

Perception of the Flow Dimensions and Influence of the Variable Sex in School Handball Athletes: A Cross-sectional Study

Percepção de las dimensiones del flujo e influencia de la variable sexo en deportistas escolares de balonmano: un estudio transversal

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Abstract. The type of sport and the sex of the player are among the variables that can influence the flow state in an athletic competition. However, as there are few studies on the manifestation of flow in school handball athletes, it is not possible to determine definitively which dimensions are present more frequently and exactly what the sex differences might be. Therefore, the objectives of this study were to analyze which flow dimensions are perceived by school handball athletes and to verify the influence of sex on the perception of these dimensions. Participants in this study were 110 young school handball athletes, 55 females and 55 males, with a mean age of 16 ± 1 and 16 ± 1 years, respectively. For data collection, a sociodemographic questionnaire and the predisposition to flow scale (FSS-2) were used. The results show that the autotelic experience, clear goals, and intense concentration were more perceived, while the least perceived dimension was action-attention fusion. In addition, it was observed that the dimensions clear goals, intense concentration, and control were more perceived by men than by women. It is concluded that school handball athletes have a high perception of the autotelic experience. They feel focused and have some clarity about their goals and objectives. However, they presented low perceptions of the action-attention fusion dimension. Finally, male athletes are sure about what they need to do, keep their attention focused on the activity, and can better manage and deal with the situation they are going through than their female peers.

Keywords: Flow State, Handball Players, Collective Sports, Sport Psychology

Resumen. El tipo de deporte y el sexo del jugador se encuentran entre las variables que pueden influir en el estado de fluidez en una competición atlética. Sin embargo, dado que existen pocos estudios sobre la manifestación del flow en atletas escolares de balonmano, no es posible determinar de manera definitiva qué dimensiones están presentes con mayor frecuencia y cuáles podrían ser exactamente las diferencias por sexo. Por lo tanto, los objetivos de este estudio fueron analizar qué dimensiones del flujo son percibidas por los atletas escolares de balonmano y verificar la influencia del sexo en la percepción de estas dimensiones. Participaron en este estudio 110 jóvenes deportistas escolares de balonmano, 55 mujeres y 55 hombres, con una edad media de 16 ± 1 y 16 ± 1 años, respectivamente. Para la recolección de datos se utilizó un cuestionario sociodemográfico y la escala de predisposición a fluir (FSS-2). Los resultados muestran que la experiencia autotélica, las metas claras y la concentración intensa fueron más percibidas, mientras que la dimensión menos percibida fue la fusión acción-atención. Además, se observó que las dimensiones, metas claras, concentración intensa y control fueron más percibidas por los hombres que por las mujeres. Se concluye que los atletas escolares de balonmano tienen una alta percepción de la experiencia autotélica. Se sienten enfocados y tienen cierta claridad sobre sus metas y objetivos. Sin embargo, presentaron bajas percepciones de la dimensión fusión acción-atención. Finalmente, los atletas masculinos están seguros de lo que deben hacer, mantienen su atención enfocada en la actividad y pueden manejar y lidiar mejor con la situación que atraviesan que sus pares femeninos.

Palabras clave: Estado de flujo, jugadores de balonmano, deportes colectivos, psicología del deporte

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Introduction

Flow is a harmonious and intrinsically satisfying psychological state characterized by focus and immersion in an activity, inhibition of irrelevant thoughts and emotions, and the ability to feel that, even in challenging situations, performance is optimal (Swann et al., 2017). This makes the experience positive and pleasurable and leads to high levels of performance (Jackson & Eklund, 2002; Nakamura & Csikszentmihalyi, 2014). This sensation of complete immersion can be experienced from simple activities to more complex practices such as sports (Nakamura & Csikszentmihalyi, 2014).

The state of flow consists of nine dimensions. Of these, three are prerequisites: the first is called “challenge-skills balance”, which consists of a feeling of facing a certain challenge that is in accordance with the skills that the individual has; the second is associated with the establishment of “clear goals”, when there is certainty about

what needs to be done; and finally, the “unambiguous feedback” is characterized by the self-perception of performance during a task and whether there is a need to make changes/adjustments (Ross & MacIntyre, 2020). The other dimensions of flow include “action-attention fusion”, in which the individual is fully immersed in the activity and things around him seem to happen automatically; “intense concentration”, when the individual’s complete attention is focused on the activity; “control”, characterized by the feeling that one can manage and fully deal with the present situation; “loss of self-awareness”, which occurs when there is no concern; “time transformation”, when the individual’s perception of time is completely distorted, and they can feel both an acceleration and a deceleration of time during the activity; and finally, the “autotelic experience”, which occurs when the activity is intrinsically gratifying just for the act of practicing it (Moral-Bofill et al., 2022; Ross & MacIntyre, 2020).

This state of experience has been gaining prominence in

the field of sport psychology due to characteristics like those of intrinsic motivation (Mouelhi-Guizani et al., 2022), life satisfaction (Habe et al., 2021), greater adherence to sports (Beltrán et al., 2018) and performance improvements (Bakker et al., 2011; Garcia et al., 2019). In soccer players, flow may facilitate performance evaluations by the coach and by the players themselves, as they would be immersed in the activity and their energy would be focused on the task (Bakker et al., 2011). In a triathlon, five of the nine dimensions (challenge-skill balance, action-attention fusion, clear goals, feedback and control) were related to better running times, thus indicating that the flow state may be positively linked to better performance (Garcia et al., 2019).

Flow in younger athletes has aroused interest in the literature. Participation in games after school hours can positively influence motivation and the experience of flow, which encourages young people to engage in sports (Beltrán et al., 2018). Feelings of flow and intrinsic motivations, such as pleasure and fun, are important for youth to take up and maintain physical activity and sports programs (Jiménez-Torres et al., 2012). In addition, college athletes who play sports have higher levels of positive body perception than nonathletes, thus favoring self-confidence and flow in sports (Soulliard et al., 2019).

Understanding the feelings of flow in athletes can be a tool for coaches conducting evaluations and training. In this sense, although some of its dimensions depend on game situations and other factors, such as action-attention and control fusion, some can be more focused and worked on before games, such as concentration and realistic goal setting (Garcia et al., 2019). In addition, the performance *feedback* offered by the coach can facilitate this state in athletes during a match (Bakker et al., 2011). Regarding school sports, the coach should not only focus on results, be authoritarian or make comparisons between athletes but also encourage the personal development of the student, thus improving the motivational climate and the occurrence of flow (Moreno et al., 2010).

Some variables can influence the flow state, such as the type of modality (Oliveira et al., 2018), age (Oliveira & Miranda, 2015) and sex (Vurgun et al., 2016). In wheelchair basketball, the transformation of time is not a frequent feeling because the characteristic of regressive time for the attack seems to hinder this state (Oliveira et al., 2018). In tennis, a sport that requires intense focus, the dimension of intense concentration on the task was more perceived (Koehn et al., 2013). Regarding age, older basketball athletes experience greater intense concentration compared to younger athletes (Oliveira & Miranda, 2015). Regarding the variable gender, there is no consensus regarding possible differences in perceptions of feelings or dimensions of flow. Male Spanish academics participating in physical/sports activities have a greater predisposition to flow than females because they practice sports more often and have greater intrinsic motivation (Jiménez-Torres et al., 2012), while in adolescent athletes in team and individual sports, this

difference was greater for men only in the control dimension (Murcia et al., 2008).

Concerning handball, elite female athletes experience greater feelings of flow because they can sustain a sense of control and focus more on the tasks to achieve their goals, even if the difficulties are greater than their abilities (Vurgun et al., 2016). However, in another study, handball athletes of both sexes did not show significant differences in perceptions between men and women (Vargas et al., 2013). Thus, there is no consensus on the differences in perceptions as a function of sex. Considering that both studies involved professional athletes, to our knowledge, there are still no studies investigating the flow among school handball athletes, especially considering these differences in perception. In addition to the incipient studies on handball and flow in school athletes, it is not possible to say which dimensions are most frequently present and which variables may influence the perception of flow. Given these gaps in perceived flow in younger athletes, this study aimed to a) identify which flow dimensions are perceived most often by school handball athletes and b) verify whether sex influences the perception of flow dimensions.

Method

This is a cross-sectional study, characterized as descriptive, inferential and quantitative, that aimed to collect information about a sample from a comparative perspective (Ato et al., 2013). This study aims to expand the knowledge about the perception of the flow dimensions and the influence of sex on the perception of these dimensions.

Participants

Participants in this study were 110 young school handball athletes, all of whom were participants in the State Student Games. The sample comprised 55 females and 55 males, with a mean age of 16 ± 1 and 16 ± 1 years, respectively. The female athletes had practiced the sport for 4 ± 2 years and the males for 3 ± 2 years. In terms of weekly training frequency, female athletes averaged 4 ± 1 sessions, while male athletes averaged 5 ± 2 sessions. The convenience sampling was nonprobabilistic. Athletes who failed to complete any of the items on the psychometric instrument were not included in the analysis. There was no requirement for minimum minutes played for athletes to participate in this study.

Instruments

The following instruments were used for data collection: a sociodemographic questionnaire containing information such as sex, age, modality, time of practice, last competition played, weekly training frequency and the Dispositional Flow Scale (Jackson et al., 1998) in its validated version for Portuguese (Garcia et al., 2022). The Flow Prediction Scale (FSS-2) consists of 36 questions that represent the nine dimensions of flow. Responses were measured on a Likert-type scale: 1- Never, 2- Rarely, 3- Sometimes, 4- Often and

5- Always. The athlete was asked to think about the frequency with which he commonly experiences the dimensions of flow in practical activity. The FSS-2 has adequate psychometric characteristics with high internal consistency (Cronbach’s alpha = 0.88), satisfactory external validity ($r > 0.344$) and temporal stability ($0.53 < \text{intraclass correlation coefficient (ICC)} < 0.86$) and is considered an adequate instrument to evaluate the flow states of Brazilian athletes (Garcia et al., 2022).

Procedures

Initially, the organizers of the event were contacted approximately one week before the opening of the games to obtain the necessary information regarding the days and locations of handball games. First, permission was requested to conduct the study. Next, the researchers addressed the young athletes, presented the research objectives and disseminated the questionnaires. The Free and Informed Assent Term of the athletes under 18 years of age was signed by their guardians before data collection. Data collection occurred based on the availability of each team, either before or after the matches, during the State Student Games championship.

Data Analysis

The normality of the data distribution was verified using the Kolmogorov–Smirnov test. The test showed a nonnormal distribution of the data, which led to the use of nonparametric tests. Thus, the median (Md) and quartiles (Q1 - Q3) were used to characterize the results. Next, the Kruskal–Wallis test with Dunn's post hoc test was used to identify which dimensions were more often perceived. The Mann–Whitney test was used to compare the female and male groups. Effect size estimates are useful for determining the practical or theoretical importance of a particular effect (Fritz et al., 2012). The effect size used for the multiple comparisons was Eta squared (η^2), with values of 0.00 representing no effect, 0.010 to 0.039 representing a small effect, 0.060 to 0.110 representing an intermediate effect, and 0.140 to 0.200 representing a large effect. Cohen's test (d) was used to compare the female and male groups, with values of 0.2, 0.5, and 0.8 defined as small, medium, and large, respectively (Cohen, 1988). The effect size and the 95% confidence interval were calculated to represent the analyses (Lenhard & Lenhard, 2016). The analyses were performed using GraphPad Prism software, version 7.03. The significance index adopted was $p < 0.05$.

Results

Table 1 presents the descriptive and inferential data for the perception of the flow dimensions for all participants. We observed that the autotelic experience was the most often perceived dimension ($p < 0.05$) with a large effect size ($\eta^2 > 0.140$). The autotelic experience was described with a frequency of “always” by the participants. Next, the

dimensions of clear goals and intense concentration were more perceived than action-attention fusion, loss of self-awareness, and time transformation ($p < 0.05$), with effect sizes ranging from small to large. The action-attention fusion dimension presented the lowest overall values, with a frequency of “sometimes”. Action-attention fusion was less perceived and had a larger effect size ($p < 0.0001$; $\eta^2 > 0.140$) than the other six dimensions: challenge-skills balance, clear goals, feedback, intense concentration, control and autotelic experience.

Table 1. General and inferential descriptive data of the perception of flow dimensions (n=110)

Dimension	Md (Q1-Q3)	Kruskal –Wallis	Dunn's multiple comparisons test	P	η^2
			CSB vs. FAA	<0.0001*	0.173
			CSB vs. CLG	>0.9999	0.008
			CSB vs. FEE	>0.9999	0.000
			CSB vs. IOC	>0.9999	0.014
			CSB vs. COM	>0.9999	0.001
			CSB vs. PEA	0.0272*	0.059
			CSB vs. TRT	0.0638	0.051
			CSB vs. EXA	<0.0001*	0.233
			FAA vs. CLG	<0.0001*	0.234
			FAA vs. FEE	<0.0001*	0.175
			FAA vs. IOC	<0.0001*	0.250
			FAA vs. COM	<0.0001*	0.154
CSB	4 (3.75-4)		FAA vs. PEA	0.4037	0.036
FAA	3 (3-4)		FAA vs. TRT	0.1961	0.035
CLG	4 (4-5)		FAA vs. EXA	<0.0001*	0.509
FEE	4 (3-4)		CLG vs. FEE	>0.9999	0.008
IOC	4 (4-5)		CLG vs. IOC	>0.9999	0.000
COM	4 (3-4)	p<0.005	CLG vs. COM	>0.9999	0.015
PEA	4 (3-4)		CLG vs. PEA	0.0002*	0.105
TRT	4 (3-4)		CLG vs. TRT	0.0005*	0.092
EXA	5 (4-5)		CLG vs. EXA	<0.0001*	0.173
			FEE vs. IOC	>0.9999	0.014
			FEE vs. COM	>0.9999	0.001
			FEE vs. PEA	0.0364*	0.060
			FEE vs. TRT	0.084	0.057
			FEE vs. EXA	<0.0001*	0.237
			IOC vs. COM	>0.9999	0.022
			IOC vs. PEA	<0.0001*	0.119
			IOC vs. TRT	0.0001*	0.046
			IOC vs. EXA	<0.0001*	0.157
			COM vs. PEA	0.1321	0.046
			COM vs. TRT	0.2796	0.040
			COM vs. EXA	<0.0001*	0.255
			PEA vs. TRT	>0.9999	0.000
			PEA vs. EXA	<0.0001*	0.384
			TRT vs. EXA	<0.0001*	0.349

Note: CSB= Challenge-Skills Balance; FAA= Action-Attention Fusion; CLG= Clear Goals; FEE= Feedback; IOC= Intense Concentration; COM= Control; PEA= Loss of Self-Consciousness; TRT= Time Transformation; EXA= Autotelic Experience; η^2 = effect size; * = $p < 0.05$.

Table 2. Comparison of the perception of flow dimensions by sex

Dimensions	Females (N=55) Md (Q1-Q3)	Males (N=55) Md (Q1-Q3)	Mann–Whitney U	P	d	95% CI
CSB	4 (3-4)	4 (4-5)	1402	0.4854	0.1	-0.357 to 0.702
FAA	3 (3-4)	3 (3-4)	1402	0.4808	0.1	-0.374 to 0.685
CLG	4 (3-4)	4 (4-5)	1201	0.04*	0.3	-0.118 to 0.951
FEE	4 (3-4)	4 (4-4)	1395	0.4512	0.1	-0.403 to 0.655
COI	4 (4-4)	4 (4-5)	1179	0.02*	0.3	-0.115 to 0.954
COM	4 (3-4)	4 (4-5)	1083	0.004*	0.5	0.023 to 1.101
PEA	4 (3-4)	4 (3-4)	1452	0.7033	0.0	-0.329 to 0.419
TRT	3 (3-4)	4 (3-4)	1337	0.2725	0.2	-0.153 to 0.597
EXA	5 (4-5)	5 (5-5)	1449	0.6561	0.0	-0.343 to 0.405

Note: CSB = Challenge-Skills Balance; FAA= Action-Attention Fusion; CLG= Clear Goals; FEE= Feedback; COI= Intense Concentration; COM= Control; PEA= Loss of Self-Consciousness; TRT= Time Transformation; EXA= Autotelic Experience; d = effect size; 95% CI= confidence interval; * = $p < 0.05$.

Table 2 presents the descriptive and inferential results of the perception by sex of the flow dimensions. The results show that clear goals, intense concentration and control were more perceived by men than by women ($p < 0.05$).

However, only the control dimension had a medium effect size ($d = 0.5$), while clear goals and intense concentration had a small effect size ($d = 0.3$).

Discussion

The objectives of this study were a) to identify which flow dimensions are most perceived by school handball athletes and b) to verify whether sex influences the perception of flow dimensions. We observed that the dimension “autotelic experience” was the most often perceived dimension among the young athletes, followed by “clear goals” and “intense concentration”. The dimension “action-attention fusion” was the least reported. Regarding gender, male athletes showed greater feelings of “control”, “intense concentration” and “clear goals” than female athletes.

The athletes present high feelings of “autotelic experience”, indicating that they practice handball for reasons of pleasure and fun. Similarly, for academics who practiced school physical/sports activities, fun and pleasure were the motivating reasons most often reported, although to a lesser extent among females (Jiménez-Torres et al., 2012). In the context of professional handball, the players presented one of the lowest mean values in the “autotelic experience” dimension, both men and women (Vargas et al., 2013). Using the Theory of Self-Determination to explain part of this impasse, it is likely that professional players have some extrinsic motivations, such as money and fame, while young people may be more self-determined when participating in sports at school, seeing the practice as pleasurable and rewarding instead of seeking external rewards (Deci & Ryan, 2008).

The dimension “action-attention fusion” was the least perceived among school athletes. Thus, age and individual modality may explain the lower perception of action-attention fusion. In basketball in the grassroots category, this dimension was one of the three least reported, along with “loss of self-awareness” and “transformation of time”, all of which were affected by age, thus suggesting that younger people may not feel these dimensions or that these youth athletes were unable to express these deeper dimensions during the interview (Oliveira & Miranda, 2015). Similarly, professional handball athletes over age 30 experience the action-attention fusion dimension more than their younger peers, showing that age interferes with the lower perception of the dimension (Vurgun et al., 2016). In addition, changes in the perception of time are characteristics present in recreational and individual adventure sports, such as mountaineering and climbing, in which “action-attention fusion” is reported by participants as an automatic sensation (Boudreau et al., 2020).

Regarding the differences in perception by sex, male athletes showed greater feelings of control, intense concentration and clear goals. In triathletes, a relationship was found between these three dimensions, that

concentration is important for athletes to take control of a situation, just as clear goals showed a positive relationship with the state of control (Garcia et al., 2019). However, professional female handball athletes had higher scores in these dimensions compared to men, which is novel because most studies show that men have greater feelings of flow. This discrepancy can be attributed as a function of the age group attributed and cultural differences of the different samples (Vurgun et al., 2016).

Anxiety in sports is among the factors that can hinder feelings of flow, such as “control”, “intense concentration” and “clear goals” (Jackson et al., 1998). This finding may be an explanation for the lower performance of female athletes in these dimensions, as multiple studies demonstrate that anxiety in the context of sports is greater among women than men (Correia & Rosado, 2019; Rice et al., 2019). In addition, studies indicate that male athletes have a greater sense of control than female athletes (Crust & Swann, 2013; Habe et al., 2021; Murcia et al., 2008).

The present study has some limitations. The first is associated with the cross-sectional nature, in which samples are analyzed in a given period with no consideration of previous or future events. Another limitation is that other issues that could alter the flow state in these young athletes (e.g., psychological states, traits, and school periods) are not considered. In addition, subjects were chosen by convenience sampling, and no statistical criterion was applied for the selection of subjects. Finally, data collection occurred based on each team's availability, potentially affecting the athletes' experience of flow state concerning the outcome of their preceding game and/or their standing in the competition.

Despite these limitations, our study presents evidence that contributes to a better understanding by the coach/teacher about which dimensions are present in their athletes, as well as differences by sex. Thus, coaches will be able to integrate into training a dialogue with their athletes about their psychological well-being, motivations, and clarity of goals. Identifying and focusing on certain dimensions of flow to increase their frequency in handball practice may result in feelings of satisfaction, greater motivation, and enhanced performance. In this sense, athletes who experience flow report experiences of automaticity and effortless performance, and are energized to continue the activity or want to do it again (Swann et al., 2017). When an athlete is in flow, there is greater ease for performance assessments by both the coach and the players themselves, as they would be immersed in the activity and their energy would be focused on the task (Bakker et al., 2011).

In general, our findings may contribute to the promotion of new studies on this subject and in the sample investigated. Future studies may explore in depth the feelings of flow in school athletes by conducting longitudinal studies that compare different school periods, such as the beginning and test periods and the end of the

school year. These different school stages are contexts that deserve attention because at times students may become overloaded with demands on their time and feel demotivated, stressed, and anxious when performing sports, thus impairing their feelings of flow. Finally, it would be interesting to understand how the dimensions of flow relate to sports performance in school athletes. This relationship has unknown directions and mediation mechanisms, as although most discussions point to flow as a predictor of better performance (Jeong, 2023), some investigations point to better performance as a predictor of flow (Harris et al., 2021).

Conclusion

The present study shows evidence that school handball athletes have a high perception of the autotelic experience, considering the sport to be pleasurable and rewarding. They feel focused and have some clarity about their goals and objectives. However, they presented low perceptions of the action-attention fusion dimension. Finally, male athletes are sure about what they need to do, keep their attention focused on the activity, and can better manage and deal with the situation they are going through than their female peers.

Conflict of interest

The authors have no conflicts of interest to declare.

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