



Digit Ratio and Soccer

Muhammad Shahidul Islam^{1,2*} and Brajanath Kundu³

¹Office of Physical Education, Shahjalal University of Science and Technology, Bangladesh

²Department of Physical Education and Sport Science, Visva Bharati University, India

³Department of Physical Education and Sport Science, Visva Bharati University, India

*Corresponding author: Muhammad Shahidul Islam, Department of Physical Education and Sport Science, Visva-Bharati University, West Bengal, India

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Abstract

The ratio between the lengths of index finger in relation to the length of ring finger of a palm is noticed to as second to fourth digit ratio. Digit ratio tented to shows the quantity of male hormone, to which an individual is exposed in the womb of the mother. Several investigations establish the negative relationship between lower digit ratio and various sports performance as the lower digit ratio settle the high prenatal testosterone hormone. The exposure of prenatal androgenisation masculinizes the human body that impacts the efficiency of sports. Soccer player perceives numerous situations and makes instantaneous decisions. Experienced players are reading the game and anticipating the next move of the opponent. Previous studies have demonstrated the link between cognitive ability and the digit ratio. Similarly, players have numerous cognitive skills to dictate soccer game such as spatial intelligence, awareness, and visual spatial ability. Here, we explore the possible causes of negative associations between lower second to fourth digit ratio and soccer performance. We also think soccer-specific skill performance is likely to be associated with lower digit ratio

Keywords: Digit ratio; Testosterone; Estrogen; Soccer

Introduction

The peripheral blood cannot be extracted in utero from fetuses [1]. The second to fourth digit ratio (2D:4D) was therefore suggested as a prenatal testosterone marker [2]. Manual second to fourth digit ratio (2D:4D) at the end of the first trimester of pregnancy is believed to be a biomarker of the balance between prenatal testosterone and prenatal estrogen hormone [2-4]. Thereafter, the digit ratio (2D:4D) probably remain unchanged throughout the life [2]. However, Manning (2002) indicated that the digit ratio (2D:4D) was set particularly between week 8 and 12 at the end of the first trimester. The male fetuses mainly produce large quantities of testosterone hormone, primarily from their testis and adrenal glands [5]. This influences brain and other organ systems development [2-6]. In general, the length of index (2D) and ring fingers (4D) in women is about the same (digit ratio=1.00), whereas in men the ring finger is generally slightly longer (digit ratio=0.98) [7]. The length difference between the two digits is higher for men than for women [8-9]. Testosterone influences the growth of the ring finger (4D), whereas estrogen exposure stimulates the growth of the index finger (2D) [7]. The ratio of the index finger to the ring finger (2D:4D) has been shown to be a sexually dimorphic trait [9-10]. Additionally, the ratio of digits

(2D:4D) measured by the length of index finger divided by the length of ring finger [7-11]. Therefore, researchers found an index of prenatal testosterone exposure relative to prenatal estrogen exposure [7-12]. The prenatal androgen is likely to be increase, if the digit ratio goes down [7]. Several studies portray the second to fourth digit ratio in which prenatal testosterone hormone was associated. The researches recommend that the lower ratio of digit is a noninvasive feasible indicator for sport success rate Manning and Taylor [13] ; Manning and Hill [14] ;Manning et al. [8]; Hone and McCullough [15] ; Longman et al. [16]; Sudhakar et al. [17]; Sudhakar et al. [18]; Bennett et al. [19]; Kim [20]. As because, adult lower digit ratio (2D:4D) promote the masculine feature [2]. The testosterone (T) is a steroid hormone that develops and maintain masculine feature of human body [21]. The specific aim of this review study was to explore the relationship between digit ratio (2D:4D) and soccer performance.

How does the digit ratio (2d:4d) fixed?

The adult finger length ratio is becoming a widely used research tools to know the tentative trait of prenatal androgens, a diversity of physiological and psychological conditions, athletic ability and sexual orientation [10,22,23]. The differentiation of gonads,

fingers, and toes is influenced by HOXA and HOXD genes. HOXA and HOXD genes are also necessary for finger length development and differentiation [24]. Congenital Adrenal Hyperplasia (CAH) is an anomalous hormonal environment that does not function correctly with the adrenal glands [25]. The 21-hydroxylase deficiency, results in the production of surplus quantities of masculine hormones by the adrenal glands [26]. However, researchers Okten and his colleagues studied digit ratio (2D:4D) and 21-hydroxylase deficiency in male (right palm) patients and reported lower digit ratio confirm the 21-hydroxylase deficiency than female and male controls. Women with CAH had a much lower second to fourth digit ratio than women without CAH on the right hand and on the left hand, men with CAH had a much lower digit ratio (2D:4D) than men without CAH [27]. Similarly, researchers [28] reveal the relationship between low digit ratio and CAH. This characteristic also supports a combination of low digit ratio and elevated Fetal Testosterone concentrations [29].

Relationship Between Digit Ratio (2d:4d) With Sports Performance

Researchers [20] widely reviewed the most correlational studies and postulated that low second to fourth digit ratios (high prenatal testosterone and low estrogen hormone) could be a determinant of high sport performance. However, the high performance of rugby depends on low digit ratios [19]. The researchers also discovered differences in the low right-left digit ratios to be a determining factor in elite rugby performance. Keshavarz and his team (2017) studied on three male groups of Wrestlers; they are:

- a) World class elite Greco-Roman wrestlers.
- b) Collegiate non-elite wrestlers.
- c) Sedentary age matched control.

The lower right- and left-hand digit ratios of world class wrestlers were predictors of high wrestling performance compared to other groups [30]. The achievement of the competition phase in team sports was also associated with the ratio of digits (2D:4D). The second to fourth digit ratio was therefore likely to have an impact on the possible athleticism [31]. Similarly, lower digit ratio (high prenatal androgens) has been shown to indicate the sport performance of soccer, surfing, sprinting, endurance, hand grip strength, rowing, kabaddi, swimming, Tennis [8,13-18,32].

Digit Ratio as Soccer Performance Determinant

High prenatal testosterone and low prenatal estrogen hormones are likely to be a strong predictor of soccer performance [7]. Competitive achievement is a major objective of soccer in connection with prenatal androgenization [31]. This prenatal situation influences the judgment of the visual perception [13]. Therefore, according to [7], "Striking a moving opponent or ball requires fine judgment of distance. Determining the exact point of impact demands an accurate perception of the surface of the target as it moves through space" (p.128). However, researchers studied on different types of soccer players and noticed 'professional', 'International' and '1st team players' had lower digit ratio (2D:4D)

than the 'control group', 'youth team' and the 'players who had not represent their country' respectively [13]. Similarly, the International presence of the player in a match is greater for the lower digit ratio individuals [7]. The lower digit ratio could therefore provide an additional discriminator to help estimate soccer capability. Prenatal testosterone exposure also influences professional soccer players' aggressive behavior. Researchers indicated that exposure to adult and prenatal testosterone detects the number of fouls per match that confirm the aggressiveness of players [33] testified by a low second-to-fourth digit ratio (2D:4D). Furthermore, aggression guarantees the dominant behavior that is essential in competitive sport.

Association among Digit Ratio, Visual-Spatial Ability and Left Handedness

Digit ratio is a putative indicator of sport performance differences [34]. A study concerning several sports related psychological variables (mental toughness, aggression, optimism scale, coping strategies, and goal orientations) with masculine digit ratio reported high scores of optimistic dispositions than those with feminine digit ratio. The study also claims that mental toughness partly determined on gestation period [34] that benefited for gender, age and sporting experience [35]. Mental rotation score test [36] can measure the visual-spatial intelligence [36-38]. Manning and Taylor found negative association between lower digit ratio and high mental rotation scores in males. So, the visual spatial intelligence may partially develop on intrauterine life [13]. High prenatal testosterone exposure is likely to associated with handedness [39,40]. Left-handed people dominated by the right hemisphere and assists visual spatial ability [41]. Interestingly, androgenisation exposure influence the right palm more than the left palm [27,42,43]. Right palm digit ratio is also significantly connected with several psychological and behavioral traits compared to the left palm digit ratio [43].

Cognitive Abilities Influence on Soccer Performance

Most team sports, particularly in soccer players, need to pursue numerous situations that are changing quickly [44]. Elite players perceive the situations and make the appropriate choice at the right moment [45,46]. Therefore, technical and tactical ability influence the outcome of the match [47,48]. Elite players perform the technical and tactical skills better in compared non-elite counterparts [49]. However, researchers postulated that distinguished correlations in male between more masculine digit ratio (lower digit ratio) and in visual-spatial ability [13,22]. On the other side, females have prone to more feminine digit ratios (higher second to fourth digit ratio) should relate to higher scores for depression (Repeat). Therefore, high prenatal testosterone exposure is likely to be predictor of soccer performance as well as cognitive ability [13]. Research also shows that human behavior and the status of cognition can result from prenatal androgenization [50].

Conclusion

Most correlational study reveals the negative relationships between lower digit ratio and sports performance. Low second to

fourth digit ratio (2D:4D) can be an indicator in scouting potential athletes especially soccer players. In multifaceted aspects, lower digit ratio is likely to be a potential indicator of soccer specific skill performance. Further studies are required to clarify whether lower second to fourth digit ratio could predict the soccer skill performance in multifaceted aspects including passing, dribbling, control, shooting and decision making within a dynamic situation. In addition, we realized that sporting success might be depended on our hands' fingers length ratio along with other variables.

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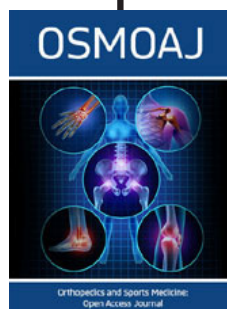
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