

# The role of physiological testing for athlete development in sport: The elite athlete perspective

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## Abstract

One common practice in talent development environments during the investment years (age 16+) and elite sport, in general, is the use of physiological testing of the athletes' physical determinants of performance. In this article, the regime of controlling and monitoring athletes' bodies for elite sport production through physiological testing will be examined. To this end, we explored athletes' experiences of what has been done and why physiological tests are carried out the way they are to understand the practice of physiological testing in relation to athlete development. The material in this study is based on interviews with adult elite sport athletes (four group interviews with eight individual athletes in three different sports, four male and four female, and individual interviews with twelve female and five male football players). Schatzki's and Reckwitz's theorizing on social practices, together with Dewey's theorizing on learning from experience, are used to explore and illuminate the practice of physiological testing and what learning is enabled and constrained within that practice. The findings show that the meaning and significance of physiological testing for athletic development relates to how the tests are followed up and talked through with the athletes. The analysis shows that there exists a form of sport-wide commonality where the same understandings, rules or ends—irrespective of which sport is concerned—govern coaches' and athletes' behavior regarding physiological tests. The physiological testing practice articulates action intelligibility through rules and structures which emphasizes tests as isolated quantified indicators of physical status. The use of physiological tests as a part of learning or as a means for athlete development can therefore be questioned.

## Keywords

practice theory, learning, talent development, performance enhancement, meaning making

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## Introduction

This study draws attention to adult elite athletes' experiences of the meaningfulness of using physiological tests for their athlete development during the transition from youth talent in the investment years (age 16+, see Côté and Abernethy, 2012) to elite athletes in adulthood. Developing talented youths in sport is about providing a learning environment that supports the process of developing sporting abilities (Baker et al., 2017; Vaeyens et al., 2008) and the transition from junior to top-level sports (Henriksen, 2010). High-profile coaching, facilities and equipment as well as medical and physiological support can be found in the environment surrounding the young athletes and are expected to contribute to their development (Güllich and Cobley, 2017). One common practice in talent development environments during the investment years and elite sport in general is the use of physiological testing of the athletes' physical determinants of performance (cf. Robertson et al., 2014). Claimed advantages of using physiological tests are that coaches can use tests to assess training outcomes and training programs and to optimize the athlete's performance (e.g., Impellizzeri et al., 2005; Lidor et al., 2009; Tanner and Gore, 2013), but also to provide feedback to athletes that can motivate them (Lidor et al., 2009).

Physiological tests and testing in sport have been of great interest to physiologists who, throughout the years of measuring human performance, have woven together force development, endurance, high-intensity exercise and sprint (Bangsbo, 2015; Tanner and Gore, 2013) as a natural part of sports which reflects what Svensson and Sörlin (2019) call a physiologization. Svensson and Sörlin (2019) suggest that athletes' tacit knowledge of their body has turned into numbers and quantifiable concepts such as  $VO_2$  max and lactic acid—favoring ideas of rationalization, professionalization and specialization. This rationalization and scientization, and what Bauman (1991: 12) terms “fragmentation of the world,” has caught the interest of sociologists through more conceptual and theoretical studies. Although not explicitly referring to physiological tests, the measurement and quantification of physical capacities in sports or health practices are problematized in such studies (e.g., Lupton, 2013; Mills et al., 2020; Ojala, 2020; van Amsterdam et al., 2017). The purpose of measurements and, in this case, physiological testing is from their perspective understood as always implicated in social relationships and power dynamics (cf. Lupton, 2013, on the discussion of the quantified body). In this sense, the use of tests can be understood as embedded in a sport practice where the coaches' work is based on reductionist, instrumentalist and mechanistic principles (Mills et al., 2020); principles that together build a regimen where athletes are seen as “objects who with the right kind of training, can be modified for achieving the success desired” (Ojala, 2020: 323).

The assumption that an athlete's physical test results can promote motivation for training that will enhance their performance presumes that they develop, or, in other words, learn from their experiences of doing tests. However, to date, there is little knowledge on whether athletes learn from and develop through the testing carried out. Given that the purpose of talent development is to be an environment to support learning and progress, it is fruitful to explore the athletes as learners and the use of physiological tests as a part of a learning environment (cf. Mackenzie and Cushion, 2013). Following

Mills et al.'s (2020: 257) reflection about whether all bioscience and technology used actually helps develop the athletes, this study explores the elite athletes' perspective on how they experienced doing physiological tests and what the tests meant for their athletic development. We use Schatzki's (1996, 2001) and Reckwitz's (2002a, 2002b) theorizing on social practices, together with Dewey's (1938, 1997) theory of learning (i.e., meaning making), to explore the athletes' experiences of physiological testing. Thereby we attempt to illuminate the physiological testing practice—"a regular bodily activity held together by a socially standardized way of understanding and knowing" (Reckwitz, 2002b: 211)—and critically scrutinize its opportunities for individuals to learn and develop as athletes.

## **Physiological testing in sport**

Using tests in sport has a long history and the use of skill outcome tests in sport is widespread (Robertson et al., 2014; Svensson and Sörlin, 2019). In research on physiological testing, it seems as though one of the most common purposes of physiological tests is to characterize the sport, that is, to develop normative values for sports and to examine the physical requirements for athletes (Abdelkrim et al., 2010; Boone and Bourgois, 2013; Chaabène et al., 2012; Forbes et al., 2013; Povoas et al., 2012; Rundell and Bacharach, 1995; Wang et al., 2023). The tests used in these studies are both field tests, sometimes called physical fitness tests, and laboratory-based tests and depending on the requirements of the sport and the purpose of the assessment, different physical capacities are measured (Bangsbo, 2015; Tanner and Gore, 2013). Research on these types of tests has also investigated correlations between them to see if field tests can be used to predict competition or match performance or to describe training intensity (Krustrup et al., 2005; Vergès et al., 2003).

Another prominent strand in this research has been to make comparisons between sports and between different cohorts and to look at changes in performance over time. For example, comparisons in physical performance between men and women in the same sport (Pallares et al., 2012; Rundell and Bacharach, 1995; Sandbakk et al., 2012, 2014; Warren et al., 1990), between athletes in different sports (Chukwuemeka and Al-Hazza, 1992; Freitas et al., 2022), between sport athletes and non-athletes (Degens et al., 2019), and between different levels, from international elite athletes to exercisers (Aubry et al., 2018; Baiget et al., 2016; Furness et al., 2018). In addition, studies have investigated the changes in anthropometric and physical performance-related variables when evaluating seasonal changes in athletes, such as from the beginning of the season to mid-season (Casajús, 2001; Mikulic, 2012) or the end of the season (Magal et al., 2009), as well as over a whole calendar year (Caldwell and Peters, 2009; Peart et al., 2018) or separately in off-season (Miller et al., 2011, Requena et al., 2017). Overall, besides enabling scientists to gather data for scientific purposes (Svensson and Sörlin, 2019), the research focusing on physiological testing has mainly gained insights into different physical capabilities.

Similarly, in talent development research, although access to physiological support (e.g., Cooper, 2021; Mitchell et al., 2021) and specific physiological training (e.g., Barth et al., 2022; Ford et al., 2009) are highlighted as central for athlete development,

no particular focus on physiological testing and athlete development can be found. Studies with an in-depth approach to talent environments and support structures in relation to the development of sport performance have not inquired into the details of physiological tests and their role in athlete development either (e.g., Henriksen and Stambulova, 2017; Larsen et al., 2013; Martindale et al., 2007). Research that acknowledges physiological testing appears to be related mostly to talent detection and identification within sports and how the sport itself—that is, clubs, federations and professional leagues—make use of physiological and physical fitness tests (Dodd and Newans, 2018; Lidor et al., 2009). Tests are, for example, used as a complement to coaches' subjective evaluations in talent identification and selection, such as using physical fitness tests and their predictive value in the selection to sports academies (e.g., Dugdale et al., 2021; Fortin-Guichard et al., 2022). Tests are also used in relation to longevity and success in professional sports (LaPlaca and McCullik, 2020; Vincent et al., 2019). However, Murr et al. (2018) found in their study that the prognostic value of physiological tests appears to be dependent on the respective study design (cf. Robertson et al., 2014) and the methodological quality of the sporting skill outcome test.

Taken together, the overview of previous research, in line with Mackenzie and Cushion's (2013) review of research on performance analysis, shows that the previous studies have not considered the role of physiological tests for the athlete. Moreover, no explicit investigation appears to have been made from a learning perspective. Knowledge of whether physiological tests motivate the athlete or impact athlete development remains to be explored (cf. Mills et al., 2020). This study attempts to fill this gap by drawing on interview data with male and female elite athletes from both individual (cross-country skiing, orienteering and track and field) and team sports (football) and their experiences of physiological testing. The aim is to explore the meaning and significance of physiological testing from the athletes' perspective. Scrutinizing the athletes' experiences of physiological testing (what has been and is being done) and why physiological tests are carried out the way they are, we try to understand the practice of physiological testing in relation to athlete development.

## Theoretical framework

To provide an understanding of the practice of physiological testing in relation to enhancing performance and athlete development in sport, different theoretical layers will be used. Firstly, physiological testing in sports such as football and cross-country skiing, which are empirical examples in this paper, is viewed as a practice that “pervade[s] and underlie[s] both agency and habitat, weaving together agents and settings through the understandings and articulated intelligibility that organize settings and govern activities” (Schatzki, 1996: 17). It is a practice in which agents (e.g., athletes and coaches) engage and “consists of a routinized set of bodily performances connected with certain know-how, particular ways of interpretation, certain aims and emotional levels which the agents, as carriers of the practice, make use of, and which are routinized as well” (Reckwitz, 2002a: 252). Schatzki (1996) put forth that the repertoire of bodily performances is acquired through social training and learning, and how athletes learn to perform activities depends on social practice. Secondly, to decipher and understand

bodily performances and the assimilated understandings articulated within the physiological testing practice in relation to athletes as learners, we utilize Dewey's theorizing on meaning making as a theoretical layer (1938, 1997). This provides a foundation for interpreting how athletes perceive and make meaning of and learn from physiological testing in their development process (cf. Mackenzie and Cushion, 2013).

For Dewey, in a situation like testing physical capabilities, athletes make meaning by making connections to past experiences to act purposefully (in this case e.g., physiological knowledge, training habits or values of competitive sports). The meaning created when carrying out tests is, in Dewey's sense, both institutionally situated and relational, meaning that the expectations, norms and values that coaches and athletes uphold are involved in deciding which experiences are desired in the situation (Garrison, 2001). For physiological tests to be an educative experience, that is, to develop an extended understanding and repertoire of actions and be involved in a transformative experience, the athlete needs to encounter some kind of indeterminate situation (Dewey, 1997). This means that in carrying out the tests, there need to be sayings and doings that may give rise to a problem or a question (a felt difficulty) that affects the athletes in an emotional, cognitive or physical way and challenges them to differentiate their actions and doings. Dewey (1997) conceptualizes such a transformative process as "inquiry." If physiological tests as learning content and learning methods are too far from the athletes' earlier experience, they risk not becoming meaningful. On the other hand, if the tests do not challenge the old ways of thinking and acting, they risk being miseducative and as such merely part of unreflective practice.

Schatzki (1996: 123) put forth that "mattering primarily determines doing by shaping people's orientation towards ends." In Dewey's theorizing, purposes function as continuous maps for developing intelligent action. For physiological testing to be something that matters to athlete development, then, purposes need to be visible and enacted to support the individual. The athlete needs to understand the meaning and experience the consequences when carrying out physiological testing (Dewey, 1938). In this process, the advice from a person (e.g., a coach) with a more extended understanding and repertoire of actions can also be used to make meaning of the situation (Dewey, 1938). Understanding how athletes make use of earlier experiences in the situation and whether tests engage them in a process of inquiry, as well as what purposes of the tests become visible to them, helps us illuminate the educative impact of physiological testing.

By focusing on the athletes' acquired experiences of the bodily doings and sayings associated with testing physical abilities, we attempt to provide insights into how the testing practice, according to Schatzki (1996), forms how things make sense and what makes sense to do: "practices are the site where human coexistence is established and ordered" (Schatzki, 1996: 172). The practice of physiological testing opens up for coexistence in the form of commonality, meaning "that the same understanding, rule or component of teleoaffectivity (end, task, emotion, etc.) governs different people's behavior" (Schatzki, 1996: 186). Teleoaffectivity, as already noted, concerns orientations towards ends and how things matter (Schatzki, 1997), similar to Dewey's view. When athletes participate in testing, they act as a carrier of a physiological testing practice which, in Reckwitz's (2002a: 250) words, is "a routinized way in which bodies are moved,

objects are handled, subjects are treated, things are described and the world is understood.”

Finally, to offer insights into and gain a wider understanding of this routinized way within the testing practice in elite sport, an additional analytical layer that considers the social relationships and power dynamics in current sport practices will be used (cf. Lupton, 2013). Scholars argue that modern elite sport practice is permeated by quantitative measurements to monitor performance (e.g., Kohe and Purdy, 2018; Mackenzie and Cushion, 2013), for the sake of elite athletic production (Zakus, 1995: 87). In this elite sport practice, training logs and training manuals built on scientific knowledge have become fundamental (Svensson and Sörlin, 2019). According to Mills et al. (2020), in a coaching context, this is transformed into a reductionist and mechanistic coaching logic. In Bauman’s (1991: 7–8) terms, this logic in elite sport is an expression of the wider societal quest for order and the effort to “suppress or eliminate everything that could not or would not be precisely defined.” As Lupton (2013) highlights in her analysis of discourses surrounding health, measuring and quantification have become a pervasive part of our daily lives. Through this theoretical layer, the use of technologies—that is, physiological tests and testing as well as other routinized habits of coaches related to testing the athletes—is problematized in relation to the construction of the athletes and athlete development (e.g., Bauman, 1991; Mills et al., 2020; Ojala, 2020; van Amsterdam et al., 2017).

## Method

The study’s methodological approach is interpretative and inductive with the goal to understand the lived experience of the athletes (Schwandt, 1998). The empirical material in this study stems from two retrospective studies with adult elite sport athletes. The voices of athletes and their experiences form the primary foundation for the analysis of how they make meaning of their participation in physiological testing early on and into their early adulthood as part of their sport activity. The first study used group interviews with eight adult elite athletes (two in each group) representing three different individual sports (cross-country skiing, orienteering and track and field)—where two groups concerned the same sport. Of these individual athletes, four were male and four were female. They were all dual career athlete–university students; there is a university dual career program for elite sport students in Sweden. The second study used individual interviews with 12 female and 5 male adult elite football players who at the age of 15 were selected to the district team (16 players) in one of the 24 football districts in Sweden. The players had played at an elite level in young adulthood or played at an elite level at the time of the interview. Our ambition when selecting these two studies was to achieve a variety and thereby be able to explore how physiological testing is understood and conducted in relation to both individual and team sports.

Both the group interviews with the individual athletes and the interviews with the football players were semi-structured, which presents reliable ways of inquiring into the athletes’ first-hand experiences (Brinkmann and Kvale, 2015). The group interviews were conducted by the first and second author in a study room familiar to the respondents and the individual interviews were conducted by the first author either by telephone or

via Zoom. The interviews in both studies lasted 60–90 min and were recorded and transcribed.

The data presented in this study were part of projects that included more than this study focuses on. The study with the individual athletes encompassed their training background and training regimes as well as their experiences of follow-ups of the training and different training environments. The study with the football players investigated pathways to the senior level and included questions that inquired into, for example, why they continued with football, the support they had from parents, coaches or others, their experiences of the club environment and other environments they participated in (e.g., upper secondary school football, youth national teams), but also training regimes and the follow-up of training. Aiming this article as a point of departure, the interviews included a focus on gathering empirical information about what the tests meant for the participants' development (Brinkmann and Kvale, 2015). Accordingly, both interview studies encouraged the athletes to elaborate on their perspectives, thoughts and actions in relation to physiological testing. The questions inquired into whether the athletes had experience of physiological testing during their career, how the tests were carried out and how they perceived doing the tests. Another theme focused on how the coaches worked with tests in relation to previous and future training. Finally, questions were asked about how the athletes experienced tests in terms of how they acted on them, how they perceived their significance for developing as an athlete, and what they learned. Before the interviews, the respondents were informed about research ethics, and they all agreed to participate. The football player study has been approved by the regional ethics review board (dnr: 2018/68-21).

### *Participants and setting*

The cross-country skiers, orienteering and track and field athletes as well as the football players had all (except for one football player) been using physiological tests as a part of their training regime. Physiological testing started at the age of 15–16 for the football players in relation to the start of an upper secondary school football specialization or moving to an elite club. For a few players who had started to play for a senior team before the age of 15, it had begun at an earlier age. For the individual athletes, the introduction to using physiological tests as part of their training started when they entered an upper secondary school sport specialization the year they turned 16. All individual athletes and the majority of the football players in this study participated in a sport specialization program at upper secondary school, as there is a dual career program in Sweden where pupils with elite sport ambitions can train during school hours.

The physiological tests the football players had been doing were first and foremost related to field tests and testing endurance, such as the Beep, Yo-Yo or Cooper tests, but some of them also had experience of strength tests and movement tests. The tests the individual athletes had carried out depended on their specific sport. Athletes in endurance sports such as cross-country skiing and orienteering had experiences of both field and lab endurance tests such as Cooper test and lactic acid ranges but also treadmill tests, while track and field athletes had experience of strength, movement and speed/explosiveness tests.

## Analysis

The analysis of the two data sets in this specific study focuses on the role of physical tests in the athletes' development environment from the interviewees' perspectives as learners. A conventional approach to content analysis was used to analyze the interviews (Hsieh and Shannon, 2005). The analysis process began with an in-depth reading and re-reading of the athletes' narratives by the first author. Thereafter, each transcript was openly coded based on the interviewees' answers to explore the space of variations in conceptions and to catch common patterns (Hsieh and Shannon, 2005). In the second step of coding, all respondents' perceptions of doing physiological tests and their relation to performance and sport development were organized into topics (e.g., test procedures, links between previous and future training, lessons learned, and coach communication). Thus, in this step, the analysis was guided by a general Deweyan understanding of the role of inquiry and visible purposes in learning processes. However, the ways athletes made meaning out of their participation in physiological tests were clustered without preconceived categories (cf. Hsieh and Shannon, 2005). As such, the topics could be integrated to convey a picture of the athletes' perspectives on how tests were carried out and what role and importance they had for them at different stages of their careers. During this phase and in subsequent steps, the first and the third authors discussed the analytical findings to deepen their understanding (cf. Tracy, 2010).

Third, representative quotes that could substantiate the athletes' narratives were sought. In the fourth and final step, by considering Warde's (2005) notion that practical activity and its representation are necessary for an analysis of practice, these topics were analyzed in relation to theoretical concepts and the questions addressed in the article to develop an understanding of the meaning of the physiological testing practice that is "unfolded by the individual carriers performing them" (Heidenström, 2022: 239). In accordance with a conventional approach to content analysis as described by Hsieh and Shannon (2005), we use the theoretical framework of Schatzki and Reckwitz—while theorizing the social relationships and power dynamics, such as the power of metrics, in current sport practices—mainly in the discussion section of the study to critically interrogate the consequences of physiological testing for the athletes.

## Findings

In the following, the athletes' narratives of the process and outcome connected to the use of physiological tests from the introduction in late adolescence to adulthood are presented. Quotes from individual athletes are marked with MI for men and FI for women, while the corresponding marking for the football players is MF for men and FF for women.

### *Athletes' views on doing physiological tests*

In the interviews with the football players, their reasoning about doing tests and the test procedures used in late adolescence was largely centred on a perception that the tests had been used as a control of "how you are doing in terms of fitness" (MF5) or, if they had



been involved in repeated tests, “getting it on paper that you can run longer or can run faster” (FF8). This view of test results is also present in the individual athletes’ responses. For example, the use of tests as indicators of them not going in the wrong direction is emphasized. In a group interview with individual athletes, one male athlete put forth that tests are helpful “to see that you are on the right track” (MI5), whilst the female athlete directly afterwards filled in “Yes, or not the wrong way” (FI6).

Another dimension related to the measurement of physical capacities, which is only present among individual athletes, is the use of a training diary. Upon entering the upper secondary school sport program, they were introduced to systematically registering and monitoring their endurance and strength capacities. “I document each session with times and so on” (MI1). The interviews with the individual athletes revealed that a sense of structure and control relates to this systematic monitoring of their training sessions. One athlete stated: “it gives me a good structure, to get it on paper, that this is really what I have done. And not just go by feeling but knowing that this is how it was” (FI4). The narratives show that the training diaries were used as a means for the school coaches to follow up on the training with the athletes. One female athlete put forth that they had meetings with the coach to “go over what you have trained, how it went, what you have to plan ahead” (FI7). Although the athletes asserted that “it is good to have a training diary that you can look back on” (MI3), it appears as though the diary did not, to any greater extent, form a basis for their own reflections on the training. In one interview a male athlete stated that “I can go back to look at them in case I feel I need it in some way. But it’s very rare that I do” (MI1), to which the female athlete directly added, “Yes, I have not done much with it” (FI2).

To sum up, physiological tests, as the narratives tell us, largely functioned as a check-point or single indicator of fitness for the athletes and were less related to something to be reflected on in relation to previous and future individual training orientation (Dewey, 1938). The athletes’ reasoning shows that doing tests or tracking the training by producing metrics on their physical fitness is embedded in a practice that, in Schatzki’s sense, carries an understanding that emphasizes monitoring and control of the athlete’s capacity at a given time (cf. Lupton, 2013, on quantification and the conceptualization of the body). This view of physiological testing, as the next section will show, is strongly related to how they perceive that coaches have worked with the tests in relation to their training regime.

### *The coach and coaching with the help of physiological tests*

When inquiring about how the athletes perceived that their coaches had worked with the tests during late adolescence, a picture emerges that reflects a coach communication and coaching strategy where little emphasis is put on using tests as something that stimulates athletes’ reflective actions and doings based on the test results (cf. Dewey, 1938). When asked how tests were followed up by the coaches, the football players described that “they were not very good at that” (FF4), while others perceived that tests were about “test and then there was not much more” (FF2), or “back then it was like just numbers” (FI4). A football player’s reasoning illustrates that a consequence of not following up test results is that tests are not linked to their football development.

I got the attitude that you never really understood what, what it was for. Because it's never been followed up on, there's never been any, like conversations about it, never really what to improve. Stuff like that, I don't think so.... (MF4)

This weak link between the test and the football practice also appears to have ruled out the possibility of learning and developing from them:

It would have been great fun to be able to say “well, this was followed up annually during my youth” and so on, and I got a training programme based on it and we worked on this and that based on what these tests showed, and then I became better. But, but, unfortunately, that has not been the case. (FF9)

The coaches' lack of communication regarding the test results, as one individual athlete pointed out, hinders the possibility of learning from them: “Because it is only then that you get something out of it. In upper secondary school, we didn't get any good help at all in going through them, and then it was completely useless” (F14). The narratives illustrate that the coaches' follow-up of the test results during late adolescence were perceived as rather superficial and not linked to previous and future actions in a concrete way, as one female individual athlete put forth: “you have this curve and you get lactic acid there and you have, it's oxygen uptake and, yes, if you continue to train it will get better” (F18).

Similarly, football players who have experience of comparisons of their test results with physiological criteria to attain to play on a certain level also illustrate a superficial approach to follow-up: “this is what you have to do, this is what you should be able to do if you are in, if you are going to play in this division” (FF11). Although this comparison of their test results with physique levels to attain was presented to them—and in some cases, as one footballer put forth, “there was some kind of comparison with the year before, I think” (FF9)—they believe that there was no clarity from the coaches on how they should proceed. From Dewey's (1938) perspective, their prior experiences could not be used to make meaning in the test situation. As Dewey (1930: 119) put it, “in the degree in which what is communicated cannot be organized into the existing experience of the learner, it becomes mere words: that is, pure sense-stimuli, lacking in meaning.” Without a follow-up strategy binding prior experiences together with current and upcoming ones, the narratives illustrate that the players are left with a feeling of having to solve for themselves how to reach the physical condition to attain a certain level. Thus, the coaches provided little help for change, that is, modified experience, by testing the physique and comparing it with physiological criteria to attain.

To sum up, the athletes' reasoning shows that the perceived role of tests as a check-point of physiological status is reinforced by the coaches neglecting to help them understand the benefit they can have from them in their continued sports development. The coaches' use of the delivery of knowledge (i.e., metrics on physical status or physiological criteria) (cf. Denison et al., 2015 on disciplinary techniques) does not engage athletes in a process of inquiry. The only purpose that the coaches enacted and made visible to the athletes, in Dewey's (1938) terms, was to check physiological status, and doing physiological testing as an educative experience can therefore be questioned.

### *The significance of tests for athlete development*

The findings presented so far show that the purpose of testing remains invisible in the athletes' narratives of their experiences of doing physiological tests. This neglect, in the athletes' view, seems to be a strong factor for the physiological tests' marginal importance and benefit for their athletic development during the upper secondary school period. The interviews with the athletes illustrate this: "for me personally, I can't say that doing those tests has really done any good" (FF7); "The benefit of that, [...] well, for me then? Nah, no use really" (MF3); or "Well, I've been sceptical and thought I didn't get much out of it" (MI5). Even if there were repeated tests during a season, based on the lack of feedback in relation to the training, the athletes perceived tests to be of little importance for their performance development, as one footballer expressed:

I think the most important thing is to follow them up and, we do this Yo-Yo test now and then I got "this" value and then we do them after the pre-season or two months after the pre-season. What effect have I had with my training, or not? It must be a very important goal that the teams I have played with have not succeeded in. (FF10)

Likewise, footballers' experiences of tests in relation to any criterion value to reach show that the significance of these tests for football development appears to have been low.

I know that when we looked at our tests in relation to the national team level and in relation to where the national A team was and what was required [...] what difference and what steps should you take in physical status to play at that level. It was quite exciting to see. But I don't really know. I think it's hard to say what I would have got out of it. (FF9)

The blurred link between the tests and the training carried out before, between and after test occasions does not, according to Dewey (1938), contribute to continuity where, for example, a first test "becomes an instrument of understanding and dealing effectively with the situations which follow" (Dewey, 1938: 37)—in this case, the training that is later followed up by a second test. Therefore, no meaningfulness in relation to their performance development appears to be attached to the tests athletes had been doing. This is a consequence of the coaches' articulation of action intelligibility (in Schatzki's sense) of physiological testing as isolated checkpoints unrelated to the performance context.

However, two female football players deviated from the pattern where the tests only were an indicator of physical status: they perceived the tests to have laid the foundation for a plan to reach farther or to work on physical weaknesses during their late adolescent years. One of them pointed out that:

I sort of got certain parts of how I should train [...] Since I had very good fitness and I was kind of fast, I didn't have that much in my training, but I had to work more on the physical side [...]. And [...] it has been positive because it has helped me out on the field since. (FF12)

What these women have in common is that they, based on the test results, received help from the coaches to analyze the tests and to draw up training plans to develop their

physique. To the question of how they analyzed their performance and made plans based on the tests, the other player responded “I got help, I did. That’s how it was” (F6).

However, when entering environments that had a different approach to tests, that is, starting to play for a senior elite-level team or, for individual athletes, when starting a university dual career program in young adulthood, the narratives reflect that physiological tests were viewed as helpful for their athletic development. One individual athlete highlighted that it had “helped me see what skills I can improve. Finding weak links. [...] And then by talking through them afterwards as well, to discuss different training strategies” (F14). A similar point is made by a footballer:

Then we did endurance tests which were followed up very well. I think it was from my x season, it was not from the beginning. [...] it then became very professional [...] was followed up and sort of adapted for each one. (FF2)

This individual adaption based on the coaches’ stimulation of reflective thought processes appears to be key for the meaning athletes make of tests and whether they learn from them. One football player’s reasoning, in addition to his feeling that the environment he is in now works with feedback on test results, suggests that the understanding of test results also has to do with maturity.

I think that when I was younger, I probably needed more ... like, more occasions where you talk and try to sort of hammer things into your head than what you do now. Because now you listen and absorb because you are a little more interested, you understand the benefit of things that you can use to improve. (MF4)

Overall, these narratives show that a different articulation of action intelligibility of what makes sense to do leaves room for helping athletes to reflect on factors that caused the results and to find solutions for future training. Dewey puts forth that “Every experience is a moving force. Its value can be judged only on the ground of what it moves toward and into. It is then the business of the educator to see in what direction an experience is heading” (Dewey, 1938: 38). In the cases where the coaches followed up the tests and discussed the results with the athletes in relation to their specific situation, the tests had meaning for them.

### *Emotions that arise when doing physiological tests*

In the interviews with the football players, some of the female players stressed that there also were negative emotions attached to doing tests. Carrying out tests was associated with anxiety and stress, especially during the upper secondary school years. One of them expressed that the tests that were carried out in groups, where it became clear who was worse than someone else, caused anxiety.

It was performance anxiety before them. I always did them [...] You have to realize that it was hard to stand there and “who will get off.. [...] I don’t know if you learn so ... much from it. [...] there may be other ways to test, especially at younger ages. I don’t know. But it was, it was not fun. (FF2)

Another example of emotional discomfort highlighted in the interviews is test occasions where a certain level would have to be reached in order not to be penalized.

I remember that some tests were full of anxiety. Because it felt like there was one, that you have to pass a certain ... level to be okay, to be on the team, roughly. And if you weren't, you had to train a little extra [...] there is certainly something positive about that. But I remember that there was a lot like, there were a lot of people who were sick. I mean, I wasn't the only one who thought it was tough. (FF12)

In other answers it appears that if you, for example, were not a good runner, tests could lead to feeling that "it also pushed me down in those tests" (FF4). This feeling could also arise if you did tests in a context other than at the club (e.g., talent selection milieus) and ended up with a result that was not as good as you were used to. This stress and anxiety in connection with tests being carried out, which some of the female football players talked about, appear to be reinforced by the lack of follow-ups and conversations about the test results.

As far as I'm concerned, I think it led to quite a lot more, like, anxiety, than they did any good. If you had learned to accept them in a different way and had been able to get a different attitude towards them, like, "this is for my own development and you rarely see what you get" and, well, some motivational factor, is surely better. But I think it is a, a difficult age for girls [...]. This measuring and comparing thing. (FF9)

Another female football player pointed out about repeated tests that the coaches argued for doing tests to follow up progression which, however, never happened.

You have done those tests and then everyone has been super nervous and you have, kind of had anxiety about that, [...] and then it has slipped through the cracks. And therefore I think it has had zero positive impact. (FF10)

In sum, the narratives of the female football players illustrate that they are exposed to an emotional challenge, a felt difficulty in Dewey's (1997) terms, that becomes miseducative. Doing tests is perceived as an examination, which exerts pressure on them "because it provides such a clear, irrefutable and objective 'mark' of one's ability" (Mills and Denison, 2018: 303). The experience they have is not directed towards reflexive learning, and therefore no ground for inquiry exists. The limited ability of the coaches to enact and make visible the purpose creates anxiety and stress for some athletes, which counteracts learning: "The most important attitude that can be formed is that of desire to go on learning" (Dewey, 1938: 48).

## **Discussion**

Drawing upon the experiences of present and former elite athletes in football and individual sports, the findings challenge the held assumptions of physiological testing in relation to athlete development. For example, that test results can be helpful for the athletes' training to augment feedback that may enable a training program based on the athletes'

physical needs (Lidor et al., 2009), or that tests can be used to design programs to improve weaknesses (Dood and Newans, 2018). In the following section, we analyze the athletes' experiences of physiological testing to provide an understanding of the practice of physiological testing. First, we provide an understanding of the bodily performances and assimilated understandings narrated by the athletes; secondly, we discuss the sport-wide commonality across sport the findings highlight and finally, in the concluding remarks we discuss educative issues associated with the physiological testing practice in sport.

### *The practice of physiological testing*

**Bodily performances and assimilated understandings:** The practice of physiological testing that emerges from the athletes' narratives may, from Schatzki's (1996) theoretical frame of reference, be understood as a practice where coaches' and athletes' bodily sayings and doings throughout the years have formed a practice consisting of a particular understanding of physiological testing in sport (cf. Svensson and Sörlin, 2019). Early on in their career (e.g., age 15–16), the athletes are introduced to the “know-how and motivational knowledge” (Reckwitz, 2002a: 256) used according to the particular practice of physiological testing centred on monitoring and checking their bodies at a given moment, not used as part of learning or as a means for athlete development. In this sense, from Mills and Denison's (2018: 304) Foucauldian viewpoint, the physiological testing practice is a disciplinary instrument, an examination in which athletes are “subjected to a state of continual assessment” and a part of a regime to control and monitor objects (i.e., athletes) in the “practices used to produce athletes for elite sport production” (Zakus, 1995: 93).

This practice, in Schatzki's sense, articulates action intelligibility through rules and structures, an order of what to say and what to do, which emphasizes tests as isolated indicators of physical status translated into numbers not related to the performance context, with few alternatives. As such, in Lupton's (2013: 399) words, physiological tests are a means for “achieving, interpreting and displaying quantification.” The numbers produced by the tests, as Lupton (2013: 399) claims, are not devoid of value judgements and meanings. The sayings and doings associated with testing physical conditions reflect a practice in “which certain actions are normatively favoured or sanctioned” (Schatzki, 1996: 163), which leads the coaches and athletes to act towards continuous monitoring and control. Both coaches and athletes assimilate the understandings within the practice (Schatzki, 1996: 114) and conform to the custom related to testing physical capabilities in sport to control and manage the athletes to meet performance agendas (see Kohe and Purdy, 2018, on the use of technology in sport). By carrying out the testing practice, the athletes and coaches “take over both the bodily and the mental patterns that constitute the practice” (Reckwitz, 2002a: 252), “though often without much reflection or conscious awareness on the part of the bearers” (Warde, 2005: 140).

This unreflective behavior surrounding the routine testing of physical capabilities and upholding of training diaries, which hinders new understandings of the training and training routines for the athletes, relates to what Schatzki calls a signifying of one particular action at a time. In Lupton's words (2013: 396), this directs the gaze directly to the body,

creating a focus on detailed knowledge of it (cf. Brown, 2016, on elite athlete programs and lack of thinking, and Mackenzie and Cushion, 2013, on the coaching process). For example, coaches' comparison of test results with norm criteria for different physiological capabilities not linked to past or future experiences creates a flow of reactions that persists, and what makes sense to do continues uninterrupted (Schatzki, 1996: 165). What makes sense to do, as the athletes' narratives highlight, appear to have no relationship to progress in their athletic development. Thinking with Dewey, the athlete's future experience does not include going beyond established chains of action, since the only prior experience they can draw upon in the situation is physiological tests being checkpoints for not going in the wrong direction. It creates, in Giddens' (1991: 44) vocabulary, a sense of ontological security, which may be reduced by a change of training regimes. The only examples found in the study that can disturb the flow of reactions, as some individual athletes' narratives show, is if the test results go backwards or are, as the female football players' narratives show, affected emotionally. However, this disruption of the flow does not appear to be sufficient to push the athletes' comfort zone in an educative way.

At the same time, the findings also show that some athletes have had an experience of physiological tests that deviate from the general picture presented so far. In cases where there was a stronger emphasis on the tests' educative role in upper secondary school or where the athletes came to a new environment later in their career, the way of working with tests contributed to helpful reflective thought processes in relation to their athletic development. A hypothetical explanation for this educative role, following what Schatzki (1996) calls fields of existential possibility, could be that a few coaches during the investment years, and especially when athletes enter senior elite level, had (a) kept, for example, the ends of athletic development constant and changed their way of following up the tests with the athlete, or (b) changed the ends from monitoring to educative, which produces a different way of carrying out tasks and actions that make sense for the sake of a new end (Schatzki, 1996: 165). Irrespective of possible explanations for the reasons why some coaches have an alternative intelligibility, for a field of existential possibility to open and help determine action, an actor needs to think about what to do (Schatzki, 1996: 166; cf. Dewey, 1938, on reflective thought processes). From a Deweyan perspective, as some athletes with an educative experience show, the purposes supported them in interweaving the coaches' and their own words, actions and thoughts. The purposes of, for example, norm criteria for physiological levels to achieve, which also shape the orientation towards ends (Schatzki, 1996: 123), had been made visible and enacted for those athletes to support progression in learning.

**The sport-wide commonality across sport:** The fact that the athletes are from different sports also tells us that the testing practices in different sports do not appear to vary much. In this sense, there is a form of sport-wide commonality. The same understandings, rules or ends, irrespective of sports, govern coaches' and athletes' behavior regarding physiological tests (Schatzki, 1996). Following Warde (2005), the understandings, knowledge and orientations in sport practice lead the practice of physiological testing to be understood in a particular way. The monitoring of performance and progress central in the practice of sport (Martindale et al., 2007) gives fuel to regular testing making sense for enhanced competitiveness. This has allowed for the practice of

testing “persistently and consistently colonising slots of time and other resources” (Shove, 2012: 106) in sport, which also has created a repeatedly performed habit-demanding practice (Shove, 2012). The practice of physiological testing is, in this sense, a practice that makes sense in relation to the sport practices it is interwoven with. Physiological tests can be understood as harbingers of progress (see Lupton, 2013, on health technologies). In Bauman’s (2001) words, physiological tests have promising pleasures in the way that coaches and physiologists are, from Mills et al.’s (2020: 245) viewpoint, attracted to the promise that the testing of athletes will help with a “coach-driven bioscientific, and systematically structured training program” necessary for producing elite athletes. The fact that every refinement of the body’s capacity is temporary means that there always is a need for repeated tests and new data to work upon, and in this sense, the practice of physiological testing continues uninterrupted (cf. Bauman, 1991). This interweaving of biology and the promise of sports development reinforces what Ojala (2020: 323) calls the figure of *homo athleticus*, that is, “seeing young athletes as objects” and conceptualizing bodies as built upon numbers pertaining to physical determinants (see Lupton, 2013, on the power of metrics and the quantified self). In this context, the use of norm criteria signals an ideal body that the athletes are expected to reach, but they do not do so (see van Amsterdam et al., 2017). The motivation injection that coaches think these criteria will provide for the athlete may instead, as the female football players’ narratives show, create an unpleasant feeling that affects not only how testing is perceived for sports development but also the athletes’ self-worth, which gives more fuel to *homo athleticus*.

The previously mentioned signifying of one particular action at a time, such as test protocols used for talent identification typically being kept in isolation from the performance context (cf. Pinder et al., 2013), may explain this normativized intelligibility of actions that makes sense across sports. This weak link between tests and sport practice, in Schatzki’s (1996) sense, contributes to an enveloping commonality across sports for certain chains of action within a testing practice with a wide number of carriers, and therefore, in Shove’s terms, it is “strong (as an entity)” (2012: 109).

## Concluding remarks

To our knowledge, this is the first study to investigate sport athletes’ perceptions of the role of physiological testing for athletic development. By connecting theorizing on social practices (Schatzki and Reckwitz) with Dewey’s ideas of meaning making this study has provided insights into the role physiological testing has for talent development. By emphasizing talent development as a learning process, where past experiences are intertwined with current and upcoming ones, it is shown that the habitual actions performed in relation to tests for the sake of developing the athletes and their performance are not effective to that end. Questions can therefore be raised about for whom physiological testing matters. The amount of research in physiology over the years tells us that more research from a physiological viewpoint, irrespective of whether it is better linked to the actual performance at play, will have limited possibilities to help make the use of tests meaningful for the athletes (cf. Mackenzie and Cushion, 2013). As this study shows, physiological tests not followed up by coaches or others in an educative way,



with a lack of inquiry and support to make sense of their experience, have little value for the athlete, regardless of whether the tests correctly measure what they are supposed to measure. An educative reflection on the experiences made from the tests needs to pave the way. Coaches need to be critical thinkers to change the prevalent coaching regime (Denison et al., 2015), because as the analysis showed, the athletes have “limited resources, power relations and forms of empowerment to resist the current practices used” (Zakus, 1995: 93). The prevalent practice analyzed here indicates the importance of supportive structures and knowledgeable individuals (i.e., coaches, organization leaders) who “understand how to disrupt the movement of power in some way that can disturb the making of athletes into docile objects” (Mills and Denison, 2018: 311), to help athletes be reflective practitioners and take responsibility for their own development and performance. Martindale et al. (2007) claim that this is what effective talent development presupposes.

Following Schatzki’s (1996) reasoning, since coaches are part of the sport system and are shaped by it, mostly through their own athletic participation and thereafter as coaches, this raises questions as to what possibilities there are for an alternative intelligibility for goals, projects and tasks to carry out within the practice of testing. Such possibilities seem limited without any fuel that, following Reckwitz (2002a), can break or shift the governing structures (cf. Mills and Denison, 2018, on endurance in running coaches’ coaching). Practices have a history, a historical context formed by tradition and custom (Svensson and Sörlin, 2019; Warde, 2005), and the 1950s’ cross-country skiers’ opinions that “they did not get a sufficient explanation of the test procedures, results and how to use them in their own training” (Svensson and Sörlin, 2019: 579) seems to be present still. However, the coach education practice is important for both reproduction and change or modification of certain practices (cf. Shove, 2012). The coach education practice may provide nourishment for alternative meanings for what makes sense to do in relation to physiological tests. For example, the teaching approach towards learning to play in Swedish football is undergoing a change from an instructional paradigm to inquiry and problem solving (cf. O’Sullivan et al., 2023), and maybe this shift in educational approach can have better chances of opening for “fields of existential possibility” (Schatzki, 1996). From this study, it is clear that athletes, especially in the investment years before the senior level, need help to translate test results into the performance context. As the findings tell us, in those cases where a different test approach is practised by coaches, for example, when purposes are visible and reflective thought processes arise on test results, tests are viewed as helpful for the athletes’ training strategies and development as an athlete.

This study has not investigated the coaches’ view of what makes sense to do. However, the athletes’ voices uncover a reductionist and objectifying coaching in relation to physiological tests in sport, which is something future studies need to address. In such studies it may be fruitful to consider the level of commitment, coaches’ capacities including new and old generations of coaches, or cultural traditions (see Warde, 2005 on suggested dimensions to explore in analyses of practices). Other subdimensions of interest within the testing practice are pedagogical approaches to learning and coach–athlete relationships in the testing procedures (see Mills and Denison, 2018, on examination and power). In addition, because physiological tests are not only in the hands of users to

control at their own will but also shape how they think and what they say and do, it is also reasonable in the future to explore the relationship between the training carried out and what can be measured in the tests (cf. Lupton, 2013).

Finally, some of the female football players' narratives also put forth possible risks of doing physiological tests. As their narratives tell us, although athletes do not find doing tests pleasant, they still do them because they rely on the coaches to know best. This means that the subjective awareness of what their bodies are telling them, such as negative emotions and discomfort, are ignored and they instead suffer in silence (Zakus, 1995: 92). Future studies need to investigate the consequences of doing tests (including how they are carried out), but also other possible risks of physiological testing in relation to athlete welfare. As the female football players' narratives tell us, these risks are probably greater the less you follow up and talk with the athletes about their test results.

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