

Eye Movement Technique Applied in Sport Psychology in China

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ABSTRACT: Eye movement technique can understand the information processing characteristics of athletes during the motion, to achieve accurate analysis of athletes' psychological activities and have strong application value, more and more researchers pay attention in this field. Our study focus on the investigation and analysis of eye movement in Chinese sport psychology. According to the trend and weakness of eye movement research in China, we provide our advice and our point of view, we hope that the reference and suggestions is helpful to the further study.

KEYWORD: eye movement; athlete; sport psychology

1 INTRODUCTION

"The eyes are the windows of the mind", we can understand a lot of mental activity rule through this window. In order to study the individual's internal cognitive processes further, eye movement technique extracts such as fixation, fixation duration and frequency, saccade distance, pupil size and other data through the eye movement trajectory. Eye movement technique are widely applied not only perception research areas, and are also used to study cognitive processes. Studies have shown that eye movements changes have been closely related to people's psychological changes and made a series of great achievements in cognitive psychology, engineering and physical science research. Eye movement technique can understand the information processing characteristics of athletes during the motion, to achieve accurate analysis of athletes' psychological activities, more and more researchers pay attention in this field.

There are complicated changes of scene in any competitive sports. Athletes should quickly and efficiently find useful visual information, self adjust focus and quickly make an appropriate motor response. In other words, understand the athlete's position in visual search and look at information for athletes, coaches, and is important to researchers, and eye movement recording methods can provide the above information. Our study focus on the investigation and analysis of eye movement in Chinese sport psychology. According to the trend and weakness of eye movement research in China,

we provide our advice and our point of view, and hope that the reference and suggestions is helpful to the further study.

2 EYE MOVEMENT TECHNIQUE IN THE DEVELOPMENT OF CHINESE SPORT PSYCHOLOGY

In view of the special cognition level of players, one of vital research project in current sports psychology field focus on exploring the developing characteristics of mental abilities of special sports and revealing training mechanism about special mental abilities. Visual information extraction is the basic mental support in the process of physical activities and its various extracting patterns is likely to reflect the distinctions of athletic abilities between excellent players and average players or novices. Eye movement analysis is believed to be one of the most effective approaches to study the visual information processing and has been widely applied to the studies on each sport. Through relevant domestic literatures, we found that the research of eye movement technique mainly involves in many projects include basketball, football, volleyball, table tennis, fencing etc.

The earliest eye movement research in Chinese psychology is the report of Yu Caigeng (1997). Their results show that with the level of referees, their score tend to be more close to the player's score, verified the high levels of the referee than low level referee score more accurate, more objectivity. In

fact, there are not obvious differences in the fixation duration and frequency between the novice and expert group. ZHANG Zhong-qiu(2001) found that there are significant differences on the information processes between two Cyclists groups. The expert group has the significant performance on fixation time, fixation frequency, fixation position and sequence. The knowledge of special cycling technique influence the cyclists' judgment of cycling movement. The fixation time of experts are longer than novices, their fixation frequenc more obvious, gaze trajectories more compact and concentrated than novice group.

ZHANG Yun-liang(2005) report that the characteristics of eye movement of male basketball guard players and university students were measured with ASL504 Eye Tracker when they fixed basketball match pictures. The results showed that basketball guard players have higher efficiency in information processing. Basketball guard players have a more proper fixation distribution and fixation model when they watched the basketball match pictures.

Liao Yan-gang(2007) analyse the visual information characteristics of volleyball players, the study tells that the information processing speed of expert group is the more fast and precise and can judge information effectively in shorter time. The more difficult a task is, the longer the first fixation lasts, the more the fixation numbers increase, the larger saccade distance becomes. As for expert group, its second fixation lasts a short time; its fixation numbers are more; its fixation duration is short. The differences of materials influence the eye movement indicators of the subjects---the second fixation, fixation number, fixation duration, pupil diameter, saccade distance, etc. By contrast, the fixation tracks of expert group are much more concentrated and effective, but the fixation tracks of novice group are much more dispersed and its fixation spots are numerous without specific regularity.

Duan Yu-fang (2008) analyzed the anticipation, reaction time and eye movement during the execution of table tennis forehand stroke. There are significant differences of fixation and location of fixation between the two group participants. The professional participants pay more attention on the information of stroke direction. The professional participants care more about the position of competitor's chest (shoulder), wrist and racket. The professional participants can search more useful visual information than non--professional participants.

Li An-min(2011) analyse the visual search features of the table tennis in sporting scenes. Their founding of experiments revealed that table tennis players demonstrate obvious strengths in reaction time and accuracy when dealing with information in

the sporting scenes and also showed outstanding advantages both in time and in space in the process of visual search in the sporting scenes.

Liang Yi-ming(2012) report that gazing and following training can help to reduce anxiety by damaging the divers' negative imagery and establishing clear positive imagery. The training of eye movement behavior is targeted directly at the damage and establishment of "the process of imagery construction", which provides new and operable measure for reducing divers' anxiety.

In the process of collecting relevant data, we can find that the use of eye movement technique presents the fast growth in recent years. The badminton, sanda, tennis, table tennis, fencing, speed skating and other projects have related research reports. Through comparing the eye movement characteristics of expert-novice paradigm, based on information processing theory, all studies indicate that there is good worthy applying the method owning ecological effect of the eye movement record for deeply study on the development level of athlete's special cognition. In addition, eye movement technique can make evaluation on information processing of the subjects at different levels on condition that it is combined with concrete cognition tasks and analyzes each indicator of the subjects on the whole.

3 THE DEVELOPMENT TREND OF EYE MOVEMENT RESEARCH

According to some researchers '(Yan Guoli ,Xi Jie, Li Jingcheng, etc) analysis summary on the current status of Chinese sports psychology, combining with the self study to understand all relevant information, we summarize some development trend of eye movement research, specific as follows:

3.1 Eye movement research is destined to have big development period in the field of sport psychology. As the eye movement recording with the increasingly close combination of computer technology, related technology rapid development, eye movement equipment is more and more practical, and affordable for the eye movement technique in extensive of sport psychology provides more likely.

At the same time, the function of eye movement instrument also has greatly improve, the continuous improvement of the eye movement related theory and eye movement analysis method, all of which attract more and more experts and scholars in the study areal. The relevant research results, project topics are also growing, which heralding the eye movement research in the field of sport psychology development era is just around the corner.

3.2 Eye movement technique and other research methods need to organic combination. At present, the development trend of eye movement analysis will make more close to the experimental situation and real situation, further empirical research on combing with movement situation, improve the effect of ecology. The experimental situation is closer to the real situation, the expert's finishing quality is better than novice. With the constant improvement of science and technology, a variety of means of science and technology mutual infiltration, the principle of eye movement record update and development, all of which make the eye movement technique is more accurate and convenient, more convenient for data processing and analysis.

As you can see, the psychological changes in the process of movement is very complex, single index has been unable to meet the needs of a lot of research. If we want to study the problem deeply, analysis of eye movement instrument should combine with EEG, EMG, polygraph and more indicators, comprehensive evaluation requires a little more depth.

3.3 The establishment of the theory model of eye movement. So far, although there have been some eye movement theory model, which can interpret the process of reading, but did not appear a convincing eye movement theory model to explain and predict cognitive behavior of athletes in sports. Some psychologists have begun to attempt in this field, which have made some achievements. In view of this, we can foresee that strengthening the theoretical research in this field is an important trend of future research.

3.4 From two aspects of the internal and external characteristics of eye movement, comprehensive study of sport in the eye patterns of cognitive processing, will make our sports psychology research more in-depth and comprehensive. In order to better know the detailed process of information processing in the movement and make our research more valuable, we should combine external indicators and internal decision-making characteristics of eye movement, assess the comprehensive characteristics of the indicators better.

4 THE LACK OF EYE MOVEMENT RESEARCH

In fact, the development of eye movement study has some limitations in sport, eye movement analysis is still questioned by some.

According to communicate with related researchers, access to a large number of literature, as well as specific experience in the personal

experience of the experiments, we conclude the following deficiencies;

First, the fixation point and scan the track is not necessarily equivalent to the information search process. Seeing is a positive message selection and processing status, Looking is not equal to seeing. Some scholars believe that the fixation point of eye tracker observed, may not be just the positions of athletes thinking and decision-making. High level of athletes may not be entirely by gathering information to get the central vision, side vision eye athlete information may be equally has important reference value. The subjects can be watched through the outer periphery of the target object information, but yet be measured. Participants can observe objects by peripheral information, but currently not been measured. Eye movement record analysis may underestimate the actual content of observation, these are our current lacking part of the eye movement analysis.

Second, high precision experimental instrument brings the limits of application. Currently, the eye movement experiments generally is limited in the laboratory, which subjects' movement have some certain restrictions, laboratory and real scene existence have certain gap.

Thirdly, the corresponding theoretical research is not perfect. As can be seen from sports psychology eye movement research process, although there are many research results, but did not find some common rules and characteristics in this area, which is the lack of appropriate theoretical exploration are directly related. Before and after a lot of eye movement research conclusions are not consistent. Currently, the eye movement studies lack of clear theoretical support, the lack of in-depth and comprehensive study of systematic, most research has focused on the openness of motor skills class projects, only a few in a closed motor skills project. The combination of eye movement and other cognitive style is less, the way of the data result analysis remains to be further improved. There has been no scholars use eye movement theory model of information processing to explain and predict the cognitive process of athletes in sports.

Fourth, how to fully and effectively reflect the athletes cognitive characteristics in the process of information processing, we need more research methods and the use of analysis methods.

We can collect some index including fixation duration and frequency, saccade distance, pupil size and other data through the eye movement technique. In fact, these are just the external characteristics of eye movements, and can reflect the visual search process external data, but it does not fully reflect the characteristics of cognitive psychology athlete decisions. We need a more comprehensive and reasonable analysis and research results. At present most of the research is also just use one or a kind of

observation indexes, but less comprehensive multiple index.

Some scholars have pointed out, the combined analysis of eye movement data and cognitive psychology reaction indicators, motion prediction, intuition, etc, the combination of movement and oral report or interview investigation method and analysis, the index will be more comprehensive, our research will also be more deeply.

5 CONCLUSION

Eye movement technique is an important research tool for future development of sports psychology, and has good potential for development.

Eye movement analysis realize the synchronous measurement of sports information processing process, more accurate and objective reflect the athletes in the process of information processing in sports situation, can be timely and effective follow-up analysis of the athlete information processing, have stronger application value.

Eye movement studies in Chinese sports psychology research is in a boom phase, the current study are mostly concentrated in the open motor skills class projects, only a few in a closed motor

skills project. Eye movement research method and means have some certain restrictions. The future development trend will be toward higher ecology aspects such as validity, the research methods, more comprehensive development.

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