Athletic Training

Aerobic Exercise Versus Rest for Treatment of Symptoms in Acutely Concussed Adolescent Athletes: A Critically Appraised Topic

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INTRODUCTION

Concussions have been a prevalent in sports for many decades and more so in recent years due to the scrutiny and shock of the injury being misdiagnosed and improperly cared for in the recent decade. Since this increase in notoriety, concussion management has become a widely studied and debated topic. To date, the widely accepted and standard of care for this closed head injury is relative physical and mental rest until symptom free followed by a progressive exercise regimen designed to slow integrate the patient back into activity. Among these still developing management strategies is the use of subsymptom threshold graded aerobic exercise. What remains unclear is whether this type of exercise for the management of acute sport related concussions is effective in decreasing recovery time. Determining the effectiveness of this treatment will aid clinicians in providing the most effective and safe treatment for these tricky injuries.

OBJECTIVES

Does subsymptomatic threshold graded aerobic exercise decrease signs and symptoms when compared to rest in adolescent athletes with acute concussions?

METHODS

Data Sources: An electronic database search was conducted using Medline, PubMed, SportDiscus, Clinical Key, and Google Scholar. Hand searching was completed through existing reference lists. Search terms included adolescent athletes with acute concussions, aerobic exercise, rest, and decreasing severity of signs and symptoms. Study Selection: Studies were included if they included aerobic exercise as an intervention for an acute concussion, included adolescent patients (ages 10-19), included patients with and acute sports related concussion (0-10 days post-injury), were published after 2009, and measured symptom severity. Studies were excluded if they required purchase, were not in English, or were narrative articles. Data Extraction: Two quasi-experimental studies and two randomized controlled trials were identified and appraised according the 2011 Level of Evidence Scale and Strength of Recommendation from the CEBM. Data Synthesis: Three studies utilized subsymptomatic threshold graded aerobic exercise on either a treadmill or a cycle ergometer. One study compared strict rest with no activity for the initial 5 days post-injury versus normal activity. All studies utilized an adolescent population (ages 10-19). Two studies looked solely at males due to a lack of eligible female participants while the other two studies looked at both sexes. Results of all four studies found that the graded subsymtomatic aerobic exercise was effective in speeding the recovery of the participants when compared to rest. Consequently, subsymptom graded aerobic exercise may be beneficial for treating adolescents with acute sports related concussions.

RESULTS

Study Authors and Title	Thomas DG et.al[9] Benefits of strict rest after acute concussion: a randomized controlled trial	Leddy JJ et.al[4] A preliminary study of the effect of early aerobic exercise treatment for sport-related concussion in males	Willer BS et.al[10] Comparison of rest to aerobic exercise and placebo-like treatment for treatment of acute sport-related concussion in male and female adolescents	Micay et.al[7] Feasibility of a postacute structures aerobic exercise intervention following sport concussion in symptomatic adolescents: a randomized controlled study
Participants	99 participants aged 11-22 years presenting to ED within 24 hours of a concussion were randomized into two groups. Strict rest mean age was 14.7 years. Exercise group mean age was 13.1 years. 33% in each group were females.	Male participants ages 13-18 years who had sustained a sport related concussion (SRC) within the previous 1-9 days. There were 30 participants in the rest group (RG) and 24 participants in the exercise group (EG).	Participants included male and female adolescents aged 13-18 years who sustained an SRC within 10 days of the initial visit. 151 total participants were included. EG and PG consisted of 24 females. RG consisted of 12 females. Mean age across all groups was 15.4 ⍰ 1.57 years.	Adolescents ages 14-18 years with a diagnosed sports related concussion presenting with symptoms day 5 post-injury. The exercise group included 8 male participants with a mean age of 15.8⍰1.2. The usual care group consisted of 7 males with a mean age of 15.6 ⍰1.0.
Purpose	The purpose of the current study was to determine if strict rest improved recovery and outcome after discharge from the pediatric ED within a 10-day period.	The purpose of the study was to determine the effects of early supervised aerobic exercise versus relative rest on the rate of recovery time in male adolescents after an acute SRC.	The purpose of this study was to add a third treatment group to a previously conducted RTC and compare recovery times in adolescents with acute SRC. The secondary purpose was to compare recovery in female versus male patients.	The study aimed to determine the practicality of implementing a standardized aerobic exercise intervention in recovery from a SRC when compares with usual care interventions.
Intervention investigated	The study compared strict rest, which meant rest at home (no school, work, or physical activity) for 5 days followed by a stepwise return progression. They compared this with a usual care (control) group. This group was instructed to rest for 1-2 days then return to school and then begin the stepwise return to activity only when asymptomatic.	The study utilized a 20-minute subthreshold aerobic exercise via stationary bike or treadmill based on 80% HR achieved at symptom exacerbation during BCTT. This was performed daily followed by symptom reporting and activity log. The RG was instructed not to participate in physical activity and to also complete a symptom score and activity log daily. Both groups were instructed to continue this prescription for 14 days the return for follow-up.	The study utilized a 20-minute subthreshold aerobic exercise via stationary bike or treadmill based on 80% HR achieved at symptom exacerbation during BCTT. This was performed daily followed by symptom reporting and activity log. A Placebo Group (PG) were prescribes a progressive stretching program to perform for 20 minutes a day, every day, followed by a symptom evaluation and activity log. The RG was instructed not to participate in physical activity and to also complete a symptom score and activity log daily. Both groups were instructed to continue this prescription for 14 days the return for follow-up.	Outcome measures of the current study included; intervention feasibility (i.e. symptom scoring pre/post-exercise) and recovery (i.e. symptom status after weeks 1,2,3, and 4 along with clearance dates. AE group completed 8 stepwise duration and intensity aerobic exercise on a cycle ergometer accompanied by symptom reporting prior to and after completion of exercise. The UC group was prescribed rest followed by physician advised progressive RTP protocol also accompanied by symptom reporting. All participants were re-evaluated by physician at weeks 1,2,3, and 4 at which time recovery was assessed.
Outcome measures	The main outcome measures of the study were compliance, evaluated through a three-day activity journal and efficacy of treatment through symptom scoring, neurocognitive and balance assessments (ImPACT and BESS).	The main outcome measure of the current study was days to recovery. Recovery was defined as return to baseline symptoms, symptom severity of <7 for 3 consecutive days.	The main outcome measures of this study were, days from injury to recovery and normal recovery (<30days) versus delayed recovery (>30 days). Recovery was defined as first day asymptomatic.	AE intervention was determined to be practical if symptoms were not exacerbated during or immediately after exercise and participants were able to complete the entire AE intervention. Efficacy of the intervention was determined by symptom status and time to medical clearance.
Main findings	Both groups reported decreased activity. The UC group reported more mental activity on days 2-5 than the strict rest group (P=.03). More than half reported symptom resolution during the follow-up period (P=.82). It took the SR group longer to recover, and they reported higher symptom scores and more symptoms over the course of the 10-day follow-up (P<.03).	IT was found that the RG recovery time was decreased by 8.29 ⍰ 3.85 days versus 23.93⍰41.73 days (P=.048). The EG had less participants with symptoms (P=.028). Finally, none of the EG had delayed recovery compared with 4 participants in the RG.	Median recovery times were; 13 days for the EG, 17 days for the PG, and 16 das for the RG (P=.020). Delayed recovery occurred in 2 EG participants, 7 PG participants, and 6 RG participants (P=.190). It was also found that females in the RG experienced increased symptoms vs. other groups (P=.013).	The study found that AE intervention did not worsen symptoms, however this was only significant in session 1 (P=.02). There was no significant difference between groups in mean time to recovery (P=.87). Recovery was not significantly different between the two groups (P=.08). There was however, a significant difference between time to medical clearance and acute symptom severity (P=.04). AEG experienced significant within-group differences in symptom resolution between week 1 and 2 (P=.01), 2 and 3 (P=.04), 1 and 3 (P<.01), and 1 and 4 (P<.01). The UCG saw significant resolution of symptoms in weeks 1 and 4 (P<.05) and 3 and 4 (P=.02).
Conclusion	Recommending strict rest for treatment of an acute concussion did not improve symptoms or objective outcomes in concussed adolescents.	This initial study's findings suggest that early subthreshold aerobic exercise to adolescent males with acute concussions speeds recovery and potentially prevents delayed recovery.	The current study found that a placebo-like stretching program and relative rest produced similar recovery times, both were delayed compared to sub-symptom aerobic exercise after and acute SRC.	The study concluded that graded AE intervention in the low-moderate intensity range is safe and practical to administer to adolescents after 6-days post-injury.

CONCLUSION

Evidence suggests that subsymptom graded aerobic exercise was effective in reducing the number and severity of concussion symptoms in adolescent athletes with acute concussions when compared to rest. The reduction of symptoms leads to a quicker recovery time in these patients; therefore, this treatment may be effective for treating adolescent patients with acute sports related concussions.
Strength of Recommendation: B

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