

Comparison of Neuropsychological Abilities of Professional Boxers, Amateur Boxers and Non-Boxers

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ABSTRACT

Pugilism has allured many individuals since its inception. Boxers are always on the risk of contracting lesion and abrasion while playing. However, head injuries are not much reported and are usually pretermitted. There is therefore a need to assess the neuropsychological impairment among boxers. This study has been undertaken to compare the neuropsychological impairments of professional, amateur and non boxers (other sports personalities). These three groups were assessed for visual memory, visuo-spatial constructional abilities, and visual motor abilities. A total of 30 participants (males and females) were divided into 3 groups. The first group comprised of national boxers (N=10), second group of amateur boxers (N=10) and third group of non boxers (N=10). Two tests were administered namely Bender- Gestalt and Rey Complex Figure Test in order to assess neuropsychological differences. The findings resulted that professional boxers had more critical neuropsychological impairment in visual memory, visuo-spatial constructional abilities, and visual motor abilities.

KEYWORDS

Professional boxers, Neuropsychological impairments, Amateur boxers.

INTRODUCTION

Boxing is one of the high body contact sports which involve premeditated punches to the opponent's head and body in order to triumph; therefore, chronic and acute brain damage can occur to pugilists. Studies in professional Boxing have shown significant risk of brain injuries, neuropsychological disorders and attention deficits.

Risk of injury is an inseparable part of any sport activity. Although, many people

who take part in these sports never undergo head injuries; damage caused by blow to the head is the main reason for neurological disorders (Forstl et al, 2010; Cantu, 1998). In sport, head injury covers a range of mild damages from temporary consciousness disorder to sever injuries such as death (Teasdale & Engberg, 2003). A great majority of head injury statistics are not reported because these injuries are not much noticed by the coach

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or even the athletes themselves.

In this regard, Waliko et al (2005) showed that Olympic boxers can inflict an average force of 3427 N with the hand velocity of 9.14 m/s and rotary acceleration of 6343 radians per second squared on the opponent's head. A rotational acceleration of 4500 radians per second squared leads to traumatic brain injury (Ommaya et al, 2002). This shows how traumatic brain injury can be.

Neuropsychological tests examine disorders concerning the function of central neural system and have been proposed as one of the best tools for measuring possible cognitive loss. Science of neuropsychology discusses the role of human brain in mental activities and pursuit of neural organization (Teasdale & Engberg, 2003). Except Boxing, there is no evidence showing long-term risks of frequent brain blows and extent of cognitive problems.

Furthermore, other factors such as professional sports, age, weak defense reflections, frequent knockouts, and resistance against blows are also effective in reducing cognitive performance (Rabadi & Jordan, 2001). In general, brain atrophy in boxers tends to occur mostly in deep pre-central area of brain rather than cortex tissue, and is most probably caused by punch blows delivered to the head.

Reports by the World Medical Association regarding neuropsychological disorders of Boxing indicate direct evidences concerning memory and learning loss. During the studies conducted on boxers, changes

were observed in boxers' hippocampus structure, showing specific memory decline in boxers. Scientific literature on professional Boxing suggests serious risks in occurrence of chronic brain damage known as boxer's dementia (Heibronner et al, 2009; Clausen et al, 2005). But consequences of brain injury in amateur Boxing are not much clear and neuropsychological disorders have been proved in some studies (Master et al, 2000; Brayne et al, 1998); but, not in others (Moriarity et al, 2004; Haglund & Bergstrand, 1990).

P. Cameron and P. McCrory (2006) did a study which aimed to determine the epidemiology of injury and exposure of amateur and professional boxers in Victoria, Australia. Results revealed that twenty one injuries were sustained by the cohort during the follow up period. Most were to the head region (71%; 95% confidence interval-3.7 to 89.4), with concussion being the most common (33%). An overall injury rate of 2.0 injuries per 1000 hours of Boxing was calculated. The results concluded that the high exposure experienced by the boxers (as a result of considerable training time) indicated that Boxing has injury rates, higher than any other contact or non-contact sports.

Objectives of the Study

To compare visual memory, visuo-spatial constructional abilities and visual motor abilities among professional boxers, amateur boxers and non-boxers (Controls).

METHODOLOGY

Sample

This study was conducted on 30

participants (23 males and 7 females). The age group ranged between 18-31 years for all the three categories. The minimum educational qualification required for all the participants was X standard.

Design

The statistical population consisted of three groups who were selected randomly. The first group consisted on national level boxers with at least 10 years of national experience. The second group consisted of amateur boxers with at least 5 years of state level experience. The third group consisted of sports personalities other than boxers.

Tools

The Rey Complex Figure Test (RCFT) and Bender Gestalt Test (BGT) were used in order to measure the neuropsychological impairments across the three categories.

Procedure

Tests on National Level Boxers: 10 boxers of at least 10 years of national level experience were called to the psychology laboratory of Jawaharlal Nehru Stadium, New Delhi, and made to feel comfortable. Purposive sampling was used for the selection of boxers. Both RDFT and BGT were administered on them.

Tests on amateur Boxers and Non-Boxers (Other Sports Personalities):

10 Amateur boxers of up to 5 years of state level experience and 10 participants belonging to different sports fields other than Boxing were called to the Psychology laboratory of Department of Psychology, Delhi University, and made to feel comfortable. Purposive sampling was used for the selection of amateur boxers. Both RCFT and BGT were administered on them.

RESULTS & DISCUSSION

Table-1: Comparison of group in two tests-RCFT and BGT

S.No	Tests	Professional Boxers	Amateur Boxers	Non-Boxers (Mean)	F
RCFT	Copy Trial	28.55	31.5	34.85	8.11**
	Immediate Recall	12.7	19.85	28	42.13**
	Delayed Recall	11.6	18.15	27.45	46.98
	Recognition total correct	16.3	16.8	20.4	8.23**
BGT	Copy Phase	22.6	32.5	40.7	35.71**
	Recall Phase	17.4	22	22.7	2.5
	Motor Test	6.8	8.5	11.8	58.75**
	Perception Test	6.2	8.5	9.8	32.54**

The F values for all the subtests of RCFT were found to be significant at $p < 0.01$. (Refer Table 1). The F value for copy phase, motor test and perception test came out to be significant at $p < 0.01$ (Refer Table 1). This study shows that individuals who compete professionally in Boxing are more likely to suffer from severe neuropsychological defects than the amateur boxers and individuals from other sports fields. Boxing leads to deficits in visuo-spatial ability and affects the short term memory of individuals. The results also indicate slightly lower visual motor and perceptual abilities among professional and amateur boxers.

Sports like Boxing, Soccer, Ice-Hockey and Wrestling are considered among risky sports in terms of head blows and brain injuries. However, in Boxing, brain and head injuries are reported to be more than any other sport (Forstl et al, 2010). That is because, among different sport activities, Boxing is a contact sport in which victory is achieved based on the number of blows inflicted successfully upon the opponent's head and body (Purcell & Leblanc, 2012).

Thus, in some researchers in medical association believe that athletes in this sport are subject to severe neurological injuries (Bianco et al, 2005; Toth et al, 2005).

Scientific literature on professional Boxing suggests serious risks in occurrence of chronic brain damage known as boxer's dementia (Heilbronner et al, 2009; Clausen et al, 2005). Neuropsychological disorders have been proved in some studies (Master et al, 2000; Brayne et al, 1998).

Due to these reasons physicians of the American Medical Association, American Academy of Pediatrics (Purcell

& Leblanc, 2012;), Australian Medical Association (1997), British Medical Association (2009) and World Medical Association (2003) issued announcements regarding prohibition of taking part in Boxing, especially for individuals under 18 years of age.

Brain trauma due to Boxing might involve headache, dizziness, cognitive problems, personality change, depression, low motivation and emotional/behavioral disorders (Butler, et al, 1993). Chronic amnesia has also been observed in some boxers. In this situation, lack of concentration and attention may occur. Boxer's dementia and boxer's dementia and boxer's amnesia syndromes are among chronic blow-induced brain injuries in Pugilism. Such injuries are accumulation of long-term repeated blows on the head region. These injuries occur very frequently among professional boxers; however, amateur boxers exposed to concussions for a longer time, too have high chances.

In this respect, Heilbronner et al (2009) reported memory and attention complications in athletes who had experienced concussions irrespective of whether they lost their conscience or not. Reports by the World Medical Association (WMA) regarding neuropsychological disorders of Boxing have also shown direct evidences of learning loss and decline in memory among boxers.

Explaining the mechanism of brain injury in Boxing is very complicated; because, it depends on both direct glove blows on skull as well as instant motor response of brain and skull. Upon collision of blow to the skull, a transient acceleration is given to the head. Because

of inertia, the skull moves faster than brain. Brain continues moving while the skull tends to stop (Walilko et al, 2005).

Boxing is faced with severe criticism over the potential damage this sport inflicts on the pugilists. Brain damage due to Pugilism can be followed by psychological and neurological impairment is arousal; concentration; motor functioning; perceptual abilities; memory; judgment and planning.

RECOMMENDATIONS

Some of the ARP (Association of Ringside Physicians) Medical recommendations to improve Boxing safety are mentioned below:

1. All sparring should take place with oversized gloves to minimize the cumulative forces of the punches during training. (i.e., Heavyweights 20-22 oz gloves...Middleweights 16 oz gloves and lightweights 12 oz gloves, etc.)
2. Promoters, managers, corner men, commissioners are encouraged to anonymously report boxer's whom they believe are showing early

changes consistent with brain damage. This information will then be investigated and (if necessary) be utilized to require more tests or to terminate a boxer's career.

3. The ringside physician should notify the local hospital and on-call neurosurgeon that a Boxing match will be taking place.
4. Further research (i.e. the medical severity index, the Impact concussion study, rapid HIV/infectious disease testing, etc.) is encouraged and should be utilized to determine those at greater risk for injury.
5. Minimize head shots during training to decrease the likelihood of pre-existing damage prior to entering the ring for the competition.

Therefore, this superlative sport should be played, across the world, by taking pre-cautions. This sport has given India a name in the world of sports and not a single sportsperson who has been trained under the guidance of expert coaches has shown any neuro-psychological disorder.

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