apunts EDUCACIÓN FÍSICA Y DEPORTES

ISSUE 157

Published: July 1, 2024
https://doi.org/10.5672/apunts.2014-0983.es.(2024/3).157.04

OPEN ACCESS

Influence of Ludotechnical Model and Teaching Games for Understanding on Roller Hockey Player Motivation

David Pizarro[1,2,3*], Jorge Cosín[2], David González-Cutre[4], Francisco Tomás González-Fernández[5] & Alba Práxedes[6]

[1] Faculty of Education, Camilo José Cela University,Madrid (Spain).
[2] Faculty of Life Sciences and Nature, University of Nebrija, Madrid (Spain).
[3] Don Bosco Center for Higher Studies (CES Don Bosco), Complutense University of Madrid (UCM), Madrid (Spain).
[4] Department of Sport Sciences, Sports Research Centre, Miguel Hernández University, Elche (Spain).
[5] Department of Physical Education and Sport, Faculty of Sport Sciences. University of Granada (Spain).
[6] Faculty of Education and Sport Sciences, Rey Juan Carlos University, Fuenlabrada (Spain).

Cite this article
Pizarro, D., Cosín, J., González-Cutre, D., González-Fernández, F. T. & Práxedes, A. (2024). Influence of Ludotechnical Model and Teaching Games for Understanding on Roller Hockey Player Motivation. *Apunts Educación Física y Deportes, 157*, 31-39. https://doi.org/10.5672/apunts.2014-0983.es.(2024/3).157.04

Edited by:
© Generalitat de Catalunya
Departament de la Presidència
Institut Nacional d'Educació Física de Catalunya (INEFC)

ISSN: 2014-0983

***Corresponding author:**
David Pizarro
dpizarro@nebrija.es

Section:
Sport Training

Original language:
English

Received:
December 3, 2023
Accepted:
February 9, 2024
Published:
July 1, 2024

Front cover:
Boat Zero and Patriot Sail on a Glamour Barcelona Day.
© Ugo Fonollá / America's Cup

Abstract

The aim of this study was to analyze the effect of an intervention program based on Ludotechnical Model and Teaching Games for Understanding (TGfU) on roller hockey players' motivation. The intervention consisted of 14 training sessions. A quasi-experimental study was developed with a pre-post design with 11 roller-hockey players from the under-10 category (M = 7.18, SD = 0.83) from a Spanish school club. The Sport Motivation Scale was used to analyze the types of motivation. Overall, results revealed an increase in some autonomous forms of motivation and a decrease in controlled motivation, as it was hypothesized. Regarding autonomous motivation, the intervention had a positive effect on intrinsic motivation to know and intrinsic motivation to experience stimulation. On the other hand, results showed a decrease in players' introjected and external regulations. Therefore, the intervention seemed useful to diminish the most negative types of motivation established in self-determination theory. This study provides initial evidence that a hybrid Ludotechnical/TGfU unit can be implemented in a sport like roller hockey to produce significant improvements in players' motivation.

Keywords: hybrid unit, Ludotechnical Model, motivation, roller hockey, Teaching Games for Understanding.

Introduction

In team sports, in which open motor skills predominate, it is required that players continuously co-adapt their actions to the movements of opponents and teammates to ensure a functional collective behavior. Thus, players need to be attuned to informational game constraints to decide what to do and how to do it (Chow et al., 2016). Specifically, roller hockey combines the complexity of the characteristics of invasion, implement and sliding sports. These characteristics make this sport an attractive and recommended practice for formative ages (Canton et al., 2021). On the other hand, it presents differences with other collaboration-opposition sports (e.g., soccer or basketball) due to the particularity of moving on skates and carrying an implement, the stick. These issues will influence the development of sport and, consequently, its teaching-learning process. Buszard et al. (2016) highlight the importance of adapting the sport to the participants, considering their age and level of experience, as well as the learning processes. In this way, faster learning of skills, better movement patterns and performance, greater self-efficacy and higher level of involvement and motivation to practice will be encouraged. Therefore, it seems interesting to study in detail how to develop teaching-learning processes in this peculiar invasion sport where players move on skates and, in addition, carry a stick in their hands, and how to keep the participants motivated during this process.

A theoretical framework that has been widely used to examine motivation in the sport context is self-determination theory (SDT; Ryan & Deci, 2020). This theory proposes that people have three innate and universal basic psychological needs (BPN), autonomy, competence, and relatedness, which must be satisfied by the social environment to promote well-being and different growth manifestations such as intrinsic motivation and internalization (Vansteenkiste & Ryan, 2013). In sport, autonomy is satisfied if coaches take the athletes' perspective in consideration, allowing them to choose some aspects of the process. Competence is promoted if athletes perceive that they have enough ability to face the different sport challenges. Relatedness refers to maintaining good relationships with teammates and the coach. Alongside these BPN, recent studies grounded in the SDT framework (González-Cutre et al., 2016) have discussed the possibility of considering novelty as a potential additional fourth BPN. Novelty can be defined as the need to experience something not previously experienced or excluded from the daily routine (González-Cutre et al., 2016). In this way, athletes' BPN satisfaction or frustration would be related to different forms of motivation, organized in a continuum of self-determination. Recent research shows that more autonomous forms of motivation, characterized by enjoyment and valuation of the activity, are likely to appear when athletes/players feel that there is an environment that supports their BPN (Vasconcellos et al., 2020). Instructional interventions have been one of the most widely studied factors from self-determination theory, with a direct impact on athletes/players' motivation and positive outcomes through BPN satisfaction and frustration (Mossman et al., 2022).

In previous studies, emphasis has been placed on the degree of autonomy support provided during sport instruction. An autonomy-supportive environment leads to more adaptive patterns of responses such as BPN satisfaction, autonomous motivation, general well-being, positive affect, life satisfaction, vitality, self-esteem, resilience/persistence, effort, performance and achievement, teamwork, engagement and physical activity participation, and less maladaptive outcomes such as negative affect, burnout, and depression (Mossman et al., 2022). In opposition, a controlling style restricts players' autonomy and choice using demanding and domineering language and excessive critical feedback (Aelterman et al., 2019). Controlling style leads to BPN frustration, controlled motivation (related to feelings of guilt and external factors, such as rewards or punishments) and lack of motivation, which would be associated with decreased interest, boredom, and dropout (Haerens et al., 2018). Despite psychosocial variables being important factors for improving athletes' experiences, sport teaching has traditionally been undertaken via a direct instruction pedagogical model (Metzler, 2017), which is not very autonomy supportive.

The direct instruction model has been criticized by researchers due to its narrow focus on sports techniques (Kirk, 2013). For a long time, the teaching of technical skills in sports has focused on teaching stereotyped sports movements that reproduce execution models of proven effectiveness (Valero-Valenzuela et al., 2009). This "traditional" methodology (Metzler, 2017) seeks to improve the technique and achieve motor patterns, prevailing a practice that benefits young people with a higher coordination and conditional level. Consequently, many children report low levels of autonomous motivation, satisfaction, and learning (Morgan et al., 2005), causing to abandon physical activity and sport participation (Gómez-López et al., 2019). As an alternative to the direct instruction model, Metzler (2017) proposed a range of pedagogical models. These pedagogical models have

key design features that promote opportunities to solve problems and make decisions, all of which can potentially lead to higher levels of autonomous motivation (Metzler, 2017).

The Ludotechnical Model was created and developed by Valero-Valenzuela and Conde (2003) for individual sports with technical predominance (specifically, athletics). This model uses played forms and modified games to encourage the practice of individual disciplines among young people, providing a set of rules that allow them to gradually acquire the technique while they are immersed in the dynamics of the playful activity practiced, developing the motor, cognitive, social, and affective areas (Valero-Valenzuela & Gómez-Mármol, 2013). The Ludotechnical Model session structure is divided into four consecutive parts: a) Presentation and challenge; b) Ludotechnical proposals; c) Global proposals; and d) Reflection and sharing. Even though this model was created for individual sports, there is current research that uses it in invasion sports to improve the technique of complex skills with an adequate motivational climate (Rubio-Castillo & Gómez-Mármol, 2016).

Teaching Games for Understanding (TGfU) is a pedagogical model developed by Bunker and Thorpe (1982). The objective of this model, based on the pedagogical principles of modified games (Small-Sided and Conditioned Games-SSCG; modified game through representation and modified game through exaggeration) and on questioning (interrogative feedback), is to understand the game through tactical knowledge (Tan et al., 2012). Specifically, modified games (SSCG) are played on reduced pitch areas, using adapted rules, and involving a smaller number of players. In formative stages, empirical evidence supports the use of SSCG (Ometto et al., 2018) and the manipulation of constraints (through approaches such as the TGfU) (Renshaw & Chow, 2019) as supportive tools for learning. In roller hockey, the modifications that have been proposed consist of adapting the playing space, the heights or location of the goals, the size and weight of balls and equipment, number of players, duration of the game or scoring systems (Timmerman et al., 2017). Regarding questioning, a basic and essential aspect of the TGfU model, Bunker and Thorpe (1982) point out that this is also a methodological tool that develops knowledge of game tactical skills. This technique consists in asking the player a series of questions that explore the critical dimension required to effectively execute a technical-tactical skill. This process requires coaches not to tell players the execution pattern that they must carry out but, instead, to ask the players to analyze their own tactical responses during the execution of the tasks, based on the key points present in the training situation (Vickers, 2007). Likewise, some of the intervention programs used are based on explicit learning (e.g., Raab, 2003). Therefore, technical skills are developed alongside tactics in the contextualized situations of the SSCG and are practiced when needed within "skill drills" (Harvey & Jarrett, 2014). In addition to designing and manipulating the learning environment, players are engaged in the process of inquiry through the coaches' use of questioning. In this sense, coaches do not use a controlling style, telling the players how to act. Instead, coaches ask questions about what to do and how, with respect to tactical complexity tasks, where the complexity is adapted to the athletes' execution level (modified games) by manipulating the task constraints. Consequently, using TGfU, coaches may develop an autonomy-supportive learning environment leading players to report high levels of autonomous motivation and more adaptive outcomes (Andrianto, 2023).

Although the Ludotechnical Model and TGfU have different features, both pedagogical models share common pedagogical processes, such as using questioning to engage players in their learning. Likewise, one of the major common features for both pedagogical models is the shift of the coach's role to one of facilitator of learning, and the related increase in responsibility and decision-making away from the coach to the players (Stran et al., 2012). Consequently, hybridizations could be an effective mechanism for achieving higher quality learning outcomes (González-Víllora et al., 2019). Therefore, the aim of the present study was to analyze the effect of an intervention program based on the Ludotechnical Model and Teaching Games for Understanding (TGfU) on players' motivation in roller hockey. We hypothesized that the intervention would increase the players' autonomous motivation and decrease their controlled motivation and amotivation.

Material and methods

Design and participants

The participants were 11 roller hockey players (8 males and 3 females) from the under-10 category (6-9 years old; M = 7.18 yrs. and SD = 0.83) from a Spanish school club. All participants had the same level of expertise (i.e., average-low skill level) and belonged to the same team. In this regard, these players had not been selected as the best of their category and their participation in the club was recreation and education oriented.

An intra-group, quasi-experimental design was used. Players had two weekly training sessions of one hour each one. The intervention was based on a hybrid Ludotechnical/TGfU models' program. Participants had no prior experience with these models. The coach who participated in this study was a 25 year old man and had taught roller hockey through direct instruction in the last four seasons to players in formative stages. In these seasons, the selection of content, their presentation, and the task structure were controlled by him. He was the "leader" in unit instruction, monitoring practice and presenting students with a model of the desired movement. The sessions were highly structured and based on the repetition of technical skills. Student learning tasks were carried out in segmented blocks of time, and the teacher controlled the pace of activities and the time between task progressions.

The research project was fully approved by the Ethics Research Committee of a Spanish University (approval code: UNNE-2022-008). The participants and their parents were informed of the study and an informed written consent was obtained from the parents/guardians. Participants were treated in agreement with the ethical guidelines of the American Psychological Association with respect to participant assent, parent/guardian consent, confidentiality, and anonymity.

Instrument

Types of motivation. The Spanish version (Núñez et al., 2006) of the Sport Motivation Scale (SMS; Pelletier et al., 1995) was used. The SMS begins with the question "Why do you participate in roller hockey?", and it is composed of 28 items that measure seven forms of motivation: intrinsic motivation to know (e.g. "For the pleasure it gives me to know more about the sport that I practice"), intrinsic motivation to experience stimulation (e.g. "For the pleasure I feel in living exciting experiences"), intrinsic motivation to accomplish (e.g. "For the pleasure that I feel while executing certain difficult movements"), identified regulation (e.g. "Because it is a good way to learn lots of things which could be useful to me in other areas of my life."), introjected regulation (e.g. "Because I must do sports to feel good"), external regulation (e.g. "To show others how good I am at my sport") and lack of motivation (e.g. "I don't know anymore; I have the impression of being incapable of succeeding in this sport"). The items were anchored on a Likert scale ranging from 1 (it does not correspond at all) to 7 (it corresponds exactly).

Procedure

The current study was conducted in one Spanish roller hockey club setting where the coach had not any experience in applying both models (Ludotechnical Model and TGfU). Thus, he completed a training course about these pedagogical models, which was developed in the four months prior to the intervention, as it has been developed in previous studies (Harvey et al., 2010). The first and the last authors led the training process. During the first week, the coach spent approximately 6 hours reading papers about the Ludotechnical Model (e.g., Valero-Valenzuela & Gómez-Mármol, 2013) and the TGfU model (e.g., Harvey et al., 2010). In the second week, authors conducted two meetings with the coach lasting for two hours each to discuss their content and began discussions about planning the intervention program using both models and the structure that would be followed (phases and the model of each session). In the third week, the coach designed the program, and its content was discussed, specifically, the prioritized technical skills and the session objectives (see Table 1). Finally, in the last week, the coach designed the first four training sessions.

Once the coach training process was completed, initial evaluation was conducted, and after that, the intervention began. The first author was present when the questionnaire was administered and answered any questions that arose from participants. All participants completed the questionnaire in a 20-25-minutes period in the absence of the coach. The intervention was conducted over a period of 14 training sessions (seven weeks), which were scheduled for 1 hour twice a week. When the intervention phase was completed, final evaluation data were collected.

Intervention

The intervention program, based on the application of the Ludotechnical and TGfU models, was designed according to the following structure: phase 1 (the ball as the center of attention; the objective was to keep the ball possession, without any specific goal or directionality), phase 2 (progression to the goal), phase 3 (orientation in the field) and phase 4 (game principles and rules). Each phase was composed of four sessions (except for the fourth phase, which had two sessions) that followed the same sequence: the ball, the ball and teammates, the ball and opponents, and the ball, teammates, and opponents. Table 1 shows these phases with objectives and contents developed on each training session during the intervention phase.

Table 1
Session's objectives and contents for each session.

Phase	*N*	Model	Session objective	Tactical Principles	Technical skills
Phase 1: the ball as the center of attention	1	LM	To keep the ball alone (individually)	None	Dribbling
	2		To keep the ball with teammates		Dribbling Static passing
	3	TGfU	To keep the ball against opponents	Width and depth in attack, creating lines of pass, keeping possession	Dribbling Protection
	4		To keep the ball with teammates and against opponents		Passing Dribbling
Phase 2: progression to the goal	5	LM	To progress with the ball	None	Speed dribbling
	6		To progress with the ball with the presence of teammates		Dynamic passing Dribbling
	7	TGfU	To progress with the ball against opponents	Attacking the goal, creating an advantage in space and number	Dribbling
	8		To progress with the ball with the presence of teammates and against opponents		Dynamic passing Dribbling
Phase 3: orientation in the field	9	LM	To orient myself with the ball	None	Ball control Skill dribbling
	10		To orient myself with the ball with the presence of teammates		Dribbling Passing Ball control
	11	TGfU	To orient myself with the ball against opponents	Interchange of positions and occupation and creation of space	Ball control Dribbling
	12		To orient myself with the ball with the presence of teammates and against opponents		Dribbling Passing Ball control
Phase 4: game principles and rules	13	SSCG and questioning	All previous	All previous	All previous
	14		All previous		All previous

*LM = Ludotechnical Model; TGfU = Teaching Games for Understanding; SSCG = Small-Sided and Conditioned Games

Table 2
Session's plan based on the Ludotechnical and TGfU models.

Time	Ludotechnical Model	TGfU Model
5'	Introduction to the session objective, the technical skill to be developed and the challenge proposed	Introduction to the session objective and the tactical principle to be practiced
10'	Ludotechnical proposal 1	Small-sided game 1
10'	Ludotechnical proposal 2	Small-sided game 2
10'	Ludotechnical proposal 3	Small-sided game 3
20'	Global proposal	Small-sided game 4
5'	Pooling to resolve the challenge	Pooling to share knowledge

The first two sessions of each phase were designed based on the Ludotechnical Model and the last two sessions, in which there were opponents, based on the TGfU model. Lastly, two sessions were developed from a SSCG perspective, trying to link all previous technical and tactical contents. However, both models followed a similar structure (see Table 2).

Regarding the Ludotechnical Model (Valero-Valenzuela & Conde, 2003), each learning task was designed focused on the learning of a technical skill. Specifically, the coach split the skill in parts through ludotechnical proposals to unify all of them at the end with a global proposal. All these tasks tried to answer the initial questions (challenge). Regarding the level of difficulty of the model (Valero-Valenzuela & Gómez-Mármol, 2013), it could be placed at "intermediate complexity", since the session was focused on one phase (e.g., the ball as the center of attention) but more than one technical skill could appear in the session tasks: dribbling and static passing (see Session 2).

Regarding the TGfU model (Bunker & Thorpe, 1982), each learning task (small-sided and conditioned games) had the objective to practice a tactical principle and to improve the technical skills developed in the previous sessions. These tasks were designed according to the characteristics of this model (modification representation, tactical complexity, and modification exaggeration; Tan et al., 2012). Modification representation (e.g., smaller formats such as 1 vs. 1 to 4 vs. 4) was used to increase the players' game involvement; tactical complexity (e.g., small-sided games with numerical superiority of players in attack such as 2 vs. 1 or 4 vs. 3 or using floorball sticks or balls) was used to adapt the complexity of the task according to the player's skill level; and modification exaggeration (e.g., replace goals by zones to arrive to promote dribbling) was used by the coach to modify game rules to emphasize specific tactical and technical learning objectives.

Finally, in both models, the coach also provided feedback to the players, through questioning (Vickers, 2007), emphasizing individual improvement and regulating the players' learning according to their personal capabilities.

Instructional and treatment validity

The fidelity of the hybrid Ludotechnical/TGfU models' program was assessed using a checklist (Table 3; Hastie & Casey, 2014). To assess the intervention, checklist items 1, 3, 5, 7, 9 and 2, 4, 6, 8, 10 enabled researchers to measure coach fidelity to the characteristics of the Ludotechnical and TGfU model, respectively. Two observers were trained in several sessions in which videos were viewed and the different items that made up the checklist were clearly defined. A sample of two training sessions for each model was finally observed (randomly selected), more than 12.5% of the total sample (Tabachnick & Fidell, 2013). 100% agreement was reached between the two observers who assessed the presence or absence of each item. Each observer therefore confirmed that all key aspects included in the instructional checklist (see Table 3) were performed by the coach in each of the observed training sessions.

Statistical analysis

The statistical program SPSS v24.0 (Chicago, IL) was used for data analysis and processing. First, preliminary assumption testing was conducted to check for homogeneity of variances and normality. Shapiro-Wilk test (for samples of 30 or less) was performed and verified that the sample distribution did not follow a normal distribution ($p < .05$), establishing the need to use non-parametric statistical methods. Second, to verify any existing differences between the different measures (pre-intervention and post-intervention) in dependent variables (types of motivation), an inferential analysis was performed using the Wilcoxon test for related samples. We calculated the effect size (ES) with Cliff's delta calculator (Macbeth et al., 2011). A Cliff's delta value of .147 is considered small, a value of .33 is considered medium, and a value of .474 is considered large (Romano et al., 2006).

Table 3
Instructional checklist.

		Present	Absent
1	The coach introduces the session and proposes a question/challenge related with a technical skill.		
2	The coach introduces the session and explains the tactical principles to practice.		
3	Ludotechnical proposals followed by a global proposal are developed.		
4	All the tasks are small-sided games (contextualized context).		
5	The learning is focused on technical skills.		
6	The learning is focused on tactical skills.		
7	Interrogative feedback is focused on the execution skill.		
8	Interrogative feedback is focused on the decision-making skill.		
9	At the end of the session, the challenge question has been answered.		
10	At the end of the session, the tactical skills have been reviewed.		

Table 4
Descriptive statistics and within-group analysis of each variable.

	Pre		Post		*p*	*Cliff's delta* |δ|	*Effect Size Interpretation*
	M	SD	M	SD			
IMtK	5.52	1.08	6.70	0.33	.008*	.68	Large
IMtES	5.98	1.27	6.80	0.40	.017*	.40	Medium
IMtA	5.89	1.23	6.23	1.03	.149	.17	Small
Identified	5.34	1.33	5.66	0.85	.496	.09	Negligible
Introjected	5.20	0.91	4.09	0.82	.005*	-.66	Large
External	5.36	1.32	3.50	1.19	.003*	-.72	Large
Amotivation	3.50	1.15	2.66	0.32	.052	-.52	Large

Note. IMtK: intrinsic motivation to know; IMtES: intrinsic motivation to experience stimulation; IMtA: intrinsic motivation to accomplish; * = significant difference ($p < .05$)

Results

The descriptive and inferential analysis between pre-intervention and post-intervention measures is presented in Table 4. The results showed a significant increase in intrinsic motivation to know ($p < .05$, large ES) and intrinsic motivation to experience stimulation ($p < .05$, medium ES), and a significant decrease in introjected and external regulations ($p < .05$, large ES). Non-significant differences were found in intrinsic motivation to accomplish ($p > .05$, small ES) and identified regulation ($p > .05$, negligible ES). Changes in amotivation were not significant ($p > .05$), but the effect size was large.

Discussion

The aim of the present study was to analyze the effect of an intervention program based on the Ludotechnical Model and Teaching Games for Understanding (TGfU) on players' motivation in roller hockey. Overall, results revealed an increase in some autonomous forms of motivation and a decrease in controlled motivation, as it was hypothesized. Regarding autonomous motivation, the intervention had a positive effect on intrinsic motivation to know and intrinsic motivation to experience stimulation. These results could be explained considering the focus of the TGfU model in the conceptual, cognitive, and tactical aspects of sports learning and the focus of the Ludotechnical Model in providing fun experiences that stimulate players. Previous research in other physical education and sport contexts also showed increases in intrinsic motivation after implementing an intervention with the TGfU (Gil-Arias et al., 2021) and Ludotechnical (Yupa-Pintado & Heredia-León, 2021) models. These pedagogical models are characterized by an autonomy supportive teaching that could satisfy basic psychological needs and promote intrinsic motivation. However, no significant effects were found for intrinsic motivation to accomplish in the present study. Considering the peculiar characteristics of this sport, in which players move on skates and carry a stick in their hands, a longer intervention may be needed to achieve higher improvements in the development of technical skills that promote intrinsic motivation. Research in this area is still scarce and the present study is the first one in roller hockey.

The intervention also had no significant effect on players' identified regulation. This could be because the intervention through these pedagogical models was not especially centered in showing the importance of sport for other areas of life. It would have been interesting to include some reflections to display the transference of the technical and tactical aspects that they have learnt to other collaboration-opposition sports.

As expected, we also found a decrease in players introjected and external regulations. This is an interesting result because players presented moderate scores in these variables before the intervention and these types of motivation are related to sport dropout (O'Neil & Hodge, 2020). In line with previous research, implementing new models that are different from the traditional methodology that the players knew helped them to reduce their objectives linked to self-approval, ego-oriented, and focused on external incentives (Valero-Valenzuela et al., 2009). Amotivation was also reduced with a large effect, but it was not significant probably due to the sample size. Therefore, the intervention seemed useful to diminish the most negative types of motivation established in self-determination theory.

Despite the strengths, several limitations and future research directions should be considered. Firstly, the effects of only a short hybrid Ludotechnical/TGfU program were examined in this study. Consequently, it would be valuable to longitudinally analyze the effect of a similar intervention during one season. Secondly, we only measure motivation as an outcome. More variables should be included in future research to analyze the complete sequence established in the self-determination theory. In this regard, it would be interesting to test if an intervention through these pedagogical models positively affects the player's perception of their coach's

autonomy support, satisfies their basic psychological needs, improves their motivation, and all of this contributes to achieve positive consequences like engagement, enjoyment, and performance, and to prevent negative consequences such as boredom, anxiety, fear of failure and dropout. Furthermore, it would be of interest to develop research that uses other instruments for collecting results (e.g., semi-structured interviews) to carry out qualitative or mixed-method studies. We have to admit that the reliability of the instrument used in this study cannot be confirmed due to the small sample size. Considering this issue, the short age of the participants (that could make the questionnaire difficult to understand), and the lack of control group, the results should be interpreted as exploratory. Further studies should be developed with a higher number of participants and different age and levels of expertise to improve the understanding of this hybrid proposal.

This study provides initial evidence that a hybrid Ludotechnical /TGfU unit can be implemented in a sport like roller hockey to produce significant improvements in players' motivation. Specifically, findings showed that the intervention increased intrinsic motivation to know and intrinsic motivation to experience stimulation and decreased introjected and external regulations. Future research in this line is necessary to provide scientific knowledge that helps coaches to improve their sports programs with the objective to manage better the motivational process of training.

References

Aelterman, N., Vansteenkiste, M., Haerens, L., Soenens, B., Fontaine, J. R. J. & Reeve, J. (2019). Toward an integrative and fine-grained insight in motivating and demotivating teaching styles: The merits of a circumplex approach. *Journal of Educational Psychology*, *111*(3), 497-521. https://doi.org/10.1037/edu0000293

Andrianto, J. R. (2023). Teaching Games for Understanding (TGfU) learning model on learning motivation in soccer learning. *Journal RESPECS (Research Physical Education and Sports), 5*(2), 296-300.

Bunker, D. & Thorpe, R. (1982). A model for the teaching of games in secondary schools. *Bulletin of Physical Education, 18*, 5-8.

Buszard, T., Reid, M., Masters, R. & Farrow, D. (2016). Scaling the equipment and play area in children's sport to improve motor skill acquisition: A systematic review. *Sports Medicine, 46*(6), 829-843. https://doi.org/10.1007/s40279-015-0452-2

Canton, A., Lacasa, E., Brufau, I., Ensenyat, A. & Torrents, C. (2021). Hockey patines "XS": ¿Afecta sobre la carga en iniciación? *Revista de Psicología del Deporte, 29*(2), 124-132.

Chow, J. Y., Davids, K., Button, C. & Renshaw, I. (2016). *Nonlinear pedagogy in skill acquisition: An introduction.* Routledge.

Gil-Arias, A., Diloy-Peña, S., Sevil-Serrano, J., García-González, L. & Abós, A. (2021). A hybrid TGfU/SE volleyball teaching unit for enhancing motivation in physical education: A mixed-method approach. *International Journal of Environmental Research and Public Health*, *18*(1), 110. https://doi.org/10.3390/ijerph18010110

Gómez-López, M., Merino-Barrero, J.A., Manzano-Sánchez, D. & Valero-Valenzuela, A. (2019). A cluster analysis of high-performance handball players' perceived motivational climate: implications on motivation, implicit beliefs of ability and intention to be physically active. *International Journal of Sports Science & Coaching, 14*(4), 541-551. https://doi.org/10.1177/1747954119861855

González-Cutre, D., Sicilia, A., Sierra, A. C., Ferriz, R. & Hagger, M. S. (2016). Understanding the need for novelty from the perspective of self-determination theory. *Personality and Individual Differences,102*, 159–169. https://doi.org/10.1016/j.paid.2016.06.036

González-Víllora, S., Evangelio, C., Sierra-Díaz, J. & Fernández-Río, J. (2019) Hybridizing pedagogical models: A systematic review. *European Physical Education Review, 25*(4), 1056-1074. https://doi.org/10.1177/1356336X18797363

Haerens, L., Vansteenkiste, M., De Meester, A., Delrue, J., Tallir, I., Vande Broek, G. Goris W. & Aelterman N. (2018). Different combinations of perceived autonomy support and control: identifying the most optimal motivating style. *Physical Education and Sport Pedagogy, 23*(1), 16-36. https://doi.org/10.1080/17408989.2017.1346070

Harvey, S., Cushion, C. J., Wegis, H. M. & Massa-Gonzalez, A. N. (2010). Teaching games for understanding in American high-school soccer: A quantitative data analysis using the game performance assessment instrument. *Physical Education and Sport Pedagogy, 15*(1), 29-54. https://doi.org/10.1080/17408980902729354

Harvey, S. & Jarrett, K. (2014). A review of the game-centred approaches to teaching and coaching literature since 2006. *Physical Education and Sport Pedagogy, 19*(3), 278-300. https://doi.org/10.1080/17408989.2012.754005

Hastie, P. A. & Casey, A. (2014). Fidelity in models-based practice research in sport pedagogy: A guide for future investigations. *Journal of Teaching in Physical Education, 33*(3), 422-431. https://doi.org/10.1123/jtpe.2013-0141

Kirk, D. (2013). What is the future for physical education in the 21st century? In S. Capel & M. Whitehead (Eds.), *Debates in Physical Education* (pp. 220-231). Routledge.

Macbeth, G., Razumiejczyk, E. & Ledesma, R. D. (2011). Cliff's Delta Calculator: A non-parametric effect size program for two groups of observations. *Universitas Psychologica*, *10*(2), 545-555. https://doi.org/10.11144/Javeriana.upsy10-2.cdcp

Metzler, M. (2017). *Instructional Models in Physical Education* (3rd ed.). Routledge. https://doi.org/10.4324/9781315213521

Morgan, K., Kingston, K. & Sproule, J. (2005) Effects of different teaching styles on the teacher behaviours that influence motivational climate in physical education, *European Physical Education Review, 11*(3), 257-286. https://doi.org/10.1177/1356336X05056651

Mossman, L. H., Slemp, G. R., Lewis, K. J., Colla, R. H. & O'Halloran, P. (2022). Autonomy support in sport and exercise settings: a systematic review and meta-analysis. *International Review of Sport and Exercise Psychology,* 1-24. https://doi.org/10.1080/1750984X.2022.2031252

Núñez, J. L., Martín-Albo, J., Navarro, J. G. & González, V. M. (2006). Preliminary validation of a Spanish version of the Sport Motivation Scale. *Perceptual and Motor Skills*, *102*(3), 919-930. https://doi.org/10.2466/pms.102.3.919-930

O'Neil, L. & Hodge, K. (2020). Commitment in sport: The role of coaching style and autonomous versus controlled motivation. *Journal of Applied Sport Psychology*, *32*(6), 607-617. https://doi.org/10.1080/10413200.2019.1581302

Ometto, L., Vasconcellos, F. V. A., Cunha, F. A., Teoldo, I., Souza, C. R. B., Dutra, M. B., O´Sullivan, M. & Davids, K. (2018). How manipulating task constraints in small-sided and conditioned games shape emergence of individual and collective tactical behaviours in football: a systematic review. *International Journal of Sports Science and Coaching, 13*(6), 1200-1214. https://doi.org/10.1177%2F1747954118769183

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Briere, N. M. & Blais, M. R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation si sporte: The Sport Motivation Scale (SMS). *Journal of Sport & Exercise Psychology, 17*, 35-53. https://doi.org/10.1123/jsep.17.1.35

Raab, M. (2003). Implicit and explicit learning of decision making in sports is affected by complexity of situation. *International Journal of Sport Psychology, 34*(4), 273-288.

Renshaw, I. & Chow, J.Y. (2019) A constraint-led approach to sport and physical education pedagogy, *Physical Education and Sport Pedagogy, 24*(2), 103-116. https://doi.org/10.1080/17408989.2018.1552676

Romano, J., Kromrey, J. D., Coraggio, J. & Skowronek, J. (2006, February 1-3). *Appropriate statistics for ordinal level data: Should we really be using t-test and Cohen's d for evaluating group differences on the NNSE and other surveys?* [Paper presentation]. Annual Meeting of the Florida Association of Institutional Research, Cocoa Beach, Florida, United States.

Rubio-Castillo, A. D. & Gómez-Mármol, A. (2016). Efectos del Modelo Ludotécnico en el aprendizaje técnico, competencia y motivación en la enseñanza del baloncesto en Educación Física. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte, 5*(2), 41-46. https://doi.org/10.6018/264631

Ryan, R. M. & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, Article 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Stran, M., Sinelnikov, O. & Woodruff, E. (2012) Pre-service teachers' experiences implementing a hybrid curriculum: Sport education and teaching games for understanding. *European Physical Education Review, 18*(3), 287–308. https://doi.org/10.1177/1356336X12450789

Tan, C., Chow, J. Y. & Davids, K. (2012). "How does TGfU work?": examining the relationship between learning design in TGfU and a nonlinear pedagogy. *Physical Education and Sport Pedagogy, 17*(4), 331-348. https://doi.org/10.1080/17408989.2011.582486

Tabachnick, B. G. & Fidell, L. S. (2007). *Using Multivariate Statistics.* Pearson.

Timmerman, E. A., Farrow, D. & Savelsbergh, G. J. (2017). The effect of manipulating task constraints on game performance in youth field hockey. *International Journal of Sports Science & Coaching, 12*(5), 588-594. https://doi.org/10.1177/1747954117727659

Valero-Valenzuela, A. & Conde, J. L. (2003). *La iniciación al atletismo a través de los juegos: el enfoque Ludotécnico en el aprendizaje de las disciplinas atléticas.* Aljibe.

Valero-Valenzuela, A., Delgado-Fernández, M. & Conde-Caveda, J. L. (2009). Motivación hacia la práctica del atletismo en la educación primaria en función de dos propuestas de enseñanza/aprendizaje. *Revista de Psicología del Deporte, 18*(2), 123-136.

Valero-Valenzuela, A. & Gómez-Mármol, A. (2013). Basis of ludotechnical model to athletics initiation. *Trances, 5*, 391-410.

Vasconcellos, D., Parker, P. D., Hilland, T., Cinelli, R., Owen, K. B., Kapsal, N., Lee, J., Antczak, D., Ntoumanis, N., Ryan, R. M. & Lonsdale, C. (2020). Self-determination theory applied to physical education: A systematic review and meta-analysis. *Journal of Educational Psychology, 112*(7), 1444–1469. https://doi.org/10.1037/edu0000420

Vansteenkiste, M. & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as an unifying principle. *Journal of Psychotherapy Integration, 23*(3), 263-280. https://doi.org/10.1037/a0032359

Vickers, J. N. (2007). *Perception, Cognition, and Decision Training. The Quiet Eye in Action.* Human Kinetics.

Yupa-Pintado, E. X. & Heredia-León, D. A. (2021). Incidencia del modelo ludotécnico sobre la motivación en la práctica del atletismo. *Revista Arbitrada Interdisciplinaria KOINONIA*, *6*(2), 707-733. https://doi.org/10.35381/r.k.v6i2.1277

Conflict of Interests: No conflict of interest was reported by the authors.