Using Functional Movement Screen to Predict Injury in CrossFit® Athletes

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Introduction

CrossFit® training has become an increasingly popular trend in the fitness world, with the potential to be an effective form of training for athletes involved in a variety of sports. One criticism of CrossFit® training, however, has been that the relatively intense CrossFit® workouts put athletes at a significant risk of injury.

The Functional Movement Screen (FMS) is a system which challenges and assesses an individual's fundamental movement patterns to measure the stability and mobility of the entire body. Any area of the body that is not performing under optimal stability or mobility is at risk for injury. The goal of FMS to pinpoint any weaknesses within a dynamic and functional setting, which may decrease the risk for future injury. Many movement patterns required in CrossFit® utilize components of the individual FMS test positions; therefore, the researchers expect the FMS to be a valid tool for identifying risk of injury in CrossFit athletes.

Objective

To determine if there is a correlation between the FMS and increased risk for injury during CrossFit® training.

Methods

A cohort study was conducted on CrossFit® athletes from a CrossFit-affiliated gym located in Southwest Florida. The athletes were assessed using the FMS screen, then observed for ten weeks to track for injuries.

The FMS was administered by the researchers with FMS Level 1 certifications, and an overall FMS score was recorded for each athlete. After the FMS was administered, participants were observed for 10 weeks in order to collect information regarding frequency of workouts and incidence of injury.

Athletes were educated on what is considered an "injury", and for this study, an injury was defined as a physical condition that occurred while performing a CrossFit workout at the participating gym that resulted in the athlete missing or modifying (specifically because of the physical condition sustained) a workout for two or more consecutive days. When logging injuries, athletes were expected to describe the injury providing information regarding mechanism of injury and area affected.

Results

Forty-one CrossFit athletes participated in this study (N=41). Of the sample, 51% were male (N=21) and 49% were female (N=20). The age of participants ranged from 20 to 49 years with an average age of 28.93 ± 6.28. The average height of the participants was 68.68 inches ± 4.03 inches. The average weight of the participants was 181.00 pounds ± 33.28 pounds. The Body Mass Index (BMI) was calculated for each participant, with an average of 26.91 ± 4.14. The average FMS total score for the sample was 15.15 ± 2.28.

Table 1: Descriptive Statistics for the Sample.

	N	Minimum	Maximum	Mean	Std Deviation
Age (years)	41	20.00	49.00	28.93	6.28
Height (inches)	41	59.00	76.00	68.68	4.03
Weight (pounds	41	115.00	260.00	181.00	33.26
Body Mass Index (BMI)	41	21.30	38.40	26.91	4.14
FMS Total Score	41	11.00	19.00	15.15	2.28

A logistic regression was conducted to identify if there is a significant relationship between FMS score and incidence of injury. Analyses were run on the relationship between incidence of injury and FMS total score as well as incidence of injury at a cut-off FMS score of 14.

The logistic regression conducted on FMS total score and incidence of injury resulted in a significance level of p = 0.58, indicating that there is not a significant relationship between these variables within this sample. The logistic regression conducted on incidence of injury for those under the cut-off FMS score of 14 resulted in a significance of p = 0.33, also indicating that there is not a significant relationship between these variables within this sample.

A logistic regression was also conducted for each of the variables collected through the demographic survey to identify if there is a significant relationship to incidence of injury.

Table 2: FMS Total Score and Incidence of Injury.

	B	S.E.	Wald	Df	Sig	Exp(B)
FMS Total Score	-.10	.19	.31	1	.58	.90
Constant	-.03	2.78	.00	1	.99	.97

Table 3: FMS Cut-off Score and Incidence of Injury.

	B	S.E.	Wald	Df	Sig	Exp(B)
Cut Off Score (14)	.96	.97	.97	1	.33	2.60
Constant	-1.47	.64	5.24	1	.02	.23

Table 4: Additional Variables and Incidence of Injury.

Variable	Level of Significance
Number of asymmetries	0.86
Gender	0.63
Age	0.92
BMI	0.66
Duration of CrossFit experience	0.50
Duration of membership at participating CrossFit affiliate	0.83
Location where CrossFit fundamentals were learned	0.21
Frequency of workouts per week	0.23
Frequency of stretching per week	0.27
History of injury interfering with workouts	0.54
History of injury interfering with activities of daily living	0.84
History of involvement with organized sports	0.61
Level of commitment to CrossFit	0.47
Involvement with CrossFit competitions	0.47

All analyses run for the above variables all resulted in a significance level greater than p = 0.05. Based on these results, it was determined that there was no statistically significant relationship between FMS score (total score and cut-off score) and incidence of injury in CrossFit® athletes in this sample. In addition, there is also no significant relationship between any of the additional variables examined and incidence of injury.

Discussion

Based on similar studies, a lower score on the FMS was expected to correlate with a higher rate of injury. In this case, that relationship was not identified. However, the researchers have identified several limitations in the methods that have been used in this study. This study consisted of 41 participants, which was too small of a sample to complete a power analysis. The sample population was taken from volunteers at a single gym. The researchers did not screen enough participants to definitively determine any relationship between these variables in this population. The researchers chose to use a single gym with the intent of keeping the programming, activity and coaching consistent. However, in order to increase the sample size, and represent the variability of the entire population, future studies should include multiple affiliates in their sample population.
In addition, the data was primarily self-reported, including all survey answers and, most importantly, record of injury. The athletes were given the operational definition of "injury" defined above and were instructed to report any event that met those criteria. However, injuries may have been underreported, as many athletes may underestimate the severity of the event, may choose to "push through" an injury, or may not want to divulge the injury for various reasons. Also, with the window of tracking injuries being relatively short, and the sample size being small, the researchers may not have collected enough data to show a relationship.

Conclusions

Further research should be conducted to determine the validity of using the FMS to determine CrossFit® athletes that are at increased risk of injury. Due to limitations of this study, the researchers were not able to determine a statistically significant relationship between incidence of injury of FMS scores in CrossFit® athletes.

References See Handout with Reference List