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THE GAME IS ELECTRONIC BUT THE EMOTIONS ARE REAL: HOW DOES WINNING AND LOSING EFFECT HRV

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Abstract

The purpose of this study is to determine how winning and losing affect the heart rate variability of soccer players. 10 licensed soccer players participated in the study who are also e-soccer players. 2 inner balance heart math biofeedback device was used to collect data. 7 e-soccer tournaments were organized to collect the data. Data were only collected from matches in which goals were scored and ended with a win or loss. As soon as a winning or losing situation occurred psychometric measurements were started simultaneously from 2 players for 1 minute. After the tournaments were finished with 93 winnings and 93 losses psychometric data was received. Results have shown that players had higher coherence (HRV) while winning, on the contrary, the coherence levels were very low while losing. A significant difference was found in players' coherence levels between winning and losing situations. In simple words players emotionally felt better when they were winning. This supports the theory that even though the game is electronic the emotions are real looking at the HRVs of the players.

Keywords: Soccer; HRV; Coherence; E-Sports, E-Soccer, Biofeedback, Inner Balance

1. Introduction

The phenomenon of sports has changed as a result of the developments brought by time and has taken its place among the important tools of the digital world. Today, this concept, which we encounter as e-sports, has become an industry with various leagues and branches (Abazir, 2019). When e-sports started being popular there has been a lot of discussion about e-sports. These discussions were mostly about whether e-sports are considered sports, or is it harmful, etc. (Parry J, 2019; Lu, 2016).

However, it will be better to leave this discussion to a side and focus on the growth of the e-sports industry. According to the statistics, the e-sports audience will reach 577,8 M by the end of 2024 (newzoo.com). In addition, merchandising, licensing, media rights, online advertising, and sponsorship revenues in e-sports are around $124Bn and it is increasing rapidly (Warman & Webinar, 2015). The development and growth in the e-sports industry should be taken seriously and supportive academic studies could be taken into consideration. When academic literature on e-sports is reviewed psychological, health, performance, emotions, etc. studies are seen frequently (Banyai et all, 2019; Wattanapisit et all., 2020; Nagorsky and Wiemeyer; 2020). Especially recent studies seem more multidisciplinary and approach e-sports from a different perspective. The rapid development of technology news has affected all areas as well as sports news and has caused new arrival. Both playing and watching competitive video games and computer games have created the concept of electronic sports (Gumusdag et all, 2021).

Football, which is the most popular sports branch in the world, is also popular in e-sports. According to the data of 2020 EA SPORTS FIFA20; 10 million players played more than

450 million virtual matches and 1.2 trillion goals have been scored (ea.com,2022). Also, famous soccer players are not just professionals on the soccer field there are famous soccer players who have FIFA 21 Pro Player Cards (goal.com). This shows that e-soccer is not just preferred for fun or leisure time activity. Even the professional soccer players take it seriously, maybe they even use it to train themselves mentally and get prepared for real soccer matches.

Figure 1.1. *List of some of the players who have FIFA 21 Pro Player Cards.*

Footballer	Club	Rating
Sergio Aguero	Man City	99
Trent Alexander-Arnold	Liverpool	99
Steven Bergwijn	Tottenham	99
Kevin De Bruyne	Man City	99
Harvey Elliott	Liverpool	99
Joao Felix	Atletico Madrid	99
Phil Foden	Man City	99
Jack Grealish	Aston Villa	99
Erling Haaland	Borussia Dortmund	99
Kai Havertz	Chelsea	99
Diogo Jota	Liverpool	99

(goal.com).

Physical performance measurements during the match in soccer are possible with devices like GPS, etc. However psychological performance measurements are quite difficult and limited. Although wearable technology devices are conveniently used, they are too sensitive and could easily be damaged during intense physical activity (Beşler, 2020; Ekmekçi 2022). Since the brain cannot distinguish between imagination and reality, it is known by neuroscientists that even thinking about an actual action has the same effect on physiology (Carter, 2014). Considering this feature of the brain, it may be possible to determine the psychological performance and status of athletes by making psychometric measurements with wearable technology devices during e-soccer matches.

HRV (heart rate variability) training is commonly used to improve psychological performance. HRV is about the communication between the heart and the brain in other words ANS (autonomic nervous system) comprises the sympathetic and parasympathetic nerves going to the heart and blood vessels which are regulated by the medulla. If this regulation is not coherent it will end up in emotional and physical stress (Triposkiadis et. all., 2009). This is an important issue in sports because if sympathetic and parasympathetic nerves are not coherent or in balance and emotional and physical stress causes a lack of performance (Grant & Janse Van Rensburg, 2008; Makivić et. all., 2013; Dong et. all., 2016)

Based on the studies and information about the effect of HRV on performance, measuring psychological performance during e-soccer could be achieved conveniently. In real soccer matches measuring psychological parameters is very difficult and requires permission from federations. Thus, this is not possible for now. However, in e-soccer measuring psychological parameters could be done easily and effectively the player just uses his/her brain and fingers.

It is assumed that in e-sports the game may be electronic, but the emotions are real. Based on this theory the purpose of this study is to determine the effect of winning and losing on the HRV of e-soccer players.

2. Method

The research design is quantitative. The purposive volunteering sampling method was used to create the research group which consists of 10 soccer players who are also e-soccer players. 7 e-soccer tournaments were organized to collect data with the Inner balance Heartmath biofeedback device. The data received from Inner Balance was analyzed with SPSS 20 after the tournaments finished.

2.1. Participants

The research group consists of 10 licensed soccer players who are also e-soccer players. The players had to be at least soccer players for 5 years. The age mean of the players is 20,8. The players are equivalent in many ways like; age, education, soccer experience, and e-soccer experience. The purpose of creating an equivalent research group was to minimize confounding variables.

2.2 Data Collection Process

During data collection, 7 tournaments were played. 5 tournaments were played with 4 teams with a league system consisting of home and away matches. 2 of the tournaments were played with 5 teams with a league system in the same way as the other tournaments. Every player had the chance to play in multiple tournaments also they had the chance to compete with each other multiple times. 93 matches finished with a win or loss while 7 matches ended up in 0-0 draw. Data were only collected from 93 matches because winning or losing emotions can only be measured during these matches. The tournaments were organized in the same place on different days. It took around 2 weeks to finish the tournaments. There were some rules during the tournaments to make the circumstances more realistic. Rules of the tournaments; players had to play with the same team all the time, injuries were on, players' performance was randomized, match time, weather, and the schedule was randomized by the computer. Also, the home team had to sit on the left side, and the away team had to sit on the right side. In addition, the same game consoles were used in every tournament. In short words the players had no reason or excuse for failure, everything was up to their fingers and brain.

To collect the data two Inner Balance Heartmath biofeedback device was used during the matches. The devices were attached to the ears and hearts of the players as soon as a goal was scored the measurements started at the same time and for 1-minute data was collected from the winner and the player who was losing.

Figure 1.2. *A Picture of Players While Data Collection and Playing E-Soccer*

2.3. Data Collection Tool

Inner balance heart math is a biofeedback device which receives signals from the heart and the brain. Inner Balance Bluetooth uses BT4.0 (BLE–Bluetooth Low Energy) which works at an output power range of 0.5 milliwatts (mW) or less — this is significantly lower than mobile phones which typically have output levels between 250 mW and 2000 mW. The tiny Bluetooth emitter is in the module that attaches to your garment, not in the ear sensor. Inner Balance Bluetooth is compliant with applicable FCC tests (Thapliyal et al., 2017; Beşler, 2020; heartmath.com). The Inner Balance™ app receives the data from the Inner Balance pulse sensor and translates it into real-time biofeedback on your Heart Rate Variability (HRV). In the App, you can also track the results, and practice guided Techniques and Exercises.

Figure 1.3. *Hearth Math Inner Balance and Android Application*

(heartmath.com)

(diygenius.com)

2.4. Data Analysis

The data collected from 93 matches (93 wins and 93 losses) were analyzed with SPSS 20. The normality test and T-Test was done after collecting the data. The coherence data was received from inner balance hearth math android application (figure 1.2).

3. Findings

According to the findings of the study 10 players have attended the tournaments. Every player was given a nickname. The age mean of the players is 20,8. The soccer age mean is 10,4 years which means how long they have been playing soccer for. In addition, the e-soccer age of the players mean is 11,4 which represents the years they have been playing e-soccer. All the players are university students studying in the department of sports management.

Table 1.1. *Demographic Information of The Research Group*

Player Nick Name	**Age**	**Soccer Age**	**E-Soccer Age**	**Occupation**
Arda	**20**	**9**	**12**	**Student**
Belotti	**19**	**9**	**11**	**Student**
Martin	**20**	**11**	**9**	**Student**
Valerio	**22**	**12**	**14**	**Student**
Jackson	**22**	**12**	**13**	**Student**

Adrian	**22**	**11**	**10**	**Student**
Maxim	**21**	**12**	**14**	**Student**
Jack	**20**	**8**	**11**	**Student**
Kevin	**22**	**10**	**9**	**Student**
Mean	**20,8**	**10,4**	**11,4**	

The t-test results of win and lose of e-soccer players are, matches won (N=93) and matches lost (N=93). According to the results there was a significant difference between coherence levels (HRV) of winning and losing ($p<0,05$). Winning players' coherence levels mean was 1,6862 while players' who lost was 0,7982.

Table 1.2. *T-Test Results of Win and Lose Matches of E-Soccer Players*

	N	Mean $\bar{x}$ Coherence	SD ±	t	p
Win	**93**	**1,6862**	**0,64857**	**11,945**	**0,000**
Lose	**93**	**0,7982**	**0,30556**		

4. Conclusion and Discussion

A recent study has shown that even though the game is electronic winning and losing has a real effect on the emotions of the e-soccer players. As it can be seen in Table 1.2. the coherence level of players who won is 1,6862. This biofeedback device gives us real-time data which means the higher coherence you have the better you feel. On contrary, the coherence levels in lost matches are 0,7982 which means players felt negative emotionally. In other words, players who won the matches felt %212,66 better than the players who lost. Normally coherence levels could go higher, and it is recommended that elite athletes should have at least 2.00 coherence (Ekmekçi, 2022). Also, academic literature claims that athletes should have high coherence to perform better and cope with stress effectively (Perry et. all., 2019). The reason why the players in this research could not reach high coherence was that they do not know HRV training techniques. In simple words, they do not know how to manage stress. Recent psychophysiology studies about managing stress with biofeedback devices and being more coherent are increasing. Nowadays it is possible to measure coherence and stress and collect data in many circumstances (Dziembowksa et. all., 2016).

Similar studies above are also done on soccer players. Proietti et. all. (2017) have compared the HRV of soccer players from different competitive levels and the results were that there was a difference between international and national level players. Another study

that was applied to Spanish First Division soccer players supported that practice of night-time HRV results in autonomic adaptation in professional soccer players (Boullosa et. all., 2013). HRV is not just important during matches or training, it is suggested that it should be also taken under consideration while recovering mentally and physically (Rave et. all., 2018). During a soccer match, many milestones affect coherence (HRV). This effect on HRV also affects the emotions of the players thus missing a penalty at the last minutes of the game could be unavoidable. A study shows that star players who are under more pressure mises more penalties (Jorget, 2009). It could be said that when you are under stress and have low coherence during an important penalty shoot-out it is your psychology that decides if it is going to be a goal or not (Jorget, 2011). As it is seen in literature during a soccer match taking a penalty, scoring a goal or any other important moment is more about the emotions of the player or team. From different point of view, it reveals in the literature that e-sports is a sport and that it does not spoil it, and the similar and different aspects of modern non-electronic sports and their relations with the said physical activity (Gumusdag et all., 2021).

When e-sports studies about HRV, stress, emotions, etc. are taken into consideration and there are some attention-grabbing studies (Gündoğdu et. all., 2021; Masala & Iona, 2018). Although there are still arguments about e-sports being sports or not and negative effects on individuals, there also studies claiming that e-sports contributes to personal development (Carbonie et. all., 2018; Palanichamy et. all., 2020;) A study on e-soccer players by Murphy et. all. (2021) have suggested that engagement in e-sports may aid the development of perceptual-cognitive skills required for expert performance in traditional sports. These results are important in line with our study because our results have shown that the game is electronic however the emotions are real. In this way, soccer players' psychometric measuring could be done during an e-soccer match, and they can be educated about how to manage stress and anxiety and perform better in real matches. It is known that HRV training has positive effects on physical performance (Oliveira et. all., 2013).

In conclusion, it has been seen that even though the game is electronic the emotions are real. Psychometrically speaking while playing an e-soccer match the brain takes everything serious and real, thus it affects the HRV which can be easily measured with an inner balance heart math biofeedback device. The results of this study have shown that winning has a positive effect on HRV while losing has a negative.

5.1 Recommendations

- This study could be done on professional soccer players

- This study could be done on different e-sports players

- This study could be done while taking a penalty or freekick on a soccer field

- Based on the results of this study soccer players could be thought how to manage HRV

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