

# Athletic Training & Sports Health Care

## Physiotherapist perspective: CrossFit, guiding you safely.

--Manuscript Draft--

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<b>Full Title:</b>	Physiotherapist perspective: CrossFit, guiding you safely.
<b>Article Type:</b>	Sports Medicine Digest
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<b>Order of Authors Secondary Information:</b>	
<b>Abstract:</b>	<p>Crossfit is a varied, functional, high intensity endurance and strength designed workout which has gained considerable popularity recently (1). With this new popularity comes more injuries, some of which are commonly seen in weight lifting, running and gymnastics which components are involved in Crossfit programming. Research regarding injuries in Crossfit are scarce and needs more attention especially from a physiotherapist and injury prevention standpoint. Research has somewhat acknowledged injuries to shoulders, knees and lower backs are most frequent due to gymnastic and power lifting motions (3) and there is a 44% incidence in joint related injuries. In order to promote prevention and enhance physiotherapy knowledge and skills to treat Crossfit individuals there is a demand for high quality evidence in this area.</p>
<b>Author Comments:</b>	
<b>Response to Reviewers:</b>	Attached manuscript amendments attached as response to reviewers.

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13/8/18

Dear Thomas W Kaminski,

I am writing to submit a new editorial entitled “Physiotherapist perspective: CrossFit - Make or Break?” for consideration in the Journal of Athletic Training & Sports Health Care.

I confirm that this work is original and has not been published elsewhere nor is it currently under consideration for publication elsewhere.

At present, research examining Crossfit injuries have not been studied extensively, however, there is Crossfit is still a growing sport and fitness pursuit. Research from an physiotherapists perceptive is scarce and would hold a valued standpoint.

Research is valuable in this area especially identifying common injuries and how injuries are caused i.e: are they traumatic or overuse? Is there any common comparisons with injuries from other sports? This editorial brings together the key themes in the current research to give a comprehensive overview of typical injuries and the similarities between other sports.

This study is a strong foundation for research to build upon due to the awareness of conditioning programmes in female soccer to enhance performance and reduce the likelihood of injuries.

I will be assuming the role of corresponding author. All authors approve the submission of this editorial in the Journal of Athletic Training & Sports Health Care and I will update them on its

27 progress. Please address all correspondence concerning this manuscript to me at  
28 K0036121@live.tees.ac.uk.

29 Thank you for your consideration of this editorial.

30 Sincerely,

31 Jo Ann Kaye. MSc.

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Reviewers comments:

Reviewer 1:

- Revised title: **changed to: Physiotherapist perspective: Crossfit: guiding you safely.**
- **L1: This has been changed**

- L29: shoulder injuries related to fatigue. Also unfamiliarity, excessive loads, speed, and repetition. Safety issues. **This has been added: Shoulder injuries related to fatigue. Also unfamiliarity, excessive loads, speed and repetition and safety issues are particularly prevalent amongst CrossFit athletes.**

- L40: addiction; this is odd here. Harm->harm. Consider discussing dosing or over training in the early periods coupled with movement unfamiliarity and high load plyometrics. The coaching and certification aspect is important, again back to safety.

**This has been changed (line 41- 47). The addictive pursuit of CrossFit training may lead to fatigue and weakness, with overtraining increasing the risk of harm. This additive nature can cause individuals to overtrain especially in the early periods of starting this type of training programming and an increase in high load plyometric training, many individuals bodies may not be conditioned with the increase in plyometric exercises as well as the increase in training dosages particularly in the early stages of starting training (9).**

- L54: components - **changed.**

- Rework your last 3 paragraphs. **Changed as seen below (Line 54-83):**

**Nonetheless, studies have shown there are no differences in fundamental movement patterns between CrossFit individuals and other traditional programs such as weightlifting (1). Crossfit leads to aerobic gains, anaerobic gains and similar injury rates as weightlifting or gymnastics. Therefore, an important factor in improving performance and prevention of injuries is to swiftly recognise and correct defects in mobility, stability and symmetry. Physiotherapists are in an ideal position to guide people safely into Crossfit training by highlighting the potential risks and outcomes and how to train and progress through skills safely and efficiently. Thereby, physiotherapists would benefit from having an in-depth understanding of the different components CrossFit offers, this will reduce altered motor programs throughout the kinetic chain if identified initially (11).**

**Meyer, Morrison, Zuniga's (2017) systematic review acknowledges individuals who engage in CrossFit perform better and have higher gains in aerobic capacity and anaerobic cover. CrossFit gives athletes the freedom to train and develop at different skills rather than**

**individuals having direct supervision which is where the knowledge and expertise from physiotherapists could provide safe and effective recommendations to prevent injury (3).**

**Every form of physical activity holds potential risk of injury, and rates of CrossFit training injuries are consistent with rates in other fitness routines (2). Individuals want to get good results safely without developing an injury, likewise, physiotherapists want to allow people to engage in fitness activities but as well as understanding the health implications of those activities and the safety of activities to continue to improve their strength, stamina, endurance and mobility but within a safe environment (3).**

**Physiotherapists should have an awareness of CrossFit training, in order to accurately treat the various patterns of injuries incurred by athletes. Comparable injuries can be found in other recreational athletes such as runners, Olympic lifters, gymnasts and power lifters (3). Despite the variety and intense nature of CrossFit, injury rates do not vary from other similar intense activities and there is no correlation between demographic or training data with the presence of injury. With safe incremental increases in intensity, accurate coaching, slow progression and good technique, CrossFit can be a beneficial form of exercise for healthy adults looking for a varied routine. There is no consistent evidence to suggest that CrossFit is injuring athletes more than other comparable exercise routines.**

**Reviewer #2:** Thank you very much for your submission. Below are comments regarding the manuscript for ATSHC's Sports Medicine Digest:

- please update publications reviewed. There are relevant 2018-2019 published manuscripts that should be included in your review.
- "research regarding injuries in CrossFit are scarce". The reviewer was able to find applicable 2018 and 2019 manuscripts relevant to your topic. Please include these recent articles in your review. They are found outside physiotherapy publications.
- This is an excellent topic for this journal and its readers. Since 2016, there has been a marked increase in injury surveillance and reporting in the literature. For this submission, publications from 2018-2019 with regards to injury prevalence introduction is required for its diverse readership.

**Thank you for your comments. Please read line 6 to 14 which includes: Research and scholarly activity focusing on the incidence, prevalence of both acute traumatic and chronic overuse injuries in CrossFit continue to rise (3). Large scale epidemiological including prospective studies are starting to gain momentum from the orthopedic, sports science and coaching sectors into associations between the physiological characteristics of CrossFit and injury (3). Despite these studies occupying valuable journal space, these insightful findings may not be reaching an appropriate physiotherapy audience. Considering physiotherapists play a key role in managing the sports performer, having a sound understanding of CrossFit is of paramount importance in positively shaping the athletes' rehabilitation outcomes and expectations (4).**



- Line 46: and studies reporting injury prevalence in weightlifting also state how common shoulder injuries are with 76% being MSK related injuries and the most common sites being the shoulder, knee and spine (9). Reference updated to a recent reference.
- Line 68: Crossfit leads to aerobic gains, anaerobic gains and similar injury rates as weightlifting, powerlifting, triathlon training or gymnastics (13).
- Line 73-76 changed and reference updated: Feito et al's (2018) Study provided a multi-year assessment of injuries amongst individuals who engage in CrossFit training which indicated that it is a safe training modality however, those within the first year of training and those who participate more than 3 days a week are at a greater risk of injury due to new intensity, duration and type of exercise (14).

1                                    Physiotherapist perspective: Crossfit: guiding you safely.

2

3    CrossFit is a constantly varied, high intensity, functional endurance and strength program  
4    which has seen a considerable growth in popularity (1). With more than 13,000 licensed  
5    CrossFit affiliates worldwide, physiotherapists have a general knowledge of CrossFit exercise  
6    routines because more patients engage in such activities (2). Research and scholarly activity  
7    focusing on the incidence, prevalence of both acute traumatic and chronic overuse injuries in  
8    CrossFit continue to rise (3). Large scale epidemiological including prospective studies are  
9    starting to gain momentum from the orthopedic, sports science and coaching sectors into  
10    associations between the physiological characteristics of CrossFit and injury (3). Despite  
11    these studies occupying value journal space, these insightful findings may not be reaching an  
12    appropriate physiotherapy audience. Considering physiotherapists play a key role in  
13    managing the sports performer, having a sound understanding of CrossFit is of paramount  
14    importance in positively shaping the athletes rehabilitation outcomes and expectations (4).  
15    The purpose of this review is to examine current literature on the effects of CrossFit on injury  
16    rates and to provide physiotherapists with an appropriate evidence platform and to generate  
17    further interest in this field.

18    CrossFit is a conditioning programme which blends multiple synchronistic exercises ranging  
19    from rowing, running and gymnastics to Olympic lifting and power lifting. These exercises  
20    are structured into high-intensity workouts that are performed in a rapid, repetitive manner  
21    with limited recovery time (5). CrossFit – whose slogan is ‘forging elite fitness’ – aims to  
22    prepare individuals for the unknown by mastering the following 10 skills, ‘cardiovascular and  
23    respiratory endurance, stamina, strength, flexibility, power, speed, coordination, agility,  
24    balance, and accuracy’ (6). CrossFit programmes are based on eccentric exercises involving  
25    open chain movements and eccentric lengthening of loaded muscle-tendon units, to generate  
26    increased force whilst using less motor units (7). Performing such exercises improperly can  
27    cause indirect musculoskeletal injuries (7).

28    Wiesenthal et al., (2014) identified that 20% of injuries among CrossFit athletes were  
29    attributable to CrossFit itself, with no significant data suggesting that those who trained more  
30    were more susceptible to injuries. Participants reported injuring their shoulders, knees and  
31    lower back most frequently which was due to gymnastic and power lifting motions (5). These  
32    findings are consistent with injury rates in gymnastics and in power lifters, both reporting

33 similar shoulder pathologies (2). Similarly, Chachula, Cameron and Svoboda's (2016) study  
34 identified 44% of CrossFit athletes (24-54) received a joint-related injury during CrossFit  
35 training. Those without prior injury had an injury prevalence of 22% (4 out of 18) which was  
36 not dependent on age or experience. A large proportion of the literature in the Chachula,  
37 Cameron and Svoboda (2016) study was limited due to different population sizes, coaching  
38 experience and risk of potential recall bias (8).

39 Shoulder injuries related to fatigue. Also unfamiliarity, excessive loads, speed and repetition  
40 and safety issues are particularly prevalent amongst CrossFit athletes. Muscular fatigue is a  
41 common cause of shoulder injury due to the congruity of the glenohumeral joint requiring  
42 correct muscular activation and stabilisation (1). Repetitive overhead movements require a  
43 large range of shoulder movement and stability, and athletes should be aware of potential  
44 risks surrounding this. Athletes should strive to reduce risk by ensuring proper range of  
45 motion and technique. Similar demands of shoulder range and stability are found in  
46 weightlifting (8) and studies reporting injury prevalence in weightlifting also state how  
47 common shoulder injuries are with 76% being MSK related injuries and the most common  
48 sites being the shoulder, knee and spine (9). Therefore, it is important that physiotherapists  
49 are aware of the mechanisms of these injuries to better manage patients who attend  
50 physiotherapy and who partake in CrossFit. Additionally, physiotherapists should consider  
51 individuals histories of injury and injury patterns before recommending returning to CrossFit  
52 to prevent re-injury (10).

53 Research has found that CrossFit training can be particularly addictive (11). The addictive  
54 pursuit of CrossFit training may lead to fatigue and weakness, with overtraining increasing  
55 the risk of harm. This additive nature can cause individuals to over train especially in the  
56 early periods of starting this type of training programming and an increase in high load  
57 plyometric training, many individuals bodies may not be conditioned with the increase in  
58 plyometric exercises as well as the increase in training dosages particularly in the early stages  
59 of starting training (11). Incorrect training and education may also hinder the safe pursuit of  
60 CrossFit programming. Each CrossFit gym coach is required to a minimum Crossfit Level 1  
61 qualification, from a CrossFit approved course and can choose to complete several additional  
62 courses to further their knowledge in specific areas such as CrossFit Kids, CrossFit  
63 Gymnastics, Crossfit Weightlifting (12). Even with these specific course, there is evidence of  
64 a wide variation in quality between CrossFit gyms, based on understanding, knowledge and  
65 experience of coaches (5).

66 Nonetheless, studies have shown there are no differences in fundamental movement patterns  
67 between CrossFit individuals and other traditional programs such as weightlifting (1).  
68 Crossfit leads to aerobic gains, anaerobic gains and similar injury rates as weightlifting,  
69 powerlifting, triathlon training or gymnastics (13). Therefore, an important factor in  
70 improving performance and prevention of injuries is to swiftly recognise and correct defects  
71 in mobility, stability and symmetry.

72

73 Feito et al's (2018) Study provided a multi-year assessment of injuries amongst individuals  
74 who engage in CrossFit training which indicated that it is a safe training modality however,  
75 those within the first year of training and those who participate more than 3 days a week are  
76 at a greater risk of injury due to new intensity, duration and type of exercise (14). Therefore,  
77 physiotherapists are in an ideal position to guide people safely into Crossfit training by  
78 highlighting the potential risks and outcomes and how to train and progress through skills  
79 safely and efficiently. Thereby, physiotherapists would benefit from having an in-depth  
80 understanding of the different components CrossFit offers, this will reduce altered motor  
81 programs throughout the kinetic chain if identified initially (14).

82 Meyer, Morrison, Zuniga's (2017) systematic review acknowledges individuals who engage  
83 in CrossFit perform better and have higher gains in aerobic capacity and anaerobic cover.  
84 CrossFit gives athletes the freedom to train and develop at different skills rather than  
85 individuals having direct supervision which is where the knowledge and expertise from  
86 physiotherapists could provide safe and effective recommendations to prevent injury (5).

87 Every form of physical activity holds potential risk of injury, and rates of CrossFit training  
88 injuries are consistent with rates in other fitness routines (2). Individuals want to get good  
89 results safely without developing an injury, likewise, physiotherapists want to allow people to  
90 engage in fitness activities but as well as understanding the health implications of those  
91 activities and the safety of activities to continue to improve their strength, stamina, endurance  
92 and mobility but within a safe environment (14).

93 Physiotherapists should have an awareness of CrossFit training, in order to accurately treat  
94 the various patterns of injuries incurred by athletes. Comparable injuries can be found in  
95 other recreational athletes such as runners, Olympic lifters, gymnasts and power lifters (5).  
96 Despite the variety and intense nature of CrossFit, injury rates do not vary from other similar  
97 intense activities and there is no correlation between demographic or training data with the

98 presence of injury. With safe incremental increases in intensity, accurate coaching, slow  
99 progression and good technique, CrossFit can be a beneficial form of exercise for healthy  
100 adults looking for a varied routine. There is no consistent evidence to suggest that CrossFit is  
101 injuring athletes more than other comparable exercise routines.

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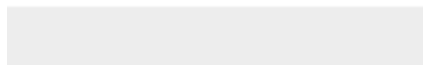
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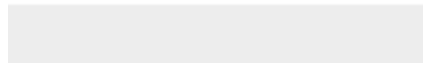
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