



Motivation Profiles, Perceived Motivational Climate, Coping Perceptions and Anxiety Among Elite Young Ice Hockey Players

Authors' contribution:

- A) conception and design of the study
- B) acquisition of data
- C) analysis and interpretation of data
- D) manuscript preparation
- E) obtaining funding

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Abstract

This study aimed to investigate the relationship between sports motivation and several sports psychological variables (Perceived Motivational Climate, Coping Perceptions and Anxiety). The data were collected from Hungarian ice hockey players (n = 293) playing in the Hungarian hockey academy system, using the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) and the Athletic Coping Skill Inventory-28 (ACSI-28) of Smith et al. (1995) and the Competitive State Anxiety Inventory-2 (CSAI-2) of Martens et al. (1990). The analysis revealed four significantly different individual sports motivation profiles, and these differed significantly in terms of athletes' anxiety, coping, and perceived motivational climate. In addition, the research highlighted the importance of diagnosing and addressing amotivation to improve overall sports performance, self-confidence, and coping skills when facing adversity. Limitations and further research directions are also considered.

Keywords: sports motivation, cluster analysis, psychological factors, ice hockey players, youth sports

Introduction

Great athletes require not only a combination of exceptional skills, natural talent, and peak physical condition, but also a supportive environment, willpower, and mental toughness (Holland et al., 2010). Psychological traits are significant factors that influence athletic performance (Smith & Christensen, 1995). Sports performance and success in sport may be influenced by athletic coping mechanisms, anxiety, and stress, according to sports psychology research (Mahoney et al., 1987). Successful athletes exhibit higher self-esteem and achievement motivation (Ozrudi & Matmask, 2019), self-confidence (Feltz, 2007), and anxiety control (Cox, Zahn & YiJun,

1996), higher task orientation (Dunn & Dunn, 1999) and improved coping skills (Mahoney, 1989). Motivation has been linked to top-tier athletic performance, with athletes' accomplishments frequently attributed to their level of motivation (Williams & Krane, 2001; Gillet et al., 2009, 2012; Roberts et al., 2018).

Relevant scientific studies have covered many sports, but ice hockey is under-represented among them, despite the fact that it is one of the most complex sports (Schulze et al., 2021). Only a few empirical studies have comprehensively assessed competitive anxiety, athletic coping skills, and perceived motivational climate among ice hockey players, although high team performance in team sports such as water polo, volleyball (Géczi, Vincze,

et al., 2009), soccer (Kiss et al., 2015), and ice hockey (Géczi et al., 2022) is contingent upon several of these psychological factors. One study (Géczi, Tóth, et al., 2009) compared these psychological variables among different age groups of Hungarian ice hockey players, while another study compared these psychological characteristics among experienced (adult national team members) and inexperienced (U18 age group of ice hockey players in Hungary) players (Tóth et al., 2010). These studies adopted a variable-centred approach and examined how variables relate to each other across a sample of individuals. Statistical techniques, such as correlation, regression analysis, and analysis of variance, are commonly used in these approaches. The goal of these studies was to understand the general patterns and trends within the entire group rather than focusing on specific subgroups or individual differences. Rather than examining the relationships between variables across the entire sample, by implementing a person-centred approach, the objective of the present study is to identify subgroups or types of individuals within the population based on shared characteristics, emphasizing the diversity and uniqueness of these subgroups, offering a more holistic approach, and revealing patterns that may be overlooked in traditional variable-centred research.

Self-Determination Theory of Motivation

Self-Determination Theory (SDT) (Deci & Ryan, 2000) is a widely recognized and used theoretical framework in psychology that focuses on human motivation and behaviour. Developed by Deci and Ryan in the 1980s, SDT posits that individuals have an innate psychological need for autonomy, competence, and relatedness. These needs drive human motivation, and the theory emphasizes the distinction between Intrinsic Motivation (engaging in an activity for inherent satisfaction) and Extrinsic Motivation (engaging in external rewards or pressures) (Deci & Ryan, 1985). SDT defines motivation regulations as the reasons people engage in certain behaviours (Ryan & Deci, 2007). In the SDT framework, motivation regulations are depicted as existing along a spectrum (Vallerand et al., 1992).

At the highest point on the self-determination continuum lies Intrinsic Motivation, the will to do something because of an inherent inclination or interest. On the other hand, the lowest point on the self-determination continuum is “amotivation”, where individuals lack both intrinsic and extrinsic motivation (Ryan & Deci, 2000) and they dislike the activity. Amotivation can result in various adverse outcomes, such as the potential desire to discontinue participation in sports, as well as the emergence of psychological and physiological issues. Between Amotivation and Intrinsic Motivation is Extrinsic Motivation. People driven by this engage in activities with the intent to attain specific external outcomes. The adjective

‘extrinsic’ refers to the motivation of the behaviour being motivated by the achievement of a goal or external factor. The goal here may be money or other material resources, but it may also be love or appreciation from others, anything that is beyond the action and more or less external to the actor (Vallerand et al., 1992).

Numerous studies employing variable-centred methodologies have explored the different antecedents and consequences of the behavioural regulations identified in SDT in the context of sports (Standage & Ryan, 2020). In the variable-centred approach, the primary focus is on examining the relationships and patterns among individual variables (e.g., traits, behaviours, and attitudes) within a dataset. Researchers typically use statistical techniques, such as correlation analysis, regression analysis, and factor analysis, to explore how variables are related to each other and to understand the overall structure of the data, implying that the results of the sample can be generalized to the population (Hofmans et al., 2020).

The person-centred approach shifts the focus from individual variables to the individuals themselves (Howard & Hoffman, 2018). It seeks to identify groups or clusters of individuals who share similar characteristics or profiles, based on a set of variables. Researchers use techniques such as cluster analysis or latent class analysis to group individuals with similar variable patterns into distinct categories.

A recent development in motivation research, particularly in the context of sports motivation, involves the exploration of person-centred studies. These studies delve into various aspects of motivation through the lens of individual perspectives, focusing on the analysis and comparison of individual motivation profiles. For instance, some athletes may exhibit a state of ‘demotivation,’ characterized by a lack of both extrinsic and intrinsic motivation, while others may demonstrate a high level of motivation, devoid of any indications of amotivation, and marked by substantial intrinsic and extrinsic motivation.

In the field of sports, researchers have been trying for decades to distinguish groups of athletes from different aspects and examine the differences between these groups. Some studies have included commitment profiles (Raedeke, 1997), goal-orientation profiles (Hodge & Petlichkoff, 2000; Cumming et al., 2002), burnout profiles (Sorkkila et al., 2019), and physical competence profiles (Weiss et al., 1997). However, the study of sports motivational profiles is a relatively new approach, with only a few publications (Lemyre et al., 2008; Gillet et al., 2012; Gustafsson et al., 2018). Lemyre et al. (2008) investigated winter sports athletes and two profiles emerged (adaptive and maladaptive), while Gillet et al. (2012) used a sample of marathon runners, and found three motivational profiles (low, moderate, and high motivation). These studies illustrated the advantages of the person-centred approach using cluster analysis or latent profile analysis techniques.

By examining, through cluster analysis, what motivation profiles individuals have and how this relates to their perception of the motivational climate, anxiety, and coping, this paper seeks to contribute to a better understanding of the relationship between sports motivation and several sports psychological variables. The complexity of the instruments used in this study permits a more thorough investigation of the relationships than earlier variable-centred methodologies.

Motivational Climate

One of the theoretical frameworks used most often in motivation research is Achievement Goal Theory (AGT) (Chazan et al., 2022). This posits that in achievement-oriented settings such as sports people differ in how they define success and competence (Sit & Lindner, 2005). These differing meanings of success have implications for how one engages in sports. Depending on the criteria used to assess competence and success, distinct motivational orientations (achievement goals) may manifest themselves. The achievement goals are future-oriented and are viewed as cognitive representations of desired outcomes (Hulleman et al., 2010), and are based on task and ego orientations (J. G. Nicholls, 1989). These orientations are important for coaches searching for motivational factors that may have an influence because, according to recent research, these task and ego orientations are flexible and context-dependent rather than personality traits (Hulleman et al., 2016).

When task oriented, one's perception of ability is self-referenced. Task orientations are associated with individual objectives such as acquiring fresh skills, striving for excellence, resolving challenges, comprehending novel concepts, and enhancing individual performance. These revolve around mastering a task and are, therefore, task-oriented goals, referred to as mastery goals. On the other hand, ego orientation is related to comparison with others, leading to personal goals such as minimising the display of one's vulnerabilities and outperforming others (Gimeno et al., 2005). A primary source of competence and subjective success for an ego-involved individual is beating or doing better than others during a competitive sporting event (J. G. Nicholls, 1984). Ego-oriented goals are often known as performance goals.

A motivational climate refers to the social and environmental factors that influence an individual's motivational orientation and behaviour in a particular setting, such as a sports team (Ames, 1992). It encompasses the attitudes, expectations, and relationships of the people involved, and the structure of the environment itself (Dweck & Leggett, 1988). Motivational climate can be categorised into two main types. In a Task-Involving Climate the emphasis is on personal improvement, effort, and mastery of skills. Athletes are encouraged to develop their abilities and are rewarded for their hard work and improvement. This

climate fosters intrinsic motivation and a love for sports. By contrast, an Ego-Involving Climate places importance on winning, competition, and social comparison. Athletes may feel under pressure to outperform others and earn external rewards. This can lead to extrinsic motivation based on external validation, such as winning or recognition (Seifriz et al., 1992).

The study of athletes' perceptions of motivational climate can be used not only to map athlete motivation and predict performance-related consequence variables but also as a predictor variable for a number of psychological and well-being factors in athletes (Duda, 2001). An athlete's perception of the type of motivational climate can significantly impact their motivation, behaviour, and overall well-being in a given context. Research in various fields, including education, sports psychology, and organisational behaviour, has shown that a mastery-oriented climate tends to foster positive outcomes, including increased intrinsic motivation, greater self-confidence, and a stronger sense of autonomy. On the other hand, a performance-oriented climate can sometimes lead to negative consequences, such as anxiety, fear of failure, and a focus on short-term rather than long-term results.

Coping

The impact of psychological factors on sports performance has been the subject of extensive research (MacNamara et al., 2010; Lochbaum et al., 2022; Pettersen et al., 2022). Mental attributes commonly linked to elite-level sports are typically referred to as mental skills, as emphasised by Lesyk (2005).

An important mental skill is mental hardiness, which was developed in the field of health psychology by Kobasa (1979), who sought to understand why some individuals seem to succeed under stress, while others are more vulnerable to its negative effects. Clough et al. (2002) attempted to explain mental toughness as a set of coping skills that combine to make an individual hardy, that is, able to thrive under pressure. They identified four characteristics underlying hardiness: control (being able to keep emotions in check), commitment (taking an active role in events), challenge (a positive attitude toward change), and confidence (self-belief). Since the beginning of the twenty-first century, there have been multiple definitions of mental toughness (Liew et al., 2019). According to Gucciardi and his colleagues, "mental toughness is a collection of experientially developed and inherent sport-specific and sport-general values, attitudes, emotions, and cognitions that influence the way in which an individual approaches, responds to, and appraises both negatively and positively construed pressures, challenges, and adversities to consistently achieve his or her goals" (Gucciardi et al., 2009, p. 68). Clough and Strycharczyk underline that "mental toughness is a narrow plastic personality trait which ex-

plains in large part how individuals respond differently to the same or similar stressors, pressures, opportunities and challenges... irrespective of prevailing circumstances” (2015, p. 33). Liew et al. (2019, p. 381) suggest that mental toughness is “a broad term that reflects the ability of an athlete to cope effectively with training and competition demands in an effort to remain resilient”.

Mental hardiness is a personality trait that can have a profound impact on how individuals cope with stress (Nicholls et al., 2011). Coping in sports refers to an athlete’s ability to effectively deal with the various stressors, challenges, and pressures they face in their athletic endeavours. It assesses how athletes respond to stress, setbacks, competition-related anxiety, and other factors that may affect athletic performance and well-being. People with high levels of mental hardiness tend to adopt positive coping strategies, view stress as a challenge, and maintain a sense of control and commitment when faced with adversity (Kaiseler et al., 2009). This can lead to better mental and physical health outcomes, and greater resilience in dealing with life challenges.

The ACSI questionnaire typically includes items that assess various aspects of coping, such as problem-focused coping strategies (e.g., goal-setting, planning, and active problem-solving) and emotion-focused coping strategies (e.g., relaxation techniques, positive self-talk, and emotional regulation).

Coping with adversity involves an athlete’s ability to handle and bounce back effectively from challenging situations, setbacks, or unexpected obstacles during their athletic journey. Peaking under pressure evaluates an athlete’s capacity to perform at their best during high-stakes or pressure-filled situations, such as important competitions or critical moments in a game. Goal-setting and mental preparation involve an athlete’s aptitude for setting clear, achievable objectives and developing mental strategies to achieve these goals. Concentration assesses an athlete’s capacity to maintain a high level of focus on the task at hand, whether during training or competition. Freedom from worry evaluates an athlete’s ability to manage and reduce anxiety, stress, or negative thoughts that could hinder performance. Confidence and Achievement Motivation measure an athlete’s self-belief and assurance in their ability to achieve success in their chosen sport. Achievement motivation assesses an athlete’s desire and drive to set and attain challenging goals in their sports. Coachability evaluates an athlete’s receptiveness to coaching, feedback, and ability to apply new techniques or strategies to their performance (Fauzee et al., 2009).

Anxiety

Anxiety is a well-studied topic in the field of sports psychology (Breslin et al., 2022; Hardy et al., 1996) because understanding how anxiety affects athletes and

how they can manage it effectively is a critical area of study (Jarvis, 2006). According to the multidimensional theory of anxiety (Martens et al., 1990), three dimensions of anxiety can be distinguished. The psychological and mental components of anxiety are referred to as cognitive anxiety. Worry, fear, and pessimistic thinking are some of the cognitive or thought-related aspects of anxiety. When someone has cognitive anxiety, their thoughts could race, they might imagine bad things happening, and they might find it difficult to focus. This aspect of anxiety is mostly focused on ideas and mental processes related to anxiety-provoking circumstances.

Somatic anxiety, on the other hand, is associated with physical symptoms and physiological reactions that arise as a result of stress or anxiety (Lane et al., 1999). These bodily symptoms can include a faster heartbeat, perspiration, tense muscles, shaking, and nausea. The physiological “fight or flight” response that the body experiences when it detects a threat or danger is reflected in somatic anxiety.

Self-confidence, often known as self-efficacy, is the third element of Multidimensional Theory of Anxiety (Martens et al., 1990). It deals with a person’s confidence in their own capacity to carry out a specific activity or deal with a specific circumstance. Low self-confidence implies uncertainty and insecurity, whereas high self-confidence indicates strong belief in one’s talent. How people approach and react to events that cause anxiety is greatly influenced by their levels of self-confidence. When compared to people who have less self-confidence, persons with higher self-confidence may feel more capable of handling pressure and may have lower levels of anxiety (Vealey, 2002).

In conclusion, the multidimensional theory of anxiety acknowledges that it is a multidimensional and complex experience that includes cognitive, physical, and self-confidence components. Individuals can benefit from an understanding of these qualities.

The relationship between motivation regulations and anxiety has been widely researched using both variable- and person-centred approaches. In the study by Cox et al. (2013), four profiles of students were identified in a cluster analysis based on autonomous motivation, introjected regulation, external regulation, and anxiety. Peng and Zhang (2021) found that ego- and task-orientations and “goal profile” moderate the relationship between competitive cognitive anxiety and motor performance.

Hypotheses

The following hypotheses were formulated in accordance with the research objectives and based on the previously outlined theoretical underpinning.

H1: Within the three-dimensional space defined by the three components of sports motivation, four different motivational clusters (profiles) of ice hockey players can be identified.

H2: A significant difference is predicted among the clusters' mean values concerning players' perceptions of the Task and Ego motivational climate. Specifically, it is expected that the perception of a Task Climate will be higher, whereas the perception of an Ego Climate will be lower in profiles characterised by high levels of intrinsic motivation.

H3: Substantial differences in the coping strategies employed by players are hypothesised among the clusters, with higher usage of coping anticipated in profiles featuring elevated levels of intrinsic and extrinsic motivation, and reduced amotivation.

H4: Significant differences in anxiety levels among the clusters are anticipated, with higher values expected in profiles characterised by high amotivation levels and low intrinsic or extrinsic motivation levels.

Methodology

Research design

The study was carried out using a quantitative research strategy, which is suitable for testing objective theories using variables that can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures (Creswell, 2009).

Sample characteristics

The sample consisted of Hungarian youth ice hockey players of the state-accredited Hungarian ice-hockey academies, aged 13–33 years. The mean age of the sample was 16.68 years ($SD = 2.53$). The sample size was 293 players (100% male¹); the distribution by age and tactical position is shown in Table 1. Regarding the highest level of ice hockey experience, 49 players (16.7%) were playing in the U14 league, 95 players (32.4%) in the U16 league, 87 players (29.7%) in the U18 league, 40 players (13.7%) in the U21 league, and 22 players in a senior professional league (7.5%).

Table 1. Distribution of the sample by age and position

	N	%
Age		
<15	51	17.4
15-16	96	32.8
17-18	91	31.1
19-21	48	16.4
≥22	7	2.3

¹ Almost only male players are playing in the state-accredited Hungarian ice-hockey academies. Therefore, this is not considered to be a sampling bias

	N	%
Position		
Goalie	37	12.6
Defender	103	35.2
Forward	153	52.2
Total	293	100%

Procedure

The Supervisor of Research Ethics at the Fehérvár Hockey Academy 19 Sport Science Center granted prior ethical permission for this study (FEHA/RE/2022/1) on the basis of a fully completed ethics review questionnaire and the supporting professional documents relating to the submitted request for research ethics approval. Before agreeing to participate, the four state-accredited Hungarian ice-hockey academies were approached by the Fehérvár Hockey Academy 19 Sport Science Center, which provided information about the purpose of the study. The objectives of the study, the confidentiality of the results, and the voluntary nature of participation were all outlined during this process. Then a written invitation letter was sent electronically to the legal representatives of the target group, informing them of the purpose of the research, the procedure and the ethical standards applied. Data were collected using a self-administered online questionnaire. After the invitation was accepted and prior parental informed consent was obtained, the online questionnaire was distributed before mid-week training sessions to the players of the four Hungarian state-accredited ice hockey academies², one Hungarian youth ice hockey club³, and one Hungarian ice hockey academy based in Csíkkarcfalva (Cârța), Romania⁴. The players were provided with a room with internet access (so they could use their mobile phones to access the questionnaire), and a member of the coaching staff (who was present while the players answered the questions, but not interfering with the process) explained the goal of the data collection and the ethical guidelines, as well as the possibility of asking questions or abandoning the task at any time. Data was collected via Google Forms. The completed questionnaires were saved in an Excel file by the computer system and analysed using Microsoft Excel 365 and IBM SPSS 29 software. For each question, only those respondents who had provided complete responses to all the questions featured in the survey were considered.

² Budapest Jégkorong Akadémia (December 2022), Diósgyőri VTK Jégkorong Sportakadémia (January 2023), Fehérvár Jégkorong Akadémia (November-December 2022), Újpesti Jégkorong Akadémia (January 2023)

³ Kárpáti Farkasok Jégkorong Egyesület (October 2022)

⁴ Székelyföldi Jégkorong Akadémia (January 2023)

Instrumentation

The questionnaire had five parts: demographic variables, the Sport Motivation Scale (SMS), Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2), The Athletic Coping Skills Inventory-28 (ACSI-28), and the Competitive State Anxiety Inventory-2 (CSAI-2).

Sport Motivation Scale (SMS)

To measure sports motivation, the Hungarian version (Tsang et al., 2005) of the SMS-28 scale by Pelletier et al. (1995) was used, which consists of 28 reflective questions which the respondent is asked to answer on a seven-point Likert scale according to how much he or she agrees⁵. The SMS-28 instrument (Pelletier et al., 1995) is designed to tap the three aspects of motivation: Intrinsic Motivation, Extrinsic Motivation, and Amotivation; it has seven subscales, each comprising four individual items. The results of the Hungarian study (Tsang et al., 2005) showed the scale to have acceptable reliability (ranging from .69 to .85). The two endpoints were Strongly disagree (1) or Strongly agree (7). Sample question: [I practice sport...] “For the pleasure of discovering new training techniques”. For all subscales, the relevant questions were averaged to produce the variables used for the analysis.

Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2)

The Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) is a tool used to assess the perceived motivational climate within a sports environment (Newton et al., 2000). The PMCSQ-2 helps assess an individual's perception of the motivational climate in their sports context. It specifically focuses on the two main types of motivational climate, providing insights into how the sporting environment may influence an athlete's motivation and behaviour, using a 5-point Likert-type scale.

In the present study, the Hungarian version (Révész et al., 2014) of the 33-item Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) was employed to measure ice hockey players' perceptions of motivational climate in their sporting context. PMCSQ-2 comprises two higher-order factors, specifically, a Task-involving Climate and an Ego-involving Climate, along with six subordinate factors (White et al., 1998). In the Hungarian validation (Révész et al., 2014), both higher-order scales exemplified adequate internal consistency (Task-involving climate, $\alpha = .80$; Ego-involving climate $\alpha = .85$). While the hierarchical factor structure has received some degree of support (Newton et al., 2000), this present study chose to maintain the two higher-order factors – task and ego-involving perceptions of the motivational cli-

mate. Given the numerous questionnaires and subscales used, this decision was driven by the aim of preventing multicollinearity concerns. The subscales were derived by averaging the scores of the responses corresponding to each factor.

Athletic Coping Skills Inventory-28 (ACSI-28)

The Hungarian adaptation (Jelinek, 2000) of the Athletic Coping Skill Inventory-28 (ACSI-28) (Smith et al., 1995) was used to assess ice hockey players' psychological coping. This comprises 28 items answered on a Likert scale that measures seven aspects of sport-specific coping: coping with adversity, performing under pressure, goal-setting and mental preparation, concentration, coachability, confidence and achievement motivation, and freedom from worry.

Participants were asked to rate their frequency of experiencing various situations on a 4-point scale, with “1” indicating almost never and “4” indicating almost always. The subscales were calculated by averaging the corresponding response scores of every factor. The Hungarian questionnaire's (ACSI-28-H) subscales demonstrated good internal consistency in a previous study, ranging between .59 (Confidence and Achievement Motivation) and .84 (Peaking under Pressure) (Tóth et al., 2010).

Competitive State Anxiety Inventory-2 (CSAI-2)

The Hungarian version (Sipos et al., 1999) of the CSAI-2 (R. H. Cox et al., 1998), consisting of 27 items, was used to measure the players' anxiety level. The answers were given on a 4-point scale, ranging from “1” indicating not at all, to “4” meaning very much. The questionnaire's subscales that assess the intensity of cognitive anxiety, somatic anxiety, and self-confidence in sport were created by summing the response scores that correspond to each factor, resulting in intensity scores ranging from 9–36 for each subscale. The subscales reported satisfactory internal consistency in a previous Hungarian study of ice hockey players (Tóth et al., 2010), with alpha coefficients from .80 to .85.

Results

Before embarking on hypothesis testing, it is essential to conduct a Common Method Bias (CMB) test, given that all data for this study were gathered using the same questionnaire at a single point in time (Podsakoff et al., 2003). To test the CMB, the Harman single-factor methodology (Harman, 1976) was applied. This involved a principal component analysis: all the questionnaire questions were grouped into a principal component, and the percentage of information covered by this principal component was checked. In this case, the value was 16.001%,

⁵ Question number 7 was omitted from the final questionnaire after pilot testing.

indicating the absence of a predominant principal component. Consequently, it can be affirmed that Common Method Bias (CMB) is unlikely to influence research outcomes.

The correlation matrix presents a comprehensive view of how different psychological factors interrelate in the context of sports performance. Each variable represents a distinct psychological aspect, and the correlations provide initial insights into how these aspects influence one another, as displayed in Table 4.

Looking at how these phenomena relate to each other, one by one, provides a good starting point to study

more complicated combined effects, i.e. to understand the different motivation profiles through cluster analysis.

The initial step in cluster analysis involved employing hierarchical cluster analysis to identify the optimal number of clusters. To accomplish this, Ward's method was applied, which relies on the square of Euclidean distances. Following this, a line diagram was constructed depicting the coefficients of the final clusters using data from the agglomeration table (Figure 1). This step aimed to determine the appropriate cluster number for future use while also considering the application of the elbow criterion. (Sajtos & Mitev, 2007, pp. 306–307).

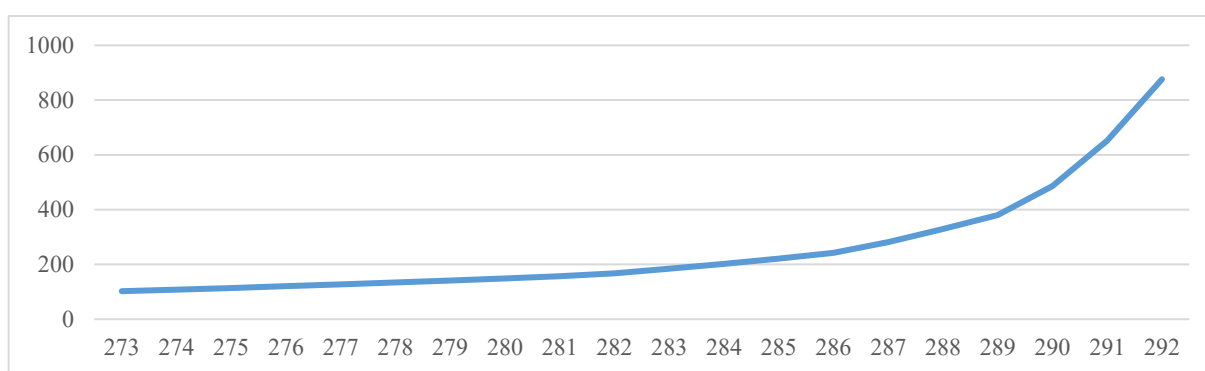


Figure 1. Increase in the coefficient of the agglomeration table

By examining the coefficient values along the vertical axis of the graph, it is evident from the line plot that the coefficient demonstrates a continuous rise, with a notable point of interest on the horizontal axis, where the values undergo a sudden change. On the horizontal axis, starting with the initial sample of 293 elements, after 292 mergers, only one cluster remains, with 291 steps, two clusters emerge, and so forth. Notably, the figure reveals a more pronounced increase in the coefficients around the range of step 288–290, suggesting that

a solution involving three to five clusters appears to be the optimal choice.

Considering the information presented above, k-means cluster analysis was conducted for various cluster numbers. Subsequently, the cross-tabulations were examined and Cramer's V-coefficient (Table 3) was considered to identify the cluster number at which both methods categorised most observations into the same clusters. The three and four cluster solutions showed the same V-value ($V = .87$), the 5 cluster version showed a lower V-value ($V = .76$).

Table 3. Descriptive statistics and correlations of the variables

	M	SD	S	K	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Intrinsic Motivation	5.83	0.93	-0.95	0.81	.92	1	.49**	-.28**	-.05	-.11	.37**	.53**	-.00	.34**	.31**	.39**	.47**	.49**	.31**	.02
2 Extrinsic motivation	4.89	1.13	-0.56	0.21	.87	.49**	1	.10	.08	.11	.20**	.27**	.16**	.22**	.06	.17**	.17**	.24**	.20**	.21**
3 Amotivation	2.69	1.48	0.90	0.13	.81	-.28**	.10	1	.31**	.33**	-.36**	-.24**	.29**	-.12*	-.32**	-.29**	-.26**	-.15*	-.12*	.41**
4 Cognitive Anxiety	17.49	6.00	0.57	-0.24	.88	-.05	.08	.31**	1	.72**	-.43**	-.09	.19**	-.15**	-.36**	-.29**	-.25**	.07	-.25**	.70**
5 Somatic Anxiety	15.27	4.63	0.91	0.65	.79	-.11	.11	.33**	.72**	1	-.43**	-.18**	.23**	-.13*	-.37**	-.21**	-.24**	.03	-.22**	.57**
6 Self Confidence	27.88	5.09	-0.29	-0.58	.85	.37**	.20**	-.36**	-.42**	-.43**	1	.37**	-.09	.45**	.34**	.57**	.56**	.28**	.47**	-.41**
7 Task Climate	4.09	0.55	-0.76	0.16	.85	.52**	.27**	-.24**	-.10	-.18**	.37**	1	-.12*	.30**	.33**	.37**	.42**	.41**	.30**	-.07
8 Ego Climate	2.71	0.67	0.58	0.23	.87	-.00	.16**	.29**	.19**	.23**	-.09	-.12*	1	.02	-.40**	-.09	-.03	.13*	.06	.33**
9 Coping with adversity	2.97	0.58	-0.19	-0.15	.71	.34**	.22**	-.12*	-.15**	-.13*	.45**	.30**	.02	1	.31**	.53**	.49**	.46**	.36**	-.07
10 Coachability	3.28	0.54	-0.47	-0.46	.62	.31**	.06	-.32**	-.36**	-.37**	.34**	.33**	-.40**	.31**	1	.36**	.35**	.15*	.09	-.33**
11 Concentration	3.20	0.53	-0.35	-0.35	.67	.39**	.17**	-.29**	-.29**	-.21**	.57**	.37**	-.09	.53**	.36**	1	.55**	.40**	.41**	-.26**
12 Confidence	3.23	0.53	-0.27	-0.63	.57	.47**	.17**	-.26**	-.25**	-.24**	.56**	.42**	-.03	.49**	.35**	.55**	1	.50**	.43**	-.22**
13 Mental preparation	3.00	0.63	-0.33	-0.48	.72	.49**	.24**	-.15*	.07	.03	.28**	.41**	.13*	.46**	.15*	.40**	.50**	1	.43**	.14*
14 Peaking under pressure	3.16	0.61	-0.46	-0.44	.75	.31**	.20**	-.12*	-.25**	-.22**	.47**	.30**	.05	.36**	.09	.41**	.43**	.43**	1	-.11
15 Worrying	2.35	0.74	0.32	-0.60	.79	.02	.21**	.41**	.70**	.57**	-.41**	-.07	.33**	-.07	-.33**	-.26**	-.22**	.14*	-.11	1

Note: M – Mean; SD – Standard deviation; S – Skewness; K – Kurtosis; * $p < .05$; ** $p < .01$

The V-coefficient suggests a preference for a four-cluster solution. However, it is important to note that this coefficient is not an absolute decision rule, and practical interpretability in cluster analysis holds significance as well. The practical interpretability aspect received strong

validation from the four-cluster solution, particularly when assessing the deviation of each cluster centre (Table 4) from the component mean (Table 5). Consequently, the four-cluster solutions derived using Ward's method were accepted.

Table 4. Each cluster's mean values (cluster centres)

	1	2	3	4
Amotivation	4.23	1.80	1.77	4.57
Intrinsic Motivation	4.93	5.44	6.26	6.52
Extrinsic motivation	4.55	3.41	5.45	5.90

Table 5. Deviation of each cluster's mean values per component from the component mean

	1	2	3	4
Amotivation	1.54	-0.88	-0.91	1.88
Intrinsic Motivation	-0.91	-0.39	0.43	0.69
Extrinsic motivation	-0.35	-1.48	0.56	1.01

The clarity and comprehensibility of the clusters can be significantly enhanced by visualising the above table in a graphic format, following the fundamental concept proposed by Wasti (2005) (Figure 2).

The interpretation and naming of the clusters were determined by examining their component(s) cluster centres in relation to the component averages, identifying instances where these values exceeded or fell below the average. As evident, there exists a specific cluster of re-

spondents whose average scores are notably lower than the component average for both Extrinsic Motivation (EM) and Intrinsic Motivation (IM), yet they substantially surpass the average in terms of Amotivation (AM). This cluster is characterised as having low motivation and is appropriately labelled “DEMOTIVATED.” Conversely, the cluster characterised by scores exceeding the average for all three components can be characterised as displaying a high level of Amotivation (AM), coupled with sub-

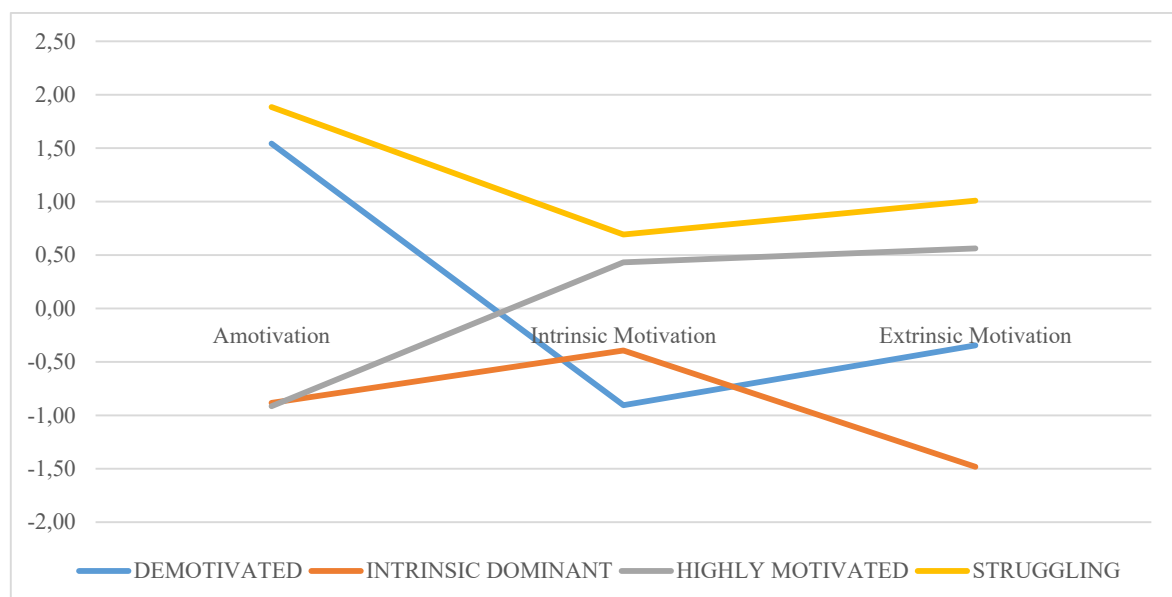


Figure 2. Interpretation of each cluster

stantial Extrinsic Motivation (EM) and a slightly lower degree of Intrinsic Motivation (IM), albeit still above the average. This cluster is appropriately designated as “STRUGGLING.”

Between these two extremes, two additional clusters can be discerned based on whether the three components of Extrinsic Motivation (EM), Intrinsic Motivation (IM), and Amotivation (AM) scored high or low. Consequently, they were designated as follows: INTRINSIC DOMINANT Cluster: In this cluster, only Intrinsic Motivation

(IM) approaches the component average, while the other two components are considerably lower than the average. HIGHLY MOTIVATED Cluster: Within this cluster, both IM and EM exhibit high mean values, while Amotivation (AM) remains low.

The mean values of the newly named and interpreted clusters are presented in Table 6. It is worth noting that the criterion of having all clusters populated with elements has also been satisfied, as outlined by Sajtos and Mitev (2007, p. 307). Consequently, H1 is deemed to be confirmed.

Table 6. Cluster names and cluster centres

	Demotivated	Intrinsic dominant	Highly motivated	Struggling
Amotivation	1.54	-0.88	-0.91	1.88
Intrinsic Motivation	-0.91	-0.39	0.43	0.69
Extrinsic motivation	-0.35	-1.48	0.56	1.01
N	65	60	130	38

To evaluate the second, third and fourth hypothesis, a MANOVA (Multivariate Analysis of Variance) was initially conducted, followed by an ANOVA (Analysis of Variance) test. For a more comprehensive understanding of the underlying methodological concepts, see Somers (2009) and Schutz and Gessaroli (1993).

The results of the MANOVA indicate a statistically significant effect of clusters on the perceived motivational climate dimensions examined in the study (Pillai's Trace = .16; Hotelling's Trace = .18; Wilks' λ = .84, $F(6, 574.00) = 8.47$, $p < .01$). Subsequently, ANOVA analysis was employed to investigate potential significant differences between clusters for each of the perceived motivational climate dimensions. The data (See Table 7) indicate significant variations in perceptions of both Task Climate and Ego Climate among the surveyed groups. The perceptions of a Task Climate (3.85; 3.95; 4.26; 4.18) were more apparent than the perceptions of an Ego Climate (2.87; 2.52; 2.63; 3.02) for all four profiles. In terms of Task Climate, athletes in the HIGHLY MOTIVATED group rated their experiences the highest (4.26), while those in the DEMOTIVATED group rated their experiences the lowest (3.85). The analysis of variance (ANOVA) revealed a significant overall difference ($F = 10.709$; $p < 0.01$), and post hoc tests revealed specific group differentiations. Notably, the DEMOTIVATED (3.85) and INTRINSIC DOMINANT (3.95) groups significantly differed from the HIGHLY MOTIVATED (4.26) group. In the realm of Ego Climate, individuals in the STRUGGLING group rated their experiences higher (3.02) than those in the other groups (2.87; 2.52; 2.63). The ANOVA for Ego Climate yielded a significant result ($F = 6.47$; $p < 0.01$), and post hoc comparisons

highlighted distinct differences between the groups (See Table 7). These results partially support Hypothesis 2.

The differences in the coping strategies employed by players in each cluster were examined using MANOVA as well as ANOVA. The results of the MANOVA suggest a statistically significant effect of clusters on the coping strategies covered by the study (Pillai's Trace = .35; Hotelling's Trace = .42; Wilks' λ = .68, $F(18, 803.76) = 6.51$, $p < .001$). ANOVA results showed significant differences (see Table 7) among the clusters regarding Coping with adversity ($F = 6.64$; $p < 0.01$), Coachability ($F = 10.19$; $p < 0.01$), Concentration ($F = 9.72$; $p < 0.01$), Confidence ($F = 17.35$; $p < 0.01$), Mental preparation ($F = 12.48$; $p < 0.01$), Peaking under pressure ($F = 6.42$; $p < 0.01$), and Worrying ($F = 10.19$; $p < 0.01$), with the DEMOTIVATED profile indicating lower mean values and the HIGHLY MOTIVATED profile showing higher averages, which partially support Hypothesis 3.

The difference of Cognitive Anxiety and Somatic Anxiety means by profile was examined by an ANOVA calculation (CA: $F = 9.155$; $p < 0.01$; SA: $F = 8.447$; $p < 0.01$) and indicates that at least one profile mean value is significantly different from the others (See Table 7). The post hoc test showed that the profiles of the DEMOTIVATED (19.78; 17.09) and the STRUGGLING (20.05; 16.89) had significantly higher means than the INTRINSIC DOMINANT (16.13; 13.88) and the HIGHLY MOTIVATED (16.22; 14.52). ANOVA results revealed significant differences in mean values for Self Confidence among the clusters ($F = 11.86$, $p < 0.01$). Post hoc tests indicated that the DEMOTIVATED cluster had the lowest mean (24.92), while the INTRINSIC DOMINANT (27.67),

Table 7. Comparison of motivation consequences by clusters

	1	2	3	4	F	Post hoc
	Demotivated	Intrinsic dominant	Highly motivated	Struggling		
Task Climate	3.85	3.95	4.26	4.18	10.71**	1<3;4 2<3
Ego Climate	2.87	2.52	2.63	3.02	6.47**	1>2 2;3<4
Coping with adversity	2.78	2.82	3.08	3.14	6.64**	1;2<3;4
Coachability	2.99	3.27	3.43	3.3	10.19**	1<2;3;4
Concentration	2.94	3.14	3.34	3.22	9.72**	1<3;4 2<3
Confidence	2.85	3.27	3.36	3.39	17.35**	1<2;3;4
Mental preparation	2.7	2.82	3.18	3.18	12.48**	1;2<3;4
Peaking under pressure	2.91	3.1	3.28	3.3	6.42**	1<3;4
Worrying	2.61	2.03	2.24	2.77	12.66**	1;4>2;3
Cognitive Anxiety	19.78	16.13	16.22	20.05	9.16**	1;4>2;3
Somatic Anxiety	17.09	13.88	14.52	16.89	8.45**	1;4>2;3
Self Confidence	24.92	27.67	29.51	27.74	11.86**	1<2;3;4

Note: * $p < .05$; ** $p < .01$

HIGHLY MOTIVATED (29.51), and STRUGGLING (27.74) clusters had significantly higher means. For most of the variables the DEMOTIVATED cluster showed significantly different results compared to the HIGHLY MOTIVATED and STRUGGLING clusters. These results partially support Hypothesis 4.

Discussion

This study makes three contributions to the existing body of literature on sports motivation. First, it represents a person-centred approach to identify motivation profiles among ice hockey players. Second, employing this methodology, the analysis revealed the presence of four distinct motivation profiles. These findings underscore the varying compositions of extrinsic and intrinsic motivation, and amotivation among the players. Third, the research indicates that when examining the relationship between motivation and sport psychological factors, it is worth considering the individual combinations of the motivational factors (intrinsic, extrinsic, amotivation) and their relationship with individuals' anxiety, coping, and perceived motivational climate. Each of these contributions is discussed in detail below.

Most published research on the relationship between the variables included in the present study (sport motivation and anxiety, motivational climate or coping) in the context of Hungarian sport is variable-focused, i.e. studies are characterised by examining the relationship between

hypothesised antecedents and consequences by examining specific forms of sports motivation (Benczenleitner et al., 2013; Bollók et al., 2011; Gyömbér, 2018; Kiss et al., 2015; Nagy, 2019; Révész, 2008). As expected, these studies have focused on testing process models using variable-oriented methodologies such as regression analyses and/or ANOVA.

Variable-oriented research does not address the fact that certain athletes may show different patterns across individuals, a potentially interesting area of research that has thus been overlooked. Studying the motivation dimensions in terms of the relative levels of individuals opens up a new perspective by examining the combined effect of each dimension in terms of patterns of certain sports psychological variables; taking all three components into account.

The focus of the research presented in this paper was on the athlete profiles emerging from each dimension of sports motivation in Hungarian ice hockey, which has not been investigated in any study so far. Some of the components of sports motivation may be strongly related to anxiety, perceived motivational climate and coping, which establishes the relevance of the profiles for the study of these phenomena. As a result of this study, four significantly different individual sports motivation profiles were identified. In the first group are the DEMOTIVATED players, who typically show a low level of intrinsic and extrinsic motivation and high level of amotivation – representing 22% of the sample. A cluster of slightly smaller size is the INTRINSIC DOMINANT group (20%), players who have high level of intrinsic motivation. The third cluster is made up of HIGHLY MOTIVATED players,

players who typically have high intrinsic and extrinsic motivation but low level of amotivation, who account for 44% of the sample. The fourth group includes STRUGGLING players, who show a high level of extrinsic and intrinsic motivation, but high level of amotivation at the same time. This group makes up 13% of the sample.

Compared to the Vlachopoulos et al. (2000) classification, which revealed only two motivation profiles, these four profiles distinguish the motivation profiles in a more nuanced manner. In their study, the first profile was the “highly motivated” profile, characterised by both high non-self-determined and high self-determined motivation, and the second was the traditional self-determined profile, characterized by low non-self-determined motivation and high self-determined motivation. The results of the present research partially support the findings of Murcia and colleagues (2007), who identified three profiles based on the results of their cluster analysis: a “self-determined profile” with higher scores on task-involving climate perception and task orientation; a “non-self-determined profile” with higher scores on ego-involving climate perception and ego orientation; and a “low self-determined and low non-self-determined profile”.

Interestingly, two profiles in the sample of the present study showed high levels of amotivation. The profiles identified in person-centred sports motivation studies based on self-determination theory are typically characterised by low or average levels of amotivation (Boiché et al., 2008; Gillet et al., 2009, 2012), possibly with an amotivated group per se (Gustafsson et al., 2018; Lindwall et al., 2017), but a group with high intrinsic motivation and high amotivation (i.e. struggling) is rarely found. This is significant because an athlete profile characterised by both high intrinsic motivation and high amotivation is an intriguing combination, as it suggests a complex motivational landscape. Understanding how these two coexist can shed light on the delicate balance between internal drive and potential external factors hindering motivation. High amotivation might indicate a disconnect between the athlete’s values and the current environment. External pressures, conflicts with other life priorities, or loss of connection with teammates, the coaching staff or the tactics might be also contributing factors. Providing opportunities for the athlete to have a say in their training and clarifying the purpose of certain activities may help align their motivation. Identifying the specific sources of amotivation is crucial for coaches and support staff to address potential barriers and create a more supportive environment.

Conclusions and Recommendations

According to the data, investigating potential patterns and implications of motivation profiles offer valuable

insights to theoretical researchers, coaches and club managers alike.

The profile with high extrinsic and intrinsic motivation exhibits low levels of anxiety and high levels of effective coping mechanisms, which highlights the potential benefit of including both transactional and transformational leadership styles in the coaching toolkit to help support these types of motivations (Welty Peachey & Burton, 2012). Indeed, the findings suggest that what appears to be most advantageous for the players is the coaches’ simultaneous attention to the players’ motivator and hygiene needs (Herzberg, 1987). Coaches should strive to create an environment that fosters intrinsic motivation, allowing players to find personal satisfaction and enjoyment in the sport. Coaches should adapt their coaching styles based on the levels of intrinsic motivation among players. Players with a high level of intrinsic motivation may require more autonomy and decision-making opportunities, while struggling players might benefit from more guidance and structured coaching. Fostering “job crafting” of these players may also be beneficial (Szóts-Kováts & Kiss, 2023).

The AMOTIVATED profile’s high stress level and coping challenges also indicate that bottom-up influences in leadership, which allow followers to affect leadership dynamics (Welty Peachey et al., 2015), may be especially significant when the coach notices signs of amotivation.

Several implications for ice hockey coaches based on the LMX theory, with a focus on dyadic relationships (Bang, 2011; Dansereau et al., 1975), can also be drawn from the data. The data show variations in motivation levels among players, ranging from highly motivated to demotivated. Recognising the unique combination of intrinsic motivation and amotivation calls for an individualised coaching approach. Recognising that LMX theory highlights the significance of dyadic relationships, coaches should focus on building strong and positive relationships with each player. This could involve regular communication, mentorship, and personalised feedback (Sinitsyna et al., 2024). Coaches should work closely with the athlete to understand their preferences, concerns, and aspirations, tailoring training programmes and communication strategies accordingly.

Understanding the levels of cognitive and somatic anxiety is essential (Zanini et al., 2018). Coaches (or sports psychologists) can help players manage anxiety through various techniques such as relaxation exercises, mindfulness, and ensuring a supportive team environment. Building self-confidence is also crucial to improving performance (Feltz, 2007).

The data indicate varying perceptions of task and ego climates. Coaches might consider working on fostering a task-oriented climate that emphasises development, effort, and improvement, and finding a balance with an

ego-oriented climate centred on intra-team rivalry and social comparisons (Iwasaki et al., 2021; Tamás et al., 2024).

Coaches should work with players to enhance their concentration and mental preparation skills. This can be done through specific training and drills, which may help players perform better under pressure (Gelei, 2022). For players who are prone to worrying, coaches can provide techniques for managing stress and anxiety. Encouraging a positive mindset and offering support can also help. Coaches should encourage and reward coachability, which includes a willingness to learn, adapt, and take feedback constructively. Players who are open to coaching are more likely to develop and improve (J. A. Weiss & Merrigan, 2021).

In summary, it could be beneficial for ice hockey coaches to acknowledge and understand the distinct needs and characteristics of their players, fostering positive dyadic relationships while tailoring their coaching approach to individual and team dynamics, avoiding the pitfalls of stereotyping or making attributions based on preconceived notions. This may help create a conducive environment for player development and overall team success (Géczi et al., 2022).

Limitations and Future Directions

It is also important to highlight the limitations of the research presented above. Firstly, this was a cross-sectional study, which inevitably provides only a snapshot. Moreover, players from several clubs were included and specific effects of team culture may have spilled over into the results. The impact of these factors may be worth exploring in future research. Thirdly, the questionnaires used for this study gathered data using pre-defined questions, which may not capture the complexity or nuances of the subject matter adequately, lacking an ability to probe deeper into the context or circumstances surrounding responses, and potentially limiting the understanding of the phenomenon being studied. Future research might consider using a qualitative approach in order to understand the complexities of the examined human experiences, behaviours, and phenomena, especially regarding the STRUGGLING profile. A repeated data collection based on the used questionnaire would enable researchers to track changes and trends over time among young Hungarian elite ice hockey players. Analysing data collected from different countries using the same questionnaire would enable researchers to interpret findings in a broader socio-cultural context.

Ethics Approval and Informed Consent

Permission for this study was granted by the ethical supervisor of the research institution. The study was carried out under license number FEHA/RE/2022/1. The participants of the study gave informed consent for the current research.

Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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