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1 **Predicting Sports Performance from Well-Being:**
2 **A Mapping of Professional Athletes', Amateur Athletes' and Non-Athletes' Positions**

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6 **Abstract**

7 *Introduction:* Prediction of performance and well-being are two essential keys in sports
8 performance.

9 *Objective:* The study aimed to map different positions regarding the way in which individuals
10 integrated mentally five elements of eudaimonic well-being (relatedness, autonomy,
11 competence, mental vitality and physical vitality) for predicting the degree of performance at
12 the beginning of a match.

13 *Method:* Twenty-four non-athletes, 44 amateur athletes and 26 professional athletes indicated
14 their prediction of performance in 32 scenarios constructed from the combination of these
15 elements of well-being. Cluster analysis, ANOVAs, and chi-square test have been done.

16 *Results:* Two positions on prediction of performance were found. The first cluster was called
17 "Sometimes Performance Prediction" and the second cluster was named "Seldom
18 Performance Prediction". The five elements had a positive effect on the prediction of
19 performance. The composition of both clusters was linked to the level of involvement in
20 sport.

21 *Conclusion:* Offering athletes a "well-being environment" may lead to predict the sports
22 performance.

23

24 *Keywords:* Mapping, sports performance prediction, psychological needs, subjective vitality

Prédire la performance sportive à partir du bien-être :**Une cartographie des positions chez les sportifs professionnels, les sportifs amateurs et les non-sportifs**

Résumé

Introduction : La prédiction de la performance et le bien-être sont deux clés essentielles de la performance sportive.

Objectif : L'objectif de la présente étude était de cartographier différentes positions caractérisant la façon dont les individus intègrent mentalement 5 éléments du bien-être subjectifs (affiliation sociale, autonomie, compétence, vitalité mentale, et vitalité physique) pour prédire le degré de performance en début de rencontre sportive.

Méthode : Vingt-quatre non-sportifs, 44 sportifs amateurs et 26 sportifs professionnels ont indiqué leur jugement dans 32 scénarios construits à partir du croisement de ces 5 éléments de bien-être. Une analyse en cluster, des ANOVAs et un χ^2 ont été effectués.

Résultats : Deux positions de prédiction de performance ont été trouvées. Le premier cluster a été appelé « Prédiction Quelquefois Performant » et le second cluster a été nommé « Prédiction Rarement Performant ». Les 5 éléments du bien-être ont eu un effet positif sur la prédiction de la performance. La composition des deux clusters est associée au niveau d'implication sportive.

Conclusion : Mettre les sportifs dans un « environnement de bien-être » semble favoriser la performance.

Mots clés : cartographie, prédiction de la performance sportive, besoins psychologiques, vitalité subjective

Predicting Sports Performance from Psychological Needs and Subjective Vitality:

A Mapping of Professional Athletes', Amateur Athletes' and Non-Athletes' Positions

Prediction of performance (i.e., judging what will the performance) and well-being are essential elements in sports performance. Well-being may help athletes to be performing optimally (e.g., Lunqvist, 2011). Judging the performance of others is a prevalent task for sports actors (players, coach, and spectators) and refers to a subjective individual estimation of the performance (Plessner & Harr, 2009). For example, a coach could assess the abilities of a player to perform in order to select him at the beginning of match or a supporter could estimate the possible performance of a player in observing him during the warm-up session. The present study aims to map different positions regarding the way in which the judgment of performance in sport may be inferred by antecedents and indicators of well-being in using the theory of integration of information (Anderson, 2008).

Integration of information: Mapping judgment and judgment of performance

Judgment of performance in the sports domain may be explained by the integration of information (see, Plessner & Harr, 2009). In sports psychology, a scientific method for examining the process of integration of information is to use the theoretical framework of integration of information (Rulence-Pâques et al., 2005a; Zarrouk & Fruchart, 2021).

The theory of integration of information (Anderson 1996, 2008) focuses on the integration processes by which various information cues are integrated into a global judgment. So, it aims to highlight the cognitive psychological laws of the treatment and the integration of several stimuli. The goal is to discover what operations of cognitive algebra persons use to process information in different situations. This cognitive algebra, dominated by additive, disjunctive, and conjunctive models, is not concerned with the actual stimuli but with their psychological consideration or subjective values that the subject gives them (for illustration in sport, see Rulence-Pâques et al., 2005b). This trend assumes that all perception,

thought or action is goal oriented and depends on the integration of different information cues.

According to Anderson (1996), when an individual integrates information to make a final judgment, a field of external stimuli undergoes three successive operations that are carried out for the purposes of the person: (1) a valuation operation that transforms stimuli into subjective representations; (2) an integration operation that transforms these subjective representations into internal responses; (3) an action operation that transforms internal responses into observable responses. Often it entails selecting a level along a scale of judgment.

The theory of information integration is a cognitive approach that has been applied in a wide range of domains in psychology (Fruchart & Kpanake, 2021), such as health (Ahmed et al., 2021; Ficty & Teisseyre, 2021; Fraux et al., 2021; Lochmann & Guedj, 2021; Teodorescu et al., 2021), economics (Pereira & Oliveira, 2021), intuitive physics (Masin et al., 2021; Vicovaro, 2021) and sport (Fruchart et al., 2010; Zarrouk & Fruchart, 2021). It was already considered to map various positions of judgment in the sports domain (e.g., Fruchart & Rulence-Pâques, 2014) and to investigate the judgment of performance in sport (Dru et al., 2004, 2008; Surber, 1981). Fruchart and Rulence-Pâques (2014) mapped professional athletes, amateur athletes, and non-athletes' positions on forgiving an aggressor in sport under various circumstances. They mapped various views of moral judgment regarding the mental processes by which the participants combined five different information cues (consequences of an act of aggression, current score, time left to play, context of the act of aggression and importance of the game). Two moral positions were identified. For 60% of the participants, violently pushing an opponent was considered as practically never condonable. For 40% of the participants, this behaviour was sometimes condonable. Both positions on moral judgment were observed according to the involvement in the practice of sport. Professional

handball players, more frequently than lay people or amateurs, supported the view that pushing an opponent can sometimes be condonable. Lay people and amateurs did not differentiate their judgment and estimated that violently pushing an opponent when he is in the goal zone is as practically never condonable.

In the same way, Fruchart et al. (2020) showed different ethical positions in judgment of acceptability of a coach's decision to select (or not) an injured athlete before a competition among non-athletes, amateur athletes, and professional athletes. Also, these different positions were linked with the involvement in sport. On the contrary, in judgment of acceptability to use a nutritional supplement in sport, the different ethical positions identified were not associated with the level of involvement in sport (Fruchart et al., 2019). These investigations showed the important place of the theory of information integration (Anderson, 2008) in mapping judgment in sport and underlined that moral judgment may differ according to the involvement in sport. However, given the divergence of findings about the link between the level of involvement in sport and various positions of judgment in sport, it is necessary to pursue these works in exploring other kinds of process of judgment such as prediction of performance.

To understand the cognitive process of judgment of performance in sport, Dru et al. (2004, 2008) investigated the way people perceive the relationship between performance level, capacity level and degree of motivation in situations in which two athletes confront or collaborate with one another. Surber (1981) showed individual differences in weighting of ability and effort information in judging performance. So, the judgment of performance may vary from one person to another. The interest of our study is to map different positions on prediction of performance in sport according to the manner in which people combine various elements of the eudaimonic well-being. Indeed, this approach has never been applied to understand the relationship between performance level and elements of the eudaimonic well-

being.

Eudaimonic well-being

The eudaimonic approach is often applied to investigate the well-being in a sports domain (e.g., Reinboth et al. 2004). It focuses on meaning and self-realization and defines well-being in terms of the degree to which a person is fully functioning (Waterman, 1993). The psychological needs and subjective vitality are two elements in studying the eudaimonic well-being (e.g., Mack et al., 2011).

The psychological needs are antecedents of well-being (e.g., Mack et al., 2011). They are based on the self-determination theory that postulates the existence of innate psychological needs for relatedness, autonomy, and competence (Deci & Ryan, 2002). Relatedness concerns the need to feel significantly connected with others, to be satisfied by your relations with others (Baumeister & Leary, 1995). Autonomy refers to the need to regulate one's action or to be the origin of one's own actions (de Charms, 1968). Competence reflects the need for feeling proficient in dealing with optimal challenges presented within one's social environment when an individual has the opportunity to use his abilities (Connell & Wellborn, 1991). This approach asserts that when needs are satisfied, well-being is enhanced, and when they are limited, there is a negative impact on one's ability to function well (Deci & Ryan, 2008). In relation with performance, Baard, Deci, and Ryan (2004) showed that individuals' psychological needs have been positively linked to performance in the workplace.

Various studies showed that the satisfaction of psychological needs had a central role with regard to performance in different sports: soccer (Adie et al., 2012; Cheval et al., 2017; Verner-Filion et al. 2017; Verner-Filion & Vallerand, 2018), hockey (Verner-Filion et al., 2017), dance (Quested et al., 2013), ski (Stenling et al., 2015). In volley-ball, Claver et al. (2015) studied the level of prediction of relatedness, autonomy, and competence on

performance in game actions. They demonstrated that psychological needs acted as predictors of performance in high-level players contrary to in low-level players.

The subjective vitality is defined by a positive feeling of being alive and a positive feeling of having energy (e.g., Ryan & Frederick, 1997). It shows the degree to which individuals feel physically and mentally vigorous and alert while practising their physical activity (Reinboth & Duda, 2006). It was often used as an indicator of well-being (e.g., Mack et al. 2011; Reinboth et al., 2004) and is positively correlated to performance in different domains (for review, see Lavrusheva, 2020) such as in work (Dubreuil et al., 2014) and in sport (Adi et al., 2008; Li, 2010; Salama-Younes, 2011).

Recently, the psychological needs and the subjective vitality were used to map various view in judgment of well-being (Fruchart & Rulence-Pâques, 2021). Two different views on judgment of well-being were found and the psychological needs and the subjective vitality had a positive impact on the judgment of well-being. These elements of well-being were shown to be essential for understanding well-being and performance in sports contexts (e.g., Stenling et al., 2015). Yet, researchers are encouraged to investigate the role of well-being in performance in order to improve continued progress in this research field (Lunqvist, 2011). For illustration, no investigation has been made on the manner in which the psychological needs and the vitality subjective are combined mentally by individuals for judging performance in sport.

The present study

The present study aimed to map different views regarding the way in which professional athletes, amateur athletes and non-athletes integrate the psychological needs and the vitality subjective for predicting (i.e., judging what will be) the athlete's performance at the beginning of match. The beginning of match refers to the first moment of confrontation between opponent teams and carries unique psychological features which may determine

performance (e.g., Marcelino et al., 2012). We suggested three hypotheses. The first hypothesis is based on different positions of judgment that were found through the use of the theory of integration of information in moral judgment in sport (e.g., Fruchart & Rulence-Pâques, 2014; Fruchart et al., 2019; Fruchart et al., 2020) and Surber (1981)'s findings about judgment of performance. We expected to find two different individual positions of prediction of performance (Hypothesis 1): The participants of the first position would view the athlete's performance as sometimes efficient at the beginning of the match according to his psychological needs and his vitality described. The participants of the second position would view the athlete's performance as seldom efficient at the beginning of the match according to his psychological needs and his vitality described (Fruchart & Rulence-Paques, 2014).

To confirm the positive effect of well-being on the sports performance (for a review, Lunqvist, 2011), we expected (Hypothesis 2) that the five information cues (autonomy, relatedness, competence, mental vitality, and physical vitality) would all have a significant positive effect on the prediction of performance in each cluster.

We expected that the composition of cluster made from the first hypothesis and the level of involvement in sport would be linked too (Hypothesis 3). More than amateur athletes and non-athletes, professional athletes would consider players to be efficient at the beginning of the match. Professionals are immersed in performance context and they are aware of the positive impact of well-being in performance (see Lunqvist, 2011). This could confirm the difference of judgment in sport between amateurs and non-athletes on the one hand and professional athletes on the other hand (e.g., Fruchart & Rulence-Pâques, 2014).

Method

Participants

Participants were 94 male French persons ($M_{age} = 22.82$, $SD = 4.28$). Forty-four ($M_{age} = 20.80$, $SD = 3.20$) were amateur athletes who trained at least three times a week, 26 were professional athletes ($M_{age} = 23.50$, $SD = 5.40$) who trained eight or nine times a week, and 24 were non-athletes ($M_{age} = 24.17$, $SD = 3.16$). They were all unpaid volunteers. The study was explained and they were asked to participate. If they agreed, we arranged an appointment.

Material

In accordance with Anderson's methodology (Anderson, 1996), the material consisted of 32 cards. Each card contained a hypothetical story, a question and a response scale. These 32 stories were built from the combinations of five within-subject factors. Three factors arose from the basic needs theory (Ryan & Deci, 2001): the relatedness (no relatedness or relatedness), the competence (no competence or competence), and the autonomy (no autonomy or autonomy). Two factors were drawn from subjective vitality (Ryan & Frederick, 1997): the mental vitality (the athlete has not felt mentally sharp or he has felt mentally sharp), and the physical vitality (the athlete has not energy or he has energy). All combinations of these factors yielded $2 \times 2 \times 2 \times 2 \times 2 = 32$ scenarios (see Annexe 1). An example of scenario was: "Judeson is a handball player and he warms up before a match. **Judeson feels he is part of the team because he maintains good relations with his teammates and his coach.** Judeson **does not feel competent** while training during the week before the match. During the coach's briefing before the match, Judeson **learns that he must follow the coach's instructions exactly.** During the warm-up session, Judeson **has felt mentally sharp** and he **has not energy**. The question was "to what extent do you think that Judeson will be efficient at the beginning of match?". Under each scenario was an eleven-points response scale with "*not at all sure*" indicated on the left and "*completely sure*" indicated on the right.

Procedure

The present study followed the ethical tenets of the Declaration of Helsinki and the ethical standard of the local institution. After obtaining the coach's consent, amateur and professional athletes were recruited in training centre, and tested individually before training. Testing took place in a quiet room in the club house for amateur athletes and in a team room for professional athletes. Non-athletes were recruited in the street and testing took place in a classroom. Participants were instructed to read the scenarios (presented one at a time in random order) describing a player who warms up before a match, and to rate along the response scale the degree to which they estimate that this player will be efficient at the beginning of the match. There were two phases: a familiarization phase and an experimental phase (see Anderson, 2008). In the familiarization phase the experimenter explained the procedure to each participant individually. During this phase, participants were presented with six scenarios from the set of 32. The choice of these scenarios was guided so as to expose participants to the full range of stimuli. The purpose of this phase was to make participants as familiar as possible with the test material and the task (Anderson, 2008). Each story was read and participants provided their ratings. During the second or experimental phase, participants were presented with the whole set of 32 scenarios. They provided their ratings at their own pace. The whole session lasted about 30 minutes.

Data analysis

Each rating by each participant from the experimental phase was converted to a numerical value expressing the distance (number of points, from 0 to 10) between the left anchor, serving as the origin and the point which has been checked on the response scale by the participant. These numerical values were then subjected to graphical and statistical analyses. We conducted a two-step cluster analysis (see Fruchart & Rulence-Pâques, 2016). Firstly, a hierarchical method using Ward's method of linkage with the squared Euclidian

distance measure was performed to define the number of clusters. Secondly, we used the *k*-means (Euclidians distances) procedure to actually form the clusters in specifying the initial cluster centres in *k*-mean clustering from a priori cluster centres identified in the hierarchical method. Finally, separate ANOVAs were performed on the data of each cluster and Pearson's chi-square tests were conducted.

Results

The results of the hierarchical cluster analysis suggested the tenability of a two-cluster solution ($K = 2$). The ANOVA with the cluster membership and information cues as independent variables, and the judgment ratings as dependent variables showed that Cluster variable is significant, $F(1, 92) = 127.87, p < .001, \eta^2_p = .58$. This finding confirmed its tenability.

Figure 1 and Figure 2 present both clusters. The Figure 1 shows combined effect of physical vitality and mental vitality on predictions of performance in both clusters. Each panel corresponds to one cluster. The mean ratings of performance prediction are on the y-axis. The two levels of mental vitality are on the x-axis. Each curve corresponds to one level of the physical vitality factor. Figure 2 shows the estimated mean of performance prediction for each variable for each cluster.

Insert Figure 1 and Figure 2

Cluster 1 ($n = 60$) was termed "Sometimes Performance Prediction" since the mean response was slightly above of the scale ($M = 5.50, SD = 0.04$). It is shown in the left panel of the Figure 1. The curves are separate, which indicates an effect of physical vitality. The curves slope clearly, which indicates an effect of mental vitality. The parallelism of the curves shows that the integration law was additive. The Mental Vitality \times Physical Vitality interaction was not significant, $F(1, 59) = 4.662, p < .03, \eta^2_p = .07$ ($p < .001$ is significant). The results with effect sizes and margins of error are shown in Table 1.

Cluster 2 ($n = 34$) was termed “Seldom Performance Prediction” since the mean response was in the bottom of the scale ($M = 3.92$, $SD = 0.09$). It is shown in the right panels of the Figure 1. The slope of the curves is ascendant, which indicates the effect of the mental vitality. The curves are parallel but less separate than they are in the cluster 1, which shows a lesser effect of the physical vitality. In the right panel, the curves are parallel. The people in Cluster 2 applied an additive rule to judge performance. The Mental Vitality \times Physical Vitality interaction was not significant, $F(1, 33) = 20.957$, $p < .03$, $\eta^2_p = .13$ ($p < .001$ is significant).

The results with effect sizes and margins of error are shown in Table 1 too. The five within-subject factors were all statistically significant in both clusters. In both clusters, the higher the relatedness, the higher the performance was predicted. The higher the competence, the higher the performance was estimated. The higher the autonomy, the higher the performance was assessed. The stronger the physical vitality, the higher the performance was predicted. The stronger the mental vitality, the higher the performance was estimated.

Insert Table 1

In cluster 1, the effect sizes were observed in decreasing order: Competence, Physical Vitality, Relatedness, Mental Vitality, and Autonomy. In cluster 2, the effect sizes were observed in decreasing order: Mental Vitality, Physical Vitality, Competence, Relatedness, and Autonomy.

Table 2 shows the composition of each cluster in terms of participants' involvement in sport. The 3 (non-athletes/amateur athletes/professional athletes) \times 2 (Clusters) Pearson's chi-square test was significant, $\chi^2(2) = 31.061$, $p < .001$. In order to depict where specifically there are significant differences in the cluster compositions in this Pearson's chi-square test, we used the Marascuilo's post-hoc multiple proportion comparisons. The 2 (non-athletes/amateur athletes) \times 2 (cluster 1-cluster 2) Marsacuilo's chi-square test was

significant, $\chi^2 (1) = 41.68, p < .001$. The 2 (non-athletes/professional athletes) \times 2 (cluster 1-cluster 2) Marsaculo's chi-square test was significant, $\chi^2 (1) = 34.94, p < .001$. The first cluster was significantly made up of the professional athletes (81%), then of the amateur athletes (80%) and then of the non-athletes (17%). The second cluster was significantly made up of the non-athletes (83%) and the amateurs (20%) then of the professional athletes (19%).

Insert Table 2

Discussion

The aim of our study was to discover various positions of prediction of performance regarding the way in which individuals, who are differently involved in the practice of sport, combine five elements of eudaimonic well-being to judge what will be sports performance at the beginning of match. Our study addressed three expectations.

The first hypothesis was that two different individual positions of prediction of performance would be identified (Fruchart & Rulence-Pâques, 2014; Surber, 1981). In a first position, the participants would view the athlete's performance as sometimes efficient at the beginning of the match according to his psychological needs and his vitality described. In a second position, the participants would view the athlete's performance as seldom efficient at the beginning of the match according to his psychological needs and his vitality described (Fruchart & Rulence-Paques, 2014). This was confirmed because two clusters have been highlighted. The members of the first cluster predicted that the athlete will be sometimes efficient and the members of the cluster 2 predicted that the athlete will be seldom efficient. The same cognitive laws have been developed by members of both clusters. The members of the two clusters integrated information cues in an additive way (i.e., the curves are parallel). The following equation may be written: $f(\text{Performance}) = \text{Mental Vitality} + \text{Physical Vitality}$. However, both clusters differed according to various characteristics (e.g., Rulence-Pâques et

al., 2005a): (1) the order of importance given to 5 factors for predicting the performance. The members of cluster 1 estimated that the competence is the primordial factor for estimating their degree of performance, followed by the physical vitality, the relatedness, the mental vitality, and the autonomy. The members of cluster 2 judged that the mental vitality is the primordial factor for estimating the level of performance, followed by the physical vitality, the competence, the relatedness, and the autonomy. (2) Whatever factor is taken into consideration, except the mental vitality, its impact on the judgment of performance is more important for the members of cluster 1 than for the members of cluster 2. This finding confirms that there are individual differences in predicting sports performance (Surber, 1981). These differences can be seen by implementing clustering procedures (Hofmans & Mullet, 2013) and the theory of integration of information (Anderson, 2008).

The second hypothesis was that the five information cues (autonomy, relatedness, competence, mental vitality, and physical vitality) would all have a significant positive effect on the prediction of performance in each cluster. It was supported by the data. When the autonomy was present, when the relatedness was current, when the competence was strong, when the mental vitality was good, and when the physical vitality was good, the participants predicted the level of performance higher than when the autonomy was not present, when the relatedness was not current, when the competence was not strong, when the mental vitality was not good, and when the physical vitality was not good. The three psychological needs and both components of subjective vitality, the physical element and the mental element, had a positive effect on the prediction of performance. This outcome completes prior investigations that demonstrated the central importance of well-being in sports performance (e.g., Lunqvist, 2011). The antecedents of eudaimonic well-being, i.e. the psychological needs, have an impact on the judgment of performance (Adie et al., 2012; Cheval et al., 2017; Claver et al., 2015; Quested et al., 2013; Stenling et al., 2015; Verner-Filion et al. 2017;

Verner-Filion & Vallerand, 2018). The subjective vitality is not only a marker of well-being (e.g., Mack et al. 2011) but an antecedent of performance too (Adi et al., 2008; Li, 2010; Salama-Younes, 2011).

The third hypothesis was that these different positions of prediction of performance made from the first hypothesis would be linked to the level of participants' involvement in sport (Fruchart & Rulence-Pâques, 2014). More than amateur athletes and non-athletes, professional athletes would consider players to be more efficient at the beginning of the match. This hypothesis is partially confirmed. The composition of both clusters was linked to the level of participants' involvement in sport. Compared to non-athletes (17%), cluster 1 included the highest number of amateur (80%) and professional athletes (81%). So, the majority of amateurs and professional athletes predicted the performance in the same manner. The percentage of the non-athletes (83%) in the cluster 2 was higher than the percentage of the amateurs (20%) and professional players (19%). Compared to amateur and professional athletes, cluster 2 included the highest number of non-athletes.

Nevertheless, professionals did not predict that the player will be more efficient at the beginning of the match than amateur athletes and non-athletes. Here, non-athletes on the one hand and amateur/professional players on the other hand did not combine the elements of eudaimonic well-being in an identical way to judge the performance. This finding confirms that individual differences may be observed according to the level of involvement in the practice of sport but it disconfirms the difference of judgment between amateur and non-athletes on the one hand and professionals on the other hand (Fruchart & Rulence-Pâques, 2014). Professional athletes and amateurs more frequently than non-athletes supported the view that well-being is important for predicting the performance in sport. Sports participation alone (and not the level of practice) has apparently an effect on the prediction of performance from elements of well-being. It would be necessary to practice sport to consider the

importance of well-being in performing in sport.

However, we can identify certain weaknesses in our investigation. Firstly, although Fruchart and Rulence-Pâques (2021) specified that the psychological needs and subjective vitality were antecedents of judgment well-being, we did not confirm that. To rectify this omission, we could reproduce this research in order to confirm our first findings and furthermore to control the link between the judgment of performance and the judgment of well-being too. We could insert a dependant variable, i.e., judgment of global well-being, in our experimental design. Secondly, we regret the lack of consideration shown in certain antecedents of eudaimonic well-being which could influence the prediction of performance, such as the social variables (e.g., Gagné et al., 2003). Thirdly, we were only interested in elements of eudaimonic well-being. We could envisage the effect of elements of hedonic well-being such as, the experience of affects (Diener, 2009). To address both of the last two critics, we intend to use the integrated model of sport-related well-being (Lunqvist, 2011). These limitations could be considered in future studies.

In view of our findings, it is important to continue to determine the factors or the combination of factors that may bring judgment of well-being or performance. It would be necessary to conduct research into highlighting how the judgment of performance and judgment of well-being build cognitively because they are both the mainstay of competitive sports (Plessner & Harr, 2006; Lunqvist, 2011). This type of study can help specialists in sports performance to understand the link between well-being and performance. It permits them to create a “well-being environment” that may be favourable to predict the performance on basing their intervention on the combination of multiple elements of well-being.

In practical terms, coaches could ensure athletes’ autonomy such as offering opportunities for athletes to develop initiative (e.g., give athletes responsibility for organizing the warm-up). They could help athletes to develop feelings of competence (e.g., positive

feedbacks on athletes' abilities) and provide opportunities for athletes to be connected to other teammates (e.g., by organizing team building session). Furthermore, they could provide opportunities to the athletes to develop a subjective vitality (e.g., by helping athletes to remove from their mind different negative feelings, by teaching athletes to focus on competition and performance, or by making athletes sensitive to the importance of a good preparation before competition). Such a well-being environment allows athletes to predict that they will be efficient at the beginning of a sporting event.

References

- Adie, J. W., Duda, J. L., & Ntoumanis, N. (2008). Autonomy support, basic need satisfaction and the optimal functioning of adult male and female sport participants: A test of basic needs theory. *Motivation and Emotion, 32*(3), 189-199. <https://doi.org/10.1007/s11031-008-9095-z>
- Adie, J. W., Duda, J. L., & Ntoumanis, N. (2012). Perceived coach-autonomy support, basic need satisfaction and the well- and ill-being of elite youth soccer players: A longitudinal investigation. *Psychology of Sport and Exercise, 13*, 51-59. <https://doi.org/10.1016/j.psychsport.2011.07.008>.
- Aldenderfer, M. S., & Blashfield, R. K. (1984). *Cluster Analysis*. Sage Press.
- Ahmed, R. A., Guedj, M., & Mullet, E. (2021). Is it acceptable for a physician to break confidentiality in the case of sexually transmitted diseases? A mapping of young Kuwaiti's views. *European Review of Applied Psychology, 71*(5), 100648. <https://doi.org/10.1016/j.erap.2021.100648>
- Anderson, N. H. (1996). *A functional theory of cognition*. Lawrence Erlbaum.
- Anderson, N. H. (2008). *Unified social cognition*. Psychology Press.
- Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology, 34*, 2045-2068. <https://doi.org/10.1111/j.1559-1816.2004.tb02690.x>
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachment as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529. <https://doi.org/10.1037/0033-2909.117.3.497>
- de Charms, R. C. (1968). *Personal causation: The internal affective determinants of behavior*. Academic Press.
- Cheval, B., Chalabaev, A., Quested, E., Courvoisier, D. S., & Sarrazin, P. (2017). How

perceived autonomy support and controlling coach behaviors are related to well- and ill-being in elite soccer players: A within- person changes and between-person differences analysis. *Psychology of Sport and Exercise*, 28, 68-77.

<https://doi.org/10.1016/j.psychsport.2016.10.006>.

Claver, F., Jiménez, R., Conejero, M., García-González, L., & Moreno, M. P. (2015).

Cognitive and motivational variable as predictors of performance in game actions in young volleyball players. *European Journal of Human Movement*, 35, 68-84.

Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy, and relatedness: a

motivational analysis of self-esteem processes. In M. R. Gunnar, & L. A. Sroufe (Eds.), *The Minnesota symposium on child psychology. Self-processes in development*, Vol. 22 (pp. 43–77). Erlbaum.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. The University of Rochester Press.

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, 49, 14-23.

<https://doi.org/10.1037/0708-5591.49.1.14>

Diener, E. (2009). Subjective well-being. In E. Diener (Ed.), *Social Indicators of Research Series. The science of well-being* (Vol. 37, pp. 11-58). Springer Science Business Media B.V.

Dru, V., Rulence-Pâques, P., & Mullet, E. (2008). Players' quality of play and overall interest of the game in dyadic competition. *American Journal of Psychology*, 121, 17-33.

<https://doi.org/10.2307/20445441>

Dru, V., Rulence-Pâques, P., & Mullet, E. (2004). Performance schemata in dyadic competition and cooperation. *American Journal of Psychology*, 117, 479-496.

<https://doi.org/10.2307/4148987>

- Dubreuil, P., Forest, J., & Courcy, F. (2014). From strengths use to work performance: The role of harmonious passion, subjective vitality, and concentration. *The Journal of Positive Psychology, 9*, 335-349. <https://doi.org/10.1080/17439760.2014.898318>
- Ficty, M., & Teisseyre, N. (2021). The acceptability of prophylactic mastectomy among lay people and health professionals: A pilot study. *European Review of Applied Psychology, 71*(5), 100714. <https://doi.org/10.1016/j.erap.2021.100714>
- Fraux, C., Muñoz Sastre, M. T., & Mullet, E. (2021). Mapping people's positions regarding the acceptability of somatic gene therapy. *European Review of Applied Psychology, 71*(5), 100688. <https://doi.org/10.1016/j.erap.2021.100688>
- Fruchart, E., & Kpanake, L. (2021). Functional measurement and information integration theory: an applied psychology. *European Review of Applied Psychology, 71*(5). <https://doi.org/10.1016/j.erap.2021.100717>
- Fruchart, E., Pâques, P., & Mullet, E. (2010). Decision making in basketball and handball games: A developmental perspective. *European Review of Applied Psychology, 60*, 27-34. <https://doi.org/10.1016/j.erap.2009.10.003>
- Fruchart, E., & Rulence-Pâques, P. (2014). Condoning aggressive behaviour in sport: A comparison between professional handball players, amateur players, and lay people. *Psicológica, 35*, 585-600.
- Fruchart, E., & Rulence-Pâques, P. (2016). Condoning aggressive behaviour in sport: a cross sectional research in few consecutive age categories. *Journal of Moral Education, 45*, 87-103. <https://doi.org/10.1080/03057240.2015.1124381>
- Fruchart, E., & Rulence-Pâques, P. (2021). Mapping judgment of well-being in sport. *International Journal of Sport and Exercise Psychology, 19*(4), 488-503. <https://doi.org/10.1080/1612197X.2020.1717577>
- Fruchart, E., Rulence-Pâques, P., & Cantisano, N. (2020). Mapping ethical positions with

- regard to a coach's decision to select (or not) an injured athlete. *International Journal of Sports Science and Coaching*. <https://doi.org/10.1177/1747954120925593>.
- Fruchart, E., Rulence-Pâques, P., & Mullet, E. (2019). Mapping adults' and young athletes' views regarding how acceptable it is to use a nutritional supplement in sport. *International Journal of Sport and Exercise Psychology*, *17*(5), 477-492. <https://doi.org/10.1080/1612197X.2017.1367952>
- Gagné, M., Ryan, R. M., & Bargmann, K. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology*, *15*, 372-390. <https://doi.org/10.1080/714044203>
- Hofmans, J., & Mullet, E. (2013). Towards unveiling individual differences in different stages of information processing: A clustering-based approach. *Quality and Quantity*, *47*, 455-464. <https://doi.org/10.1007/s11135-011-9529-7>
- Lavrusheva, O. (2020). The concept of vitality. Review of the vitality-related research domain. *New Ideas in Psychology*, *56*. <https://doi.org/10.1016/j.newideapsych.2019.100752>
- Li, C.-C. (2010). Predicting subjective vitality and performance in sport: The role of passion and achievement goals. *Perceptual and Motor Skills*, *3*, 1029-1047. <https://doi.org/10.2466/05.06.07.14.PMS.110.C.1029-1047>
- Lochmann, M., & Guedj, M. (2021). Under what conditions do lay people and health professionals accept a breach of doctor-patient confidentiality regarding a patient with signs of terrorist radicalization? *European Review of Applied Psychology*, *71*(5), 100558. <https://doi.org/10.1016/j.erap.2020.100558>
- Lundqvist, C. (2011). Well-being in competitive sports-The feel-good factor? A review of conceptual considerations of well-being. *International Review of Sport and Exercise Psychology*, *4*, 109-117. <https://doi.org/10.1080/1750984X.2011.584067>
- Mack, D. E., Wilson, P. M., Oster, K. G., Kowalski, K. C., Crocker, P. R. E., & Sylvester, B.

- D. (2011). Well-being in volleyball players: Examining the contributions of independent and balanced need satisfaction. *Psychology of Sport and Exercise, 12*, 533-539. <https://doi.org/10.1016/j.psychsport.2011.05.006>
- Marcelino, R. O., Sampio, J. E., & Mesquita, I. S. (2012). Attack and serve performances according to the match period and quality of opposition in elite volleyball matches. *Journal of Strength and Conditioning Research, 26*, 3385-3391. <https://doi.org/10.1519/JSC.0b013e3182474269>
- Masin, S. C., Weiss, D. J., & Brancaccio, A. (2021). Further evidence of the invalidity of the magnitude estimation method. *European Review of Applied Psychology, 71(5)*, 100649. <https://doi.org/10.1016/j.erap.2021.100649>
- Pereira, T., & Oliveira, A. (2021). The usefulness of the averaging rule in consumer studies: A partial replication with an eye at neuroeconomics. *European Review of Applied Psychology, 71(5)*, 100718. <https://doi.org/10.1016/j.erap.2021.100718>
- Plessner, H., & Harr, T. (2009). Sports performance judgments from social cognitive perspective. *Psychology of Sport and Exercise, 7*, 555-575. <https://doi.org/10.1016/j.psychsport.2006.03.007>
- Quested, E., Duda, J. L., Ntoumanis, N., & Maxwell, J. P. (2013). Daily fluctuations in the affective states of dancers: A cross-situational test of basic needs theory. *Psychology of Sport and Exercise, 14*, 586–595. <https://doi.org/10.1016/j.psychsport.2013.02.006>.
- Reinboth, M., & Duda, J. L. (2006). Perceived motivational climate, need satisfaction and indices of well-being in team sports: a longitudinal perspective. *Psychology of Sport & Exercise, 7*, 269-286. <https://doi.org/10.1016/j.psychsport.2005.06.002>
- Reinboth, M., Duda, J. L., & Ntoumanis, N. (2004). Dimensions of coaching behavior, need satisfaction, and the psychological and physical welfare of young athletes. *Motivation & Emotion, 28*, 297-313. <https://doi.org/10.1023/B:MOEM.0000040156.81924.b8>

- Rulence-Pâques, P., Fruchart, E., Dru, V., & Mullet, E. (2005a). Decision-making in soccer game: a developmental perspective. *European Review of Applied Psychology*, *55*, 131-136. <https://doi.org/10.1016/j.erap.2004.05.003>.
- Rulence-Pâques, P., Fruchart, E., Dru, V., & Mullet, E. (2005b). Cognitive algebra in sport decision-making. *Theory and Decision*, *58*, 387-406. <https://doi.org/10.1007/s11238-005-3890-8>
- Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: a review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, *52*, 141-166. <https://doi.org/10.1146/annurev.psych.52.1.141>
- Ryan, R. M., & Frederick, C. M. (1997). On energy, personality, and health: subjective vitality as a dynamic reflection of well-being. *Journal of Personality*, *65*, 529-565. <https://doi.org/10.1111/j.1467-6494.1997.tb00326.x>
- Salama-Younes, M. (2011). Positive mental health, subjective vitality and satisfaction with life for French physical education students. *World Journal of Sport Sciences*, *4*(2), 90-97.
- Sheldon, K. M., Zhaoyang, R., & Williams, M. J. (2013). Psychological need-satisfaction, and basketball performance. *Psychology of Sport and Exercise*, *14*, 675–681. <https://doi.org/10.1016/j.psychsport.2013.05.006>.
- Stenling, A., Lindwall, M., & Hassmén, P. (2015). Changes in perceived autonomy support, need satisfaction, motivation, and well-being in young elite athletes. *Sport, Exercise, and Performance Psychology*, *4*, 50-61. <https://doi.org/10.1037/spy0000027>
- Surber, C. F. (1981). Effects of information reliability in predicting task performance using ability and effort. *Journal of Personality and Social Psychology*, *40*, 977-989. <https://doi.org/10.1037/0022-3514.40.6.977>
- Teodorescu, D. I., Muñoz Sastre, M. T., Kpanake, L., Sorum, P. C., & Mullet, E. (2021).

- People's positions regarding social security's health insurance programs: The case of Romania. *European Review of Applied Psychology*, 71(5), 100716.
<https://doi.org/10.1016/j.erap.2021.100716>
- Verner-Filion, J., & Vallerand, R. J. (2018). A longitudinal examination of elite youth soccer players: The role of passion and basic need satisfaction in athletes' optimal functioning. *Psychology of Sport & Exercise*, 39, 20-28.
<https://doi.org/10.1016/j.psychsport.2018.07.005>
- Verner-Filion, J., Vallerand, R. J., Amiot, C. E., & Mocanu, I. (2017). The two roads from passion to sport performance and psychological well-being: The mediating role of need satisfaction, deliberate practice, and achievement goals. *Psychology of Sport and Exercise*, 30, 19-29. <https://doi.org/10.1016/j.psychsport.2017.01.009>
- Vicovaro, M. (2021). Intuitive physics and cognitive algebra: A review. *European Review of Applied Psychology*, 71(5), 100610. <https://doi.org/10.1016/j.erap.2020.100610>
- Waterman, A. S. (1993). Two conceptions of happiness: contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment. *Journal of Personality and Social Psychology*, 64, 297-333. <https://doi.org/10.1037/0022-3514.64.4.678>
- Zarrouk, L. A., & Fruchart, E. (2021). The relationship between purposiveness and information integration: The effect of metamotivational states on cognitive rules in sport. *European Review of Applied Psychology*, 71(5).
<https://doi.org/10.1016/j.erap.2021.100689>

Table 1

Main Results of the ANOVAs Performed on Cluster 1 and Cluster 2

Factor	Effect		Error		<i>F</i>	<i>p</i>	η^2_p
	<i>df</i>	<i>MS</i>	<i>df</i>	<i>MS</i>			
CLUSTER 1							
Relatedness	1	2553.02	59	9.93	257.03	.000	.81
Competence	1	1668.80	59	4.03	414.11	.000	.88
Autonomy	1	225.50	59	4.30	52.50	.000	.47
Physical Vitality	1	1786.41	59	6.04	295.62	.000	.83
Mental Vitality	1	1336.67	59	5.97	223.87	.000	.79
CLUSTER 2							
Relatedness	1	643.90	33	6.76	95.18	.000	.74
Competence	1	595.61	33	5.65	106.00	.000	.76
Autonomy	1	115.83	33	4.47	25.90	.000	.44
Physical Vitality	1	449.08	33	3.18	143.60	.000	.81
Mental Vitality	1	1188.21	33	4.41	269.12	.000	.89

Table 2

Composition of the Clusters in Terms of Involvement in Sport.

Participants	Clusters		Total
	Sometimes Performance	Seldom Performance	
	Prediction	Prediction	
Non-Athletes	4 (17%)	20 (83%)	24
Amateur Athletes	35 (80%)	9 (20%)	44
Professional Athletes	21 (81%)	5 (19%)	26
Total	60	34	94

Note: Percentages in bold are significant at $p < .001$ in the 3 (non-athletes/amateurs/professional players) \times 2 (Clusters) Pearson's chi-square test.

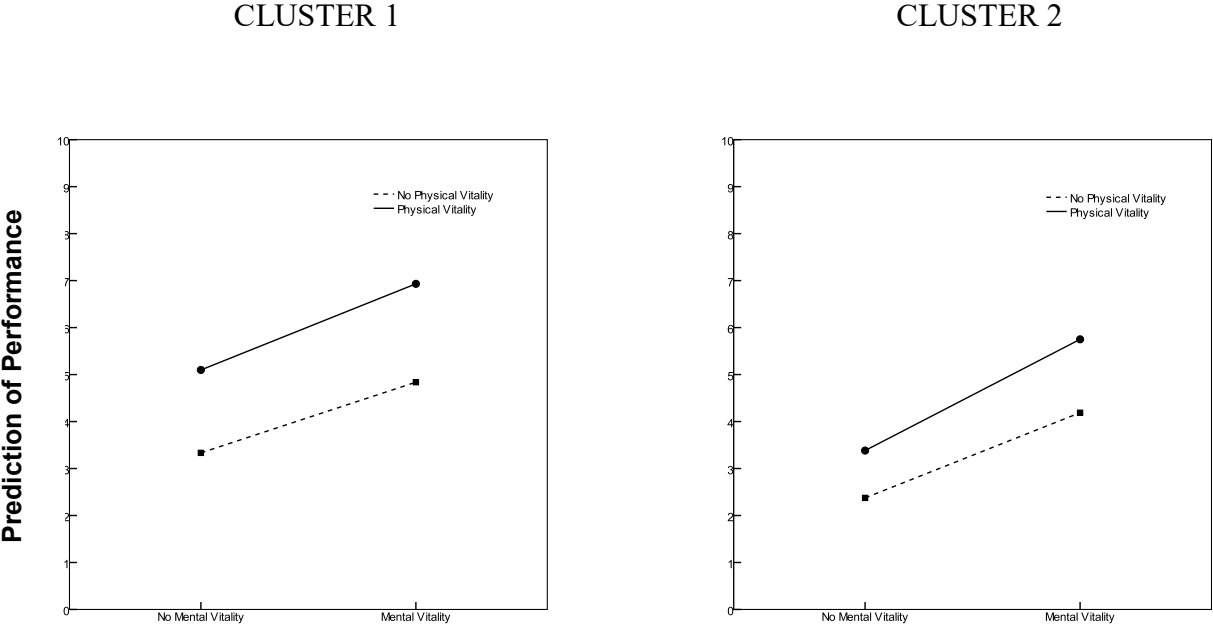


Figure 1. Effect of physical vitality and mental vitality on prediction of performance in both clusters.

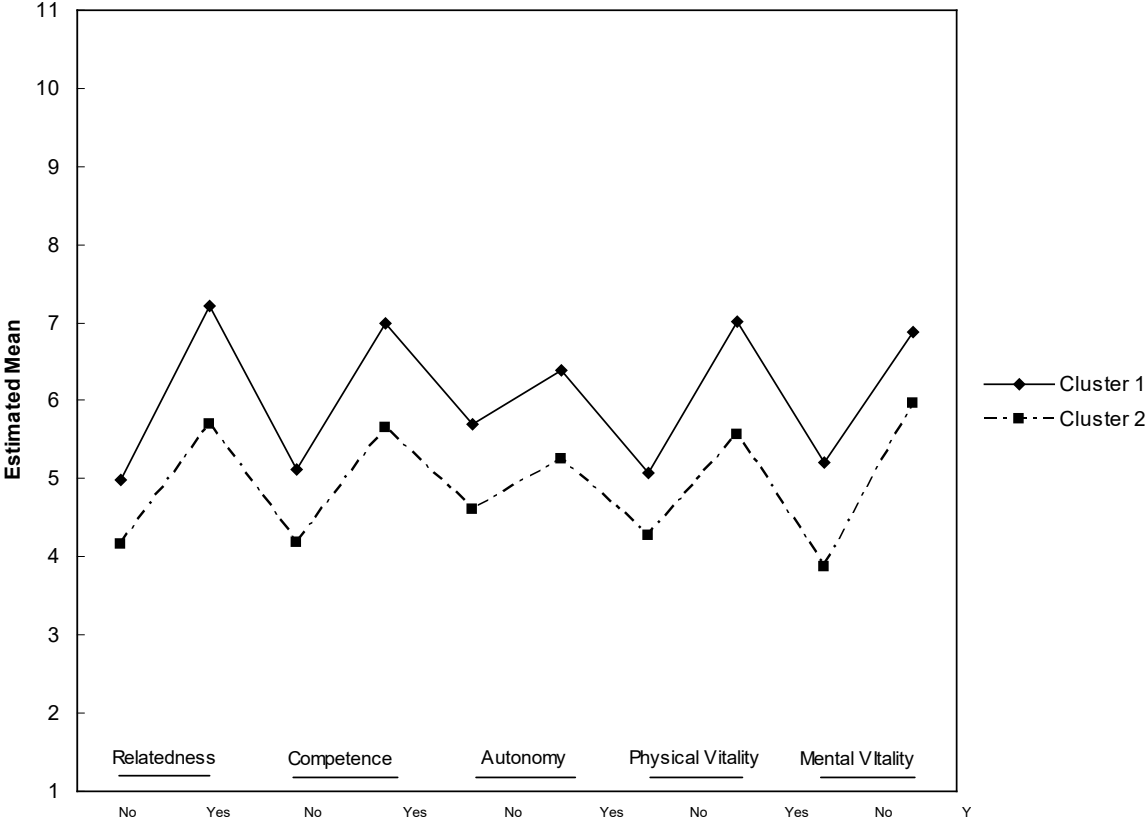


Figure 2. Estimated means of performance prediction for each factor for both clusters