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Modeling athletic career of football players: Implications for career management and retirement

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Abstract

This study aimed to identify Career Indicators (CIs) over the stages of career development (Initiation/Development, Mastery, and Discontinuation stages) in the retirement stage of Portuguese football players. Three thousand five hundred retired Portuguese football players that played between 1960 and 2018 were considered in this study. A path analysis was performed to identify the standardized direct and indirect effects of the CI at each stage of career development, on Portuguese football players' retirement age. The proposed model highlighted that the relationship between the CI number of seasons as a youth player, number of seasons as a youth player in top 3 clubs, age of first registration as a senior player, number of seasons as a senior player, number of seasons as a senior player in top 3 clubs, number of total games as a senior player, age of the last best result age achieved, number of games in the retirement season, and discontinuation stage length contribute to explain 40% of the retirement age of Portuguese football players. Results allowed the understanding of the influence of each stage of career development on career length. According to the Holistic Athletic Career Model, it was the first attempt to create a predictive model of CI of athletic variables. Further research should be developed to incorporate some mediator variables such as players' performance levels and achievement to improve the explanation of the development of football players' careers and retirement.

Keywords

Life cycle, soccer, youth-to-senior transition

Introduction

Nowadays, athletes' career termination is considered a process that needs to be managed over the lifespan to prevent negative consequences for the former players' life.[1,2] To improve knowledge about this transition process, key factors were identified that constraint the quality of life of athletes after career termination. For example, the voluntariness of sports career retirement, the level of athletic identity, the evaluation of athletic achievements, and the pre-retirement plans were identified as some of the key aspects that allow athletes to achieve a better career retirement.[2–4]

One of the main factors that constraint the psychological, health, social, and economic problems that players face at the end of their careers is related to the lack of planning and preparing for retirement.[1,5] The lack of ideas about career planning and retirement and the need to maintain the focus on athletic performance is natural and entirely justified at the beginning of a sports career.[6] However, approximately 45% of athletes do not project retirement over their entire career[7] and only start to consider it when their performance stagnates or decreases.[8] Indeed, throughout their career, most elite

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athletes create a robust athletic identity[3,9] that contributes to improving their actual athletic performance day by day; however, without any project of career and life management. Consequently, the lack of plans and consciousness of career retirement weakens the relationship between career achievements. At the same time, prospective planning seems to promote lengthy careers, with an increase in the retirement age and career termination quality.[1,10]

For example, in Portugal, football is the most popular sport with around two hundred thousand players in total and two thousand professional players. However, in line with other countries, elite football players in Portugal do not plan or participate in any pre-retirement program and do not recognize the importance of planning for career retirement.[11] More than that, in Portugal, only in recent years programs were implemented to support elite athletes. Some of such programs come from the Football players Union but remain only as single programs without a clear strategy, and others grow from some individual initiatives of elite players such as the program "My cause" promoted by the first author of this study. "My cause" mentorship program has the goal to sensitize youth and elite football players to the problems of career retirement and particularly to the lack of career management and planning for retirement. However, one of the biggest issues that such programs face is the lack of information regarding contextualized football players careers that helps to characterize the athletic career and the identification of the variables that support their understanding of the different stages of their careers.[12]

Based on the Holistic Athletic Career Model (HAC-model[13]) players career results from a sequence of phases, multiple events, and choices in a multilayer process of athletic, psychological, psychosocial, academic, vocational, financial, and legal issues. The HAC model synthesized the athlete's career as a non-linear process and at the athletic level it is composed of four stages of development with the correspondent normative athletic transitions: *Initiation* in competition sports, starting from 6 to 7 years of age; *Development*, increase in the level of training and competition, starting from 12 to 13 years of age; *Mastery*, transition to the senior level and participation at high competitive level, starting from 18 to 19 years of age; and *Discontinuation*, preparation of transition out of the sports career, starting from 28 to 30 years of age.[13,14] Previous research predominately used such a model to characterize or analyze transitional challenges during each stage of the athlete's career[15] and to develop general career framework models for specific contexts and sports.[9,16] In general, such research collected lifespan information about players' career experiences in order to identify the themes that describe the main occurrences in each career stage. With this approach, the authors contextualized empirical models with indications about the particular needs of such athletes in their specific context. Using a similar approach, previous research has characterized the Development, Mastery, and Discontinuation stages, as well as the transitional challenges, faced by Portuguese football players to understand the process of retirement.[11] However, based on these results, it was not possible to understand the relationship between the perception of players about their career stage and their actual stage in the life cycle of the athletes' careers. For that, there is a need to identify some career indicators that describe and identify critical moments in the life cycle of the athletes' careers. Following the last position of the International Society of Sport Psychology for career development and transitions of athletes,[17] to improve the understanding of the career pathways of athletes until retirement, there is a need to identify and relate the career change events that support and characterize each stage of development.

Recently Monteiro et al.[12] identified some Career Indicators (CIs) to characterize the athletic career and retirement. Particularly, the authors analyzed the Mastery stage of players' athletic careers to evaluate the weight of each CI on the determination of the competitive level of retirement (professional vs. non-professional). Results revealed that the first senior registration level, number of seasons in the Mastery stage, the total number of games as a senior player, total number of games in the retirement season, and the age of the last best result achieved contributed to explaining and predicting the competitive level of retirement of Portuguese Football players. In general, with each additional season played as a senior player, the chances the Portuguese players had of finishing their careers as a professional players decreased by 26.9%. Furthermore, a player who begins in senior at the elite level in comparison with a player that begins at the non-professional level is 4.6 times more likely to terminate his career as a professional. In line with this approach, further research is required to identify the CIs that characterize each stage of development and their implications for the process of retirement.[16,18] More than the description of each stage of the players' career development, a formalization of a model that supports the understanding of changes in CI over the Initiation/Development, Mastery, and Discontinuation stages, for the understanding of the career retirement is required.

Thus, the aim of this study was to propose a model that links Portuguese Football players' athletic career stages and the retirement age according to the stages of the HAC model (Initiation/Development, Mastery, and Discontinuation). Specifically, we intended to understand the direct and indirect associations between the CIs at different stages of the life cycle of athletes' careers and the age of players' career termination to improve the management and development of more appropriate programs to support players' careers.

Method

Participants

Public data about all the retired Portuguese football players that played between 1960 and 2018 (age = 32.70 ± 4.27,

number of years as football players = 17.51 ± 4.89) registered on a private digital website platform (www.zerozero.pt) was considered for analysis ($n = 3500$).

Data collection

Data was registered from the youth level until the end of each player's career, allowing the tracking of their athletic career path. It was registered and grouped according to stages of the athletic career[13]: (a) Initiation/Development; (b) Mastery; (c) Discontinuation (see Table 1). The Initiation/Development stage was characterized through the CIs: (i) number of seasons as a youth player and (ii) number of seasons as a youth player in Top3 clubs (the best three clubs in Portugal according to the word clubs ranking in that time). The Mastery stage was characterized through the CIs: (iii) age of first registration as a senior player, (iv) number of seasons as a senior player, (v) number of seasons as a senior player in top 3 clubs, (vi) a total number of games as a senior player, and (vii) age of the last best result achieved. The Discontinuation stage was characterized by the CIs: (viii) number of games in the retirement season, (ix) Discontinuation stage length, and (x) retiring age (see Table 1 for a detailed description of each variable).

Five percent of the data was subjected to a comparison with data from the Portuguese Football Federation about players' careers using Cohen's Kappa index (k).[19] The results revealed an almost perfect agreement between data ($k = .97$).

Statistical analysis

Means, standard deviation, range values, and bivariate correlations were analyzed for the studied variables. In order to determine the required sample size, a power analysis using G*Power 3.1,[20] was performed with the following parameters: effect size $f^2 = .10$; $\alpha = .05$; statistical power = .95; and nine predictors. The minimum sample size requirement of 245 was respected in the present study.

A preliminary analysis revealed that missing values are less than 0.1%, and consequently, the Full Information Maximum Likelihood estimation (FIML) was considered for analysis.[21] Additionally, no outliers (univariate and multivariate) were identified. Finally, the collinearity diagnosis was checked using variance inflation factor (VIF) and tolerance tests and the results revealed values between 1 and 2.13 for VIF and 0.23 and 0.52 for the tolerance test, demonstrating acceptable conditions for regression analysis.[22]

A path analysis through Maximum Likelihood (ML) in AMOS 23.0 was performed. The standardized direct and indirect effects on the outcome variable were analyzed to test the effects across the variables under analysis. Bootstrap resampling (1000 samples), with bias-corrected 95% confidence intervals (CIs), was used to assess the significance of the direct and indirect effects. An effect is considered significant (at $\leq .05$) if the 95% CI does not include zero.[23,24] Due to the over-sensitivity of the chi-square statistics on large samples and the model complexity,[22] we considered several common goodness-of-fit indices to assess model fit, namely: Tucker-Lewis Index (TLI),

Table 1. Description of the career indicators (cis) of the stages of athletic career of Portuguese football players.

Stage	Variable		Description
Initiation/ development	Number of seasons as youth player	NSYP	Total number of seasons that a player played as a youth
	Number of seasons as youth player in top3 Clubs	NSYPT3	Top three clubs in Portugal according to world clubs rankings https://iffhs.de
Mastery	Age of first registration as senior player	AFRSP	Age in which an athlete starts to play in seniors. It allows to identify the age of transition from junior to senior
	Number of seasons as senior player	NSSP	Total number of seasons that a football player played as a senior
	Number of seasons as senior player in top 3 clubs	NSSPT3	Top three clubs in Portugal according to world clubs rankings https://iffhs.de
	Total number of games as senior player	TNGSP	Total number of games that a football player played as a senior
	Age of the last best result achieved	ALBR	Players' age at the time of the last season at the peak performance (higher competitive level achieved)
Discontinuation	Number of games in retirement season	NGRS	Total number of games that a football player realized in the retirement season
	Discontinuation stage length	DSL	Number of seasons from the peak performance to the final stage
	Retiring age	RA	Football player's age at end the sports career

NSYP: number of seasons as a youth player; NSYT3: number of seasons as a youth player in top 3 clubs; AFRSP: age at first registration as a senior player; NSSP: number of seasons as a senior player; NSSPT3: number of seasons as a senior player in top 3 clubs; TNGSP: total number of games as a senior player; ALBR: age of the last best result achieved; NGRS: number of games in the retirement season; DSL: discontinuation stage length; RA: retiring age.

Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA) and its respective CI at 90% (CI 90%), and Standardized Root Mean Residual (SRMR). For CFI and TLI, values ≥ .90 are typically interpreted to reflect adequate fit and for SRMR and RMSEA, values of ≤ .080 are indicative of adequate fit to the data.[22,25] Effect sizes were evaluated as trivial (0–0.19), small (0.20–0.49), medium (0.50–0.79), and large (0.80 and higher), as suggested by Cohen.[26] The trivial effects between variables were neglected in the analysis.

Results

Descriptive results revealed that most of the bivariate correlations were significant (see Table 2). Specifically, the most positive and significant bivariate correlations occurred in the Mastery stage, namely the number of seasons as a senior player with the age of the last best result age achieved ($r = .53$) and the number of seasons as a senior player in the top 3 clubs with a number of total games as a senior player ($r = .55$) and between variables of Mastery and Discontinuation stages: number of seasons as a senior player with retiring age ($r = .93$). In contrast, the most negative and significant bivariate correlation observed was the age of the last best result achieved (Mastery stage) with discontinuation stage length (Discontinuation stage) ($r = -.60$).

Results from the proposed model showed that the model fit the data: [$\chi^2(16) = 2820.489$; $p < .001$, CFI = 0.917, TLI = 0.907, SRMR = 0.059, RMSEA = 0.073 (CI 90% = 0.063, 0.083)]. In addition, the path analysis revealed that the majority of direct and indirect effects were significant (Table 3) and fluctuate from trivial to large. The most positive effects between variables of Initiation/Development and Mastery stages were the number of seasons as a youth player positively predicted the age of the first registration as a senior player ($\beta = .58$; CI 95% .563–.600, $p = .001$); the number of seasons as a youth player in top 3 clubs positively predicted the age of the first registration as a senior player ($\beta = .30$; CI 95% .290–.311, $p = .001$), the number of seasons as a senior player in top 3 clubs ($\beta = .26$; CI 95% .217–.306, $p = .001$), and the total number of games as a senior player ($\beta = .22$; CI 95% .178–.256, $p = .001$).

Conversely, the most positive effects between variables from Mastery and Discontinuation stages were that the age of the first registration as a senior player positively predicted both the discontinuation stage length ($\beta = .56$; CI 95% .539–.576, $p = .001$) and the number of games in the retirement season ($\beta = .50$; CI 95% .478–.522, $p = .001$). Positive effects were observed between the number of seasons as a senior player and discontinuation stage length ($\beta = .53$; CI 95% .518–.546, $p = .001$); the total number of games as a senior player and the number of games in the retirement season ($\beta = .36$; CI 95% .328–.395, $p = .001$), as well as the age of the last best result achieved and the number of games in the retirement season ($\beta = .22$; CI 95% .193–.248, $p = .001$). Negative effects were verified between the age of the last best result age achieved and the discontinuation stage length ($\beta = -.58$; CI 95% −.597 to −.566, $p = .001$).

Finally, the most positive effect on the Discontinuation stages variables was observed between the discontinuation stage length and the retiring age ($\beta = .60$; CI 95% .573–.621, $p = .001$). Figure 1 synthesizes the direct effects between CIs according to the stages of the athletic career from the Holistic Athletic Career Model.

Analysis of the standardized indirect effects of regression analysis (Table 3), revealed positive effects across the studied variables. The effect sizes varied between trivial to small. Analysis between variables of Initiation/Development and Discontinuation stages revealed: that the number of seasons as a youth player positively predicted discontinuation stage length ($\beta = .33$; CI 95% .307–.346, $p = .001$), the number of games in the retirement season

Table 2. Means (*M*), standard deviations (*SD*), ranges, and bivariate correlations between variables.

Variables	*M*	*SD*	Range	1	2	3	4	5	6	7	8	9
1. NSYP	2.55	2.55	1–19	–	–	–	–	–	–	–	–	–
2. NSYT3	.47	1.32	1–10	.41**	–	–	–	–	–	–	–	–
3. AFRSP	17.94	.690	15–19	−.001	−.013	–	–	–	–	–	–	–
4. NSSP	14.18	4.25	5–27	−.05**	−.023	−.13**	–	–	–	–	–	–
5. NSSPT3	.53	1.94	1–18	.052**	.24**	−.12**	.14**	–	–	–	–	–
6. TNGSP	92.96	25.67	1–919	.023	.18**	−.11**	.40**	.55**	–	–	–	–
7. ALBR	26.85	5.07	16–44	−.035*	.00	.070**	.53**	.24**	.45**	–	–	–
8. NGRS	3.37	7.49	0–52	.101**	.09**	−.00	.10**	.23**	.45**	.32**	–	–
9. DSL	5.51	4.58	1–21	−.019	−.032	−.081**	.28**	−.17**	−.17**	−.60**	−.25**	–
10. RA	32.70	4.27	21–45	−.057**	−.042*	.019	.93**	.10**	.33**	.52**	.06	.35**

Note. NSYP: number of seasons as a youth player; NSYT3: number of seasons as a youth player in top 3 clubs; AFRSP: age at first registration as a senior player; NSSP: number of seasons as a senior player; NSSPT3: number of seasons as a senior player in top 3 clubs; TNGSP: total number of games as a senior player; ALBR: age of the last best result achieved; NGRS: number of games in the retirement season; DSL: discontinuation stage length; RA: retiring age; * $p < .05$; ** $p < .01$.

Table 3. Direct and indirect effects of regression analysis and variance are explained among all variables.

Stage	Path	β	R^2	CI-95%	p
Direct effects					
Initiation/development	**NSYP→AFRSP**	**.58**	**.34**	**[.563, .600]**	**.001**
	NSYP→NSSP	−.05	.002	[−.084,−.020]	.006
	NSYP→NSSPT3	−.06	.003	[−.079,−.029]	.001
	NSYP→TNGSP	−.07	.005	[−.098, −.033]	.001
	NSYP→ALBR	−.04	.002	[−.076, −.008]	.048
	NSYPT3→AFRSP	**.30**	**.09**	**[.290, .311]**	**.001**
	NSYPT3→NSSP	−.002	<.001	[−.031,.030]	.943
	NSYPT3→NSSPT3	**.26**	**.07**	**[.217, .306]**	**.001**
	NSYPT3→TNGSP	**.22**	**.05**	**[.178, .256]**	**.001**
	NSYPT3→ALBR	.02	<.001	[−.012, .049]	.285
Mastery	**AFRSP→DSL**	**.56**	**.31**	**[.539, .576]**	**.001**
	AFRSP→NGRS	**.50**	**.25**	**[.478, .522]**	**.001**
	NSSP→DSL	**.53**	**.28**	**[.518, .546]**	**.001**
	NSSP→NGRS	−.14	.02	[−.164, −.116]	.001
	NSSPT3→DSL	−.06	.004	[−.078, −.038]	.001
	NSSPT3→NGRS	−.09	<.001	[−.126, −.049]	.001
	NTGSP→DSL	−.06	.003	[−.078, −.039]	.001
	TNGSP→NGRS	**.36**	**.13**	**[.328, .395]**	**.001**
	ALBR→DSL	**−.58**	**.34**	**[−.597, −.566]**	**.001**
	ALBR→NGRS	**.22**	**.05**	**[.193, .248]**	**.002**
Discontinuation	**DSL→RA**	**.60**	**.36**	**[.573, .621]**	**.001**
	NGRS→RA	.18	.03	[.158, .203]	.002
Indirect effects					
Initiation/development	**NSYP→DSL**	**.33**	**.11**	**[.307, .346]**	**.001**
	NSYP→NGRS	**.27**	**.07**	**[.252, .287]**	**.001**
	NSYP→RA	**.25**	**.06**	**[.229, .259]**	**.001**
	NSYPT3→DSL	.13	.02	[.110, .147]	.001
	NSYPT3→NGRS	**.21**	**.04**	**[.190, .147]**	**.001**
	NSYPT3→RA	.11	.01	[.102, .127]	.001
Mastery	**AFRSP→RA**	**.42**	**.17**	**[.400, .447]**	**.001**
	NSSP→RA	**.29**	**.08**	**[.272, .310]**	**.005**
	NSSPT3→RA	−.05	.002	[−.067, −.037]	.001
	TNGSP→RA	.03	<.001	[.014, .048]	.001
	ALBR→RA	**−.31**	**.10**	**[−.322, −.291]**	**.001**

Note. NSYP: number of seasons as youth player; NSYT3: number of seasons as youth player in top 3 clubs; AFRSP: age at first registration as senior player; NSSP: number of seasons as senior player; NSSPT3: number of seasons as senior player in top 3 clubs; TNGSP: total number of games as senior player; LBRAA: age of the last best result achieved; NGRS: number of games in retirement season; DSL: discontinuation stage length; RA: retiring age; β: direct effects; R^2: variance explained; CI-95% = confidence interval; p = level of significance.

($\beta = .27$; CI 95% .252–.287, $p = .001$), and the retiring age ($\beta = .25$; CI 95% .229–.259, $p = .001$); the number of seasons as a youth player in top 3 clubs positively predicted the number of games in the retirement season ($\beta = .21$; CI 95% .190–.147, $p = .001$); age at the first registration as a senior player positively predicted retiring age ($\beta = .42$; CI 95% .400–.447, $p = .001$), and the variable number of seasons as a senior player positively predicted retiring age ($\beta = .29$; CI 95% .272–.310, $p = .001$); the age of the last best result age achieved negatively predicted retiring age ($\beta = -.31$; CI 95% –.322 to –.291, $p = .001$).

Collectively (direct and indirect effects), the model (see Figure 1) explains 47% ($R^2 = .47$) of the number of games in retirement seasons, 92% ($R^2 = .92$) of the discontinuation stage length, and 40% ($R^2 = .40$) of retiring age in the Discontinuation stage.

Discussion

The aim of this study was to propose a model that links Portuguese Football players' athletic career stages and the retirement age according to the stages of the HAC model (Initiation/Development, Mastery, and Discontinuation). Our focus was on the identification of direct and indirect associations between career indicators from the career's athletic layer and the age of players' career termination.

Based on our intents, it was clear that the proposed model contributed to explaining 40% of Portuguese football

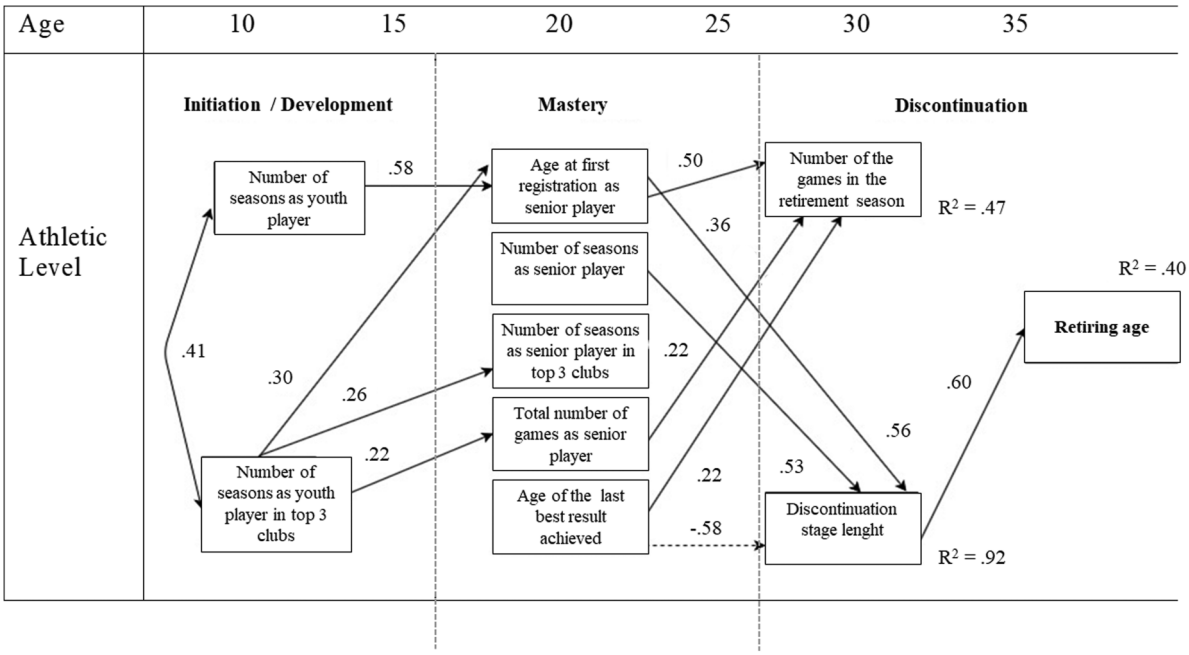

Figure 1. Direct effects between CIs of players' athletic career and the retirement age according to the stages of the HAC model (Initiation/Development, Mastery, and Discontinuation).

players' retirement age. CIs from all the stages of development revealed direct positive and negative effects with CIs from other stages, and indirect positive and negative effects were observed between CIs and retirement age, contributing to clarifying career change events that support each stage of career and its transitions,[4] and to promote the understanding of career retirement.[17] Results from this study introduce a new approach with quantitative data to track players' careers reinforcing previous results that used a qualitative approach to understand the athletic career of players.[1,16,27] The use of quantitative data from players' athletic careers allows to monitor the process on a year-to-year basis from an individual or more generalized perspective. It is a new approach that could help players to evaluate and understand the path of their career,[12] and support the definition of career goals and career planning and management from the Initiation to the Retirement stage. This is a new challenge for the future due to the huge number of players in Portugal, and in other countries, rise and fall too fast, promoting issues of dropout with the consequent personal, social, and economic problems.

Initiation/development stage

The CIs number of seasons as a youth player revealed a direct positive effect on the age at first registration as a senior player. Also, indirect effects were observed between CIs number of seasons as a youth player with CIs from the Discontinuation stage, discontinuation stage length, the number of games in the retirement season, and the retiring age. Such results reinforce that the process of athletic career and retirement starts during the Initiation and Development stages. The age for the start of practice, as well as the initial decisions of career paths by youth players, could constraint, in particular, the longevity of their careers.[14]

In opposition to the results of Carapinheira et al.,[28] which revealed that the increase in the number of seasons as youth players tends to decrease the number of seasons as senior players and the age of retirement, we observed that the increase in the number of seasons as a youth player did not decrease the age of retirement. Results revealed that players with a higher number of seasons as youth players tend to increase the length of the Discontinuation stage, and consequently the age of retirement. Based on previous research, a longer Discontinuation stage could be linked to a higher probability of ending the career as a non-professional.[12]

A higher number of seasons as a youth player in the top 3 clubs revealed an impact on the Mastery stage in the age of the first registration as a senior player, a number of seasons as a senior player in the top 3 clubs, and the total number of games as a senior player, but in opposition to our expectations only a small effect on the CI number of games in the retirement season from the Discontinuation stage. The impact of the results from the Initiation/Discontinuation stage on the path of players' athletic careers should be linked with issues related to early diversification or specialization. Previous studies have noted that specialization should only occur around the ages of 13–15 years.[29]

Indeed, according to the Development Model of Sports Participation,[6] this stage is characterized by the commitment to a specific sport, diminishing the opportunities for playful activities with an impact on their future career. Therefore, it is a timely opportunity to merge talent development and career transition approaches to a new process of continuous evaluation of an athlete's development pathway.[17,29]

Mastery stage

Significant effects were observed between variables from Mastery and Discontinuation stages. The CI age of the first registration as a senior player revealed a direct positive effect on the number of games in the retirement season and on the discontinuation stage length. Also, indirect effects were observed between CI age at the first registration as a senior player and retiring age. Such results reinforce the importance of the junior-to-senior transition (JST).[17] The JST is a particular normative transition in the athletic career of players with increased demands. In fact, increased demands seem to be related to different modifications and transitions that generally occur in these age groups (e.g. academic, familiar, and professional context), requiring an additional balance of the different spheres in which the athlete is involved.[30] Furthermore, the age of the first appearance as a senior player seems to have an immediate influence on players' performances and an impact on the development of their future careers. Hollings et al.[31] considered that players should reveal more than a good performance in their first appearance as a senior. Particularly, youth players should reveal exemplary commitment with realistic goals, and reveal a strong self-efficacy, identity, and resilience to their athletic and other commitments in order to be successful in sport and in life. Our results reinforced this idea, revealing that players who become senior players later in time have longer careers.

It is possible to assume that different retirement age variations could be achieved by different paths,[32,33] thereby having different implications on the quality of retirement. In line with previous results,[12] the increase in the number of seasons as a senior player seems to increase the discontinuation stage length with an increase in the retiring age. Based on that, it seems that the increase in the retiring age occurs as an attempt to extend the career regardless of the level. The increase in the age of the last best result achieved seems to increase the number of games in the retirement season and decrease the discontinuation stage length with a decrease in the retiring age. This particular path could positively impact players' transition due to feelings of achievement they mostly feel by maintaining a high level of practice during most of their career.[34] However, it is not a linear process and it depends on the existence of the individual resources[5] and the definition of pre-retirement planning.[27] Also, in conclusion, the integration of information from other HAC-model layers,[13] as well as the development of a qualitative approach to compare the quality of retirement of players of different ages, different levels of retirement, or with different individual resources should be considered to contemplate a more holistic perspective of the problem and to better predict the process of retirement.[7,8]

Discontinuation stage

The results of the Discontinuation stage revealed a direct positive effect between the discontinuation stage length and the retiring age. Thus, as previously mentioned, the relationship between an increase in the discontinuation stage length associated with an increase in the retiring age could be related to a decrease in the players' levels of practice over the years.[12] Therefore, the increase in the Discontinuation stage associated with the increase of the retiring age seems to indicate an attempt of players to extend their career and maintain their athletic identity. That is, players tend to decrease their level of practice from a professional to a non-professional practice year after year in order to maintain their status as football players and delay the inevitable transition to life after sport.[3,7,9] Such time of refusal to end the career and the maintenance of a sports career at lower levels of practice was not used to plan and prepare for retirement, and therefore potentially negative social and economic consequences could occur.[1,35,36] Even without results from other HAC-model layers[13] and about the quality of retirement, the analysis of the relationship between CIs from Mastery to Discontinuation stages allows us to combine the levels of performance (number of games as a senior player) with the players' levels of achievement (number of seasons as a senior player in top 3 and age of the last best result achieved) and number of games in the retirement season and discontinuation stage length, to infer about the motivation and autonomy to retire with consequent implications on the quality of retirement.[35] It will be valuable information for managers and players to prospectively manage and better understand the implications of each career decision. Indeed, the increase in the level of consciousness about athletic careers and retirement is of particular interest to promote career planning and for better quality in career retirement.[36] Further research is required using qualitative and quantitative approaches to evaluate the implications of such results for the athletes' future lives.[17]

The current research presents some limitations. First, the database used only considered the athletic career paths of Portuguese players. Second, although the Holistic Athletic Career Model emphasized a holistic view of athletes' careers in a multilayer process, as previously mentioned, it was the first attempt to explore new variables from the athletic career life cycle that could be considered to complement previous holistic approaches. This is quite a complex phenomenon[17] that requires further research, particularly to

identify the profiles of players at different levels of performance and the particular changes in each stage of development that constraint their career path.[16,18] Also, it was not possible to identify a preferable path of career and further research should identify players' profiles of career to better understand the implications of some career decisions in the career lifespan of players and retirement. In the end, a qualitative clarification about some of the considered CIs and their implications for the development of athletes' career paths should be considered in the future.

Besides the limitations, as implications, the results of athletes' career paths and the relevant CIs identified should be used to improve players' career management and to develop further support programs that help players to better identify the stage of their career in relation to the termination process. The evaluation of each moment of their career through the evolution of each of the CIs identified could help coaches, managers, and of course, the players to identify the actual moment in the life cycle of their athletic career and prospectively plan and prepare, in a more conscious way, each normative transition and in particular the retirement.[1,12] The longitudinal perspective of the life cycle of athletes' careers and its tendency of evolution based on CIs clearly could provide more accurate and timely management of decisions related to the player trade, the contracts for the future, or even the start of a dual career in order to better support the quality of career retirement.

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