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Chapter 2

Acquisition and maintenance of excellence:
the challenges faced by Dutch top-level
gymnasts throughout different stages of
athletic development

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Abstract

The purpose of the present study is to identify the within-career challenges top-level gymnasts experience during the initiation, development and mastery stage of athletic development in training sessions, competition, and in daily life. In-depth interviews are used to explore the perceived challenges of 16 talented and elite gymnasts ($M = 16.5$ years, $SD = 4.6$ years). Participants are divided into three groups, according to the stage of their athletic development. Several challenges are perceived in all stages of athletic development (e.g. learning new elements, dealing with stress under pressure, dealing with distractions and managing their dual career). As the number of different challenges increases as the gymnasts reach the mastery stage, challenges seem to become more personal and specific than in previous stages. The study shows obvious differences in the nature of the perceived challenges for different stages of athletic development, which provides useful insights for those who work with talented and elite athletes.

Keywords: challenges; talent development; elite gymnastics; Holistic Athletic Career; transitions

Introduction

The pathway to acquisition and maintenance of excellence is rarely smooth. It has been described as dynamic, complex, challenging and unpredictable (Henriksen, Stambulova & Roessler, 2010; MacNamara, Button & Collins, 2010a). To realize their full potential, athletes need to engage in many hours of deliberate practice (Ericsson, Krampe & Tesch-Römer, 1993), while they need to deal with the trials and tribulations this rocky road throws at them. Athletes have to take multiple hurdles not only in their sport (e.g. during training sessions, competitions) but they also face challenges in their daily life (e.g. at school, in building up friendships, adapting to elite lifestyle) throughout their athletic career. The Cambridge dictionary defines challenge as: '*(the situation of being faced with) something which needs great mental or physical effort in order to be done successfully*'. In our view, challenges can be barriers, stressors and/or struggles which need to be handled in order for further athletic development and performance at the highest levels. Dealing with these challenges can be seen as minor transitions, because being confronted with such challenging situations results in a change in assumptions about oneself and the world and thus require a corresponding change in one's behaviour and relationships (Schlossberg, 1981). Considering that the talent pathway is challenging in itself, knowing *what* challenges athletes are confronted with and *when* they probably will occur allows to prepare athletes for those challenges and in this way benefit the most from these challenging experiences.

Understanding the impact and relevance of challenges during the athletic career requires a conceptual framework for thinking simultaneously about sports as context in which development takes place and about the changing developmental needs of athletes as they move through their athletic careers. Such a framework is provided by the stage-environment fit theory, which is based on the person-environment fit models and takes into account that the fit between individual characteristics and the environment changes as individuals go through different stages of development (Eccles & Midgley, 1989). This perspective is also reflected in the person-task-environment model of Elferink-Gemser and Visscher (2012). In their view, depending on the task, an athlete

needs a certain combination of person-related and environmental characteristics to be successful. The interplay between personal and environmental characteristics related to the task results in an athlete's sports performance (Elferink-Gemser & Visscher, 2012). This changes over time and is influenced by maturation (Malina et al. 2005), learning and training of the athlete. Given the changes in different stages of athletic development, the interplay between person, task and environment may change.

Recent research focused mainly on the perceived challenges and experiences of athletes during specific transitions, such as readiness for structured competitive sports or entering the elite sports context, transition from junior to senior competition, primary to high school or into athletic retirement (e.g. Franck, Stambulova & Ivarsson, 2016; Knights, Sherry & Ruddock-Hudson, 2016; Morris, Tod & Eubank, 2016; Morris, Tod & Oliver, 2015; Rosier et al. 2015; Willard & Lavallee, 2016). Other research focused on the challenges within specific stages of development (e.g. Poczwardowski et al., 2014; Pummell, Harwood & Lavallee, 2008; Tekavc, Wylleman & Cecic, 2015) or challenges within specific domains such as the dual career (e.g. Aquilina, 2013; Debois, Ledon & Wylleman, 2015; Stambulova et al., 2015). For example, research by Bruner, Monroe-Chandler and Spink (2008) investigated the experiences of young ice-hockey players in transitioning to elite sports. They found that young athletes were confronted with on-ice issues associated with performance, for example earning playing time and coaches comments, and off-ice issues relating to relationships and personal development. Further, recent research by Kristiansen and Stensrud (2017) examined the challenges perceived by female handball players in the first years of high school. Due to a significant increase in training volume, a reduction in sleeping time and the development of severe and long-lasting injuries, young handball players were confronted with challenges related to competition, combining sport and school and personal stressors such as the balance between social life and sport. Research by Wylleman, Reints and Van Aken (2012) showed that, depending before, during or after the Olympic Games, Olympic athletes perceived different challenges (e.g. training load, feelings of pride, self-confidence, pressure from media/public, social contacts). While these studies

gave a deeper insight into the challenges in a specific stage of development, research into the occurrence of the challenges faced by athletes *within* different stages of athletic development and how they change over time was still lacking. The Holistic Athletic Career (HAC) model of Wylleman and Rosier (2016) provides a perspective on the stages of development for different domains of development, while taking into account the 'whole-person'. The HAC model shows athletes' multilevel development, as they develop during their athletic career as well as in psychological, psychosocial, educational/vocational and financial domains. While the HAC model outlines developmental stages and challenging transitions to a new stage from a developmental and holistic perspective (Wylleman, Reints & De Knop, 2013), there is still a lack of research into the challenges athletes experience *within* the initiation, development and mastery stages and how they change or remain the same over time.

Female gymnastics, characterized by early specialization, requires that talented athletes go through these stages at a very young age. This means young gymnasts start at a younger age with their investment years, which as a consequence may have implications for parental involvement (Côté, 1999), the coach-athlete relationship (Fraser-Thomas, Côté & Deakin, 2005) and issues related to mental health (Francisco, Alarcão & Narciso, 2012). The structure of the talent development program for Dutch gymnasts offers them an environment in which to progress through the three stages of athletic development, shown in the HAC model, in order to achieve peak performance. In the Netherlands, the initiation stage in the development of talented gymnasts includes participation, from the age of nine onwards, in structured talent programs. This implies that these young athletes are involved in professional training and competition programmes. In some cases, this implies living with a host family and/or changing primary schools. Gymnasts enter the development stage of athletic development from the age of thirteen years. This stage is not only accompanied by an intensification of the level of training and competitions but imply also being part of the Dutch national team during international youth tournaments. Sixteen-year-old gymnasts make the transition from junior to senior competition. Peak performance in female gymnastics is usually reached

around this age (Pion, Lenoir, Vandorpe & Segers, 2015). The Royal Dutch Gymnastics Federation (KNGU) aims for peak performance in female gymnasts at age 17 in order to allow them to get accustomed to senior competition when they enter the mastery stage of athletic development.

Task characteristics and performance demands in female gymnastics are set out in the Women's Artistic Gymnastics Code of Points by the international governing body of gymnastics. Performance in artistic gymnastics is built up from a score of difficulty (D-score) and score of execution (E-score). The D-score is the score the gymnast receives based on the difficulty of the routines content. The E-score reflects the gymnast's execution of the routine. The finale score (F-score) is the sum of the D and E score. For each of the four apparatus activities, performance is defined as content and construction of the exercise, composition requirements, connection value and specific deductions, allowing a slight margin for personal contribution to performance development.

Considering the well-defined task characteristics of female gymnastics, there is a strong need for more insight into the environmental and personal factors that contribute to successful talent development and elite performance in female gymnastics. Further, considering that the developmental demands may change as athletes develop to elite level, there is a need how these environmental and personal factors change over time. Therefore, the focus of this article is on perceived challenges by gymnasts within different stages of athletic development, taking into account both challenges in the athletic as non-athletic domain. The purpose of the present study is to identify the within-career challenges top-level gymnasts experience during the initiation, development and mastery stage of athletic development in training sessions, competition, and in daily life. We are interested in the pathway to elite sports and the route an athlete takes to achieve and perform at the highest level of competition. For this reason, we focus on within-career challenges of active athletes and do not investigate the challenges experienced by athletes in the fourth stage of athletic development (the discontinuation stage) of the HAC model.

Method

Participants

Data was collected using in-depth interviews with 16 female elite gymnasts. The ages of the gymnasts ranged from 10 to 24 years old ($M = 16.5$ years, $SD = 4.6$ years). Based upon the development programme of the Dutch Federation of Gymnastics, the gymnasts were divided into three groups, according to the different stages of athletic development of the HAC model: initiation stage (10 to 12 years; $n=4$, $M=11.6$ years, $SD=0.5$), development stage (13 to 16 years; $n = 6$, $M = 14.8$ years, $SD = 1.3$) and mastery stage (17 years and older; $n = 6$, $M = 21.6$ years, $SD = 2.7$). Table 2.1 shows the demographic data for the three groups.

Table 2.1. Demographic data participants per stage of athletic development

	Initiation stage	Development stage	Mastery stage
Participants	1, 2, 3, 4	5, 6, 7, 8, 9, 10	11, 12, 13, 14, 15, 16
Age	$M = 11.6$ $SD = 0.5$	$M = 14.8$ $SD = 1.3$	$M = 21.6$ $SD = 2.7$
Education	Primary school ($n = 4$)	High school ($n = 6$)	Secondary education ($n = 2$) No education ($n = 4$)
Training hours per week	$M = 21.5$ $SD = 0$	$M = 28.8$ $SD = 2.4$	$M = 29.5$ $SD = 0.8$
Age started with gymnastics (years)	$M = 5.8$ $SD = 1.0$	$M = 5.8$ $SD = 1.5$	$M = 5$ $SD = 1.5$
Age started in structured talent programs (years)	$M = 7.5$ $SD = 1.3$	$M = 9.2$ $SD = 1.3$	$M = 8.7$ $SD = 1.4$

Procedure

Approval was granted from the Ethics Committee Human Movement Sciences of the University of Groningen and procedures were in accordance with the ethical standards for sports research. Purposeful selection was used to select the

gymnasts who participated in this study. The logic and power of purposeful selection lies in selecting information-rich cases for the study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research (Patton 1990, p. 169). Therefore, a combination of homogenous sampling (i.e. female Dutch top-level gymnasts), intensity sampling (i.e. gymnasts in different stages of the athletic career) and criterion sampling was used. The head coach of the Dutch national team selected sixteen gymnasts who met the criteria of (1) part of the Dutch national team for their age, (2) competed at the highest level possible at their age and (3) identified by the KNGU as high potential for future success. So, at the time the interviews took place, all gymnasts participated in the national team for their age group, competed at the highest level possible at their age and were seen as high potential.

The head coach of the KGNU informed the selected gymnasts, their parents and their coaches about the research. Subsequently, the researcher contacted the gymnasts with further information by way of an informative letter and made an appointment for the interview. Before the interview, the gymnast signed the informed consent and, if under-age, the parents also gave their permission by signing the informed consent. All interviews were conducted face-to-face. The interviews took place at the gymnast's club or at home, whichever best fitted the schedule of the gymnast. Efforts were made to ensure that it took place in a quiet room with only the interviewer and gymnast present, so that the gymnasts could speak openly. The researcher made clear that all information was analysed anonymously, and that no one other than the researcher had access to the original interview. The interviews lasted between 50 and 120 minutes ($M = 80$ minutes, $SD = 22$ minutes). The interviews with the youngest girls were the shortest.

Interviews

In-depth interviews enable the researcher to gain insight in subjective experiences and feelings (Robson, 2002). In-depth interviews were therefore used to discover the perceived challenges of gymnasts in the different stages of

athletic development. As in-depth interviews need to be flexible, interactive and responsive in nature, only a list of three key topics was designed to be explored during the interview, namely challenges in training, in competition and in their daily life. Table 2.2 shows a list of the key questions. Gymnasts were asked to guide the interviewer through a training, day of competition and how their weekly schedule looked like. Afterwards, gymnasts were asked to describe two or more challenges they have recently been faced with in each of the three topics. Follow-up questions enabled the interviewer to go more deeply into what they experienced to be challenging in specific situations. The researcher was flexible in the way topics came up, so that the questions flowed naturally from the conversation and the interview was interactive and responsive in nature.

Table 2.2. Overview of the key questions

Q1	Walk me through a training. What do you do just before, during and after the training session?
Q2	Can you describe two or more challenges you are <i>recently</i> faced with during your training sessions?
Q3	Walk me through a general match day from the moment you arrive at the location until you are done. What do you do just before, during and after your performance at a match?
Q4	Can you describe two or more challenges you are <i>recently</i> faced with during matches?
Q5	Can you describe your living situation outside the gym? What does your week normally look like?
Q6	Can you describe two or more challenges you <i>recently</i> faced in your daily life?

The interviewer (i.e. first author) is a 26-year-old female, with a background as a sport psychologist who, due to earlier qualitative research activities, had experience in conducting interviews.

Prior to the interviews with the 16 gymnasts, the interview was piloted with two talented female handball players. The ages of the handball players in the pilot were 16 and 18 years. They both were in the development stage of their athletic career. Both athletes were seen as high potential and both attended a talent

program of the national handball federation. In the pilot, the talented athletes were interviewed about challenges in their athletic, psychological, psychosocial and educational level (in line with the HAC model of Wylleman and Rosier, [2016]). According to the handball players, the distinction between the levels of the HAC model was hard to make for them. Although handball is a team sport, the way the handball players approached their personal development and their athletic career was quite individual (e.g. ‘What challenges do I experience on the route?’ ‘What do I need to become a better player?’). Since we were interested in these subjective experiences and reflections, we considered this pilot very useful. Considering this and aligning with contemporary views pertaining to generalizability in qualitative research, we assessed this interview to be generalizable, in terms of transferability, to the context of elite female gymnastics (Smith, 2008). That is why we took their considerations on board and changed the main topics of the interview into training, competition, and daily life. Therefore, the main topics of the structure of the interview were changed as this was more concrete and could be better understood by the athletes.

Data-analysis

Interviews were transcribed verbatim. Thematic data analysis was used to analyse and interpret the data. Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data (Braun & Clarke, 2006). Part of the flexibility of thematic analysis is that it allows the researcher to determine themes and prevalence in a number of ways. According to Braun and Clarke (2006) there is no right or wrong method for determining prevalence, but what is important is that the researcher is consistent in the way it is done within any particular analysis and that it is in line with the research question. As the research question of the present study is to determine *what* perceived challenges occur *at what moment* in the athletic career, we are interested in the prevalence of perceived challenges and try to give a rich description of the entire data set. Therefore, it was chosen to count and quantify the number of challenges in each of the stages of the athletic career. We acknowledge that some depth and complexity is lost, in order to maintain a rich overall description (Braun & Clarke, 2006). Further, thematic data analysis usefully summarizes key

features of a large body of data and can highlight similarities and differences across the data set, which is in line with the research question of the present study.

Data analysis was done following the guidelines and six phases for thematic analysis by Braun and Clarke (2006). To start, all interviews were read and re-read while noting down some initial ideas (phase 1). Then, all quotations referring to challenges were depicted from the interviews (phase 2). Following the three key topics of the interviews, three major themes were deductively identified as 'challenges during training', 'challenges during competition' and 'challenges in daily life'. All quotations of perceived challenges depicted in phase 2 were divided as into those major themes (phase 3). As a result of the specificity of the interview guide, all quotations were easily to divide into training *or* in competition *or* in daily life. Then, all quotations of perceived challenges were reviewed. Challenges of the same nature in each setting were brought together and counted for each of the stages of athletic development (phase 4). In the ongoing process of the data analysis, the labels of the perceived challenges were refined. The perceived challenges were discussed and choices were made to merge and/or to split after reviewing, because gymnasts had different meanings with their quotes. For example, the challenge 'to keep your attention to your exercise' had a different meaning than 'to deal with distractions during the match', although both challenges refer to staying focused during competition. Last, it was calculated for how many gymnasts mentioned a specific challenge in their stage of athletic development (phase 6).

Rigor

Although concepts of validity and reliability in qualitative research cannot be addressed in the same way as in quantitative work (Shenton, 2004; Smith & McGannon, 2018), several steps were taken to ensure the rigor of the present study. We align with contemporary views of Smith and McGannon (2018) for the ineffectiveness of calculating the inter-rater correlation. We believe that we can never achieve theory-free knowledge and therefore, inter-rater reliability will always be influenced by people's theoretical proclivities and tied to people's

subjectivities. Thus, instead of calculating the inter-rater reliability, we used critical friends in the process of data-analysis to reflect on and discuss about the choices we made in the research process. Using critical friends is viewed as an opportunity for dialogue and the reflexive acknowledgement of multiple truths, perspectives and results in the research process. For example, several opinions and perspectives were discussed about the choices made whether something was interpreted as a challenge and to distinguish challenges or to cluster challenges of the same nature. Further, during a follow-up meeting with the participants, member reflections were used in order to generate additional insight in the challenges and to explore any gaps in the results or similarities they share concerning interpretations of the findings (Smith & McGannon, 2018).

Results

A distinction is made between the number of quotations (referring to an individual quote about a singular challenge) and the number of challenges (a specific challenge that is experienced by one or more gymnasts). Table 2.3 provides an overview of all the challenges gymnasts mentioned, specified for gymnasts in the initiation stage, development stage and mastery stage and during training, in competition and in their daily life. The number of participants gives an indication how many of the gymnasts mentioned a challenge. We acknowledge that quantifying the results might be not in line our ontological perspective. Nevertheless, in view of the research question, we see it useful to illustrate the richness of the data and the prevalence of the perceived challenges within different stages of athletic development.

Table 2.3. Perceived within-career challenges for Dutch female gymnasts during the initiation ($n=4$), developmental ($n=6$) and the mastery stage ($n=6$) during training, competition and in daily life

Perceived challenges during training sessions	Initiation ($n = 4$)	Development ($n = 6$)	Mastery ($n = 6$)
To learn new (more difficult) elements	4	3	3
To execute elements that scares you	4		2
To achieve the D-scores that are required	2		1
To decide on your own what elements you need to learn to make progression	1		
To insert new elements into your exercise		2	
To deal with fatigue during your training		2	
Working with another coach when your own coach is not around		2	
To divide your energy over the training and the four apparatus			2
To deal with distractions in the environment			2
To deal with the intensity of training on tough days			2
To persevere when an exercise/element repeatedly fails		2	2
When you suddenly stop in the execution of an element/exercise		1	
To get in shape after an injury		1	
To give 100% each day		1	1
To see what is possible each day			1
To take a next step in learning a new element		1	1
To deal with stress during training sessions in preparation of competition			1

To train effectively when you are injured			1
Perceived challenges during competition	Initiation (n = 4)	Development (n = 6)	Mastery (n = 6)
To deal with stress and nerves under pressure	2	3	3
To keep your attention to your exercise	2		
To deal with distractions (internal and external) during the match	1	3	3
To gain flawless execution of your exercise	1		
To achieve your level of performance as you do during training sessions	1		
To reset your thoughts when you failed the previous exercise	1	1	1
To try a new exercise for the first time in competition		2	1
To perform on apparatus of another brand	1	1	3
To complete your exercise after you felt		1	
To be assertive and combative			2
To give 100% effort			1
To have confidence in yourself			1
To be fit and have no injuries			1
To achieve your intended goals and score			1
To achieve peak performance in important matches			1
To deal with different preparation time			1
Perceived challenges in daily life	Initiation (n = 4)	Development (n = 6)	Mastery (n = 6)
To switch host family	1		
To be yourself when your living with a host family	1		

Transition from primary school to secondary school	1		
To combine your gymnastic career with school	1	6	2
To maintain social contacts and undertake social activities		3	5
To be fit (physically as psychological as well)		2	
To deal with the loss of a family member		1	
To control your weight and nutrition			2
To have limited general knowledge			1
To create an optimal balance between gymnastics, school and social activities			1

Initiation stage

Training

All gymnasts in the initiation stage mentioned experiencing the challenge of learning new and more difficult elements during training sessions. To make progress and acquire higher E-scores, young gymnasts need to push themselves repeatedly to learn new, more difficult, elements. One of the gymnasts explains it this way:

I have things I can already do. When you are working on new things, you do the same elements, but then a little bit more difficult ... For example, I can already do a backflip, so now I am working on a backflip followed by a whole turn (gymnast 1).

To learn more difficult elements is scary and frightening most of the time, according to all gymnasts in the initiation stage. To do new frightening elements you have never done before, is another challenge during trainings sessions. This challenge is also named by all four gymnasts in the initiation stage. The challenge is about 'just doing it' instead of 'suddenly stop with an action', which is reflected in the next quote:

If you are very nervous before you start with your exercise, sometimes you don't want to do the exercise anymore, because you are scared of the elements. But you just have to deal with that (gymnast 4).

Also, half of the gymnasts in this stage said they had experienced challenges in meeting the goals that are set. One of them referred to the demands set by the governing body for participation in competition, and the other one referred to meeting her own goals and personal demands.

Competition

Related to competition, gymnasts experienced challenges in their attentional focus, such as 'to keep your attention on your exercise' and 'to deal with distractions'. As the quotations of the gymnasts shows, distractions can be internal (e.g., own negative thoughts) and/or external (e.g., noise in the gym, other children). This is illustrated by the following quote: *'I am not very good at concentrating during competition, because I hear a lot of noise and other children in the gym and I really can't stand that'* (gymnast 2).

In addition, half of the gymnasts mentioned that it is a challenge to deal with their nerves before and during the match. They said they felt nervous and tense before performing. This is also reflected in their thoughts, which distract them from their tasks: *'The challenge for me is not to get too excited and busy in my head, like: I must do it right now'* (gymnast 1). The following quote of gymnast 2 reflects several factors that are challenging during competitive performance, which influence her feelings of stress and nerves:

I like doing competition, however... during training, you have your 'own apparatuses', each time the same apparatuses so you are used to them. In competition, they are different and then you need some time to get used to the apparatus. You become nervous, also because there is a jury and they're not easy to handle. They are really strict. And then you have the audience watching you. And if you fall, they all go like: Oh no! That is challenging.

Daily life

In daily life, four challenges were identified, which were: 'to switch host family', 'to be yourself when you're living with a host family', 'transition from primary to high school' and 'to combine your athletic career with school' (more specific: to do your homework on your only day off'). All gymnasts are attending two different schools; two days in the city where they are training and three days in their hometown.

Only one of the gymnasts in this stage lives in a host family. Remarkably, she mentioned two challenges of living in a host family. The following quote reflects the complex situation she is in:

Since I'm 10 years old, I am living in a host family. In the first family, I really didn't like it, so I switched to another family. But unfortunately, I couldn't stay there, so I had to switch families again. Now I'm in my third host family, where I really like it. There is another gymnast staying there as well. I can be myself in this family and I don't have to hide myself anymore. Oh, but on Tuesday I'm going to my real parents and on Wednesday I'm going to school in my hometown (gymnast 1).

Developmental stage

Training

Half of the gymnasts in the developmental stage said they experienced challenges in learning new elements during training sessions, which is the same challenges as mentioned by all gymnasts in the initiation stage. In order to develop themselves, gymnasts need to push themselves to learn new and more difficult elements:

The challenge is in learning new elements. For example, when the coach says: 'You are doing it well with my help, now you can do it on your own'. Then I think: 'Yeah, I want to do it on my own, but do I dare to do it all by myself?'. That is a challenge for me, because: 'Am I really going to do it or do I let it go?'. With some elements, I can push myself to get over it, but with other things I am not so sure (gymnast 5).

Thereby, they experienced several challenges related to their energy level (e.g., dealing with fatigue during your training, getting in shape after an injury, and giving 100 percent every day). It is challenging to pay attention and do what you have to do when you are tired, as is reflected in this quote:

Sometimes I'm so tired. Because I have to do my homework in the evening and I'm working on that until midnight. Besides, sometimes I just can't fall asleep. But the next day, when I'm fatigued, I've to focus on my training again. That is often a challenge; to deal with fatigue and do your thing during training (gymnast 6).

They are also confronted with challenges related to the perseverance required to develop themselves (e.g., to persevere when an exercise/element repeatedly fails, when you suddenly stop in the execution of an element/exercise and take a next step in learning a new element), like: *"Sometimes it just doesn't work out. When I am trying something and it doesn't work over and over again. It's frustrating."* (gymnast 9)

Competition

'To deal with stress and nerves under pressure' is a challenge for half of the gymnasts in the developmental stage. Half of them reported to be very nervous before a match. To deal with this stress and to relax is seen as a challenge before and during competition, which is illustrated by the quote of gymnast 7:

The preparation and warming up is really stressful. I want to do everything right from the start, because it gives me a good feeling. So, before the match I am really nervous. During the match, it gets better. Back in the days, I used to be really stressed during the whole match, but now I can handle it better and I manage to relax in between the apparatus, to look around a little bit and to think of something else.

Just like the earlier stage, half of the gymnasts in the developmental stage felt challenged by distractions. As in the initiation stage, distractions can be internal (e.g., own negative thoughts) and/or external (e.g., other gymnasts, other

apparatus, the audience). Disappointing results on a previous apparatus can also be distracting:

My exercise on uneven bars went totally wrong! I thought: 'Oh help! Now I have to perform on balance beam and that is my last exercise. So, my thoughts were about not being selected if I were to fail on balance beam. I had to go all out, which made me very nervous (gymnast 6).

Further, to try new exercises during competition is identified as a challenge in this stage. When they have worked on building up a new element in their exercise, or doing a whole new exercise, gymnasts are challenged:

For example, when you're doing an element for the first time in competition, then it is kind of a challenge to do it right there and show it to everyone. Because then you must do it. That's a nice challenge, but also very nerve-wracking (gymnast 5).

Daily life

In daily life, all gymnasts experienced challenges in combining their athletic career with school. They mentioned various challenges regarding their dual career, including too little time to do homework, having to do homework when tired, not being able to take tests at appointed times, to stay focused in class after training, to reschedule missed classes/tests and to keep up with the subject material. The next quote describes several aspects of this challenge:

It is challenging, when you come home late after training and you have to do your homework. For example, when you have a test the next day and you already have rescheduled it once, you cannot postpone it any more. Then it is a challenge to really focus yourself and to study for a test (gymnast 5).

In addition, half of them said they experienced challenges in combining their athletic career with social activities with friends and family and maintaining social contacts. This also included undertaking social activities, because they had little free time due to the amount of time spend in training and at school.

Therefore, they are not always able to attend birthdays and parties, or to hang out with friends after school, which they experienced as a challenge:

Most of the times, I have to refuse invitations to activities, because I have to train. For example, my class is going on a school camp next week, but I cannot go with them. I am preparing for the Youth European Championship, so I cannot go with them. That is a hard decision, but I cannot skip my trainings sessions for a whole week. Sometimes that is a challenge: to say no to these activities (gymnast 10).

They are challenged to make ‘the right choice’ in the way they spend their free time, as explained by the same gymnast: “Sometimes they undertake activities that are not good for me, for example when the class decides to go ice-skating. That kind of activity is too intense for me and high at risk for injuries.” This is reported to be challenging as peers do not always understand what is like to be so passionate about a sport and to invest that many hours of training.

Mastery stage

Training

Just like in earlier stages, ‘to learn new (more difficult) elements’ during training sessions is identified as a challenge for half of the gymnasts in the mastery stage. Gymnasts in this stage mentioned that they are still pushing themselves to learn new elements to get a higher score of difficulty, which is reflected in the quote of the following gymnast:

At this moment, I am working on learning new elements for Rio. That is challenging, because it is new and scary, you know. So, every time I get a huge adrenaline rush (gymnast 14).

Learning new elements is the only challenge mentioned by 50% or more of the gymnasts in the mastery stage. Besides learning new elements, gymnasts in this stage experienced other challenges related to learning new elements, such as performing new elements that scare you, persevering when an element repeatedly fails and taking a next step in learning a new element.

Further, they mentioned a number of challenges, most of them related to their energy level. For example, distributing your energy equally throughout a training session, dealing with the intensity of each training session, giving 100% each day and seeing what is possible depending on the energy level available, which is reflected in the following quote:

For me it's a challenge to give everything every day time after time. It's difficult, because if I've given everything today, I'll be tired tomorrow. And I know that tomorrow it will be hard to give everything again. Then I get this feeling like: oh no, it's not working out any more. That's a big challenge (gymnast 12).

Competition

Regarding competition, three challenges were reported by 50% of the gymnasts. First, half of the gymnasts said they experienced challenges in dealing with stress and nerves under pressure. This challenge is also named by gymnasts in earlier developmental stages. They feel the stress and nerves before the game, in particular, or about performing on a specific apparatus:

When I start my warming up, most of the time I am really nervous ... During the warming-up and when I am doing my pre-performance routine, I feel that I am less nervous than before, because I am busy and getting focused. But when the game begins and I have to start my first exercise, I am very nervous because I have in mind that it is the first one and I want to do it right. After the first exercise, the nerves disappear (gymnast 11).

Second, it is challenging to deal with distractions during competition for half of the gymnasts in this stage. Internal distractions included negative thoughts as well as positive thoughts (e.g., I already won this game). An example of how negative thoughts can be a distraction is illustrated by the quote of the following gymnast:

When I make a mistake on an apparatus, I am really mad at myself. I hate it, when I made a mistake. The vision of that mistake stays on my mind all the time. To begin with an open and positive mind with the next exercise is really

challenging for me. It is a challenge to reset my mind and not visualise that mistake over and over (gymnast 13).

External distractions included the emotional climate in the team, the performance level of opponents, how impressive your opponents' outfits are and people in your direct environment wanting to have a chat.

Third, half of them also reported that it is challenging to perform on apparatus of another brand than usually used in training. There are several brands of gymnastic apparatus which differ in elasticity or stiffness. Even apparatus of the same brand can differ in this way. Because of the precision of the sport, gymnasts experience challenges when they need to perform on other apparatus than they are used to at their own training location:

Different apparatuses, different brands... Performance on one bar is not the same as on another bar. Although it might be the same brand as you are used to working on in training, it feels different because of the tension and how it has been set up. I think that is the biggest challenge, to adapt to the different apparatuses during a game (gymnast 15).

Nine other challenges were identified regarding competition, but none of them were reported by more than 50% of the gymnasts, which reflects the specificity of the challenges of gymnasts in the mastery stage. These challenges concerned their focus, assertiveness, energy level, self-confidence, achieving goals and adapting to the situation.

Daily life

Five out of six gymnasts said that it is a challenge to maintain social contacts and undertake social activities, because they have little free time to meet friends and build up a social network outside their sport. This is reflected in the following quote:

As an elite athlete, you have to be a bit antisocial. You have to be that to a certain extent, but that doesn't mean you always want to be that way. That is sometimes a conflict for me. I hardly ever have time for friends to hang out ...

That has to be enough, because there's no room in my schedule for more social activities. And thereby, friends have to understand why I don't have more time to spend with them. I would love to spend more time with friends and family, but it is just not possible (gymnast 13).

Gymnasts said to have limited social contacts and restricted social networks, which is also seen as challenging for the future, because they are worried about not having a lot of friends when they end their career.

The consequence for me of being an elite athlete is that I don't have many friends. The friends I do have, I know from gymnastics. They are here in the gym or in the selections of the Dutch team, living throughout the Netherlands. The only thing I am really worried about... If I ever quit my athletic career, that I will be confronted with 'the black hole', because I do not have a social life (gymnast 11).

Two gymnasts experienced challenges in combining their athletic career with attending school or study. It is especially challenging to deal with the periodisation of their sport:

To communicate with school about your periodisation is a challenge. It is necessary to communicate when you have a quiet period with gymnastics, when you have enough time spend on your schoolwork, but there are also periods when you don't have time to do anything for school. That is the only challenge... To succeed this year, I need to do one individual assignment and one group assignment. That is a challenge, because I'm very often away and then it is difficult to do group assignments (gymnast 11).

Because the gymnasts were asked to name challenges they were *recently* confronted with, only gymnasts 11 and 12 reported challenges regarding their dual career. The other four gymnasts (13, 14, 15 and 16) explained they quitted school to be able to focus completely on gymnastics in preparation for the Olympic Games. However, they all said that having a dual career is challenging and so they have decided to quit school:

I want to go on to higher education, but that is too difficult to combine with gymnastics. So now I am taking a year off, allowing me to really focus on the Olympic Games. Imagining combining with that education, even if it was actually possible, I would be very tired for my training. After all these years of school, which were so hard to combine, it is really pleasant to have some rest (gymnast 16).

Discussion

The purpose of the present study was to identify challenges gymnasts are confronted with during training, competition and in daily life during three stages of athletic development. Results allow to identify and compare challenges that occur during all stages of athletic development. Our study shows that gymnasts in the initiation stage perceived the fewest challenges. Gymnasts in the initiation stage felt mainly confronted with challenges during training. Research on entering elite sports and athletes in the initiation stage showed challenges in the readiness for structured competitive sports (Wylleman, De Knop & Reints, 2011; Bruner, Munroe-Chandler & Spink, 2008). From a cognitive point of view, readiness refers to young athletes' capacity for abstract reasoning, as well as for an understanding of roles, responsibilities and relational characteristics relevant to the setting of athletic competition (Wylleman, De Knop & Reints, 2011).

Gymnasts in the initiation stage especially experience changes in these professional roles and responsibilities in the context of training and competition, which may be the reason why they primarily experience challenges in these situations. Despite the complex lifestyles of gymnasts in the initiation stage (i.e. high number of training hours, attending two different schools, travelling time and/or living with a host family), they only reported a few challenges regarding their psychosocial development. Earlier research by Bruner and colleagues showed that young ice-hockey players who enter elite sports were confronted with 'on-ice' challenges, as well as various 'off-ice' challenges. However, in their study, ice-hockey players were around seventeen years old, whereas gymnasts in our study were around eleven years old when they entered elite sports. Age may be an explanation for why gymnasts in our study reported to experience

only a few challenges in daily life in comparison to older athletes. Children in early adolescence are unable to fully link feelings to events (Vernon, 2002) and athletes' ability to think abstractly and process and retrieve information improves as they progress through adolescence (Sherman & Poczwadowski, 2005). The gymnasts' cognitive development, who were around eleven years old when they entered elite sports, could be of impact on their ability to analyse the challenges in their (complex) environment.

During the developmental stage, the number of quotations and the number of perceived challenges increases. In contrast to the initiation stage, the perceived challenge most reported in the developmental stage concerns their daily life, specifically their dual career of study and sport. The perceived challenges are in line with earlier dual career research (e.g. Aquilina, 2013; Debois et al., 2015; Stambulova et al., 2015). Gymnasts reported a considerable number of challenges regarding their energy level. This is in line with research on young handball players in high school (Kristiansen & Stensrud, 2017), who reported various stressors due to a significant increase in training volume, reduction in sleeping time and development of severe and long-lasting injuries. Although gymnasts did not explicitly mention being injured as a challenge, they experienced the difficulty of staying fit, rehabilitation and fatigue.

Gymnasts in the mastery stage not only give the most quotations and experience the most challenges, but these perceived challenges seem also to become more personal and specific than in previous stages. In late adolescence, athletes gain multiple ways of evaluating their competences (Fox & Lindwall, 2014). Where younger children use peer comparison in particular as a way to evaluate their personal qualities, older athletes make use of advanced methods such as accomplishment of goals, competitive results, evaluative feedback of significant others and the ease of the learning process to evaluate their performance (Fox & Lindwall, 2014). The specificity of reported challenges in the mastery stage may be due to these advanced methods and the ability to evaluate their performance. Also, the context of their situation changes with even higher frequencies and standards of training and competition (Sorkkila, Aunola & Ryba,

2017). Aspiring elites not only gain greater independency, but also need to take more responsibility for their development and performance (Morris, Tod & Eubank, 2016; Rosier et al., 2015). These higher frequencies and standards in their sport, in combination with the growing expectations and pressures, may thus be more challenging to these athletes.

Our study found that some challenges which are experienced during all stages of the athletic career (e.g. learning new elements, dealing with stress under pressure, dealing with distractions, and managing their dual career and social life). Some of these challenges seem to arise from task characteristics of (female) gymnastics, while others appear to be linked to characteristics of the elite sports context. For example, the reported challenge of learning new and more difficult elements might be linked to task characteristics of (female) gymnastics. Due to central changes in performance requirements from the international governing body of the sport, combined with the increasing specialization on one apparatus, skill complexity of artistic gymnastics is constantly increasing. To improve their gymnastic performance, gymnasts have to gain higher scores of difficulty through constantly learning new, more difficult elements. As our results show, all gymnasts, also those preparing for the Olympic Games, are experiencing challenges in learning more difficult elements. The perceived challenges of dealing with stress under pressure, dealing with distractions and managing their dual career and social life, seem to be characteristic for the elite sports context. According to the stage-environment fit models (Eccles & Midgley, 1989; Elferink-Gemser & Visscher, 2012), an athlete needs a certain combination of person-related and environmental characteristics to be successful on a specific task and this interplay changes over time. Given that the task characteristics and some of the environmental characteristics remain the same, there might be a set of personal characteristics that is required during the whole athletic career. Additional, other personal characteristics might be necessary at a particular time within the athletic career.

We followed the recommendations by Wylleman and Rosier (2016) to broaden the research on within-career challenges that athletes are confronted with in

different stages of their athletic career. Our study has several strengths. Interviewing gymnasts in three different stages of development made it possible to indicate and compare challenges within different stages of athletic development, which is a strength of our study. Another strength is that gymnasts only had to reflect on the stage they are currently in and challenges they were *recently* confronted with. As a result, we gained insight in the perceived challenges that are characteristic for the present situation in Dutch female gymnastics. Consequently, this ensured the truthfulness and reliability. In contrast to earlier research, we focused on challenges in athletes' athletic career (e.g. injury, unexpected deselection) as well as challenges experienced at other levels of development such as psychological and psychosocial (e.g. having only a few social contacts, missing exams at high school), taking into account the 'whole person' and development in different domains.

Some aspects of the athletic career that might be expected to be challenging (e.g. Côté, 1999; Francisco et al., 2012; Fraser-Thomas et al., 2005), were not mentioned as challenges by the gymnasts themselves. For example, only a few challenges concerning injuries were reported, while several gymnasts in the development and mastery stage were recently confronted with serious injuries. Probably they did not really perceive this as a challenge, or they did not report it as a challenge. So, the challenges presented in the results are the challenges the gymnasts experienced. As a consequence of the design of the interview with a limited number of key questions, gymnasts were free to come up with every challenge they recently experienced. We did not want to be too directive and therefore asked the gymnasts in general about challenges they experience during training, competition, and in their daily life. In view of our holistic and developmental perspective, we were interested in the challenges perceived in all domains of development of the HAC model, both athletic as non-athletic. During the process of data analysis, we experienced that it is difficult to distinguish the perceived challenges into the levels of the HAC model. For example, challenges which have a cognitive or psychological component, might be closely related to challenging aspects of athletic performance.

The results of the present study raise the question how athletes can be prepared to deal successfully with the challenges which they await. Future research should examine the personal characteristics that are required to deal with the perceived developmental challenges. Psychological characteristics and skills play an important role in how athletes deal with the challenges (Collins et al., 2016; Dohme, Backhouse, Piggot & Morgan, 2017). Therefore, future research should explore the psychological characteristics and skills needed by talented and elite athletes in different stages of the athletic career. Longitudinal research could examine the fit between psychological, environmental and task characteristics, and how this interplay changes over time.

From an applied perspective, the results of our study provide coaches, parents, sport psychologists and other people involved in the development of aspiring and elite gymnasts the knowledge of what kind of challenges need to be handled at different times in the athletic career. According to Holland, Cooley and Cumming (2018) the effectiveness of guidance and counselling of talented athletes may be diminished if they are not appropriate to the developmental stage of the athlete. Our study shows that although some challenges were identified in each stage of athletic development, there are also obvious differences in the nature of the challenges for the varying stages of athletic development and various domains, which can be seen as a first step into appropriate guidance for those who work with talented and elite athletes. Outlining the challenges throughout the whole athletic career, our study offers coaches, parents and sport psychologists insight in the developmental needs of female gymnasts, which helps them to draw their attention to stage-specific themes and needs in order to give appropriate guidance.

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