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Research Article

The Postural Alignment Determinants: What is Known And Further Research

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ABSTRACT

The aim of this mini-review was to identify the main determinants for postural misalignments. This paper gathered information about growth, physical activity, physical fitness and postural asymmetries interdependency and implications in sports and quality of life. This paper stated that there is a lack of research about postural misalignments and/or asymmetries and its associations with sedentary behaviours and physical fitness. Joints motion, endurance, agility, speed, balance, rhythm, and the maturation may be studied to assess their relations with postural misalignments or asymmetries.

Keywords: Posture; Growth; Physical activity; Physical fitness

INTRODUCTION

The postural behaviour and postural profile/alignment has been considered important for health, wellbeing and sports [1,2]. It is speculated that, a perfect body alignment may results in better functionality, body symmetry and satisfaction and sports performance. This paper emerged from author's reflections about postural analysis in sports and active living. Upon that, the authors aimed to review the determinants that may affect postural profile and the relation with physical fitness, sports performance and quality of life. The authors hypothesised that growth, physical activity and fitness may affect the postural alignment.

HUMAN GROWTH AND POSTURE

The human growth is not symmetrical or at constant speed and so it is expected that postural asymmetries may exist during growth [3]. The growth is dependent of biological characteristics, physical health (including the physical fitness), the environmental conditions, socio-demographic profile and daily habits [3,4]. Moreover, the technological development and the computers and gadgets has increased its dependency. That is due the new and emerging tasks or web-jobs, these new jobs may minimize sports and leisure activities. Most of the time is spend seated in front of a computer, or looking down to smartphones or tablets [5]. Those habits may cause some postural issues, resulting in misaligned postural profiles [5,6].

Posture can be defined as the body alignment with minimal physiological or mechanical stress [7,8]. That sad, the aligned postural profile may results in less mechanical and physiological stress. This can also be called a good posture. In sports sciences, athletes, coaches and sports analysts have been raising the concerns about postural profile aiming to reduce the injuries probabilities [7-9]. Upon that, a symmetrical posture and growth will be dependent of the individual growth, physical health, environmental conditions, socio-demographics and daily habits. That said, Physical activity may play an important role in subjects postural profile.

Physical activity and posture

As higher, the physical activity levels, the individuals may spent less time in seating positions and minimize sedentary behaviours [10]. Therefore, the physical activity levels may predict some postural behaviours [11,12]. Moreover, as higher the physical activity levels, better the physical fitness [13]. Upon that, physical fitness may allow preserving or adopting aligned postures. It is worthy to not that sometimes, subjects adopt aligned posture, however, that aligned postures are not the most daily used postural profile. Due the physical and mental fatigue, the postural profile is characterized by the shoulders depressed, looking down and adopting hunchback position [5,6]. That may also be related with social status, depression and mental health [14]. To date, only few studies have analysed the effect of physical activity in postural alignment [12]. The vertebral column asymmetries or misalignments is the most

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assessed body part for sports related postural issues [2]. Most of the vertebral column misalignments results in back pain [9]. That may raise the need to stop or change the sports practice or adjust the performance goals. Moreover, assessing physical activity and daily tasks may predict several postural issues.

Physical fitness and posture

The physical fitness plays an important role in postural profile. As much symmetric and higher the strength levels the muscles may have, a more aligned posture the subject may adopt [8,15]. The subjects may have an involuntary aligned posture based on their habits. So, as much muscular strength, higher the capacity to maintain an aligned posture without physical or mental fatigue [5,8]. Some studies have assessed the effect of strength variables with body posture. However, the strength levels seem to present a lower association with postural misalignments [8]. That might be due the evaluations methods. Most of the studies with youths assess physical fitness and postural profile with physical fitness batteries, where physical fitness strength are mainly assessed by number or repetitions tests [16]. Forte et al. assessed the maximal voluntary strength levels by dynamometry [8]. However, maximal strength may not predict the ability to stand aligned for a long period. So far, no study was founded relating postural profile with electromyography. Electromyography allow to assess the number of muscular fibres in activity and the influence of fatigue. Upon that, further studies may assess strength and muscular activity by electromyography trying to gather new insights about the associations between postural misalignments, muscular activity and fatigue.

Assessing postural changes and asymmetries associations

To better understand the postural profile, there are many assessing methods. It is possible to assess by X-ray (Gold standard), the visual scan and photogrammetry and techniques such as Adam's test, vertical line, palpation, symmetograph and scoliometer. Moreover, different protocols assess different postures [2]. Some of the protocols indicate that the subjects may be in the typical comfortable positions [2, 8]; whereas, others specify arms and feet's positions.

The postural misalignments are not single factors dependents. Sometimes, postural alignment or misalignments events are due involuntary actions. That unpredictability raises the needs to control every variable that may affect the postural profile. That said, the postural profile is multifactorial. However, it is well known that the postural misalignments are interrelated [8]. The misalignments interdependency is well explained by the grown up and top down postural misalignments explanation theories [17]. These theories explain that an upper body misalignment is predicted by lower body misalignments (grown up); whereas, the top down theory explains that a lower body misalignments are predicted by upper body misalignments.

Posture, sports and ageing

In sports context, it is suggested that as higher the asymmetries of the vertical projection of the center of mass in the support base, higher the injuries risk [8,9]. Thus, as much postural misalignments higher the muscle tension in different body structures, higher the muscles overuse, fatigue and higher the injuries risk [2,18,19]. The ankle sprains, muscular strains or ruptures seem to be maximized with postural misalignments [9].

Gait and posture have been assessed in the last decades and the orthostatic postural alignment is related with balance. These analyses have been conducted assessing different age's body posture [20]. The evaluations have been made by photogrammetry and it allows to assess the center of mass vertical alignment [21]. The center of mass vertical alignment allows understanding the elderlies balance. As far as the center of the mass goes out of the support base, lesser the balance ability [22]. For instance, in elderlies, balance is mainly affected by the diminishing capacity of the proprioceptive system reducing the perception of the body segments positions and motions due ageing [23]. This reduction of functional capacity also contributes to increase risk and fear of falls and so, quality of life. Upon that, the postural misalignments that results from biological human growth may affect elderlies postural profile. Moreover, as said before, the postural misalignments may affect the proprioceptive system, reducing balance and increasing the risk of falls.

CONCLUSION

Altogether, postural misalignments play an important role in human growth, sports practice and ageing. The postural misalignments assess during youth may prevent further problems such as low back pain and reducing the quality of life due ageing. In sportsmen, postural asymmetries seem to be associated with sports performance and injuries. Thus, exercise protocols may be designed to ensure an athlete longer career. Finally, in elderlies, postural assessment allows to better understand the subjects gait and balance assessing the center of mass vertical alignment. Moreover, postural assessment may help to analyse elderlies balance, minimize the risk of falls and increase the quality of life. The different protocols and analysis to assess posture still lacks of research. So far, the authors consider that it is not clear the most accurate method to associate physical fitness variables with postural profile. Some studies assessed the strength by physical fitness batteries and others by dynamometry. Also, some authors assessed postural profile by visual scan and quantified the number of misalignments; others assessed the postural profile by photogrammetry, quantifying the postural asymmetries magnitude.

That said, further studies are needed to better understand the association between strength levels and posture. Most of postural concerns have been focused on strength levels. However, variables such as range of motion, endurance, agility, speed, balance, rhythm, and the maturation status and growth peak, maximal consumption of oxygen (VO_2 max) might be associated with postural imbalances.

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