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The Effect of Attention Focus on Heart Rate During Dart Throws in Recreation Dart Players

Rekreatif Dartçılarda Dart Atışı Sırasında Dikkat Odağının Kalp Atım Hızına Etkisi

Aylin ZEKİOGLU [1]

[1] *Manisa Celal Bayar University, Faculty of Sport Sciences, Manisa, TÜRKİYE / aylinzekioglu@yahoo.com / 0000-0002-7455-4845*

Abstract: The Heart Rate Variability (HRV), which affects dart shot performance, is an important psycho-physiological parameter in that it provides data on the sympathetic also parasympathetic sections of the Central Nervous System. The purpose of the present study was to examine the effect of Internal and External Attention Foci on Heart Rates during dart shot. A total of 34 students, who were studying at Physical Education Sports Sciences Faculty, participated in the study. According to the t-test results, the HF/LF ratio measured under External Attention focus conditions was higher than the HF/LF ratio measured under Internal Attention conditions. This explains that there is a relationship between autonomic nervous system activity and fine motor skill performance. The heart rate changed according to the attention focus during motor skill ($p<0.05$). it was observed that activities requiring motor skills were associated with a higher Heart Rate Variability. These study report that Heart Rate Variability during throws increases and may be associated with performance.

Keywords: Dart, heart rate, attent+on focus.

Özet: *Dart atışı performansını etkileyen Kalp Atış Hızı Değişkenliği (KHD), Merkezi Sinir Sisteminin sempatik ve parasempatik bölümleri hakkında veri sağlaması açısından önemli bir psiko-fizyolojik parametredir. Bu çalışmanın amacı, dart atışı sırasında İç ve Dış Dikkat Odaklarının Kalp Atış Hızları üzerindeki etkisini incelemektir. Çalışmaya Beden Eğitimi Spor Bilimleri Fakültesi'nde öğrenim gören toplam 34 öğrenci katılmıştır. T-testi sonuçlarına göre, Dış Dikkat odağı koşullarında ölçülen KY/KF oranı, İç Dikkat koşullarında ölçülen KY/KF oranından daha yüksektir. Bu durum, otonom sinir sistemi aktivitesi ile ince motor beceri performansı arasında bir ilişki olduğunu açıklamaktadır. Motor beceri sırasında kalp hızı dikkat odağına göre değişmiştir ($p<0.05$). Sonuç olarak, motor beceri gerektiren aktivitelerin daha yüksek Kalp Hızı Değişkenliği ile ilişkili olduğu gözlenmişti. Bu çalışma, atışlar sırasında Kalp Atış Hızı Değişkenliğinin arttığını ve performansla ilişkili olabileceğini bildirmektedir.*

Anahtar Kelimeler: *Dart, kalp atış hızı, dikkat odağı.*

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INTRODUCTION

Darts is a sport that involves intense mental activities such as making a decision within a short time, planning the implementation of this decision, and in case of failure, coping with the intense discouragement experienced and thinking about how to shoot the next throw. It often helps develop skills such as hand-eye coordination, concentration, and focus on the target. Also, it is generally considered a less physically demanding sport because it has a low level of physical activity. Studies in the literature on darts focus on hand-eye coordination, concentration, and sensory-motor skills.

Attention is the state of the nervous system focusing only on a certain event within a certain period and being closed to external stimuli (1). Attention is the level of effort spent focusing on an area of experience and being able to maintain one's focus on an activity and the ability to concentrate (2).

According to Singer et al., individuals must be able to concentrate and selectively pay attention to related stimuli while ignoring irrelevant stimuli to exhibit psychomotor skills successfully (3). A person can absorb a certain amount of internal and external information overload (4). The ability to direct attention to the appropriate stimulus and maintain attention is an important factor for success in sports.

Attention is among the most important factors that affect practice in darts. Internal and external focusing of attention is also among the factors that affect motor learning skills (5). There are different types of attention focusing on the development of motor learning in different sports skills. The external focus of attention is the focus of the practitioner's attention on the environmental effect and consequences of actions. The inner focus of attention, on the other hand, directs the attention to specific body parts and movements (6).

In the literature on motor learning, it is reported that external attention focus is more beneficial for improving motor skill performance than internal focusing. The branches in which the participants use objects come to the fore among the sports and sports skills that benefit from external attention focus (e.g., kicks in football, serves in volleyball (7), kicks in golf (5), dunks in tennis (8), free throws in basketball (9), and dart shootings (10, 11).

Emotional inconsistency affects dart shooting performance by revealing characteristics such as, worry, insecurity, irritability, and anxiety (12). McCrae and Costa (1995) agree that emotional balance involves negative emotions such as anxiety, depression, anger, and distress (13).

Heart Rate Variability (HRV), which affects dart-throwing performance, is an important psychophysiological parameter for providing information on the sympathetic and parasympathetic parts of the Central Nervous System. Although the sympathetic system increases the working rate of the heart and the blood pressure in the arteries, the parasympathetic system causes the heartbeat to slow down (14). Although the sympathetic system plays roles in activating the catabolic activities that cause the energy produced by the body to be consumed, the parasympathetic system ensures the production of energy and the storage of the produced energy (15).

In the present study, the purpose was to examine the effects of the internal and external focus of attention on heart rate during dart throws because dart is a physical activity that requires intense mental activities.

METHODS

Research Model: This researchwas designed to be descriptive and an experimental model as sdata collective tool. The study used a descriptive survey model.

Purpose of the research: In the present study, the purpose was to examine the effects of the internal and external focus of attention on heart rate during dart throws because dart is a physical activity that requires intense mental activities.

Research Group: A total of 34 subjects who had an average age of between 19 and 24, studying at the Faculty of Sports Sciences dealing with recreational darts, participated in the present study

Data Collection: After the purpose of the experiment and the expected task were explained to the participants, the experimental application was made. At this stage of the experiment, 3 self-adhesive disposable electrodes were placed in the chest area of the participants to measure the HRV variability, and the Nexus 10 Device, which would record HRV activity, was attached to the waist of the subjects. Then, the participant was kept in a fixed sitting position for 240 seconds. Dart shooting was performed in an indoor setting with normal ambient lighting. During dart throws, it was requested to throw 18 dart arrows in 3 blocks within 240 seconds (3 minutes) from a distance of 270 cm together with the commands of external attention focus. HRV activity continued to be recorded during the shootings and participants rested for 240 seconds after the completion of the throws.

In order to record and analyse HRV data Nexus 10 system and its supplied software Biotracet + was used. HRV activity was examined in terms of two main frequency bands: the low frequency (LF:0.04-0.15 Hz) and high frequency (HF:0.5-0.40 Hz). The LF/HF ratio was also determined as the marker of sympathovagal balance.

External Focus of Attention Commands

1-Feel the weight of the dart!

2-Bring the dart at ear level!

3-Feel the bend in your elbow!

4-Feel the dart leave your fingers!

With the commands of the internal focus of attention, during dart throws, it was requested to throw 18 dart arrows in 3 blocks in 240 seconds (3 minutes) at the dart target from a distance of 270 cm. HRV activity continued to be recorded during the shootings. Participants rested for 240 seconds after the throws were completed.

Intrinsic Focus Commands

1-Focus on the center of the dartboard'

2-Try to enlarge the target by focusing on the middle point!

3- Throw it when you are ready!

Analysis of Data: The data obtained from each individual in the research will be transferred to the SPSS 23 statistical program. t test and correlation analysis were used in the statistical analysis of the data set obtained.

RESULTS

The HF/LF ratio that was measured under extrinsic focus conditions was higher than the HF/LF ratio that was measured under intrinsic focus conditions. Internal attention-focused darts had a mean of HF/DFmean=1.69 and external-attention darts had a mean of HF/LFmean=2.18. As seen in the table, as a result of the t-test, the difference between the arithmetic means of the groups was found to be statistically significant (t=-2.50; p<.05). The difference was detected in the internal attention-focused dart-throwing HF/LF. According to the results, it was found that the heart rate changed in the internal attention-focused dart shooting (p=0.18) (Table 1).

Table 1. The Intrinsic and Extrinsic Attention Focused Dart Shooting Averages (HF/LF)

	n	Mean	SD	T	p
Intrinsic Attention-focused dart shooting (HF/LF)	34	1.69	1.08	-2.50	0.18
Extrinsic Attention-focused dart shooting (HF/LF)	34	2.18	1.18		

As a result of the Correlation Analysis, it was found that there was a positive relationship between internal and external attention-focused dart shooting averages. There was a moderately strong and positive relationship between the two variables and the correlation coefficient was 0.494. It showed that the correlation was statistically significant at p=0.003.

As a result, it can be argued that there was a moderately strong and positive relationship between internal and external attention-focused dart shooting averages and this relationship was statistically significant (Table 2).

Table 2. The Correlations of Internal and External Attention-Focused Dart Shooting Averages (HF/LF)

	n	Correlation	p
Intrinsic Attention-focused dart shooting (HF/LF)	34	0.494	0.03
Extrinsic Attention-focused dart shooting (HF/LF)			

DISCUSSION

The purpose of the present study was to examine the effect of Internal and External Attention Foci on Heart Rates during dart shot. Dart shooting requires concentration and coordination because it is a competitive sport. Heart Rate Variability (HRV), on the other hand, refers to the variability of the heart rate at rest and is used to measure stress levels (16). The effect of HRV on dart-throwing performance is significant.

HRV is an important psycho-physiological parameter in terms of providing information on sympathetic and parasympathetic parts of the Central Nervous System. Study findings are reporting that HRV variability may be effective on the stress response in athletes (14). The changes in HRV levels occur as a response to stressful conditions. Stress activates the body in a fight-or-flight response and this leads to increased heart rate and HRV levels. Players' stress levels can be high in a competitive setting such as dart shooting and this can affect performance (17). In the present study, it was found that dart shooting accuracy was positively correlated with HF and LF values. The HF/LF ratio measured under extrinsic focus conditions was higher than the HF/LF ratio

measured under intrinsic focus conditions. It is possible to argue that the external focus of attention is more effective in this regard than the internal focus of attention (18). These findings explain the relationship between Autonomic Nervous System activity and Fine Motor Skill Performance. Heart Rate Variability in activities that require motor skills increases when compared to activities that require attention. This is associated with the body's response to physical activity. It was seen that the Heart Rate increased during the competition when it needed a high-level concentration because of the signals sent by the brain increasing the blood circulation in the body and accelerating the heartbeat. Studies are reporting that activities that require motor skills are associated with a higher Heart Rate Variability compared to activities that require attention (19,20,21, 22, 23). The results of the present study support this situation.

In the present study, which focused on the Heart Rate Variability of the intrinsic and extrinsic focus of attention during dart throws, the Heart Rate Variability of 12 male dart players was measured before and during the throws. The increased Heart Rate Variability during the throws was associated with increased nervous system activity of the focus of attention (24).

Another study investigated the relationship between Heart Rate Variability and athlete performance. In the present study, it was concluded that Heart Rate Variability provides information on the psychological state of an athlete before a competition and can predict the performance level (25). Many studies examined the effects of motor skill activities on Heart Rate Variability and it was found that the Heart Rate Variability of athletes increased during activities requiring high motor skills (26,27).

However, activities requiring attention appear to have effects on Heart Rate Variability. It was found that performing a task that requires attention while using a driving simulator increases Heart Rate Variability (28). It was observed that performing a task that requires attention increases Heart Rate Variability (29).

Conclusions: It appears that motor skills and attention-demanding activities have effects on Heart Rate Variability. However, it was observed that activities requiring motor skills were associated with a higher Heart Rate Variability. For this reason, it is recommended that athletes do exercises, including activities that require motor skills, to increase their performance. In the literature, the number of studies conducted on Heart Rate Variability of internal and external attention focus during dart shooting is limited. These studies report that Heart Rate Variability during throws increases and may be associated with performance. It is observed that conducting similar studies with larger sample groups for different sports branches will contribute to the understanding of the effects of HRV response on motor skill performance in athletes.

Ethical Considerations: *All experimental procedures were approved by Manisa Celal Bayar University Institute of Health Sciences Ethics Committee (Approved number:27/09/2023/20.478.486/2017) and all data were collected in accordance with latest version of the Helsinki Declaration. Subjects were informed of the risks and benefits of the study and provided written informed consent before participating.*

Conflict of Interest: *The author states no conflict of interest.*

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GENİŞLETİLMİŞ ÖZET

Çalışmanın Amacı: Dart, kısa süre içinde karar verebilme, bu kararın uygulamasının planlanması gibi yoğun zihinsel faaliyetler içeren bir spor dalıdır. Dart atma performansını etkileyen Kalp Atım Hızı Değişkenliği (KHD) merkezi sinir sisteminin hem sempatik hem de parasempatik bölümleri hakkında bilgi vermesi açısından önemli olan psikofizyolojik parametredir. Bu çalışmanın amacı içsel ve dışsal dikkat odağının dart atışı sırasında kalp atım hızına etkisini incelemektir.

Araştırma Sorusu: İçsel ve dışsal dikkat odağının dart atışı sırasında kalp atım hızına etkisi varmıdır?

Literatür Araştırması: Dikkat, dart branşında uygulamayı etkileyen en önemli faktörlerin başında gelmektedir. Dikkatin içsel ve dışsal odaklanması motor öğrenme becerilerini etkileyen faktörlerdendir (5). Değişik spor becerilerinde, motor öğrenmenin geliştirilmesine yönelik farklı dikkat odaklanma tipleri bulunmaktadır. Dışsal dikkat odaklanması, uygulayıcının dikkatini hareketlerin çevreye olan etki ve sonuçları üzerine yönlendirmesidir. İçsel dikkat odaklanması ise, uygulayıcının dikkatini kendi spesifik vücut bölümlerine ve hareketlerine yönlendirmesidir (6).

Motor öğrenme ile ilgili literatürde, dışsal dikkat odaklanmasının içsel odaklanmaya oranla motor beceri performansının geliştirilmesinde daha yararlı olduğu belirtilmektedir. Dışsal dikkat odaklanmasından yarar sağlayan spor ve spor becerileri arasında katılımcıların obje kullandığı branşlar öne çıkmaktadır. Örneğin futbolda vuruşlar, voleybolda servis atışları (7), golfte vuruşlar (5), tenisde smaçlar (8), basketbolda serbest atışlar (9), dart atışları (10,11). Dart atma performansını etkileyen kalp atım hızı değişkenliği (KHD) merkezi sinir sisteminin hem sempatik hem de parasempatik bölümleri hakkında bilgi vermesi açısından önemli bir psikofizyolojik parametredir. Sempatik sistem, kalbin çalışma hızını ve atardamarlardaki kan basıncını artırırken parasempatik sistem, kalp atışının yavaşlamasına neden olmaktadır (14). Sempatik sistem; vücut tarafından üretilen enerjinin tüketilmesine neden olan katabolik aktivitelerin harekete geçmesinde rol oynarken, parasempatik sistem ise enerjinin üretilmesi ve üretilen enerjinin depolanmasını sağlar (15).

Yöntem: Araştırmaya Spor Bilimleri Fakültesi'nde eğitim gören, 18 yaş üstü ve sağlıklı yaklaşık 34 katılımcının dahil edilmiştir.

Deney 3 aşamada gerçekleşmiştir. Aşağıda her bir aşamaya ait işlemler ayrıntıları ile açıklanmıştır.

1. Aşama: Gönüllüye deneyin amacı ve kendisinden beklenen görev açıklandıktan sonra deneysel uygulamaya geçilecektir. Deneyin bu aşamasında katılımcıların gögüs bölgesine KHD değişkenliğinin ölçülebilmesi için 3 adet kendinden yapışkanlı tek kullanımlık elektrot yerleştirilecek ve KHD aktivitesini kayıt edecek olan Nexus 10 cihazı deneklerin dart atış sırasında deneğin beline iliştirilecektir. Bu işlemden sonra gönüllü 240 saniye boyunca olabildiğince sabit bir şekilde oturur pozisyonda duracaktır.

2. Aşama: Kapalı bir ortamda dart atışı yaptırılacaktır. Normal ortam aydınlatması altında dart atışları yapılacaktır. Dart atışları sırasında dışsal dikkat odağı komutları ile birlikte, 2.47 metrelik mesafeden dart hedefine 240 (3 dakika) saniye süre içinde 18 dart okunu 3blok şeklinde atması istenecektir. Atışlar sırasında KHD ve GSR aktivitesi kaydedilmeye devam edecektir. 3 blok atışı sonrası gönüllülerin 240 saniye dinlenmelerine müsade edilecektir.

Dışsal Dikkat Odağı Komutları:

1-Dartın ağırlığını hisset

2-Kulak hizasında dartı getir

3-Dirseğindeki bükülmeyi hisset

4-Parmaklarından dartın ayrıldığını hisset

3. Aşama: Bu aşamada kapalı bir ortamda atış yaptırılmıştır. Normal ortam aydınlatması altında dart atışları yapılmıştır. Dart atışları sırasında içsel dikkat odağı komutları ile birlikte, 2.47 metrelik mesafeden dart hedefine 240 (3 dakika) saniye süre içinde 18 dart okunu 3blok şeklinde atması istenmiştir. Atışlar sırasında KHD ve GSR aktivitesi kaydedilmeye devam etmiştir. 3 blok atışı sonrası gönüllülerin 240 saniye dinlenmelerine müsade edilmiştir.

İçsel Dikkat Odağı Komutları:

1-Dart tahtasının ortasına odaklan

2-Orta noktayı odaklanarak hedefi büyültmeye çalış

3-hazır olduğunda at

Araştırmaya Dahil Edilme Kriterleri: Katılımcıların; 18 yaş ve üzerinde olması, Manisa Celal Bayar Üniversitesi Spor Bilimleri Fakültesinde aktif öğrenci olması ve dart atmaya engel herhangi bir sağlık probleminin olmaması araştırmaya dahil olma kriterleri olarak belirlenmiştir.

Araştırmadan Dışlanma Kriterleri: Katılımcıların; profesyonel dart lisansı bulunması, kalp ile ilgili bilinen bir rahatsızlığı olması veya kalp rahatsızlıkları ile ilgili ilaç kullanması, dart atmaya engel bir sağlık probleminin olması ve araştırmanın bir bölümünde araştırmadan ayrılmayı

istemesi araştırmadan dışlanma kriterleri olarak belirlenmiştir.Araştırmada her bir bireyden elde edilen veriler SPSS 23 istatistik programına aktarılacaktır. Elde edilecek veri setinin istatistik analizinde korelasyon analizi ve t testi analizi kullanılmıştır.

Sonuç ve Değerlendirme: Sonuç olarak, motor beceri gerektiren ile dikkat gerektiren aktivitelerin her ikisinin de kalp atım hızı değişkenliği üzerinde bir etkisi olduğu görülmektedir. Ancak, motor beceri gerektiren aktivitelerin daha yüksek bir kalp atım hızı değişkenliği ile ilişkili olduğu izlenmektedir. Bu nedenle, sporcuların performanslarını artırmak için, motor beceri gerektiren aktivitelerin de dahil olduğu egzersizler yapmaları önerilmektedir. Literatürde dart atışı sırasında içsel ve dışsal dikkat odağının kalp atım hızı değişkenlikleri üzerine yapılan araştırmaların sayısı sınırlıdır. Bu araştırmalarda, atış sırasında kalp atım hızı değişkenliklerinin arttığını ve performansla ilişkili olabileceğini görülmektedir. Benzer çalışmaların, farklı spor dallarında daha geniş örneklem gruplarında yürütülmesinin sporculardaki motor beceri performansına verilen KHD tepkisine olan etkisinin anlaşılmasına katkı sağlayacağı gözlenmektedir.