

The differentiation of single and dual career athletes falls short: A person-oriented approach to characterize typical objective life situations of elite athletes

International Journal of Sports Science
& Coaching
2023, Vol. 18(3) 717–727
© The Author(s) 2022



Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/17479541221090941
journals.sagepub.com/home/spo



Merlin Örencik , Michael J. Schmid , Jürg Schmid
and Achim Conzelmann 

Abstract

Research concerning athletic career development in high-performance sport typically uses demographic data, sport characteristics or pursuing a dual career (i.e. having an educational or vocational career simultaneous to the athletic career) to identify developmental processes. In defiance of these attempts, considerable heterogeneity remains within these sub-groups of the elite athlete population. In line with the person-oriented approach, the objective of this study was to develop a comprehensive typology of athletes with similar objective life situations by considering both sport-related as well as non-sport related aspects. To this end, data were collected about athletic performance level, weekly amount of working time (i.e. sport-related activities, education, and vocation), and financial information (i.e. gross annual income and income generated from sport). Based on a sample of 733 elite athletes, a cluster analysis was performed to divide the sample into groups of similar patterns on the aforementioned factors. Five different athlete patterns were found: (1) *working dual career athletes*, (2) *high-income professional athletes*, (3) *medium-income professional athletes*, (4) *family-supported athletes*, and (5) *student dual career athletes*. These findings support the dual career literature of separating dual career (*Cluster 1* and *Cluster 5*) from single career athletes, which, in turn, should also not be regarded as a single population, but further divided (*Cluster 2*, *Cluster 3*, and *Cluster 4*). This typology may aid federations and practitioners within athletic career development in providing individual assistance for elite athletes.

Keywords

Education, family support, high-performance sport, income, vocation

Introduction

Everyday life of elite athletes is substantially different from individuals pursuing life outside of high-performance sport. Compared to the general population, elite athletes are faced with strong prevailing pressures to perform successfully, elevated media attention, and global travel to training camps and competitions. In order to compete at the highest levels, athletes must adhere to a stringent training regime regardless of the day of the week and hardly have time to relax their body and mind fully during off-season. Athletes undoubtedly experience peculiar life situations and as a result, research treats them as a distinct population. However, are the life situations of all elite athletes indeed identical, or must we assume their life situations to be rather diverse and heterogeneous? Consequently, is a generalization of research findings within high-performance sport

for all athletes justified? Due to these potentially varying life situations, taking a differentiated approach is necessary when investigating research questions within high-performance sport (e.g. career transitions, career termination, and impacts of the COVID-19 pandemic) but also for federations and practitioners in providing tailored and more effective assistance to athletes.

Reviewer: Cristina López de Subijana (Polytechnic University of Madrid, Spain)

University of Bern

Corresponding author:

Merlin Örencik, Institute of Sport Science, University of Bern, 3012 Bern, Switzerland.

Email: merlin.oerencik@unibe.ch

A review of the literature on athletic career development revealed that the population of elite athletes is usually differentiated according to three criteria: First, quite common is the differentiation by demographic information. For instance, numerous studies were conducted focusing on differences according to gender,¹⁻⁴ ethnicity,⁵⁻⁷ or age.⁸⁻¹⁰ While these approaches to divide the population into more homogeneous subgroups provide valuable insights, they cannot sufficiently assess the individual life situations of elite athletes by merely considering demographic classification variables, which cannot be influenced.

Secondly, studies investigated whether differences within and across sports could be identified. Here, the differentiation is based upon the type of sport (e.g. individual vs. team sport;^{9,11} Olympic vs. non-Olympic sport;¹² summer vs. winter sport;¹³ or endurance vs. power vs. technical sport¹⁴) or performance level.¹⁵ Thus, athletic characteristics are crucial to encompass the diverse life situations from a purely sporting perspective.

Adding a third perspective, the majority of research investigating athletic career development focused on how high-performance sport may be combined with an academic or vocational career (dual career).¹⁶ According to a typology by Pallarés *et al.*,¹⁷ the heterogeneity of dual career athletes characterized by either an equal priority of sport and secondary occupation (parallel career) or a sport prioritization (convergent career) and athletes fully dedicated to sport (linear career) is acknowledged both theoretically and methodically. The typical sample in this research area consists of student or working athletes facing the challenges of pursuing an athletic and educational or vocational career simultaneously.¹⁸ Managing two potentially time-consuming careers entails overcoming obstacles (e.g. adapting to environments and balancing priorities of demands).^{19,20} However, even within the population of dual career athletes, the amount of time dedicated to either sport, education, or vocation varies across individuals and cross-national dual career systems.^{21,22} Consequently, the allocation of time is crucial in shaping the life situation of elite athletes and in return, this distribution directly affects their financial status. Although the time allocation and financial status shape their life situation,²³ the factor of time allocation is usually neglected in the dual career research. Financial aspects have received consideration in studies on retired athletes,²⁴⁻²⁶ however, studies investigating active athletes are scarce and typically of qualitative nature.²⁷ Nevertheless, both types of studies indicate variance in the economic security across (former) athletes. Highly successful athletes in popular spectator sports may earn a fortune, whereas others ensure their livelihood only by pursuing a job simultaneously.

The first two differentiation approaches (based on demographic or sport-related characteristics) indicated major differences within the high-performance sport population. However, these unidimensional approaches do not capture

an athlete's life holistically. The scientific consensus exists that in order to adequately explain athletic career development across the lifespan, a more holistic perspective should be taken.²⁸⁻³⁰ Taking a step into that direction, the dual career approach adds the perspective of a secondary occupation by also considering aspects outside of sport (i.e. education and vocation). However, is this approach sufficient in adequately differentiating between athletes, thus reducing the aforementioned heterogeneity within these subgroups?

The present research

The primary objective of this study is to find a comprehensive typology of elite athletes based on the holistic perspective.²⁸⁻³⁰ Following this holistic line of thought, an athlete's life situation will be investigated while taking a person-oriented approach.³¹ This approach focuses on the human development and functioning as an integrated organism³² within the person-environment system, which can be further divided into various subsystems, each consisting of interacting *operating factors*. The focal subsystem of the present study is the socioeconomic system, which will be comprehensively assessed (i.e. athletic, educational, vocational, and financial). Thus, the holistic objective life situation of elite athletes will be investigated. The specific organization of the operating factors result in observable patterns of similar person-environment interactions. These processes are not accidental but occur in a specific manner within organized structures. The aim is to measure the contribution of the operating factors to the overarching system. Moreover, this perspective allows for potential compensation between operating factors, which cannot be adequately rendered by the variable-oriented approach.³³ The latter is based on the general linear model (GLM) establishing a "the more the merrier" relationship between one or more independent and dependent variable/s and cannot account for the complexity of human development from a dynamic-interactionist perspective.³⁴⁻³⁶ Applied to athletic career research, instead of adhering to the GLM, cluster analysis³⁷ can be used to identify common life situation patterns. Consequently, this study investigates what groups of elite athletes can be observed when using pivotal (operating) factors to characterize their objective life situations within Switzerland. The Swiss elite sport system rests on two pillars: the Swiss Olympic Association and the autonomous sport federations. They collaborate with partner schools, universities, units of federal departments (e.g. Swiss Armed Forces), as well as private sector employers,³⁸ which are crucial in facilitating dual career pathways.³⁹ As a consequence, athletes may have, for example, individualized study programs with flexible attendances and exam schedules. Additionally, the Swiss Olympic Association provides career planning and job placing services for retiring

athletes. According to Aquilina and Henry's typology,²² the Swiss elite sport system may be characterized as a bottom-up organization of the sport system without a formal structure in promoting dual career pathways (*laissez-faire*).⁴⁰

Methods

Participants

In total, 1710 Swiss elite athletes possessing a Swiss Olympic Card (i.e. elite, bronze, silver, and gold) from Olympic sports as well as non-Olympic sports in the top two categories of the Swiss Olympic Association classification of sports⁴¹ (resulting in the inclusion of floorball and orienteering) were invited to participate in the survey. The classification is based on international competitiveness of the respective sports as well as their popularity in Switzerland. The response rate was 57.5% with a completion rate of 43.9%. Additionally, two inclusion criteria were applied to participants. First, in order to exclude junior athletes, previous participation at a senior level competition was necessary. Second, participants with incomplete data (< 50% of total data) were omitted, resulting in a sample of 739 athletes from 67 sports, including several world championship and Olympic medalists. Direct binary logistic regression was performed to assess whether demographic and sport-related characteristics affected the response behavior. Specifically, we regressed study participation on gender, age, Swiss Olympic Card, and type of sport (i.e. Olympic summer sport, Olympic winter sport, and non-Olympic sport). The full model was statistically significant, $\chi^2(7)=177.08$, $p < .001$, Nagelkerke $R^2=0.13$, $n=1710$, indicating that it was able to distinguish between respondents and non-respondents. Concerning the individual predictors, age and type of sport were not significantly associated with participation. However, there was a slight overrepresentation of female athletes as well as respondents with higher ranked Swiss Olympic Cards. The latter finding might be attributed to the fact that it was communicated to the athletes that the study was supported by the Swiss Olympic Association and the Swiss Sport Aid Foundation. Thus, gold, silver, and bronze athletes, who benefit more from these institutions than elite athletes, might have felt particularly obliged to reply to the questionnaire.

Measures

For the purpose of the study, demographic information was collected and specific measures were constructed in order to assess the objective life situation of elite athletes. Unlike in dual career differentiation, not only the amount of hours spent within vocation, education and high-performance sport were considered, but also data about the level of

athletic performance and financial status were assessed. The athletic performance level was measured on a 5-point Likert scale (1 = *extended national top class*, 2 = *national top class*, 3 = *extended world class*, 4 = *world class*, 5 = *absolute world class*). Additionally, the weekly amount of high-performance sport activities was surveyed. Here, not only training and competitions but also administrative and organizational obligations (e.g. commute, travel, recovery measures, and media relations) were addressed in order to obtain a comprehensive picture of the hours invested into the sport career. Moreover, for the year of 2019 the participants were asked to indicate the weekly amount of hours spent for education and vocation as well as their gross annual income (response format: eight income ranges from 1 ≤ 14,000 CHF, ..., 4 = 50,001–70,000 CHF, ..., 8 ≥ 200,000 CHF; for reference 1 CHF = 1.03 \$ in 2019). For subsequent analyses mid values of these ranges were used as an estimation of the gross annual income (i.e. 1 = 7000 CHF, ..., 4 = 60,000 CHF, ..., 8 = 250,000 CHF). In contrast to all other questions in the survey, the "no answer" option was enabled for the question regarding an athlete's gross annual income. This approach deemed appropriate in order to not compromise the validity of the information and the response rate, because it is conceivable that some athletes, although we guaranteed them absolute confidentiality, may not want to divulge this sensitive information in a study conducted under the auspices of the Swiss Olympic Association and the Swiss Sport Aid Foundation, the major funding agency for athletes. Last, the participants indicated the percentage of income generated from high-performance sport in 2019 (e.g. price money, sport federation, Sport Aid Foundation, sponsors, canton).

Data collection

This online survey (programmed on the digital tool LimeSurvey, Version 2.50) was carried out in accordance with the requirements of the Ethical Principles of Psychologists and Code of Conduct, Ethics Committee of the Faculty of Human Sciences of the University of Bern. All participants were contacted via email and provided their written informed consent before participation. Depending on their first language, the German or French version of the questionnaire was presented.

Data processing

Of the total sample, 20 athletes (2.7%) opted out of answering the question about their annual income. Thus, annual income as well as the percentage of income generated from high-performance sport were singly imputed based on the available information on the demographic, athletic, educational, vocational, and financial variables using the Expectation Maximization algorithm implemented in IBM

SPSS MVA procedure (Version 27.0).⁴² Next, a multivariate outlier analysis using z -standardized data and an average squared Euclidean distance threshold of $T=0.8$ led to the exclusion of six cases with anomalous patterns of operating factors. Consequently, the final sample consisted of 733 athletes ($M_{\text{age}}=25.20$ years, $SD=5.13$; 44.7% female, 55.3% male). At the time the data was collected, the mean duration of their sport career (i.e. performance oriented training and national competitions) was 9.26 years ($SD=4.83$). Of the final sample, one participant (0.1%) finished basic compulsory school, 5.0% general education, 59.9% secondary education (i.e. qualification for vocational apprenticeship or university entrance), and 35% tertiary education (i.e. higher vocational or university level education).

Data analysis

In line with the person-oriented approach, clustering techniques were used, specifically, Ward's method with an average squared Euclidean distance and subsequent k -means optimization.³¹ This approach aims to find promising nonlinear patterns (clusters) of a set of variables (operating factors) within persons. In order to determine the optimal cluster solution, theoretical aspects as well as statistical criteria^{31,43,44} were considered, in particular the mean homogeneity coefficient ($HC_{\text{mean}} < 1.0$), the silhouette coefficient ($SC > 0.5$), and the size of explained error sum of square percentage ($EESS\% > 67\%$). The operating factors chosen to assess the specific life situation of elite athletes can be found in the Measures section. Cluster analyses were carried out with ROPstat 2.0,⁴³ while all other analyses were performed with IBM SPSS Statistics (Version 27.0).⁴²

Results

Overview

Table 1 provides descriptive statistics for the operating factors. The median performance level was 3, which is indicative of *extended world class*. On average, the sample invested 29.73 h per week ($SD=10.92$) into sport-related

activities. Regarding activities outside of sport, 35.6% of the athletes were in education (mostly as undergraduate students), 31.1% held a job, and 3.8% pursued both simultaneously to their sport career (the percentages are based on the athletes who dedicated at least one hour to education or work). The average total weekly amount of sport, education, and vocation was 43.54 h with the majority coming from high-performance sport activities, which is slightly above the Swiss standard weekly working hours of 42. The average gross annual income was 44,307 CHF, 49.28% of which originated from sport, 22.76% from family, 26.72% from work, and 1.24% from other sources (e.g. donations or payments for conference presentations). In comparison to the median income of the sample ($Mdn=23,000$ CHF; which might be biased due to the operationalization of this item), the median income of the general population of Switzerland (2019) was 62,500 CHF for self-employed workers and for 68,800 CHF for employees.⁴⁵ Overall, the descriptive statistics indicate substantial heterogeneity on the operating factors of the total sample.

Cluster analysis

First, from theoretical considerations based on the dual career literature, a three-cluster allocation was performed to investigate if the differentiation between athletes solely dedicated to sport, student dual career athletes, and working dual career athletes could be replicated. Table 2 displays descriptive statistics of the six operating factors (before z -standardization) for the respective clusters.

Cluster a, in comparison with the other clusters, was characterized by a medium performance level, medium amounts of sport, low amounts of education, high amounts of vocation, and high gross annual income, only a small percentage of which was generated by the sport career. Thus, this cluster resembles *working dual career athletes*.

Cluster b comprised athletes who had a very high performance level, did not combine their sport activities with education or other work, and had a relatively high income

Table 1. Descriptive statistics of the operating factors.

Operating factor	Total ($n=733$)					
	M	SD	Mdn	IQR	Minimum	Maximum
Performance level (1–5)	2.69	1.14	3	1	1	5
Sport amounts (hr)	29.73	10.92	30	13	6	80
Education amounts (hr)	6.45	11.30	0	10	0	50
Vocation amounts (hr)	7.36	13.36	7.19	10	0	55
Gross annual income (CHF) ^a	44,307	50,184	23,000	53,000	7000	250,000
Sport Generated Income (%)	49.28	37.78	50	80	0	100

^aMid values were used as an estimation of the gross annual income (i.e. 1 = 7,000, 2 = 23,000, 3 = 41,000, 4 = 60,000, 5 = 85,000, 6 = 125,000, 7 = 175,000, 8 = 250,000). Thus, the true minimum could be lower than 7000 CHF and the true maximum higher than 250,000 CHF.

Table 2. Descriptive statistics of the operating factors for the three-cluster solution.

Cluster	Performance level (1–5)		Sport amounts (hr)		Education amounts (hr)		Vocation amounts (hr)		Gross annual income (CHF) ^a		Sport generated income (%)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Cluster a: Working dual career athletes n = 155	2.79	1.21	23.57	8.52	0.32	2.02	30.90	9.60	50,109	31,764	13.47	17.24
Cluster b: Single career athletes n = 346	3.09	1.04	34.17	10.73	2.78	5.76	1.30	3.90	60,563	62,354	81.03	22.08
Cluster c: Student dual career athletes n = 232	2.04	0.91	27.22	9.83	16.02	14.67	0.67	3.09	16,185	16,976	25.88	26.01

^aMid values were used as an estimation of the gross annual income (i.e. 1 = 7,000, 2 = 23,000, 3 = 41,000, 4 = 60,000, 5 = 85,000, 6 = 125,000, 7 = 175,000, 8 = 250,000).

that originated from their sport career. This cluster can be labeled as *single career athletes*. We refrain from using the term *linear career*¹⁷ since it entails more than just a neutral definition and contradicts the general postulates of the person-oriented approach of nonlinearity.

Athletes with the lowest performance level, medium amounts of sport, high amounts of education, and low gross annual income, which is partially generated by high-performance sport, were allocated in *Cluster c*. Cluster members displayed the typical characteristics of *student dual career athletes*.

In sum, the differentiation into three clusters, which prevails in the dual career literature, could be retrieved in our sample. However, according to the criteria by Vargha et al.,⁴⁴ the observed statistical properties of the three cluster solution are insufficient (EESS = 38.29%, SC = 0.58, HC_{mean} = 1.27 [0.96; 1.35]): Particularly, the low EESS indicates a considerable loss of explained variance in the operating factors and thus a rather inaccurate assessment of an athlete's life situation; and the high HC_{mean} signals substantial heterogeneity within the clusters. Therefore, this cluster solution seems inadequate.

Upon inspecting allocations with 4 to 10 clusters, we selected, on both statistical as well as theoretical grounds, the 5-cluster solution as the most appropriate classification. Two of the applied statistical criteria were met (SC = 0.60, HC_{mean} = 0.89 [0.79; 1.40]), indicating a good cluster fit, while the EESS value (55.98%) fell slightly below the threshold defined for the third criterion. The individual HCs of the respective clusters can be found in Figure 1, the descriptive statistics of the operating factors before z-standardization in Table 3.

Cluster 1 was characterized by medium performance levels, medium amounts of sport, low amounts of education, high amounts of vocation, and above-average gross annual income, a relatively small percentage of which is derived from the sport career. Thus, this cluster closely resembled the first cluster (*Cluster a*) of the 3-cluster solution, the *working dual career athletes*. Approximately 19.6% of the total sample were allocated to this cluster.

Cluster 2 consisted of athletes who committed their time resources almost entirely to the sport career, which was also reflected by the high performance level. Moreover, they earned an extraordinary high income that was primarily generated by sport. This cluster represents *high-income professional athletes* and only 7.4% of elite athletes were assigned to it.

Cluster 3 is similar to the *high-income professional athletes (Cluster 2)* on most operating factors. Athletes within this cluster performed at a very high level with an exclusive devotion to their sport career. The percentage of income generated by sport was comparable to *Cluster 2*. However, the absolute income was substantially lower but seems to be sufficient to support a livelihood. Thus, members of this cluster display the characteristics of *medium-income professional athletes*. It was the biggest cluster with 37.1% of the total sample.

Athletes of *Cluster 4* exhibited the lowest performance level, while also distributing their resources on the sport career with no other occupation. Furthermore, the exceptionally low income was mostly generated outside of their sport career. In contrast to the other clusters, no adequate label could be found for this one by examining the values of the operating factors. However, further exploratory analyses indicated that athletes of this cluster were financially supported by their family (48.21% of gross annual

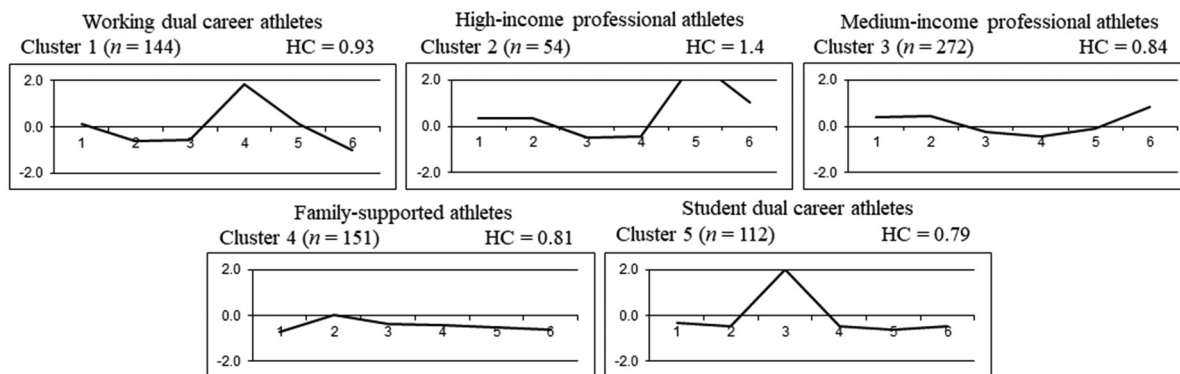


Figure 1. z-standardized vocational career patterns for the 5-clusters solution. Operating factors: 1 = Performance level (1–5); 2 = Sport amounts (hr); 3 = Education amounts (hr); 4 = Vocation amounts (hr); 5 = Gross annual income (CHF); 6 = Sport generated income (%). HC = Homogeneity coefficient per cluster. Note that because of space restrictions, operating factor 5 (gross annual income) for Cluster 2 (high-income professional athletes) exceeds the depicted range (> 2 SD).

Table 3. Descriptive statistics of the operating factors for the five-cluster solution.

Cluster	Performance level (1–5)		Sport amounts (hr)		Education amounts (hr)		Vocation amounts (hr)		Gross annual income (CHF) ^a		Sport generated income (%)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Cluster 1: Working dual career athletes n = 144	2.84	1.22	22.84	8.10	0.35	2.09	31.92	9.15	51,291	32,422	12.27	15.86
Cluster 2: High-income professional athletes n = 54	3.11	1.36	33.78	10.76	0.69	2.39	1.26	3.90	187,963	58,426	88.65	21.66
Cluster 3: Medium-income professional athletes n = 272	3.16	0.91	34.41	10.94	3.78	6.37	1.42	4.10	38,698	21,734	81.42	19.82
Cluster 4: Family- supported athletes n = 151	1.85	0.88	30.18	10.13	2.08	4.58	1.65	4.82	18,582	17,051	25.64	28.22
Cluster 5: Student dual career athletes n = 112	2.30	0.95	24.67	8.17	29.45	8.09	0.82	3.83	14,366	9636	31.74	26.39

^aMid values were used as an estimation of the gross annual income (i.e. 1 = 7,000, 2 = 23,000, 3 = 41,000, 4 = 60,000, 5 = 85,000, 6 = 125,000, 7 = 175,000, 8 = 250,000).

income) and lived with their parents (53.0% lived in the parental home). Hence, this cluster represents *family-supported athletes* and 20.6% of the total sample were allocated to it.

Last, *Cluster 5* (15.3% of athletes) demonstrated a similar pattern of operating factors as the third cluster (*Cluster c*) of the 3-cluster solution. Members displayed the second lowest performance level, medium amounts of

sport, high amounts of education, and low gross annual income, which was partially generated by high-performance sport (32%). Thus, the label *student dual career athletes* was chosen for this cluster, too.

Cluster description

In order to provide a more comprehensive overview, demographic information describing the clusters can be found in Table 4. Moreover, these values can be compared with the ones of the total sample. Relative to the other clusters, *working dual career athletes (Cluster 1)* had a high mean age and a slight overrepresentation of female athletes. The typical sports observed in this cluster were floorball, rugby, shooting, and wrestling. Their total weekly hours spent to duties (sum of sport, education and vocation hours) was 55.11 h. Additional analysis demonstrated that 79.2% of the income was derived from their professional vocation outside of sport. *High-income professional athletes (Cluster 2)* were the oldest and had the lowest percentage of females (35.2%). They allocated a total of 35.73 h to their duties and sports most often carried out in this cluster were ice hockey, alpine skiing, road cycling, and tennis. *Cluster 3 (medium-income professional athletes)* contained 40.1% female athletes with a mean age similar to the total sample. Compared to *Cluster 2*, there was a slightly lower overrepresentation of male athletes, but a greater variety in regards to the practiced sports (e.g. rowing, cross-country skiing, and different types of cycling). *Medium-income professional athletes* indicated spending a combined 35.38 h to

all duties. Relative to the other clusters, *family-supported athletes (Cluster 4)* were young on average, the gender distribution was similar to the one observed in the total sample, and artistic sports were typical. This cluster indicated the least amount of total hours for duties (33.91 h). Last, *student dual career athletes* had the lowest mean age, typical sports were orienteering, karate, and athletics, and an overrepresentation of female athletes (51.8%) was observed. This cluster spent a total of 54.94 h to sport and other occupations.

Discussion

Current methods of differentiating athletes in high-performance sport are usually based on either demographic data, characteristics of sports, or pursuit of a dual career.^{2,11,18,29} The aim of this study was to provide a typology of elite athletes with similar objective life situations by adhering to a person-oriented approach³¹ and examine the overlap with the usual single and dual career differentiation.

Initial attempts of identifying a 3-cluster solution which mirrored the current thinking in the dual career literature were successful, in so far as we found a cluster of individuals who focused solely on their sport career (*single career athletes*) as well as clusters of individuals who could be characterized as *working dual career athletes* and *student dual career athletes*. However, the poor statistical properties indicated substantial heterogeneity within the groups on the operating factors.

Table 4. Demographic information for the five-cluster solution.

Cluster	Gender		Age		Typical sports
	Male	Female	M	SD	
Cluster 1: Working dual career athletes n = 144	71 (49.3%)	73 (50.7%)	28.52	5.84	Floorball, Rugby, Shooting, Wrestling
Cluster 2: High-income professional athletes n = 54	35 (64.8%)	19 (35.2%)	28.53	4.56	Ice hockey, Road cycling, Alpine skiing, Tennis
Cluster 3: Medium-income professional athletes n = 272	163 (59.9%)	109 (40.1%)	25.05	4.03	Rowing, Cross-country skiing, Track cycling, Cycling mountain bike, BMX racing
Cluster 4: Family-supported athletes n = 151	82 (54.3%)	69 (45.7%)	23.05	5.27	Figure skating, Artistic gymnastics, Tennis
Cluster 5: Student dual career athletes n = 112	54 (48.2%)	58 (51.8%)	22.02	2.42	Orienteering, Karate, Athletics
Total n = 733	405 (55.3%)	328 (44.7%)	25.20	5.13	

Reanalysis of the data revealed a 5-cluster solution, which was superior, both on statistical and theoretical grounds. Similar to the 3-cluster solution, the general pattern of both *Cluster 1 (working dual career athletes)* and *Cluster 5 (student dual career athletes)* were consistent with minor differences on the operating factors. This supports the general notion of separating athletes having other occupations from athletes only pursuing sport.⁴⁶ Interestingly, a slight overrepresentation of female athletes was observed for both dual career clusters. This result expands the findings of Brustio *et al.*,⁴⁷ namely that female student athletes follow that career path more often additional to identifying with the role of a student in comparison with male student athletes. Moreover, the current findings demonstrate that both dual career clusters experience a substantially higher workload with all of their duties combined (> 20 h per week) than athletes who focus only on sport. Thus, dual career athletes require extraordinary time-management and organizational skills in order to combine these two time-consuming careers. However, even within dual career athletes, who show similar values on the amounts of sport and total weekly occupation hours, there is considerable heterogeneity with respect to performance level and financial status. In particular, *working dual career athletes* have a higher performance level and income. Hence, the experienced life situation, challenges, and demands faced by *student dual career athletes* and *working dual career athletes* are not identical.^{48,49} Students may experience pressure to complete their program in the designated period of study, worry about tests being too difficult, or feel stressed about poor grades.⁵⁰ As a result, combining the sport career and secondary occupation has been found to be associated with impaired sleep,⁵¹ poor physical health outcomes,⁵² and either academic dropout⁵⁰ or athletic disengagement.⁵³ In contrast, workers receive a regular salary but have to deal with potential stressors related to the workplace (e.g. long work hours, high job demands, or unfavorable economic forecasts),⁵⁴ which in return might negatively affect their athletic career. Taking on an additional job to support their livelihood may be almost inevitable for these individuals, because the monetary compensation they receive is often marginal, even if they excel in their respective sports.²⁷ However, pursuing a dual career in general can protect against adverse effects of a foreclosed identity.⁵⁵

In contrast, individuals pursuing sport only experience distinctively different life situations. They are more likely to experience athletic burnout⁵⁶ as well as poor adjustment after career termination,²⁸ particularly when the transition out of sport is unexpected, for example due to a career-ending injury.^{57,58} However, the current findings suggest that it is not recommended to merge all athletes who devote their time fully to sport into one overarching group because they experience completely different life situations with different demands and needs. Thus, the

former cluster of *single career athletes* was further divided into three groups: *Cluster 4 (family-supported athletes)* is the most divergent group competing at a substantially lower performance level and having financial deficits as well as slightly lower amounts of weekly sport activities. This cluster relies heavily on financial support from their family to finance their high-performance sport career. These individuals are not able to support their livelihood on their own and thus do not qualify for the label of "professional" athletes like *Cluster 2 (high-income professional athletes)* and *Cluster 3 (medium-income professional athletes)*. Because their performance level is rather low, they may not meet the criteria for being funded by the Swiss Sport Aid Foundation. In view of their young age, it might be hypothesized that these individuals are talented athletes just about to enter the world of high-performance sport.

Furthermore, qualitative studies indicated an association between an exclusive commitment to sport and athletic success.^{59,60} Again, our findings underline the merits of a differential approach. On the one hand, *Cluster 4* had the lowest performance level, although it focused completely on sport. Whereas, *Cluster 2* and *Cluster 3* competed at the highest performance level. Thus, with the exception of *family-supported athletes*, the notion of a single career in sport resulting in higher athletic success could be supported. In general, the level of professionalism of *Cluster 2* is analogous to the one of *Cluster 3*. Both groups are termed professional athletes because they completely focus on their sport career and are able to fund their livelihoods. The crucial factor separating these groups is their annual income. The differences in income might be explained by the fact that the typical sports of the two clusters differ in popularity and, as a result, in money involved.⁴⁸ Ice hockey and alpine skiing are likely to receive high media attention, television money and in return, more lucrative sponsorships compared to sports like rowing. However, the similar amount of hours invested in sport and performance level suggest that both clusters do not differ much in their training regime and are competing at the highest level of their respective sports. In conclusion, athletes earning a good living and competing at the highest level of a popular sport (*Cluster 2*) should not be grouped with up-and-coming talents who require their family to fund the sport career (*Cluster 4*) nor with athletes who exhibit similar standards of professionalism but cannot even remotely profit as much from sport (*Cluster 3*).

This study intends to advance the current research knowledge by overcoming the rather simplistic single and dual career typology and provide comprehensive profiles of athletes. Moreover, the quantitative findings especially regarding the economic situation and performance level of dual career athletes and the clusters of athletes solely pursuing sport contribute to the existing literature. Adopting this differentiation method can be beneficial when

investigating research questions within high-performance sport (e.g. career transitions, career termination, and impacts of the COVID-19 pandemic) but also when providing services in the practical world of sports. The clusters are based on objectively observed data only. Sport federations either already possess (e.g. information on performance level or financial status) or could collect the data (amounts of sport activities, education, and vocation) without much effort. Hence, they could easily assign their athletes into the five clusters and use this typology to adapt existing or create novel support programs in order to meet the individual needs and demands, which could further facilitate transitions within and out of high-performance sport. For example, providing monetary aid to all *single career athletes* in times of financial hardship (e.g. COVID-19 pandemic) seems like a suboptimal distribution of resources: While the *medium-income professional athletes* and the *family-supported athletes* would benefit a lot from it, *high-income professional athletes* experience a much lower economic insecurity. Furthermore, both dual career clusters experience a large amount of weekly workload extending the standard weekly working hours by over 20%. Governing bodies should either implement or extend formal high-performance sport programs (e.g. sports-friendly schools/universities, national sports or military programs)³⁹ to facilitate the dual career pathway. Additionally, coaches and practitioners should carefully address and provide assistance for athletes to cope with these time-management demands effectively.

Limitations and future research

Due to the current data being solely collected in Switzerland, the findings are only valid for similar cultural and sport environments. Nevertheless, comparable results are expected in countries that have similar *laissez-faire* structures as the Swiss sports system (e.g. Austria or the Netherlands).²² Moreover, the large sample size including athletes of different age and all Olympic sports similar to the elite athlete population of Switzerland, attests the representativeness of our sample even though a slight overrepresentation of female athletes and respondents with higher ranked Swiss Olympic Cards was found. However, future research should examine the generalizability of our findings across different cultural and sport contexts (e.g. state regulated or facilitated organization of the sport system).²²

With the design of the current study, we were able to display a 5-cluster solution of objective life situations of elite athletes for one particular moment in their athletic career development. However, transitions within this developmental process²⁶ and across clusters with respect to the advancing age of athletes may occur: Towards the end of their athletic career, *high-income professional athletes* and *medium-income professional athletes* may prepare for

their lives after high-performance sport by switching to a dual career pathway in order to facilitate the transition. Furthermore, after finishing their education, *student dual career athletes* may continue the dual career pathway and transition into *working dual career athletes* or shift their focus completely towards sport and become *medium-income professional athletes*. In order to observe potential transitions a longitudinal assessment is required.

To further pursue the holistic idea within athletic career development,^{28–30} it seems useful to collect not only objective, but also subjective data, notably elite athletes' evaluation of their life situation as well as psychological or psychosocial aspects of elite athletes. Recently, a study by Cartigny *et al.*⁶¹ combined the dual career approach with the psychological constructs of identity and self-efficacy. By also using cluster analysis, three patterns of athletes could be identified, namely (a) student athletes demonstrating an education or vocation prioritization; (b) dual career athletes balancing vocational and sporting career; and (c) athlete students showing sport prioritization. These findings complement the general idea of dual careers, i.e. athletes are either fully absorbed in vocation, fully absorbed in sport or balance vocation and sport, but missed the interesting differentiation among athletes focusing primarily on sport. Future studies should focus on a combination of various aspects that constitute an athlete's life situation both objectively (e.g. operating factors of this study) as well as subjectively (subjective evaluations or psychological factors, e.g. identity or self-efficacy).⁶¹

Because their financial status was considered an important operating factor, we asked the athletes to divulge their gross annual income. In order to reduce the high sensitivity of this question, specific ranges of income plus the opportunity to skip this question altogether were provided. This approach was linked with two consequences: On the one hand, as a measure of the individual income, the mid values of the predefined income ranges had to be used. This, along with the introduction of a maximum income cap of 250,000 CHF, automatically reduced the variance of the income variable. On the other hand, missing data were present and had to be imputed. Of course, asking for the exact amount of income in a mandatory item format would have reduced measurement error, however, at an increased risk of non-participation and false information. Thus, the current approach deemed appropriate in order to not compromise the validity of the information and response rate.

Conclusion


In summary, this study presents a comprehensive typology of athletes with similar objective life situations complementing but also extending the dual career perspective. While the traditional groups of *working dual career athletes*, *student dual career athletes*, and *single career*

athletes could be replicated in the study, it also shows that it is inadequate and oversimplified to consider only one overarching group of single career athletes. Three quite homogeneous subgroups of athletes focusing entirely on sport have been identified, namely *high-income professional athletes*, *medium-income professional athletes*, and *family-supported athletes* who experience highly diverse sporting lives. Hence, the findings extend the current literature that treats single career athletes as a homogenous group and encourages sports federations and practitioners to take an individualistic approach in assisting elite athletes.


Acknowledgements

We would like to thank the Swiss Olympic Association and the Swiss Sport Aid Foundation for their help conducting this research project. Additionally, we want to acknowledge Andreas Bieri for programming and Bryan Charbonnet for translating the questionnaire.

ORCID iDs

Merlin Örencik  <https://orcid.org/0000-0002-6255-2068>

Achim Conzelmann  <https://orcid.org/0000-0001-7474-086X>

Michael J. Schmid  <https://orcid.org/0000-0003-2491-1610>

References

1. Crocker PR and Graham TR. Coping by competitive athletes with performance stress: gender differences and relationships with affect. *Sport Psychol* 1995; 9: 325–338.
2. Hoar SD, Crocker PRE, Holt NL, et al. Gender differences in adolescent athletes' coping with interpersonal stressors in sport: more similarities than differences? *J Appl Sport Psychol* 2010; 22: 134–149.
3. Madden CC, Kirkby RJ and McDonald D. Coping styles of competitive middle distance runners. *Int J Sport Psychol* 1989; 20: 287–296.
4. Smith AM, Stuart MJ, Wiese-Bjornstal DM, et al. Competitive athletes: preinjury and postinjury mood state and self-esteem. *Mayo Clin Proc* 1993; 68: 939–947.
5. Johnson C, Crosby R, Engel S, et al. Gender, ethnicity, self-esteem and disordered eating among college athletes. *Eat Behav* 2004; 5: 147–156.
6. van Sterkenburg J and Knoppers A. Dominant discourses about race/ethnicity and gender in sport practice and performance. *Int Rev Sociol Sport* 2004; 39: 301–321.
7. Anshel MH, Sutarso T and Jubenville C. Racial and gender differences on sources of acute stress and coping style among competitive athletes. *J Soc Psychol* 2009; 149: 159–178.
8. Nicholls AR, Polman RC, Levy AR, et al. Mental toughness in sport: achievement level, gender, age, experience, and sport type differences. *Pers Individ Dif* 2009; 47: 73–75.
9. Correia M, Rosado A, Serpa S, et al. Fear of failure in athletes: gender, age and type of sport differences. *Rev Iberoam Psicol Ejerc Deporte* 2017; 12: 185–193.
10. Weiss MR ed. *Developmental sport and exercise psychology: a lifespan perspective*. Morgantown, WV: Fitness Information Technology, 2004.
11. Correia M and Rosado A. Anxiety in athletes: gender and type of sport differences. *Int J Psychol Res* 2019; 12: 9–17.
12. Boostani MH, Boostani MA, Javanmardi R, et al. Investigation and comparison of aggression in Olympic and non-Olympic athletes of sport fields. *Ido Mov Culture. J Martial Arts Anthropol* 2011; 11: 37–41.
13. Selge C, Thomas S, Nowak D, et al. Asthma prevalence in German Olympic athletes: a comparison of winter and summer sport disciplines. *Respir Med* 2016; 118: 15–21.
14. Alaranta A, Alaranta H, Holmila J, et al. Self-reported attitudes of elite athletes towards doping: differences between type of sport. *Int J Sports Med* 2006; 27: 842–846.
15. Jonker L, Elferink-Gemser MT and Visscher C. Differences in self-regulatory skills among talented athletes: the significance of competitive level and type of sport. *J Sports Sci* 2010; 28: 901–908.
16. Stambulova N, Engström C, Franck A, et al. Searching for an optimal balance: dual career experiences of Swedish adolescent athletes. *Psychol Sport Exerc* 2015; 21: 4–14.
17. Pallarés S, Azócar F, Torregrosa M, et al. Modelos de trayectoria deportiva en waterpolo y su implicación en la transición hacia una carrera profesional alternativa. *Cult Cienc y Deporte* 2011; 6: 93–103.
18. Stambulova N and Wylleman P. Psychology of athletes' dual careers: a state-of-the-art critical review of the European discourse. *Psychol Sport Exerc* 2019; 42: 74–88.
19. Harrison GE, Vickers E, Fletcher D, et al. Elite female soccer players' dual career plans and the demands they encounter. *J Appl Sport Psychol* 2020; 34: 1–22.
20. Brown DJ, Fletcher D, Henry I, et al. A British university case study of the transitional experiences of student-athletes. *Psychol Sport Exerc* 2015; 21: 78–90.
21. Debois N, Ledon A and Wylleman P. A lifespan perspective on the dual career of elite male athletes. *Psychol Sport Exerc* 2015; 21: 15–26.
22. Aquilina D and Henry I. Elite athletes and university education in Europe: a review of policy and practice in higher education in the European Union member states. *Int J Sport Policy Politics* 2010; 2: 25–47.
23. Ivantchev N and Stoyanova S. Athletes and non-athletes' life satisfaction. *Athens J Sports* 2019; 6: 45–60.
24. Barriopedro M, López de Subijana C and Muniesa C. Insights into life after sport for Spanish Olympians: gender and career path perspectives. *PLoS One* 2018; 13. doi:10.1371/journal.pone.0209433
25. López de Subijana C, Ramos J, García C, et al. The employability process of Spanish retired elite athletes: gender and sport success comparison. *Int J Environ Res Public Health* 2020; 17: 5460.
26. Tekavc J, Wylleman P and Cecić Erpič S. Perceptions of dual career development among elite level swimmers and basketball players. *Psychol Sport Exerc* 2015; 21: 27–41.
27. Moreno R, Chamorro JL and de Subijana C L. Employee-athletes: exploring the elite Spanish athletes' perceptions of combining sport and work. *Front Psychol* 2021; 12: 633133.
28. Schinke RJ, Stambulova N, Si G, et al. International society of sport psychology position stand: athletes' mental health,

- performance, and development. *Int J Sport Exerc Psychol* 2018; 16: 622–639.
29. Stambulova N and Wylleman P. Dual career development and transitions. *Psychol Sport Exerc* 2015; 21: –3.
 30. Wylleman P, Reints A and De Knop P. A developmental and holistic perspective on athletic career development. In: P Sotiriadou and V De Bosscher (eds) *Managing high performance sport*. London: Routledge, 2013, pp.159–182.
 31. Bergman L, Magnusson D and El-Khoury BM. *Studying individual development in an interindividual context: a person-oriented approach. Vol. 4*. Mahwah, NJ: Erlbaum, 2003.
 32. Magnusson D. Personality development from an interactional perspective. In: LA Pervin (ed) *Handbook of personality: theory and research*. New York: Guilford Press, 1990, pp.193–222.
 33. Bergman L and Trost K. The person-oriented versus the variable-oriented approach: are they complementary, opposites, or exploring different worlds? *Merrill Palmer Q* 2006; 52: 601–632.
 34. Lerner RM. Developmental science, developmental systems, and contemporary theories of human development. In: W Damon and RM Lerner (eds) *Handbook of child psychology. 6. ed*. New York, NY: Wiley, 2006, pp.1–17.
 35. Magnusson D and Stattin H. The person in context: a holistic-interactionistic approach. In: W Damon and RM Lerner (eds) *Handbook of child psychology. 6. ed*. New York, NY: Wiley, 2006, pp.400–464.
 36. Overton WF. Processes, relations, and relational-developmental-systems. In: WF Overton, PCM Molenaar and RM Lerner (eds) *Handbook of child psychology and developmental science: theory and method. 7th ed*. Hoboken, NJ: Wiley, 2015, pp.9–62.
 37. Trost K and El-Khoury BM. Mapping Swedish females' educational pathways in terms of academic competence and adjustment problems. *J Soc Issues* 2008; 64: 157–174.
 38. Kuettel A, Christensen MK, Zysko J, et al. A cross-cultural comparison of dual career environments for elite athletes in Switzerland, Denmark, and Poland. *Int J Sport Exerc Psychol* 2018; 2: 1–18.
 39. Morris R, Cartigny E, Ryba TV, et al. A taxonomy of dual career development environments in European countries. *Eur Sport Manag Q* 2021; 21: 134–151.
 40. Kuettel A, Boyle E, Christensen MK, et al. A cross-national comparison of the transition out of elite sport of Swiss, Danish and Polish athletes. *Sport Exerc Psychol Rev* 2018; 14: 3–22.
 41. Swiss Olympic Association. Einstufung der Sportarten [Classification of sports], https://www.swissolympic.ch/dam/jcr:da040ed7-b3df-42f5-ba07-1cf14b1b285b/20200201_Einstufung_Sportarten_für%20Internet_D_per_1.1.2020.pdf (2020, accessed 3 March 2021).
 42. IBM Corp. *IBM SPSS statistics for windows*. IBM Corp., 2020.
 43. Vargha A, Torma B and Bergman L. ROPstat: a general statistical package useful for conducting person-oriented analysis. *J Pers Oriented Res* 2015; 1: 87–98.
 44. Vargha A, Bergman L and Takács S. Performing cluster analysis within a person-oriented context: some methods for evaluating the quality of cluster solutions. *J Pers Oriented Res* 2016; 2: 78–86.
 45. Bundesamt für Statistik. Bruttoerwerbseinkommen pro Jahr der Erwerbstätigen nach Erwerbsstatus, Berufsgruppen ISCO 08, Beschäftigungsgrad und Geschlecht – Zentralwert (Median) in Franken [Gross income from employment per year from employed persons according to economic activity status, group of occupation ISCO 08, work-time percentage and gender-median in Francs], <https://www.bfs.admin.ch/bfs/de/home/statistiken/arbeit-erwerb/loehne-erwerbseinkommen-arbeitskosten/erwerbseinkommen.html> (2020, June 26, accessed 5 March 2021).
 46. Cartigny E, Fletcher D, Coupland C, et al. Mind the gap: a grounded theory of dual career pathways in sport. *J Appl Sport Psychol* 2019; 33: 280–301.
 47. Brustio PR, Rainoldi A, Mosso CO, et al. Actual and wished supports to promote a successful dual career according to Italian student-athletes' point of view. *Sport Sci Health* 2020; 16: 625–634.
 48. Linnér L, Stambulova N and Ziegert K. Maintaining dual career balance: a scenario perspective on Swedish university student-athletes' experiences and coping. *Scand J Med Sci Sports* 2021; 3: 47–55.
 49. Koen De Brandt. A holistic perspective on student-athletes' dual career demands, competencies and outcomes. *PhD Diss Vrije Universiteit Brussel* 2017.
 50. Pascoe MC, Hetrick SE and Parker AG. The impact of stress on students in secondary school and higher education. *Int J Adolesc Youth* 2020; 25: 104–112.
 51. Noland H, Price JH, Dake J, et al. Adolescents' sleep behaviors and perceptions of sleep. *J Sch Health* 2009; 79: 224–230.
 52. Stults-Kolehmainen MA and Sinha R. The effects of stress on physical activity and exercise. *Sports Med* 2014; 44: 81–121.
 53. Torregrosa M, Chamorro JL, Prato L, et al. Grupos, entornos y carrera deportiva. In: *Dirección de equipos deportivos*. Valencia, ES: Tirant Humanidades, 2021, pp.255–371.
 54. Goh J, Pfeffer J, Zenios SA, et al. Workplace stressors & health outcomes: health policy for the workplace. *Behav Sci Policy* 2015; 1: 43–52.
 55. Aquilina D. A study of the relationship between elite athletes' educational development and sporting performance. *Int J Hist Sport* 2013; 30: 374–392.
 56. Goodger K, Gorely T, Lavallee D, et al. Burnout in sport: a systematic review. *Sport Psychol* 2007; 21: 127–151.
 57. Ronkainen NJ, Kavoura A and Ryba TV. A meta-study of athletic identity research in sport psychology: current status and future directions. *Int Rev Sport Exerc Psychol* 2016; 9: 45–64.
 58. Park S, Lavallee D and Tod D. Athletes' career transition out of sport: a systematic review. *Int Rev Sport Exerc Psychol* 2013; 6: 22–53.
 59. Carless D and Douglas K. Living, resisting, and playing the part of athlete: narrative tensions in elite sport. *Psychol Sport Exerc* 2013; 14: 701–708.
 60. Douglas K and Carless D. Performance, discovery, and relational narratives among women professional tournament golfers. *Women Sport Phys Act J* 2006; 15: 14–27.
 61. Cartigny E, Fletcher D, Coupland C, et al. Typologies of dual career in sport: a cluster analysis of identity and self-efficacy. *J Sports Sci* 2021; 39: 583–590.