Understanding motivation as a process in the context of LTAD

Abstract of PhD thesis

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Introduction

In psychology, motivation is an umbrella term covering all the factors that motivate action and behaviour (Oláh 2006). Initially, researchers drew a sharp distinction between the intrinsic and extrinsic factors of motivation, which lead to different goals and result in different incentives for the activity performed (Deci and Ryan 1985). As it was found later, however there is a link between the two, with external factors changing intrinsic motivation, while external incentives and negative feedback reducing the level of intrinsic motivation (Kollár and Szabó 2004).

Nowadays, motivation research in sport is mostly focused on the self-determination theory (SDT), which emphasises the motivational power of the desire for self-actualisation. The SDT makes a distinction between four types of extrinsic motivational structures differing in the level of autonomy-supporting feelings that the given extrinsic motive elicits from the individual. The degree of autonomy is the lowest at the level of extrinsic regulation, with behaviour being dependent on different types of reinforcement, such as the pursuit of external rewards or the avoidance of punishment. At the level of introjected regulation, the individual has introjected the previously external reasons for his/her behaviour, whose presence is thus no longer needed for the activity to be pursued. At this level the activity is motivated by pride and self-esteem enhancement, or by avoiding shame and anxiety. At the level of identification, the reasons for and evaluation of the behaviour are experienced by the individual as his or her own (Deci and Ryan 1991). In the process of integrated regulation, past impulses are brought more in line with future needs. An athlete characterized by integrated regulation is able to set serious

performance goals and work hard to achieve them. Integrated regulation is distinct from intrinsic motivation, which latter is characterized by a sense of flow is absent or rarely present (Vallerand 2007, reviewed in Taylor 2015). Vallerand (1997) developed the SDT theory further, proposing the Hierarchical Theory of Motivation (HIEM), in which he defines amotivation as a continuum ranging from amotivation, through increasingly internally regulated forms of extrinsic motivation to intrinsic motivation. Amotivation occurs when individuals are not motivated to perform a behaviour or have lost motivation. In such cases, athletes feel they are not competent and have no control over the movement, with no link between their actions and the outcome. While most researchers consider intrinsic motivation to be an unidimensional construct, some authors make a distinction between several specific intrinsic motives (knowledge, accomplishment, stimulation).

Based on previous empirical findings, a comprehensive study by Clancy and colleagues (2016) found differences in the degree of self-determination across by gender, age, type of sport, level of sport participation, context, monetary rewards and culture. The SDT constructs allow for defining different motivational profiles (Tóth-Király et al. 2020). Furthermore, high levels of self-determination are positively related to task orientation and perceived autonomy support (Pelletier et al. 2017) and they facilitate the flow experience (Kowal and Fortier 1999). By contrast low levels of self-determination are associated with burnout (Lemyre et al. 2006) and are also related to ego orientation (Pelletier et al. 2017).

Currently, one of the most prominent research fields is young athletes' motivation, which is particularly important because more than one third of young people quit sport at secondary school despite the many positive effects

of sport and its generally increasing popularity (Patriksson 1988). Several practical frameworks for adequate sporting development have been proposed to help sport professionals increase sport participation rates, reduce talent attrition and support young people to stay in sport for longer (Balyi et al. 2016). Nowadays, the Long-Term Athlete Development (LTAD) programme dominates the period of sporting development in the youth sector. In order to ensure proper development, the model takes account of age specificities, sensitive development periods and competitive structures appropriate to the quality level. In most sports, athletes' preparation is divided into seven stages (Balyi 2001). The first three stages focus on physical literacy and recreational sport, the second three stages aim to establish excellence, while the last stage supports lifelong sporting development (Balyi et al. 2016).

In line with the developmental stages of the LTAD, the presence of curiosity at the beginning and then enjoyment as intrinsic motives are required. They youngest athletes have a high level of autonomy and, as they develop, an increasing sense of competence, therefore feedback is crucial to their emotional state. As early as at the beginning of a sport career, the enjoyment of playing sport is developed through lots of play, and if the need for contact with peers is satisfied, a strong intrinsic motivational basis is established in children. Interest in peers increases over the learning to train stage and junior athletes develop intrinsic motivation for acquiring more knowledge than others with the emergence of egocentric thinking. From the train to compete stage, the main motivator is the improvement of existing skills, complemented by powerful external motivators such as the rewards and success that can be achieved through performance and the avoidance of poor judgement and failure. An athletic identity is formed and a strong commitment to sport is

developed, which is maintained over the activity-for-life stage progresses (Hui and Tsang 2012; McNeil et al. 2014).

Research aims

My dissertation consists of two studies, the aims of Study 1 were as follows: (1) A complex methodology was used to investigate the motivational structures of talented athletes aged 11 to 16 years taking account of the stages of LTAD. In addition to quantitative and qualitative assessments of motivation, the obtained measures were tested for their expected close positive or negative associations with factors such as flow experience, perceived motivational environment and burnout. Furthermore the sample was tested for possible gender-, age- and sport-related differences, and finally the participants' motivational profiles were explored for a deeper understanding.

(2) The self-report measures administrated to the children were tested for reliability, psychometric properties and intercorrelations, with the aims of making recommendations for their use in practice.

(3) Study 1 focused on swimming and football, which respectively are the individual and team sport most popular and supported in Hungary, and in wich sports professionals have already started to incorporate the LTAD recommendations into their own development programmes. The obtained findings on motivation were compared to relevant previous findings, thereby indirectly assessing the impact of the LTAD programme, which was employed in the sample of Study 1 but not in those of the previous studies in focus.

Study 2 aimed to (4) provide empirical support for the developmental nature of motivation, in which environmental influences were hypothesised to play a major role. According to the LTAD programme, it is recommended to start

mental development as early as 10 years of age with basic psychological techniques such as goal setting, relaxation, focusing, inner speech, imagination. Since most previous studies of the effects of sport psychology methods involved young adults, the present study was targeted at a sample of 11-year-old athletes with the aim of assessing the effectiveness of a complex sport psychology programme in improving the participants' sport motivation. The so-called individually focused experimental design was used in the study, which, according to the author's knowledge, is a novelty in Hungarian sports science. The advantage of an IFE is that it only requires a minimum sample of three to five participants and no control group while data on each participant is collected in a serial assessment (Barker et al. 2013). The employed longitudinal design provided an opportunity to assess the impact of intrinsic motivation on performance, while controlling for natural developmental potential, and to examine which of the tested sport psychology methods would have a substantial positive effect when employed alone.

Methods

Study 1

To ensure the level of excellence and high performance, I used the results of the last four years of national championships and match centre rankings to select seven swimming clubs and a total of four football clubs and academies involved in Study 1. A total of 420 athletes participated in the study, 341 boys (81.2%) and 79 girls (18.8%). The participants were aged 11 to 16 years (M=13.51 years, SD=1.33 years), by sport 304 participants were footballers (72.4%) and 116 were swimmers (27.6%).

Self-determination was measured with Hungarian version of the SMS-II (developed by Smohai et al. 2021), which measures all six levels of motivation continuum (internal regulation, integrated regulation, identified regulation, introjected regulation, external regulation and amotivation). The participants' perceived motivational environment was assessed with Hungarian version of the PMCSQ-II (adapted by Révész et al. 2014), which consists of the task and ego scales, each comprising three subscales (role within the team, striving for improvement, cooperative learning, fear of failure, unequal recognition, intra-team rivalry). Flow experience was measured with the FAK questionnaire developed by Magyaródi and colleagues (2013), which measures nine components based on the "Challenge-Skill Balance" and the "Task Alignment" factors. Burnout was assessed with the ABO-S developed by Isoard-Gautheur and colleagues (2018), which provides measures of physical exhaustion, a sense of reduced performance, negative sport-related feelings and emotional exhaustion (Kovács et al. 2020).

The research plan was licensed by the Research Ethics Committee of the Hungarian University of Sports Science under License No. TE-KEB/No1/2020. Data were collected from February to May 2020, both online and in a paper-and-pencil format.

Study 2

Five 11-year-old swimmers (three males, two females) participated in the study, all of whom were selected by their coach at the Ferencváros Gymnastics Club Swimming Department. All swimmers were participants in the Future Champions Programme for talented junior athletes. The sample was split by gender for hypothesis testing. Two boys missed several training sessions due to ear infections and abdominal pain, and although they fully participated in

the interventions, their performance measures were incomplete, due to which they were excluded from the sample (Barker et al. 2011).

The independent variable used in Study 2 was complex sport psychology mental preparation training. The training consisted of seven sessions and included goal setting, inner speech and imagination. The exercises were selected from the complex development programme based on the cognitive behavioural therapy by Beauchamp et al. (1996) and on the mental diary for young athletes by Gyömbér and colleagues (2016). One of the two dependent variables was the development of motivation in athletes, which was measured with the BRSQ (Lonsdale, Hodge, Rose, 2008, adapted to Hungarian by Reinhardt and Tóth 2017). The BRSQ enabled a separate assessment of intrinsic motivational structures, for which the participants were assessed both before and after the interventions. The other dependent variable was performance as measured by the results of 800-m freestyle swimming. The choice of this performance measure was informed by the participants' coach, who had found it a reliable indicator useful for training purposes. Performance was measured weekly at the baseline assessment 2, 3, 4, at the intervention stage 12, and at the follow-up 3, 2, 1.

The research plan was licensed by the Research Ethics Committee of the Hungarian University of Sports Science under License No. TE-KEB/No17/2019.All participants' parents gave formal permission to their children's participation in the study. The interventions took place before training sessions in a room provided by the participants' club. The interventions started one week after the meetings, and they were conducted biweekly.

Results

Study 1

Under Hypothesis 1, the employed self-report scales were expected to provide statistically reliable and valid measures of children's motivational characteristics. For the SMS-II, a confirmatory factor analysis (CFA) showed that the expected factor structure adequately fit the data (CFI = 0.92, TLI = 0.90, RMSEA = 0.08, SRMR = 0.08), whereas an exploratory factor analysis (EFA) revealed that the items measuring internal regulation and autonomous extrinsic motivational structures composed one single factor. For the PMCSQ-II, the CFA indicated somewhat poorer fit (CFI = .85, TLI = .84, RMSEA = .06, SRMR = .07), while the EFA reproduced the original factor structure. For the GFC questionnaire, the CFA also indicated relatively poor fit (CFI = .83, TLI = .80, RMSEA = .08, SRMR = .07), while the EFA revealed that the items measuring task alignment composed three separate factors, which were interpreted as other flow components. However, these items showed better reliability when treated as a unifactorial measure. For the ABO-S, the CFA showed adequate fit (CFI = 0.93, TLI = 0.91, RMSEA = 0.08, SRMR = 0.06), and the EFA reproduced the original factor structure, but with a stronger association with 5 other items.

Under Hypothesis 2 differences in motivational structures were expected between the periods before vs. after the growth peak. A paired-samples t-test showed a statistically significant reduction in amotivation ($t(418)=-3.324$, $p=0.001$, $d=0.75$). A 2x2 factorial ANOVA test with amotivation as the dependent variable revealed sicnificant main effects for gender ($F(1,416)=5.725$, $p=0.017$, $\eta^2_p=0.01$) and for sport ($F(1,416)=19.233$, $p<0.001$,

η^2_p=0.04), a significant gender-age interaction (F(1,416)=5.387, p=0.021, η^2_p=0, 01), and a sport-age interaction (F(1,416)=3.906, p=0.049, η^2_p=0.01). Furthermore, the quantitative self-report data were consistent with the qualitative data obtained from the participants' narrative accounts in terms of the motivational structures of the participants' reasons for pursuing their sport, except that the qualitative data indicated higher levels of external regulation and introjection and lower levels of identification.

Under Hypothesis 3, four distinct types of motivational structures were expected to emerge in the sample. A *k*-means cluster analysis defined four groups as expected, while the associated motivational structures did not meet the expectations. The first group included competitors with high intrinsic motivation, the second group included those who lacked motivation, the third group included those who sought for motivation, and the fourth group included those who had both extrinsic and intrinsic motivation.

Under Hypothesis 4, the athletes' motivational structures were expected to be associated with their perceived motivational environment, flow experience, and athletic burnout. . The obtained Spearman's rank correlation coefficients generally showed weak associations between the measures, apart from the moderate positive correlation between negative sport experiences and amotivation (r=0.409).

Under Hypothesis 5, the swimmers and football players assessed in the present study were expected to report higher levels of autonomous extrinsic motivational structures, higher intrinsic motivation, lower levels of controlled extrinsic motivational structures, and lower amotivation as compared to their respective counterparts assessed in related previous studies (Kiss et al. 2015, Csáki 2017, Győri 2018, Nagy et al. 2016, Nagy 2019). A series of one-sample

t-tests revealed the expected significant differences for all motivational structures in both sports.

Under Hypothesis 6, the LTAD was expected to produce poorer results in a Hungarian sporting environment than comparable interventions conducted in other countries did. A series of one-sample *t*-tests revealed the expected significant differences for both sports in terms of training time and number of competitions. Futhermore, a binomial test for the distribution of the participants' positive and negative responses to whether they would be willing to pursue another sport and work with a sport psychologist showed that the proportion of negative responses (0.88) was significantly higher than in the hypothetical case of equal distribution (0.50, $p < 0.001$).

Study 2

Under first research question the complex mental preparation programme was expected to increase intrinsic motivation and autonomous extrinsic motivational structures and to decrease controlled extrinsic motivational structures and amotivation. The BRSQ scores obtained at Assessment 1 indicated that the participants had low amotivation (M=1.42, SD=0.72) and external regulation (M=1.67, SD=0.58), moderate introjection (M=3.83, SD=2.47) and identification (M=4.58, SD=1.84), and high integration (M=5.67, SD=0.38) and internal regulation (M=5.83, SD=0.80). The measures obtained at Assessment 2 indicated that although none of the mean values had changed significantly, a decreasing trend was shown by amotivation (M=1.08, SD=0.14) and external regulation (M=1.25, SD=0.25), while each of the other motivational structures showed a slight increase. Among the different components of internal regulation, the largest mean difference between

Assessments 1 and 2 was obtained for pleasure seeking, which increased over time (M_1=5.33, SD_1=0.80, M_2=5.92, SD_2=1.32). In terms of the obtained Cohen's d effect sizes, however, no substantial effect was observed for any of the components.

Under second research question the interventions were expected to account for incremental performance improvement over the participants' natural developmental potential. The observed performance trend indicated that swimming times decreased on average after the last baseline assessment (M_A=10:57; M_B=10:22; M_U=10:35). Performance improvements appeared soon after the interventions started. The linear trendline indicated a steady increase in performance, for which a high effect size was obtained (Δ=7, PND=100%). Although the first follow-up assessment showed a slight decline after the end of the interventions, the relatively low standard deviations of swimming times indicated balanced performance throughout the assessment period (SD_A=0:05, SD_B=0:08, SD_U=0:04, see Figure 1).

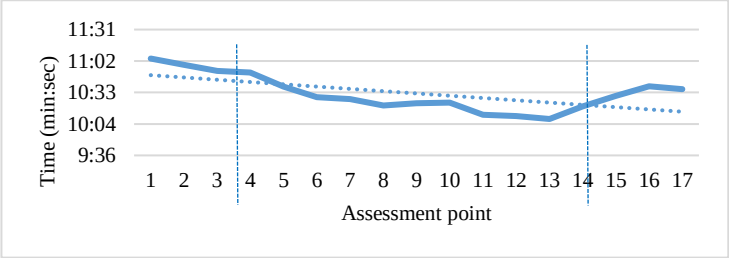

Figure 1: Performance trend over the pre-intervention, intervention and post intervention phases

Under third research question the employed mental preparation techniques were expected to show substantial differences in effectiveness when employed

alone. Among the techniques listed in the literature, goal setting and inner speech were more effective in terms of performance improvement than other techniques, while performance profiling, active imagination, and certain elements of cognitive behavioural therapy were also found to be effective

Conclusion

Study 1

Although the factor structures and other psychometric properties of the self-report scales used in Study 1 differed in some cases from those of the original scales or from the adequate value ranges proposed in the literature, all four measures proved adequate for practical use with children. The results of the t-tests indicated higher levels of amotivation in female swimmers at post-peak-growth age compared to male footballers at pre-peak-growth age. This difference may be accounted for by the onset of menstruation associated with the achievement of peak growth (Ozbar et al. 2016), or by the more intense performance pressure and the higher importance of athletes' self-set expectations characteristic to individual sport (Teichman, 1974, reviewed in Sanchez-Miguel et al. 2013).

A cluster analysis based on motivational structures revealed a group of highly motivated competitors, a group of unmotivated athletes, and a group of slightly motivated competitors. At the same time, an extrinsically and intrinsically motivated cluster emerged, which finding is inconsistent with those of previous cluster-analytic studies (Tóth-Király et al. 2020) but consistent with related previous findings obtained for Hungarian samples (Szemes and Harsányi 2015, Szemes et al. 2016, Szemes et al. 2017) and other domestic studies (Géczi et al. 2011, Benczenleitner et al. 2013, Csáki et al. 2016, Nagy

et al. 2016). In sum, it is possible that the different types of motivation in focus form a multidimensional rather than a hierarchical unidimensional structure, which might explain the absence of a moderately motivated group.

The self-report measures showed the expected intercorrelations. The observed associations suggest that a task-oriented environment predicts high self-determination (Sarazzin et al. 2002), which in turn provides a protective factor against burnout (Lonsdale et al. 2008) and facilitates flow experience (Kowal and Fortier 1999).

The availability of qualified and highly motivated coaches, a more modern training environment and systematically structured talent development programmes lead to high motivation in the post-graduate age group (Berzi et al. 2011, Wladár 2019, Hui and Tsang 2012, McNeil et al. 2014). However, both the swimmers and the footballers involved in Study 1 spent more time with training compared to the recommended daily amount, footballers training three hours/day and swimmers training two hours/day. Furthermore, the athletes also competed more than recommended, footballers playing nine games/XX and swimmers participating in one competition/XX. The overwhelming majority of both swimmers and footballers had undergone early specialisation (92.5% and 86.0%, respectively), while high proportions of both groups lacked sport psychology training (51.0% and 63.2%, respectively). These findings are alarming, considering that pursuing several sports together potentially ensures children's enjoyment of sport, prevents injuries and overuse, and contributes to overall physical growth (Normand et al. 2017). Moreover, providing adequate information for athletes, parents and coaches about the opportunities of mental skills development, its impact on performance and about the sport psychologist's role can significantly improve

perceptions and motivate the use of sport psychology services for prevention or treatment (Acsai et al. 2002, Fortin-Guichard et al. 2017).

In total, six hypotheses and seven sub-hypotheses were tested. Of the hypotheses, four were partially confirmed (P) and two were fully confirmed (C), while two of the sub-hypotheses were partially confirmed and five were fully confirmed. In sum none of the thirteen hypotheses was rejected (see Table 1).

Table 1.: Summary of the Hypotheses of Study 1

Hypotheses	
H1: All employed self-report scales provide reliable and valid measures of junior athletes' motivational characteristics.	P
H2: There are differences in motivational structures between the pre- and post-peak-growth periods within the age 3 phase of the LTAD (for girls, 11 to 12 and 13 to 15 years, respectively; for boys, 12 to 14 and 15 to 16 years, respectively). Specifically, the post-peak-growth groups show lower levels of intrinsic regulation and autonomous extrinsic motivational structures (integration, identification) and higher levels of controlled extrinsic motivational structures (introjection, extrinsic regulation) and amotivation. H2-A: There are gender differences in motivational structures. Girls typically have autonomous extrinsic motivational structures and intrinsic regulation, whereas boys have more controlled extrinsic motivational structures. H2-B: There are sport-related differences in motivational structures. Athletes pursuing individual sports have higher levels of autonomous extrinsic motivation and intrinsic motivation than those pursuing team sports. H2-C: Both quantitative and qualitative data on the athletes' reasons for pursuing their sport consistently reveal the same motivational structures.	P P P C
H3: Four distinct groups can be defined by motivational characteristics: (1) Highly motivated competitors are characterised by high intrinsic motivation and autonomous	P

and controlled extrinsic motivational structures, which are associated with low amotivation; (2) Moderately motivated competitors are characterised by moderate intrinsic motivation and autonomous and controlled extrinsic motivational structures, and by low amotivation. (3) Slightly motivated competitors have low levels of intrinsic motivation and autonomous and controlled extrinsic motivational structures, and moderate levels of amotivation. (4) Unmotivated competitors have low levels of intrinsic motivation and autonomous and controlled extrinsic motivational structures, which are associated with high levels of amotivation.	
H4: Junior athletes' motivational structures are related to their perceived motivational environment, flow experience and, athletic burnout. Controlled extrinsic motivational structures and amotivation are positively related to athletic burnout and a perceived ego-oriented environment, while autonomous extrinsic motivational structures and intrinsic motivation are positively related to flow experience and a perceived task-oriented environment.	P
H5: Compared to previous findings on swimmers' and footballers' motivational structures, the athletes involved in the present study have higher levels of autonomous extrinsic motivational structures and intrinsic motivation, and lower levels of controlled extrinsic motivational structures and amotivation.	C
H6: The LTAD produces poorer results in a Hungarian sporting environment than in other countries.	C
H6-A: Overtraining is still present (7.5 to 9 hours/week for footballers, 12 to 18 hours/week for swimmers, but more than this is recommended for athletes).	C
H6-B: Overcompetition is still present (the recommended amount is 20 competitions/season for footballers and 10 competitions/season for swimmers, but more competitions are attended).	C
H6-C: Early specialisation is still present (trying various sports is recommended until 15 years of age, but the participants generally specialise in their sport earlier).	C

H6-D: There still is a lack of mental preparation (recommended from the age of 10, yet many participants have never participated in a mental preparation programme).	C

Study 2

Self-determination showed an increasing trend in the sample. Specifically, the levels of autonomous extrinsic motivational structures and intrinsic motivation increased in Participant 1, intrinsic motivation increased Participant 2, and amotivation decreased in Participant 3, consistently with the effects of several interventions aimed at improving motivation in sport (Beauchamp et al. 1996, Weston et al. 2011, Blanfield et al. 2014).

A visual inspection of the obtained performance trends revealed that a steady performance improvement started soon after the intervention in all three cases. These results indicate positive changes in the assessed performance dimensions, , which suggests that the employed interventions were effective even at the young age of the participants, although they contributed minimal incremental improvement over from the participants' natural developmental potential on some measures (Barker et al. 2013). Interestingly, however, all three participants showed a decline in performance at the follow-up assessment, for which a possible explanation is that although cognitive development has been found to promote long-term improvement, it may also be associated with short-term stagnation or deterioration in performance (Parkerson 2015, reviewed in Szemes et al. 2019). Furthermore, considering the small number of baseline and follow-up assessments, it is possible that the observed decline only indicated an ineffective training session rather than the beginning of a declining trend (Barker et al. 2011).

The employed mental preparation techniques showed substantial differences in effectiveness when employed alone. Among the techniques listed in the literature, goal setting and inner speech were more effective in terms of performance improvement than other techniques, while performance profiling, active imagination, and certain elements of cognitive behavioural therapy were also found to be effective in the age group in focus, consistently with previous findings (Lambert et al. 1999, Mellalieu et al. 2006, O'Brien et al. 2009, McCarthy et al. 2010, Hamilton et al. 2007, Johnson et al. 2004, Landin and Hebert, 1999, reviewed by Barker et al. 2013). The hypotheses of Study 2 are summarised in Table 2.

All these results are encouraging in terms of the effectiveness of domestic sport development and the tools for talent education (Berzi et al. 2011, Wladár 2019). However, further measures such as those clarifying the importance of parents (Martindale et al. 2005) and sport psychology training for the post-school age group may be necessary to gain a better understanding of the factors facilitating long-term sport participation (Acsai et al. 2002, Nádori et al. 2011). Social support and positive feedback from coaches is essential during this period to keep athletes motivated, therefore coaches' education should also be a priority (Adzhar et al. 2019). It is also important to coordinate micro- and macro-level plans, that is, designing competition and training regimes that are consistent with the development plans (Balyi et al. 2013).

Table 2.: Summary of the research questions for Study 2

Research questions	Answer
Q1: The complex mental preparation programme package increases intrinsic motivation and autonomous extrinsic motivational structures, while	Increasing trend in self-determination

it decreases controlled extrinsic motivational structures and amotivation.	
Q2: The interventions contribute incremental performance improvement over the participants' natural development potential.	Measurable incremental performance improvement
Q3: There are substantial differences in effectiveness between the tested interventions when employed alone.	Goal setting and inner speech were more effective than other techniques

Regarding future studies, it should be considered operationalising items in questionnaires, adapting self-report measures originally developed for adults to the age specifics of the assessed children, and removing items showing low validity. In addition, the knowledge required for carrying out the planned interventions, their practical applicability, and the challenges posed to the professionals responsible for the implementation of the development programme (sports coaches, sports administrators, strength and conditioning coaches, physical education teachers, physiotherapists and other health care providers) should be examined to strengthen the link between theory and practice.

List of own publications

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