

Climbing Injuries in Children and Adolescents

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Abstract

With the inclusion into the Olympic program the number of young climbers as well as their trainings intensity are rising. While epidemiological data exist for injuries in adults, there are less data for children and adolescent climbers. These data show it as a comparably safe activity, especially in indoor and sport climbing. Most injuries are related to either a fall or are overstrain injuries. Most common acute injury is an ankle sprain, while the most frequent overstrain injury is a growth plate fracture in the fingers. These injuries are currently intensively studied, as well as their prevention and matters of early detection.

Key Words

Rock climbing, epiphyseal stress fractures, finger injuries, climbing injuries, growth spurt

Lésions dues à l'escalade chez les enfants et les adolescents

Concept

Faire partie d'un programme olympique signifie que le nombre de jeunes grimpeurs et de leurs heures d'entraînement vont augmenter. Des données épidémiologiques existent déjà pour les lésions chez les adultes mais il en existe beaucoup moins concernant les adolescents et les enfants. Ces données montrent qu'il s'agit d'une activité relativement sûre, surtout en salle ou en escalade sportive. La plupart des lésions sont dues à des chutes ou à un surmenage pendant un entraînement. La lésion la plus souvent évoquée est une entorse de la cheville, alors que la lésion due à un surmenage est une fracture de la plaque de croissance dans les doigts. On se penche beaucoup sur ces lésions, tout autant dans le but de les prévenir que de les détecter à temps.

Mots-clés: varappe, fracture épiphysiale due au stress, lésions des doigts, lésions dues à l'escalade, poussée de croissance.

Introduction

Rock climbing, especially indoor and competition climbing is a fast-growing sport and was just recently added to the Olympic program of the 2020 Games in Tokyo (V. Schöffl, Lutter, Wollings, & Schöffl, 2018). This will further increase the sports professionalism, and influence training hours, schedules, regimens as well as injury rates and profiles (Lutter, El-Sheikh, Schoffl, & Schoffl, 2017; V. Schöffl, Burtscher, & Coscia, 2013). Also, the mean age of the athletes, especially in the highest levels has decreased over the last decades as a consequence of a better strength-weight ratio helpful in this sport (Morrison & Schöffl, 2007; V. Schöffl et al., 2018). Nevertheless, few studies do specifically focus on adolescents and children, most of them on specific orthopedic conditions in this population, especially epiphyseal growth plate fractures (I. Schöffl & Schöffl, 2017; V. Schöffl et al., 2018).

Methods

An initial PubMed query was performed using the key words "rock climbing", "sport climbing", "alpine injuries", "climbing injuries" and "adolescent climbing". More than 250 extracted papers were analyzed which gave information on injury, mortality/fatality, prevention and risk factors. Cross-references were also scanned according to the above given criteria. The data sources of the UIAA and IFSC Medical commissions were

analyzed and the known studies of prior review article re-evaluated with regards to data on adolescents (V. Schöffl et al., 2018; V. Schöffl, Morrison, Schöffl, & Küpper, 2012; V. Schöffl, Morrison, Schwarz, Schöffl, & Küpper, 2010; Woollings, McKay, & Emery, 2015). Children and adolescents were defined as being under 18 years of age.

Results

Injury Incidence

Only two studies provide incidence rates for young climbers (V. Schöffl et al., 2018; Woollings, McKay, Kang, Meeuwisse, & Emery, 2015). Woollings et al. examined injuries in 116 elite and recreational youth climbers and found the overall incidence rate of injury to be as high as 4.44 injuries per 1000 participation hours (Woollings, McKay, Kang, et al., 2015). This rate is similar to some but mostly higher than in other studies on adult climbers (Neuhof, Hennig, I., & V., 2011; V. Schöffl et al., 2012; V. Schöffl & Winkelmann, 1999; V. R. Schöffl, Hoffmann, & Kupper, 2013). In an analysis of 515,337 indoor climbing visits, Schöffl et al. (V. R. Schöffl et al., 2013) found six out of 22 injuries requiring immediate medical attention occurred in those under 18 years of age in their survey. Four of these injuries occurred in boys and two in girls with an average age of 13.7 years. As the overall injury rate was 0.02/1000 participation hours, it is quite surprising that the young climbers making up only a minor proportion of the population of climbing wall visitors investigated in this study accounted for 6/22 (27%) of all injuries (V. Schöffl et al., 2018).

Anatomical location

Similar to adult injuries most acute injuries are happening because of a fall and involve the lower extremity while most overstrain injuries are on the upper extremity. This distribution of the anatomical location is also depending on the studies setup. While some studies present the data of mostly semi-acute patients (V. R. Schöffl et al., 2013), which are thus underlying a selectional bias, others look in a cross-sectional way at all NEISS hospitals and use these data to calculate the overall numbers (Nelson & McKenzie, 2009). Woollings et al. (Woollings, McKay, Kang, et al., 2015) found a high percentage of finger injuries (21% of 142 injuries), as well as the shoulder (15%), knee (9%), ankle (9%), and wrist (8%), which is consistent to the data from Schöffl et al. (V. R. Schöffl et al., 2013) and Schlegel et al. (Schlegel, Buechler, & Kriemler, 2012). Epiphyseal fractures of the fingers are most common on the middle finger (I. Schöffl & Schöffl, 2017) and are on a raising number (V. Schöffl et al., 2018; V. R. Schöffl et al., 2013).

Acute versus chronic injuries

Woollings et al. (Woollings, McKay, & Emery, 2015; Woollings, McKay, Kang, et al., 2015) found that of self-reported injuries incurred during both bouldering and sport climbing, repetitive overuse had the highest incidence rate of injury at 1.13 injuries per 1000 athlete-exposure hours (95% CI 0.79 to 1.56), while falls accounted for 0.88 injuries per 1000 hours (95% CI 0.58 to 1.27), and strenuous moves caused 0.56 injuries per 1000 hours (95% CI 0.33 to 0.89). Schöffl et al. (V. R. Schöffl et al., 2013) found overstrain injuries in 69.2% and acute injuries in 30.8%. Epiphyseal fractures in the finger of climbers are believed to be a consequence of repetitive trauma in contrast to an acute event leading to this injury (I. Schöffl & Schöffl, 2017). This

assumption would place them into the chronic injury group (V. Schöffl et al., 2018). However, most often the athletes describe a final eliciting trauma as the cause of the injury (I. Schöffl & Schöffl, 2017; V. Schöffl et al., 2018).

Injury severity and type

Using the UIAA score, Schöffl et al. (V. Schöffl, Popp, Küpper, & Schöffl, 2015) found all injuries in a recent study to be grade two injuries. This is a similar finding to Woollings et al. (Woollings, McKay, Kang, et al., 2015) who found all 142 reported injuries to be UIAA grades one and two, and to Schlegel et al. (Schlegel et al., 2012) who report about no serious injuries in a group of 29 youth competition climbers as well as to Schöffl et al. (V. R. Schöffl et al., 2013). The most frequent injuries reported in literature are sprains, strains and fractures (V. Schöffl et al., 2015). Almost all of the chronic injuries focus on the upper extremity, while acute injuries are distributed over the upper and the lower extremity. However, where adults sustain mostly pulley injuries and tendonitis, epiphyseal growth plate fractures are the most common injury type in the age group under 18 years (V. Schöffl et al., 2018). Woollings et al. (Woollings, McKay, Kang, et al., 2015) found ligament sprains (27% of injuries, incidence rate of 0.72 injuries/1000 hours) and muscle or tendon strains (26% of injuries, incidence rate of 0.69 injuries/1000 hours) to be the most commonly observed self-reported injuries in youth climbers aged 11-19 years. Tendonitis was also common (11%, 0.34 injuries/1000 hours).

Risk factors

Maturation, biological age and psychosocial characteristics are important injury predictors in injury predisposition (Morrison & Schöffl, 2007). Unfortunately, little scientific research is performed on behalf of these topics in the sport of climbing (V. Schöffl et al., 2018; Woollings, McKay, & Emery, 2015). It is known that the risk of growth plate fatigue fractures correlates with puberty, which most often will occur at an age of 13-15 years (I. Schöffl & Schöffl, 2017). As puberty onset differs, this age span can also differ (I. Schöffl & Schöffl, 2017; V. Schöffl et al., 2018). Also in young high-level climbers, the suspicion of anorexia athletica and the so-called female athlete triad is not rare and must be considered (Morrison & Schöffl, 2007; V. Schöffl et al., 2018). Woollings et al. (Woollings, McKay, & Emery, 2015) performed exploratory analyses examining several potential risk factors for injury, and found that adolescents aged 15-19 years were at a significantly higher risk of injury than younger climbers aged 11-14 years. They also found no significant correlation between the injury risk and level of climbing (elite versus recreational), height, weight and highest difficulty of climbing achieved (Woollings, McKay, & Emery, 2015).

Conclusion

While the injury rate and severity in young climbers is rather small it is to be expected to be raising with the evolution of the sport into an Olympic discipline (Lutter et al., 2017; V. Schöffl & Lutter, 2017). Also the risk of fatal injuries is ever present and not only based on the fact that rock climbing itself can result in a fatality but also on the limited ability of risk calculation in children and adolescents (V. Schöffl et al., 2018). Little research has been performed to test the effectiveness of injury prevention measures yet and must be a part of further

studies (V. Schöffl et al., 2018). This will need to include longitudinal studies in order to establish clear risk factors for injury and impacts from the sport as well as screening methods for growth plate injuries.

Table: Injuries of junior climbers (<18y) (26 of 911 climbing injuries) (extracted from Schöffl et al.(V. Schöffl et al., 2015), first presented in (V. Schöffl et al., 2018))

Injury type	Frequency
Epiphyseal growth plate fracture	13 (50%)
Capsulitis (finger)	3 (11.5%)
Shoulder dislocation	1 (3.8%)
Discus injury (carpal)	1 (3.8%)
Wrist sprain	1 (3.8%)
Meniscus tear	1 (3.8%)
Ankle sprain	1 (3.8%)
AC-joint separation	1 (3.8%)
Elbow dislocation	1 (3.8%)
Tenosynovitis forearm	1 (3.8%)
Overstrain forearm muscles	1 (3.8%)
Sprain finger joint capsular	1 (3.8%)

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