

CrossFit® instructor demographics and practice trends

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Abstract

CrossFit® is an increasingly popular exercise modality that uses high intensity power training. The literature to date regarding CrossFit® has focused on its benefits to VO2 Max, body composition and the motivational variables of participants of CrossFit®. A computerized survey was distributed to CrossFit® instructors using Survey Monkey® (Palo Alto, CA, USA). One hundred and ninety-three CrossFit® instructors responded to the survey. Of these 86.6% (155/179) reported being a certified CrossFit® instructor with 26.7% (48/180) having a bachelor's degree in an exercise-related field. Instructors with a CrossFit® certification have less bachelor's (P=0.04) or master's (P=0.0001) degrees compared to those without a CrossFit® certification, more utilization of Olympic weightlifting (P=0.03), one-on-one teaching (P=0.0001), 1-RM max on snatch (P=0.004), 1-RM on clean and jerk or hang clean (P=0.0003), kettlebell use (P=0.0001) and one-on-one training (P=0.0001). Instructors report differences in their education and differences in use of weightlifting platforms and various types of footwear. Non-certified instructors differ from CrossFit® certified instructors in regards to teaching of Olympic weightlifting and exercise programming.

Introduction

There has been a rise in high intensity power training (HIPT) with the popularization of CrossFit, Inc.^{1,2} CrossFit® affiliated gyms are located worldwide and athletes follow a similar workout of the day (WOD) that is posted for open access viewing by CrossFit® on their website. CrossFit® uses a range of exercises that incorporate strength, endurance, metabolic conditioning, and power.³ CrossFit, Inc was developed to improve the general physical skills of cardiovascular/respiratory endurance, stamina, strength, flexibility, power, speed, coordination, agility, balance, and accuracy.⁴ In

order to achieve these goals, the CrossFit® method is built upon diet, metabolic conditioning, gymnastics, weightlifting, throwing and sport.⁴ Metabolic conditioning incorporates both anaerobic and aerobic training styles in intervals to increase total work. CrossFit® participants have been found to spend less time exercising per week and were able to maintain enjoyment. These participants are more likely to continue the program.⁵

CrossFit® is inclusive of all types of athletes and individuals seeking to become more physically fit.⁴ The complex Olympic weightlifting exercises, snatch and clean and jerk, are thought of by the general population as very complex and technical, however, CrossFit® instructors may teach them or teach variations of the lifts based on ability to anyone who would like to learn them.⁴ Greg Glassman, founder of CrossFit®, emphasizes teaching basic movements and waiting until they are mastered before allowing participants to do the advanced lifts (*i.e.* snatch). A focus on the ability to perform a correct snatch relies on mastering the *air squat* and then the overhead squat.⁴ Partridge and colleagues investigated the motivational variables in CrossFit® facilities and found that males reported higher levels of performance goals and females reported higher levels of exercise mastery goals. Shorter membership times were found to have higher exercise mastery related goals than athletes who had been doing CrossFit® longer.³ The study confirms participants are following the teaching by Glassman to work on form and then performance.⁴ CrossFit® offers a variety of trainer courses and seminars. Currently, there is a CrossFit® Level 1 Trainer Certificate Course, Level 2 Certificate Course, Certified CrossFit® Level 3 Trainer Certification (CF-L3), CF-L4, and Certified CrossFit® Trainer.⁶ The Level 1 trainer has no prerequisites. The Level 2 certification requires a Level 1 certification and at least 6 months of CrossFit® coaching. The CF-L3 trainer course requires either a Level 1, Level 2 and 750 hours of CrossFit® coaching experience or 1500 hours of general physical preparedness coaching experience at a college level or higher. CF-L4 coach requires prior attendance of Level 1 and Level 2 courses as well as an active CF-L3 trainer certification.⁶ Maintenance of certifications requires continuing education. Additional qualification courses include further training in endurance running, gymnastics, kettlebell, mobility, power lifting, strongman, rowing, weightlifting, and other aspects of CrossFit®. CrossFit® is developing new and more advanced certifications and obtaining a high level of accreditation for their certifications.

The HIPT that is the training type in CrossFit®, has been shown to increase maximal aerobic capacity (VO2 max) and body com-

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position as decreased body fat percentage in a 10 week program.¹ HIPT may offer aerobic fitness improvements that require less time commitment than traditional types of aerobic training.¹ HIPT differs from high intensity interval training (HIIT) in that HIPT includes a prescribed rest period, emphasis on high power output, and multi-joint activities.¹ Since HIPT and HIIT training are increasing in popularity, there is little known about the safety and effectiveness of these training styles as research has lagged behind what is being performed by the general population. To date, there has not been a study focusing on evaluating the CrossFit® instructors in regards to their training backgrounds and trends in individualizing the workout of the day or WOD that is posted by CrossFit® website. Evidence from Weisenthal and colleagues 2014 showed a significantly decreased injury rate with more CrossFit® instructor involvement in workouts.⁷ The aim of the study was to assess the current education and certification levels of the instructors and further investigate the exercise programming done by CrossFit® instructors. The study was reviewed and granted exempt status by the Institutional Review Board at Rhode Island Hospital/ Lifespan.

Materials and Methods

The online survey was created utilizing Survey Monkey® (Palo Alto, CA) by the study authors. A written survey instruction and

Table 1. Demographics of CrossFit® instructors.

Question	Tot.	Variable	N.	% or SD
Gender	188	Female/Male	66/122	35.1/64.9%
Age	192	Years	36.3	SD 9.6
How many years have you been working in the exercise field?	191	Years	8.5	SD 8.5
How many hours per week do you work at your exercise related employment?	191	Hours	36.2	SD 20.3
Is your primary employment in an exercise related field?	189	Yes/No	140/49	74.1/25.9%
Approximately how many people do you teach exercise to each week?	192	Number	89.8	SD 100.4
What is the average number of members per class/session you teach?	180	Number	9.7	SD 5.0
What is the average number of instructors per class?	179	Number	1.4	SD 0.9

recruitment letter was included stating that the respondents did not have to answer all the survey questions. The survey, application and recruitment letter were presented to the Institutional Review Board at Rhode Island Hospital/Lifespan Corporation and the project was granted exempt status.

CrossFit gyms in the United States were identified utilizing Crossfit.com. The survey and recruitment letter were distributed by finding any instructor email addresses or the gym email address on the individual gym websites and contacting through email. The recruitment letter was also posted on social media (Facebook®) and on the Crossfit.com forum with a link to the survey.

The recruitment letter asked instructors or the gym to distribute the survey to all other CrossFit® instructors they knew. The survey was designed to be filled out only by CrossFit® instructors as specified in the recruitment letter. It is unknown how many individuals saw the recruitment letter, thus the response rate is incalculable. The survey was conducted between February and May 2014.

Statistical analysis was performed using Chi-Square test with a P value set to less than 0.05 as significant. Analysis was performed to examine the effect of a bachelor's degree, a master's degree, instructor gender, and CrossFit® certification status on an instructor's practice.

Results

There were a total of 193 individuals that participated in the survey. The average age of the respondents was 36.3±9.6 years. There were more male instructors (64.9%) than female instructors (35.1%). The average number of years working in an exercise related employment was 8.5±8.5 years. Instructors worked 36.2±20.3 hours per week at an exercise related employment and 74.1% stated that CrossFit® was their primary employment. The average CrossFit® instructor teaches 89.8±100.4 (range 4 to 600) people per week with an average class size of 9.7±5.0 (range 1

Table 2. Personal trainer certification as CrossFit® instructor (n=172).

Answers	N. (%)
Yes	88 (51.2)
No	84 (48.8)
American Council of Exercise	25 (14.5)
American College of Sports Medicine	30 (17.4)
American Fitness Professionals and Associates	1 (0.6)
Aerobics and Fitness Association of America	8 (4.7)
International Sports Sciences Association	8 (4.7)
National Academy of Sports Medicine	14 (8.1)
National Exercise and Sports Trainers Association	1 (0.6)
National Council for Certified Personal Trainers	1 (0.6)
National Strength and Conditioning Association	24 (14.0)
Other	22 (12.8)
Functional Movement Systems	1 (0.6)
Cooper Institute	2 (1.2)
C.H.E.K Exercise Coach	1 (0.6)
Exercise Safety Association	1 (0.6)
Australian Institute of Fitness	1 (0.6)
Action Personal Trainer Certification	1 (0.6)
National Strength Professionals Association	2 (1.2)
Athletic Certification Training	1 (0.6)
Optimum Performance Training Fitness	2 (1.2)

to 25). Each class has 1.41±0.9 (range 1 to 4) instructors present (Table 1).

In total, 26.7% of CrossFit® instructors reported having obtained a bachelor's degree in an exercise-related field, 16.2% having obtained a master's degree in an exercise-related field. A CrossFit® instructor certification was held by 86.6% of survey participants, the survey did not specify what level of certification or what CrossFit® certification the participant had obtained.

A personal trainer certification (Table 2) was held by 51.2% of instructors with the most common being from the American College of Sports Medicine, American Council of Exercise, and the National Strength and Conditioning Association (NSCA).

CrossFit® instructors reported 51.8% having a strength and conditioning certification (Table 3). A certified strength and condition-

ing specialist through the NSCA was held by 17.7%. A strength and conditioning coach certified from the Collegiate Strength and Conditioning Coaches Association was held by 0.6% of instructors. A USA weightlifting certification was held by 40.0% of CrossFit® instructors. Instructors utilize a variety of different stretching types with only 1.3% reporting not having participants stretch. Dynamic stretching was taught by 86.7%, static stretching by 77.2%, proprioceptive neuromuscular facilitation by 63.3%, active isolated by 42.4%, ballistic by 21.5%, mobility by 8.7% and myofascial stretching by 1.9% of instructors.

CrossFit® instructors reported that 30% of their programming was based off barbell/dumbbell resistance training, 21% by Olympic weightlifting, 22% cardiovascular training, 18% other, 5% resistance bands, and 2% related to exercise machines.

Olympic weightlifting (Table 4) is taught by 92.2% of instructors with 100% of these instructors teaching the hang clean, 96.1% clean and jerk, and 94.2% snatch. One-on-one teaching to ensure proper form in the Olympic lifts is performed by 92.0% of instructors. Instructors reported teaching Olympic lifts for 18.4±29.6 hours (range 0 to 150) prior to allowing someone to be less supervised.

Olympic weightlifting (Table 5) was mostly performed (74.4%) after the warm-up during minimal fatigue. One repetition maximal lifts (1-RM) are performed by 70.6% on either the hang clean or clean and jerk and 66.7% on snatch.

Kettlebells (Table 6) are used at 97.0% of facilities. One-on-one teaching with kettlebells occurs by 90.3% of instructors. The most common way an instructor learned how to use kettlebells was by a course 41.5%.

Odd-shaped objects that mimic a *strongman* competition are used by 52.7% of instructors. Olympic weightlifting platforms or specialized rubberized mats are used by 85.8% of instruc-

tors. Athletes are allowed to lift barefooted by 45.9% of instructors. *Toe shoes* are allowed by 55.6% of instructors. Instructors reported having athletes use Olympic style weightlifting shoes by 78.3% of survey participants.

Analysis of differences between male and female CrossFit® instructors responding to the

survey revealed that males were more likely to be CrossFit® certified (P=0.01). Male instructions taught Olympic weightlifting more than female instructions (P=0.022). Olympic platform use was more by males as well (P=0.005). There were no statistically significant differences in other forms of education or certifica-

Table 3. Strength and conditioning certification as CrossFit® instructor (Do you have any of the following strength and conditioning certifications?) (n=170).

Answers	N. (%)
Yes	88 (51.8)
No	82 (48.2)
Certified Strength and Conditioning Specialist	30 (17.7)
Strength and Conditioning Coach Certified	1 (0.6)
USA Weightlifting	68 (40.0)
Other	12 (7.1)
Strength and Conditioning Australia	1 (0.6)
Australian Weightlifting	1 (0.6)

Table 4. Trends in Olympic weightlifting teaching.

Question	Tot.	Variable	N.	% or SD
Do you teach Olympic weightlifting (clean and jerk, snatch) at your facility?	167	Yes/No	154/13	92.2/7.8%
Do your athletes...?	155	Number		
Hang clean			155	100.0%
Clean and jerk from the floor			149	96.1%
Snatch			146	94.2%
Is there any one-on-one teaching to ensure proper form of Olympic style lifts?	162	Yes/No	149/13	92.0/8.0%
Approximately how many hours of teaching Olympic lifts are done prior to allowing someone to be less supervised?	151	Number	18.4	SD 29.6

Table 5. Trends in Olympic weightlifting timing and one repetition maximum lifts.

Question	Tot.	Variable	N.	% or SD
When do your athletes do their Olympic lifting?	164	Number		
We do no Olympic Lifting...?			10	6.1
Right after the warm-up (minimal fatigue)			122	74.4
After they are already fatigued (mid class)			5	3.1
At the end of class			0	0
Other			27	16.5
Do you have your athletes max on clean and jerk or hang cleans?	163	Yes/No	115/48	70.6/29.5
Do you have your athletes max on snatch lifts?	162	Yes/no	108/54	66.7/33.3

Table 6. Kettlebell trends in CrossFit®.

Question	Tot.	Variable	N.	% or SD
Do you use kettlebells at your facility?	165	Yes/No	160/5	97.0/3.0
Is there any one-on-one teaching with kettlebells to ensure proper form?	165	Yes/No	149/16	90.3/9.7
Who taught you how to use kettlebells?	164	Number		
I do not know how to use kettlebells			2	1.2
Course			68	41.5
Apprenticeship			27	16.5
Self-taught			38	23.2
Other			29	17.7

tions. CrossFit® instructors with a bachelor's degree made up a higher percentage of non-CrossFit® certified ($P=0.04$) compared to instructors without a bachelor's degree (Supplementary Table S1). Having a bachelor's degree had more personal trainer certification ($P=0.002$). CrossFit® instructors with a master's degree had a lower percentage of CrossFit® certification ($P=0.0001$), Olympic weight lifting taught ($P=0.001$), and Olympic platform use ($P=0.0002$) (Supplementary Table S1). A higher percentage of instructors with master's degrees also had a personal trainer certification ($P=0.01$).

Having a CrossFit® certification was statistically significant for less bachelor's ($P=0.04$) or master's degrees ($P=0.0001$), more utilization of Olympic weightlifting ($P=0.03$), one-on-one teaching ($P=0.0001$), 1-RM max on snatch ($P=0.004$), 1-RM on clean and jerk or hang clean ($P=0.0003$), kettlebell use ($P=0.0001$), and kettlebell one-on-one training ($P=0.0001$). Instructors with a CrossFit® certification had more use of Olympic style platforms ($P=0.0001$) and Olympic weightlifting shoes ($P=0.0001$).

Discussion

To our knowledge, this is the first study to evaluate the demographics of CrossFit® instructors and the exercise breakdown they employ during CrossFit® instruction. Other studies to date have looked at motivational variables, outcomes of maximal oxygen consumption (VO_2 Max) and body composition, and injuries retrospectively by use of an online forum.^{1,3,5}

CrossFit® certified instructors reported a statistically higher percentage of one-on-one Olympic weightlifting and kettlebell training along with a higher percentage of instructors that utilize these training methods. This shows that CrossFit® certified instructors more than non-certified instructors are aware of the importance of teaching participants how to perform the exercises.

The Olympic lifts snatch and clean and jerk, can be an extremely difficult group of exercises to master the correct lifting technique. Most fitness professionals would agree that learning these lifts is most effective by a trained strength and conditioning professional,⁸ however there is no evidence to date as to what certification or collegiate degree guarantees ability to teach these lifts properly. The overwhelming majority of CrossFit® instructors surveyed have a CrossFit® certification, but some also have exercise related bachelor's or master's degrees and can have further certifications as personal trainers and strength and conditioning professionals. NCAA strength and

conditioning research suggests that some type of internship may be beneficial as well,⁹ but this is not necessarily a requirement for even those professionals at the current time. Having a bachelor's or a master's degree led to less CrossFit® instructor certifications, but more personal trainer certifications. CrossFit® certified individuals had no difference than non-certified individuals in regards to further strength and conditioning certification ($P=0.07$). This may be due to instructors feeling confident in educating themselves because they have a collegiate education or because the CrossFit® instructor certification courses are being taken by those entering a second type of career or that the instructors have not been able to take the course yet. Further research should be performed to determine the reason for this difference. We did not evaluate for knowledge or proficiency and therefore we do not know if one type of educational pathway is more optimal to make better or more prepared instructors. The evidence suggests that more instructor involvement in the WOD will decrease the injury rate.⁷

The timing of complex lifts raises the question of the potential risk of injury increasing with fatigue. CrossFit® workouts can include as many reps possible or reps for time. Kuni and colleagues demonstrated that there was impaired jump landing after exercise in both recreational and in high-performance athletes,¹⁰ but there has been no research to our knowledge that shows that fatigue leads to increased injury specifically with Olympic weightlifting. There is evidence that fatigue can lead to suboptimal changes in technique seen in high repetition sets. These changes lead to a smaller knee flexion angle and a larger hip flexion angle during a barbell back squat,¹¹ but this has not been shown in the literature to result in increased injury. There is also evidence that resistance training leading to fatigue can lead to lasting negative impacts on form.¹² In our survey, most of the Olympic lifting was reported as being done right after the warm-up in a minimal fatigue state which based on the limited evidence available would likely be the safest way to ensure the best form for complex multi-joint exercises like snatch or clean and jerk. The kettlebell is a cannonball shaped object with a handle that has an off center of gravity lending itself to ballistic style full body exercise.¹³ The popularity of kettlebells has increased due to its potential benefits as an acceptable alternative type of exercise to achieve similar fitness results to aerobic fitness, dumbbells, and Olympic weightlifting.^{14,15} Kettlebell training has been suggested to reduce pain in the neck, shoulders, and low back while increasing strength,¹³ and improving vertical jump and half-squat.¹⁶ Our investigation revealed that kettlebells are very commonly used in CrossFit® with most instructors

utilizing these exercise tools having learned them from a variety of different methods including courses and self-instruction. Being taught at a course would suggest more standardized training than self-instruction. All CrossFit® certified individuals in the survey responded (100%) that they teach kettlebells, however only 72.2% of non-CrossFit® certified instructors taught with kettlebells.

Footwear is a topic that has been poorly studied to date in the exercise literature as it pertains to resistance training and Olympic weightlifting. The movement towards barefoot running and *minimalist* shoes possibly helping with injury prevention,¹⁷ may be transferring over to the weight room without any evidence supporting it. Olympic weightlifting shoes are recommended by the International Weightlifting Federation to protect the lifter's feet and provide a stable base on the weightlifting platform.¹⁸ Sato and colleagues found that weightlifters using weightlifting shoes with elevated heel had a reduced trunk lean and an increased foot segment angle which lead to decreased shear stress in the lumbar spine and increased knee extensor activation.¹⁸ The high use of Olympic style weightlifting platforms and specialized rubberized mats in CrossFit® shows that instructors are attempting to follow the standards of care for Olympic weightlifting training and competition as emphasized by CrossFit®. There was variability in instructor allowance of barefoot and minimalist *toe shoe*, which corresponds to the lack of evidence in this field in the literature for or against use. CrossFit® certified instructors reported more use of Olympic weightlifting shoes, barefoot lifting, and *toe shoe* compared to non-certified instructors. Gender and collegiate education had no impact of use of footwear choices.

Gender of the instructor had no impact on use of kettlebells or *odd-shaped objects*, however less females reported performing Olympic weightlifting (84.7 vs. 96.2%, $P=0.022$). Allowing athletes to perform 1-RM on snatch or clean and jerk/hang clean did not statistically differ between genders. Collegiate education, personal trainer certification, and strength and conditioning certification were not statistically different between men and women. This could relate to the gender differences in motivational variables reported by Partridge in regards to exercise *versus* performance related goals.³ Further investigation is warranted to determine if there is a reason why female instructors were less likely to incorporate Olympic weightlifting into programs.

This study had several limitations. It is unknown exactly how many individuals actually received the survey invitation due to the possibility of incorrect or inactive email accounts; therefore we are unable to provide a percent response rate. The authors were not able to

access a database of instructors and therefore in order to increase the number of survey responses, the authors posted links to the survey on social media sites, on-line forums, and asked survey participants to forward the recruitment email to other CrossFit® instructors. To help increase our survey completion, we did not require all survey participants to answer every question, but this caused different number of answers for each question. We did not differentiate between CrossFit® Level 1 to 4 training certification but rather just asked if the instructor was certified or not. There could be differences between these credentials, but we opted not to investigate these in this study. The possibility of recall bias by the instructors is likely.

Conclusions

In conclusion, there is variability in the training methods and educational background of CrossFit® instructors. Training differences seems to be mostly related to presence or absence of a CrossFit® certification rather than other education or certifications. Knowledge of exercise theory and ability to effectively teach was not evaluated as part of this study.

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