> And today, says Mills, the situation is exacerbated compared to seven years ago. "The material was so *different*. I pulled out some of my old squat suits from ten or maybe eleven years ago, and I showed it to one of my young clients. She thought it was my singlet!"<sup>14</sup> When the equipment used today is so vastly dissimilar from that in the past, one wonders whether the sport itself can be compared across eras. If not, records – one of the hallmarks of modern sport – begin to lose significance.

Mills also spoke about issues that female lifters face when choosing whether to compete in equipped divisions. "As uncomfortable as the equipment is for men, it's probably twice as uncomfortable for women, because it's not made for us. It twists your breasts; it's just miserable."<sup>15</sup> In this case, access to equipment is not truly equal. Female lifters are effectively limited because gear designed for female lifters does not exist. Women can lift in men's gear, but only at the cost of additional discomfort from an already unpleasantly tight squat suit or bench shirt.

There were sometimes benefits, however, from using the equipment other than remaining competitive. Mills says that her first bench shirt helped her overcome a shoulder injury by taking some pressure off of the joint during her lifts. And Titan Support Systems and Inzer Advanced Designs, two of the major powerlifting equipment suppliers in the world, have made it possible for many lifters to get involved in the sport through their sponsorship of athletes. On the whole, though, Mills favors raw lifting. When it comes to equipment, she



As an undergraduate, Kim Beckwith was a three-time winner at the American Drug Free National Championships and she was also chosen as the best pound-for-pound female lifter each year. Beckwith is currently a faculty member in the Department of Kinesiology and Health Education at the University of Texas where she also coaches the Longhorn Powerlifting Team, promotes the Longhorn Open Powerlifting Championships each November, and referees dozens of meets each year for the USAPL federation. In 2014 she was honored as USAPL Collegiate Coach of the Year. She is also the associate editor of *Iron Game History*.

says, "It's one of those things ... I've always felt like the less, the better."<sup>16</sup>

USAPL bench press world record holder in the junior division, Preston Turner, complicated the matter even more by providing a different perspective on powerlifting gear. He asserted that geared lifting and raw lifting are essentially two different events because geared and raw lifters usually do not compete in the same division. Turner claimed, "There is always a misconception that anyone can just throw on a bench shirt and lift 700 pounds or more. This could not be further from the truth. Powerlifting gear adds another very big technical aspect that makes the sport so much more difficult than lifting without." He added, "I have competed both raw and equipped, and there is a huge difference in the type of training, focus, and technicality in equipped lifting." In discussing this altered technique of geared versus raw lifting, Turner alluded to what scholars call re-skilling,



Jill Mills, one of the strongest women in history, has competed both with and without PEG during her career in powerlifting. At present, Mills primarily trains and competes as a raw lifter as she found using gear was taking the fun out of the sport. In a meet in January 2015 Mills set a new raw record in the deadlift of 243 kilos (535 pounds) while weighing only 163 in the United States Powerlifting Association (USPA).

which is increasing the complexity of a certain skill or job.<sup>17</sup>

Turner then explained how he views powerlifting gear. "I always think of equipped lifting in terms of other sports," said Turner. "In baseball, a player wears a glove to enhance his ability to catch the ball. He can catch the ball without a glove, but the sport allows a glove. The same goes for cleats in sports like football and soccer; the athletes can run just fine with flat shoes, but the cleats enhance their ability to accelerate and turn. The same goes for caps and swimming, and a large list of other equipment in sports." He then made it clear, "I cannot put on any of the gear I mentioned above and compete with the professionals. The same goes for powerlifting; people cannot just 'throw on' the powerlifting gear and expect to lift the amount of weight the top in the game do. It is not magic." He reiterated that the playing

field is even in terms of powerlifting gear as there are different divisions of raw, singly ply, and multi-ply, each with its own meticulous equipment specifications. Because of this, he said, "It then comes down to factors always involved in sports: genetics, work ethic, consistency, and determination."<sup>18</sup>

When asked about his recent consideration of lifting raw, Turner summarized his thoughts on the raw versus geared debate. He explained that he is considering raw lifting because although geared lifting has reigned supreme in powerlifting, raw is where the sport is headed, and he wants to compete against the best competition. Turner summed up his view of the issue with a firm statement: "Strong is strong, and the strong will succeed in both equipped and raw, because like I said, the gear is not magic."<sup>19</sup>

Although Louie Simmons shares some of Turner's opinions, he is more outspoken and extreme in his views. A well-known advocate for supportive gear, Simmons owns Westside Barbell Club, an invitation-only gym that has produced large numbers of elite powerlifters. In an article by Simmons in *Powerlifting USA* titled, "Equipment: Never Looking Back," he wrote, "It's not the equipment that makes a champion, but rather your mind. There is really no reason for the controversy over power gear." He then provided an example of his assertion: "When Fred Boldt came to Westside, he used a poly shirt. It took 3 months for him to master a double denim. In his first meet, he did 450, but within a year he made 540 in the same shirt. Where did the 90 pounds come from? Training."<sup>20</sup> The "poly shirt" and "double denim" that Simmons mentioned are different types of bench press shirts, and Simmons asserted that whether or not gear is used, the athletes must train in order to become stronger.

In the same article, Simmons explained that he

sees no issue with gear because there has always been a push for a competitive edge in powerlifting. He explained that lifters have always searched for ways to gain an advantage. "I remember 20 years ago some knee wraps had a rubber lining. Bill Kazmaier had a pair of shoes that were supposed to be worth \$1000," he said. He then told a story about Fred Hatfield — known to many in powerlifting as Dr. Squat — at the 1979 North American Championships in Canada. Simmons wrote, "[Hatfield] showed up at the equipment check with a pair of knee wraps make (*sic*) of jock strap waist bands. The IPF ref looked at them and said he couldn't wear them. They were twice as thick as normal wraps. But Fred won the argument and proceeded to break Ron Collins' world record squat." This was not the only notable action by Hatfield at the meet. Simmons explained, "[Hatfield] also had the squat rack pulled out of his way instead of walking the weight out. Was he cheating or innovative? Being a lifter, I thought he was innovative."<sup>21</sup>

Simmons unapologetically champions the use of powerlifting gear, as he views it as progress. In comparing powerlifting to other sports, he wrote, "Powerlifting is years behind other sports as far as equipment is concerned, including swimming, track, football, and even bowling ... The racing association made recommendations for a better safety belt harness after Dale Earnhardt's death. But in powerlifting when new innovations come about we're cheating? This doesn't make sense."<sup>22</sup> Simmons stands firm by his beliefs, and many support his assertion that we will always find ways to win.

It is interesting, however, that some lifters who spent time training under Simmons at Westside Barbell — and embraced his philosophy — have since altered their views. Brandon Lilly, who is still ranked highly in both raw and geared powerlifting federations, is one of Simmons' former pupils.<sup>23</sup> Lilly expressed his disillusionment with supportive gear after realizing that his idea of "strong" differed from what he embodied as an equipped lifter.

At 19 years of age, as a 220-pound lifter Lilly was able to squat 660 pounds with only a weight belt. Ten years later — and 90 pounds heavier — Lilly squatted over 1000 pounds using a squat suit. However, he also found that he was then unable to squat 650 pounds without gear. "That for me was the end point," said Lilly. "I couldn't lie to myself anymore and continue to lift in the gear ... I felt like I was dis-servicing myself, because

I was putting so much emphasis on the gear that I was detracting from my physical body."<sup>24</sup>

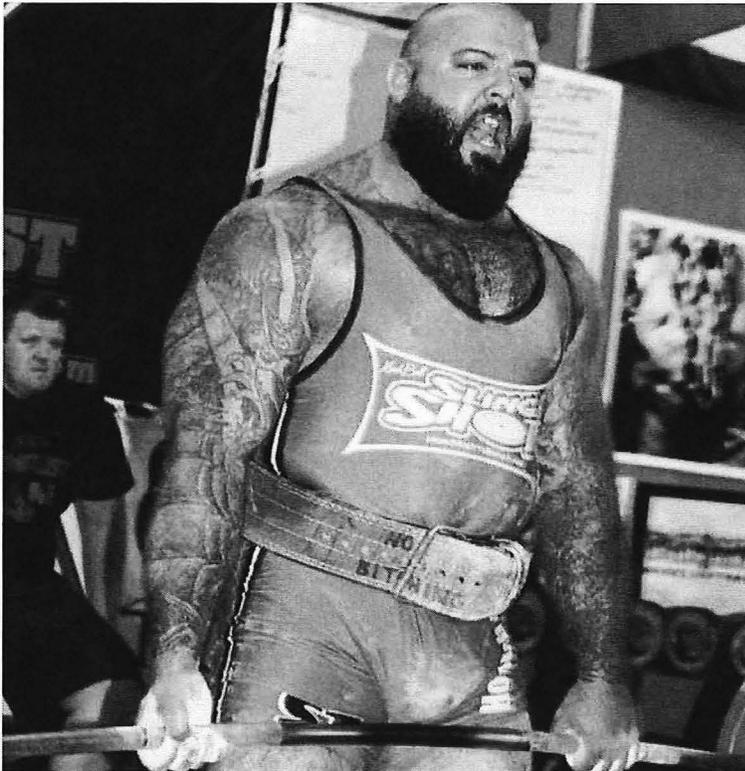
As Lilly explained, he began lifting weights with the original goals of becoming bigger, stronger, more muscular, and more athletic. As time went on and he continued lifting and training in supportive equipment, however, he found himself far from those aims. After this realization, he altered his training with the idea of becoming more well-rounded and functional as a lifter. He said, "To me, the way that I look now, the way that I feel now, has been a look and a feeling that I have strived for since I was an 18-year-old kid and had just started lifting. I was so far away from that as a geared lifter. And I'm not more proud of the way that I lift, because I lifted with everything that I had when I did gear. It's just that I'm closer to the original goals that I had set out to achieve."<sup>25</sup>

In an e-book he published called *The Cube Method*, Lilly outlined a program that helped him achieve his original goals, and expressed similar thoughts, albeit more intensely. He wrote:

*Watch a Multi-Ply powerlifting meet, you tell me what you see is wrong. You don't see it? I sure do, because I lived it. I hid behind layers of canvas, and polyester material that allowed me to showcase my "talents." What were those talents? Getting fat, and getting weak, getting my gear altered so that I would get more "pop" rather than getting strong enough to move weights.<sup>26</sup>*

Lilly's change involved modeling his training after those who compete in the sport of strongman, which requires competitors to train for strength in a number of disciplines rather than only the squat, bench, and deadlift in order to succeed.<sup>27</sup>

Jim Wendler, who also trained under Simmons, had a similar experience regarding supportive lifting. In his popular e-book, titled *5/3/1*, he stated that after accomplishing his powerlifting goals, including squatting 1,000 pounds, he was "dissatisfied with how [he] felt," and wanted a change.<sup>28</sup> His first priority was losing weight. "I was about 280 pounds, and I wanted to be able to tie my shoes without turning red," Wendler wrote. "I wanted to be able to walk down the street without losing my breath. Like many people, I played football in high



Powerlifter Brandon Lilly began his career by using PEG but soon realized he was neither as fit nor as strong as he had been before he began using PEG. Lilly has used his awareness of the limitations of gear to help market his new training system called The Cube.

school and college. I was in shape then, and could do just about anything. Fast-forward five years, and I was at the bottom of the food chain. That feeling of being a fat-ass was awful. I was exactly what I despised.”<sup>29</sup> Wendler summed up his thoughts by writing, “*I was fat and out of shape. And even though I’d recently squatted 1000 pounds, I really wasn’t strong. I couldn’t move, and I couldn’t use this strength for anything other than waddling up to a monolift and squatting.*” [Editors’ Note: *A monolift device allows a lifter to start and finish a squat without walking either backward or forward.*]<sup>30</sup>

Similar to Lilly, Wendler became disheartened about his physical state. His notion of “being strong” meant more than training solely for the bench, squat, and deadlift. As such, his e-book represents a shift from focusing only on these exercises to becoming a well-rounded athlete with strength that can be transposed to everyday life.

Lilly’s thoughts about gear included more than just the physical effects, however. He stated, “At some point ... I recognized that [geared records are] a unique human achievement, but it’s no longer sport. To me it’s

technology.” This is not to say that those lifters who train in gear do not exert an exceptional amount of effort to reach their goals, however. Similar to Yoxall’s statements, Lilly said, “People that train that way, I respect what they do, because it’s a huge investment.” There remains something amiss with that effort, however, and he argued, “But I think that the gear started out as a safety mechanism ... and then it became, ‘Okay, how far can we take this?’”<sup>31</sup> These final thoughts indicate that — in the minds of a growing percentage of powerlifters — the past increase in the use of supportive gear changed the sport of powerlifting so much that the weights lifted in many federations are not accurate representations of a person’s functional strength. According to Lilly, he could no longer reconcile performance enhancing gear with his idea of all around, useful strength.

### Final Thoughts

Through these varying perspectives, it becomes clear that lifters have conflicting attitudes toward supportive gear that have been influenced by their experiences. Further, it’s easy to see there is no consensus regarding supportive gear. Some lifters embrace it wholeheartedly and assert that it represents human nature in the form of striving for progress. Sport philosopher Andy Miah agrees that this attitude is justified.<sup>32</sup> Others strongly resist it, insisting that it alters our natural movements, misrepresents what it means to be strong, introduces new dangers to lifting, and/or confounds records.

Still others appreciate qualities from both sides of the issue. In their chapter “Reflections on the Parallel Federation Solution to the Problem of Drug Use in Sport: The Cautionary Tale of Powerlifting,” Jan and Terry Todd suggested that the current state of powerlifting is best explained by a postmodern framework.<sup>33</sup> In other words, multiple value systems may be represented, and participants can each reap different rewards from their interpretation of the sport. Many of those interviewed indirectly supported this view as their participation in powerlifting — and their use of supportive gear — changed in accordance with their goals.

Some traditionalists may believe that the recent influx of raw divisions — as discussed in this article’s sister piece in this issue — will be the “saving grace” of powerlifting that will bring it back to its roots. However,

there may also be problems with this view. First, the early years of powerlifting were not without participants who pushed the boundaries of legal equipment regulations. The early years were fraught with supportive gear, albeit primitive, used in an effort to set records and lift more weight. Although there were certainly those during that period that did not use gear — just as there are those who do not use it today — powerlifting was never untouched by it.

Second, the authors worry that the raw division will experience what the early days of powerlifting experienced; gear will slowly creep into even these kinds of competitions. Signs of this were evident at the 2013 USAPL Raw National Championships. Author Ben Pollack, who lifted in that contest, learned prior to the meet that Titan was sold out of its XXX-small knee sleeves. One might think this is odd, since a size this small would normally have little demand. However, when knee sleeves are the only allowable wrapping around the knee, and when it is widely known that tight knee sleeves work more or less like tight knee wraps, XXX-small knee sleeves sell out. Even raw lifters will push to the very limits of the rules in order to gain a competitive advantage while still claiming to be “raw.” According to Pollack, during the meet, some competitors needed two handlers to help pull their knee sleeves on because they were so small. In 2014, the USAPL, to their credit, passed a rule prohibiting lifters from receiving this type of assistance. However, that didn’t deter Anderson Powerlifting LLC from selling KLA Knee Sleeve Slip-Ons. These are thin, smooth tubes of material, almost like stockings, that lifters put on before donning knee sleeves. Lifters pull the tube over the knee, and then pull the knee sleeve into the correct position over the slick fabric. Because the material is thin and smooth, the lifter does not need help from others in order to put on sleeves and after the lifter dons the sleeves, the slip-ons are easily pulled out from underneath.<sup>34</sup>

What does this all mean? Pete Alaniz of Titan-Support Systems suggests that “the actual relationship of gear to the sport is that lifters have changed gear just as gear has changed lifters. Lifters, like all other athletes, are always looking for an ‘edge.’” This relationship goes both ways, he claims. “Gear development has been driven by lifter demand. The various gear companies have all attempted to give the lifter that extra ‘edge’ to gain market share; same as in every other industry,” said Alaniz.<sup>35</sup>

One notable, relatively recent trend that may be

influencing lifter demand is CrossFit. Started by Greg Glassman and Lauren Jenai in 2000, CrossFit is promoted as an exercise philosophy and a competitive fitness sport that builds power, flexibility and endurance.<sup>36</sup> The exercise program consists primarily of high intensity training using many movements from a number of physical culture disciplines such as gymnastics, weightlifting, powerlifting, and Strongman. As a business entity, CrossFit has experienced explosive growth; it boasts approximately twelve thousand gyms worldwide and paid out over two million dollars in prize money at its 2015 CrossFit Games; it also has a partnership with Reebok.<sup>37</sup>

Although not backed by scholarly research, it seems clear to us that the growth of CrossFit has increased the popularity of sports such as powerlifting and, especially, Olympic weightlifting.<sup>38</sup> CrossFit’s emphasis on bodyweight movements, agility, speed, and flexibility, is a polar opposite to what is required in the most extreme forms of equipped powerlifting. As such, CrossFit can be expected to only encourage raw powerlifting, so that any CrossFitters who make the transition to powerlifting, or who compete in both sports, will do so as unequipped, or, at most, only lightly equipped competitors.

This article was not intended to solve the philosophical dilemma the sport of powerlifting currently faces. Instead, our purpose here was to give voice to the varied opinions that powerlifters from many different backgrounds have on the subject. Future researchers may, perhaps, be able to unpack the various factors influencing the ebb and flow of supportive gear in the sport, and other questions that are beyond our focus here. For example, does CrossFit actually have an effect on powerlifting, or is this simply conjecture? Have sociocultural factors influenced attitudes which have led to differences in preferences over the years? Also, have organizations or businesses — other than the ones mentioned earlier in this article — affected the amount or types of gear being used? And finally, if PEG is left unchecked, “how far will it go?”

Ultimately, the most interesting question related to this entire debate is this: what are the limits of gear in this sport? Louie Simmons maintains, “Nothing has changed since powerlifting began. Everyone looks for an edge. That’s simply sport.”<sup>39</sup> Our analysis of the opinions of a wide variety of lifters who have moved away from gear, however, reveals that when Simmons uses the

term “everyone,” he is simply mistaken. Many people who lift raw do so to compete on equal terms with other lifters of a similar size who for reasons of safety, ethics, pursuit of functional strength, and the wish to determine which man or which woman can lift the most weight — not which man and his gear or which woman and her gear can lift the most weight.

## NOTES

1. Our interviewees consisted primarily of elite level lifters and/or those with reputations in other aspects of the world of strength such as coaching. Additionally, we supplemented interviews with selections from magazines such as *Powerlifting USA* and from interviews and opinions published online.
2. Interview with Kim Beckwith, 25 April 2014.
3. Ibid.
4. Ibid. For information on ethics and sport technology see Lee Ann Paradise, Eileen Imada, and Peter Andrews, “Have Technological Advances in Sports such as Tennis, Golf, and Track and Field Supplanted the Athletic Achievements of the Participants in Those Sports?” *Science Clarified*, 2014, viewed at: [www.scienceclarified.com/dispute/Vol-1/Have-technological-advances-in-sports-such-as-tennis-golf-and-track-and-field-supplanted-the-athletic-achievements-of-the-participants-in-those-sports.html#b](http://www.scienceclarified.com/dispute/Vol-1/Have-technological-advances-in-sports-such-as-tennis-golf-and-track-and-field-supplanted-the-athletic-achievements-of-the-participants-in-those-sports.html#b); Josh Chan, “A New Breed Of Unfair Advantage In Sports – ‘Technology Doping,’” *Engineering*, 12 July 2012, viewed at: [www.engineering.com/3DPrinting/3DPrintingArticles/ArticleID/4519/A-New-Breed-Of-Unfair-Advantage-In-Sports-Technology-Doping.aspx](http://www.engineering.com/3DPrinting/3DPrintingArticles/ArticleID/4519/A-New-Breed-Of-Unfair-Advantage-In-Sports-Technology-Doping.aspx).
5. Interview with Larry Pacifico, 15 April 2014.
6. Interview with Kevin Yoxall, 8 August 2013. Yoxall was head strength and conditioning coach at Auburn University from 1999-2012.
7. Ibid.
8. Ibid. PR is an acronym for “personal record.” This means a lifter achieved a new best in a particular lift.
9. Interview with Kevin Yoxall.
10. Ibid.
11. Ibid.
12. Interview with Jill Mills, 1 August 2013.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
17. Preston Turner, “Re: Questions,” email to Dominic Morais, 28 April 2014, email in author’s possession. For information on reskilling see Ivo van Hilvoorde, Rein Vos and Guido de Wert, “Flopping, Klapping and Gene Doping: Dichotomies Between ‘Natural’ and ‘Artificial’ in Elite Sport,” *Social Studies of Science* 37, no. 2 (2007): 173–200; Andy Miah, “Rethinking Enhancement in Sport,” *Annals of the New York Academy of Sciences* 1093, no. 1 (2006): 301–320; Heather Sheridan, “Tennis Technologies: De-Skilling and Re-Skilling Players and the Implications for the Game,” *Sport in Society* 9, no. 1 (2006): 32–50.
18. Turner, “Re: Questions.”
19. Ibid.
20. Louie Simmons, “Equipment: Never Looking Back,” *Powerlifting USA*, April 2003: 26.
21. Ibid., 26–27.
22. Ibid., 27.
23. Brandon Lilly, *The Cube* (Bookbaby e-book, by the author, 2012), 5-6; “American Best of the Best Lifter Rankings 2007 to Present,” *Powerlifting Watch*, viewed at: [www.powerliftingwatch.com/all-time](http://www.powerliftingwatch.com/all-time).
24. Interview with Brandon Lilly, 30 May 2015.
25. Ibid.
26. Lilly, *The Cube*, 8.
27. Ibid., 10–11.
28. Jim Wendler, *5/3/1: The Simplest and Most Effective Training System to Increase Raw Strength* (Lulu Ebooks, by the author, 2009), 6.
29. Ibid.
30. Ibid.
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