

INJURIES AMONG FIRST TIME PARTICIPANTS IN A COSTA RICAN HIGH-INTENSITY FUNCTIONAL TRAINING FACILITY- A PILOT STUDY

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Escalante G and Gentry C. Research examining injuries in high-intensity functional training (HIFT) programs is scarce, especially when prospectively exploring the injuries of those new to HIFT. The purpose of this prospective pilot study was to explore the injuries of first time HIFT program participants in a HIFT facility in Costa Rica. Four males (30.23 ± 3.6 yrs) and 8 females (29.3 ± 8.7 yrs) filled out six weekly prospective injury surveys via qualtrics.com. All participants were new to HIFT as defined by having no previous HIFT experience and having become a member of the same HIFT training facility within the last 2 months. Injuries were defined as anything that hurt the participant more than muscle soreness within the last seven days. The survey also asked about the injury location as well as the severity, time lost from training/work, exercise performed when injured, instructor supervision during the injury, and history of a related injury. Furthermore, the survey included items related to the amount of hours and number of days spent doing HIFT over the last week. Participants reported doing HIFT workouts at an average 3.8 ± 0.7 days per week for a total average of 3.3 ± 0.3 hours per week. A total of two participants reported three injuries, yielding an injury prevalence of 16.7% and an estimated injury incidence of 11.6 per 1000 hours of HIFT. The most common injury reported was to the shoulder (66.7%) and the knee (33.3%). Additional prospective studies are warranted to determine the effects of injuries that occur among HIFT beginners.

Key Words: High-intensity functional training (HIFT), exercise, injury, injury rate

INTRODUCTION

Fitness is a growing industry in the United States and worldwide. According the most recent annual report by the International Health, Racquet, & Sportsclub Association (2019), worldwide health club industry revenue totaled \$94 billion USD in 2018 as 210,000 clubs served over 183 million members (IHRSA, 2019). High intensity functional training (HIFT) programs are a type of fitness service that are sometimes offered in health clubs or as specialty stand-alone fitness businesses. HIFT programs have been defined as “a training style [or program] that incorporates functional, multimodal movements, performed at a relatively high intensity, and designed to improve parameters of general physical fitness and

performance” (Feito, Heinrich, Butcher & Carlos Poston, 2018, p.13). CrossFit® is a specific type of HIFT that boasts over 15,000 affiliates nationwide (CrossFit, 2019). These affiliate gyms, also called boxes, have commercial fitness practitioners with at least a Level 1 CrossFit Certification that utilize CrossFit® resources (CrossFit, 2019). In Costa Rica, there are 26 confirmed CrossFit® affiliates (CrossFit, 2019). Although this number does not compare to the explosion of affiliates in larger countries such as the United States, it does indicate that there is a strong interest in facilities that provide HIFT programs such as CrossFit®.

Despite the large number of HIFT programs available, the literature examining injury prevalence

and type in such programs is growing but still deficient. This is especially true when prospectively exploring the injuries to those new to HIFT programs. A limited number of studies provide some evidence as to what should be expected for those entering HIFT programs (Aune & Powers, 2017; Feito, Burrows, & Tabb, 2018; Mehrab, de Vos, Kraan, & Mathijssen, 2017; Sprey, Ferreira, de Lima, Duarte, Jorge Jr., & Santili, 2016; Weisenthal, Beck, Maloney, DeHaven, & Giordano, 2014), but the results vary. For instance, Weisenthal et al. (2014) found no significant difference between injury rates among experienced and inexperienced HIFT participants. Conversely, Feito, Burrows, & Tabb (2018) found that the highest rate of injuries were among those in their first six months of HIFT participation.

HIFT research conducted with Costa Rican participants is even more limited. However, a retrospective study did explore the injury rates and patterns among Costa Rican HIFT participants (Escalante, Gentry, Kern, & Waryasz, 2017). It stated that of the 88 male and 71 female HIFT participants that completed a participation and injury survey, 74 reported at least one injury within the last twelve months (Escalante et al., 2017). In total, 127 injuries were reported with the most common being the shoulder (33.1%), low back (18.1%), knees (12.5%), wrists (10.2%), elbows (5.5%), and one case of rhabdomyolysis (0.8%) (Escalante et al., 2017). With the continued global expansion of HIFT programs, it is necessary to examine those just beginning to use this exercise modality. As a result of the limited number of studies focusing on these parameters, the purpose of this pilot prospective study was to explore the injury rates and types of first time participants in a HIFT facility in Costa Rica.

METHODS

Four males (30.23 ± 3.6 yrs, 1.75 ± 0.05 m, 77.55 ± 11.10 kg) and eight females (29.3 ± 8.7 yrs, 1.61 ± 0.06 m, 61.75 ± 9.35 kg) signed an informed consent approved by the university Institutional Review Board, filled out six continuous weekly prospective injury surveys to completion, were measured for height/weight, and were included in this prospective pilot study. The participant's height, weight, and age was collected in person by the principal investigator when the informed consent was

signed. The injury survey data was collected utilizing the secure website qualtrics.com by sending each participant that volunteered for the study a link to the survey for six continuous weeks via email; the link was sent on a Sunday and the participants had one week to submit their answers. All participants were new to HIFT as defined by having no previous HIFT experience and having become a member of the same HIFT training facility in Costa Rica within the last 2 months.

Injuries were defined loosely as anything that hurt the participant more than muscle soreness within the last seven days. The severity of the injury was then classified according to the following: a) injury caused total removal from HIFT training and other outside physical activity for more than 1 day, b) injury caused modification of normal training activities in duration, intensity, or mode for more than 1 day, c) injury resulted in consultation with a healthcare professional to diagnose or treat the injury, or d) none of the above. The survey also asked about the injury location as well as the diagnosis (if applicable), time lost from training, time lost from work, exercise performed when injured, instructor supervision during the injury, and history of a related injury. Furthermore, the survey included items related to the amount of hours and number of days spent doing HIFT over the last seven days. Descriptive statistics and frequencies were generated to describe some of the data. Furthermore, the relationship between the occurrence of experiencing an injury during HIFT over the six week period and length of time (hours per week and days per week) doing HIFT during the previous week, gender, and coach supervision were analyzed using Chi Square. All statistics were analyzed using SPSS version 24 (SPSS Inc., Chicago, IL). Injury prevalence, defined as the proportion of injuries reported over the six week period, and injury incidence as the mean number of injuries incurred over the six week period per 1000 hours of HIFT participation, were also calculated.

RESULTS

Participants reported doing HIFT workouts at an average 3.8 ± 0.7 days per week for a total average of 3.3 ± 0.3 hours per week over the six week period. A total of two participants reported three injuries over the six week period, yielding an

injury prevalence of 16.7% and an estimated injury incidence of 11.6 per 1000 hours of HIFT. The most common injury reported was to the shoulder (66.7%) followed by the knee (33.3%). Only one of the injuries was reported as occurring while under the direct supervision of a HIFT coach, but all injuries were reported to be accidents and not from a lack of instruction. No cases of rhabdomyolysis were

reported over the 6 week period. None of the participants reported having to miss work or to see a healthcare professional due to their injury. Furthermore, one of the three participants had a related injury before initiating HIFT training. Table 1 identifies the injuries reported and specific answers to the questions about the injuries.

Table 1: Reported Injuries

	Right Shoulder	Left Shoulder	Right Knee
Number of Injuries Reported	1	1	1
Average Severity (1/10 = not serious 10/10 = extremely serious)	2	1	2
Average Days Lost from CrossFit® and Other Exercise	1	1	1
Average Days Lost from Work	0	0	0
Received Medical Treatment	No	No	No
Medical Diagnosis	NA	NA	NA
Required Surgery	No	No	No
Occurred While Supervised by Coach	Yes	No	No
Previous Injury to Body Part	Yes	No	No
Exercise Performed When Injured	Snatch	Snatch	Box Jump

The chi square analysis revealed there were no relationships between days per week of HIFT vs injury ($p = 0.89$), hours per week of HIFT vs injury ($p = 0.99$), gender vs injury ($p = 0.76$), or coach supervision vs injury ($p = 0.41$). It is important to note, however, that all participants from the HIFT facility where this study was conducted were required to go through a formal small group (1-3 people) HIFT introduction period (2 classes) with direct supervision from an experienced HIFT coach before being able to participate in the larger HIFT classes.

DISCUSSION

When discussing injuries, it is necessary to define what constitutes an injury. However, it is important to recognize that not all studies define injuries or injury severity the same. A universal definition of both would be helpful, but not possible. However, similarities in results will point to future considerations for HIFT programs, and, as a result, comparisons are still valuable and necessary.

Feito, Burrows, & Tabb (2018) completed a four year analysis of HIFT injuries through survey

distribution over the internet (2018). They discovered that of the 3049 completed surveys, the proportion of injuries were lowest among participants that had been involved in HIFT for less than one year (18.0%) compared to those with 1-3 years of experience (38.8%) and those with more than three years of experience (43.1%) (Feito, Burrows, & Tabb, 2018). Conversely, the highest rate of injuries per 1000 hours were found within those that had been participating in HIFT for less than six months (minimum, 1.15/1000 work hours; maximum, 3.9/1000 work hours). In addition, it was determined that those who participated in the least number of workouts per week had a higher risk of injury (Feito, Burrows, & Tabb, 2018). This differs from our study which found no relationship between days per week of HIFT vs. injury; however, it must be noted that our pilot study had a significantly smaller sample size.

Mehrab, de Vos, Kraan, & Mathijssen (2017) surveyed 449 Dutch HIFT athletes and found an injury incidence rate of 56.1%. It was also stated that injury risk among participants who were new to HIFT (less than six months) was significantly higher (Mehrab et

al., 2017). In contrast, Sprey, Ferreira, de Lima, Duarte, Jorge Jr., & Santili (2016) surveyed 622 HIFT participants in Brazil and found that those regularly involved in HIFT beyond six months (35.1%) displayed significantly higher injury rates ($p = .004$) when compared to those with less than six months (22.9%). Also in contrast, Weisenthal, Beck, Maloney, DeHaven, & Giordano (2014) surveyed 386 HIFT participants from the United States and found no significant difference in injury rate based on length of participation in HIFT.

Beyond injury rates, studies have explored the type of injuries that occur among beginners in HIFT programs. Aune & Powers (2017) surveyed 247 participants in Iron Fitness gyms that provide extreme conditioning (EC) programs (a form of HIFT) to compare the number of shoulder and back injuries in EC programs to that of weightlifting. They hypothesized that injury rates would be greater in EC programs, but injury rates were similar. However, the injury rate of those participating in EC programs for less than six months was found to be 2.5 times greater than those who had been participating for more than six months (Aune & Powers, 2017).

Within this study, the two types of injuries that occurred were injuries to the shoulder and the knee. These findings match two of the most common injury locations cited in several other studies (Escalante, Gentry, Kern, & Waryasz, 2017; Minghelli & Vicente, 2019; Summit, Cotton, Kays, & Slaven, 2016). This would seem to suggest that the injuries that occurred within this study are not abnormal to those new to HIFT programs. For example, a Costa Rican HIFT study found that the two most common injuries among the participants were shoulder (33.1%), low back (18.1%), and knee (12.5%) injuries (Escalante et al., 2017). In addition, Minghelli and Vicente surveyed 270 HIFT practitioners and found that the most common injury locations were the shoulder (35.9%), the lumbar spine (17.9%), and the knee (11.5%) (2019). Finally, Summit, Cotton, Kays, & Slaven (2016) surveyed 189 individuals who trained in HIFT gyms and found that 23.5% had experienced a shoulder injury during HIFT training within the previous six months.

This study included multiple limitations in large part due to the PI of this investigation being in

Costa Rica for a short period of time (12 days). Since it was not feasible to recruit a large number of first time HIFT participants from more than one HIFT location for this pilot study, the small sample size from this investigation may have resulted in skewed injury rates and types despite some of the common trends reported in other related investigations as previously discussed. Furthermore, since all of the surveys were filled out on a weekly basis, the length of the prospective study was limited to six weeks to prevent participant attrition due to the time required to complete the survey every week. In addition, survey responses were self-reported which is affected by the participants' abilities to accurately recollect and diagnose injuries; however, it must be noted that most prospective and retrospective injury data reported in HIFT participants is self-reported and is a common limitation. It is recommended that future studies have the PI or research assistants near the HIFT facilities where the research is being conducted so that the study may include more participants from various locations and ideally extend beyond six weeks to provide longer prospective results.

CONCLUSION

Previous studies suggest that the highest risk and rate of injuries occurs among those who are new to HIFT programs (Aune & Powers, 2017; Feito, Burrows, & Tabb, 2018; Mehrab, de Vos, Kraan, & Mathijssen, 2017), but this is not without disagreement (Sprey, Ferreira, de Lima, Duarte, Jorge Jr., & Santili, 2016). As a result, more studies exploring the rate and type of injuries occurring among beginners in HIFT programs are necessary. Interventions within HIFT programs focusing on new participants would seem valuable.

Additional prospective studies are warranted to determine the long-term effects of injuries that occur among HIFT beginners. Multi-year studies would provide a clearer picture of the impact of injuries and the impact of injuries on long-term HIFT program participation. In addition, future studies are necessary to explore injury prevalence among new HIFT program participants as well as to help determine if injury prevalence differs between HIFT facilities.

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