

ORIGINAL ARTICLE

## Situated activity analysis of elite track and field athletes' use of prohibited performance-enhancing substances

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### Abstract

This study aimed to identify the links between the use of prohibited performance-enhancing substances and the changing characteristics of athletes' activity within the framework of situated action and dynamical investigations. The changes in diverse components of activity (e.g. performance, forms of training, modes of involvement) of 10 elite track and field athletes (5 with 2-year suspensions) were compared. Data were collected by enquiries and structured and self-confrontation interviews. Results showed that during the use of prohibited substances, doping athletes appeared (1) to be closed to all external environmental offers except training and performance, (2) to experience changes in their sporting results and (3) to be experiencing disturbances in their lives. Doping appeared after (4) a specific number of years of sporting activity (i.e. 17 years), (5) a specific path had been followed (i.e. a shorter time spent in "open focus" during the development of activity), (6) 2 years of regular legal substance use, (7) a change in training and (8) a period of personal distress. A signature of doping activity was identified in relation to suffering athletes. Several initial conditions that lead to prohibited substance use were extracted and are utilized for educational programmes.

**Keywords:** *Doping, situated cognition, elite performance, career*

### 1. Introduction

Social science research on doping has promoted several models to describe how elite athletes make the decision to use prohibited substances for performance enhancement (Backhouse et al., 2007, for a review). This research assumes that athletes are accountable for their acts and that their behaviours reflect the endeavour to attain sporting and financial goals after reflection and planning (Donovan et al., 2002; Strelan & Boeckmann, 2003; O'Donnell et al., 2006). The studies have thus sought to identify the precipitating and protecting factors that are in play. Some of the models used to examine the decision to use prohibited substances have focused on the compromise between the athletes' intention to

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maximize their advantages and minimize their risk of being sanctioned in relation to their sporting and financial goals. For example, doping may occur when all other endeavours to gain a competitive advantage have failed (e.g. Queval, 2004). Doping may be more likely in the presence of personality variants like harm avoidance (e.g. O'Donnell et al., 2006) or sensation seeking (Zuckerman, 1986) and may be more easily rejected in the presence of deterrent factors like the fear of sanctions or negative health concerns (e.g. Strelan & Boeckmann, 2003). Despite the scientific legitimacy of these investigations, however, our understanding of drug use and doping in sports remains limited (Backhouse et al., 2007; Mazanov et al., 2008). In addition, many authors have underlined the weak impact of anti-doping campaigns, noting that despite several measures (e.g. random tests for illicit substances, competition sanctions, drug education programmes), doping continues to be a major problem in elite sports (DuRant et al., 1995; Laure et al., 2004; Backhouse et al., 2007). These concerns suggest the need to reconsider the social science research programmes on prohibited substance use in sports (i.e. doping).

Three points of entry can be considered to improve the efficiency and relevance of research programmes on doping. First, current research models in the social sciences specifically focus on the point when the final decision about drug use is made (e.g. Donovan et al., 2002; Strelan & Boeckmann, 2003). Yet, it is quite likely that the decision is not a binary process but rather a progressive movement in the direction of a final decision. It is also likely that the process of decision-making proceeds somewhat erratically, with brief trials of drug-taking, stops, readjustments of quantities and so on (e.g. Perkonigg et al., 2008). Thus, we may lack knowledge about a long and dynamical process that finally culminates in the decision on whether to use performance-enhancing substances. Second, social science research models are principally based on a cognitive epistemology, with attitude assumed to be the best predictor of drug use. This has led to an emphasis on problem-solving strategies in which (1) the dilemma, to use or not to use, is already established (Suchman, 1987), (2) the intention, before any action or attitude, is assumed to be a stable attribute that highly constrains the decision and behaviour (Ajzen, 2001; Lucidi, 2004; Petróczy and Aidman, 2008) and (3) context is considered to be a secondary factor in this decision on whether to use illicit drugs (Schön, 1983). However, recent developments in the social sciences have suggested an alternative approach to the study of doping by taking a holistic perspective on human activity and by emphasizing the dynamical and contextual adjustments in all human activity (e.g. Robbins & Aydede, 2009). From this perspective, whether an elite athlete uses performance-enhancing substances is assumed to be in relation to an individual and meaningful context (i.e. a situation), which is linked to more general activity that can be studied (Bruner, 1990). For example, this meaningful context could be the expression not only of the athlete's current concerns but also of his/her autobiographical experience that has been progressively embodied, situated and shared (Robbins & Aydede, 2009). Third, it is not surprising that the connections between research and educational programmes have remained weak, given the wide gap between data collection methodologies and the everyday world of athletes. Most of the knowledge on performance-enhancing substance use is based on speculative models that are grounded in surveys to assess the final intention to use (e.g. Beck et al., 2001; Waddington et al., 2005; Dodge & Jaccard, 2008). These methodologies have limited relevance for building and implementing educational anti-doping programmes (Bilard et al., in press; Simon et al., 2006), as they do not address such problems as, for example, the difference between the declaration of intention and the situated action, the difficulty of assessing personal experience and the unreliable characteristics of declarative knowledge. Thus, situated or

everyday cognition approaches have a major advantage: scientific studies for educational programmes (interventions strategies, target groups, etc.) need to be grounded in methodologies that do not destroy the natural context of activity (Woll, 2002; O'Connor & Glenberg, 2003).

A research programme developed within the framework of situated activity theory would thus take into account (1) the entire process that progressively builds towards a final doping decision, (2) the interactions between athletes' activity and the use of prohibited substances and (3) the meaningful world (i.e. situation) of athletes that provides many clues to athletes' specific concerns. This type of research might yield a more powerful arsenal for the battle against doping, such as situated education programmes. Working from this approach, we thus focused on (1) the local dynamics of doping, which refers to the specific properties of the activity of athletes who have decided to use prohibited performance-enhancing substances; and (2) the global dynamics of doping, which refers to the entire process that led these athletes to use the prohibited substances. The course-of-action theory was adapted to investigate the long-term dynamics of the activity and meaningful world of athletes, as well as their use of prohibited substances (e.g. Theureau, 2003).

According to the course-of-action theory, activity refers to the linkage between actions and situations that can be studied at the level at which individuals perceive, feel, know and do (Bruner, 1990; Theureau, 2003). Several levels of linkage in the everyday life events of high-level athletes have already been explored, including performance (e.g. Hauw et al., 2003; 2008; Hauw & Durand, 2008), competition (e.g. D'Arripe-Longueville et al., 2001; Hauw & Durand, 2005) and training (e.g. Saury & Durand, 1998). Theureau (2006) suggested that higher levels of linkage can also be analysed, as seen in life course studies (Elder & Ziele, 1998; Halonen, 2006). The level of linkage for this study was thus the athlete's career and this was termed the "sporting life course". The meaningful world was patterned using three components of activity, as has been done in earlier sport science studies: (1) *potential states* that correspond to the meaningful field of possible activities one can undertake. This potential state is related to the expectations and the mode of involvement, and it is grounded in the knowledge drawn from past cognitions that the individual brings to bear in the here and now (i.e. situation); (2) *actual states*, which correspond to the diverse meaningful actions that characterize each period of life (i.e. form of training, types of consumption, leaving school, etc.); and (3) *virtual states* or meaningful life experience, which corresponds to the processes of extracting elements of generality from actual activity that build autobiographical memory (Piolino et al., 2006). Hence, from these processes emerge immediate understanding, familiarity or surprise as well as learning and personal development in relation to the growth of experience. The local organization of the sporting life course was conceived as the interaction of these meaningful components taken at a specific moment. Because the course of action is also the flow of these components, the global organization was assumed to be the form that the stream of components takes moment after moment. Thus, the dynamics were considered by the analysis of the local and global organization of the sporting life course.

To summarize, the aim of this study was to identify the links between the use or rejection of prohibited performance-enhancing substances and elite athletes' activity over the course of their career. Activity was considered as a single entity constituted of meaningful actions, situations and experience emerging during the career (i.e. sporting life course). By comparing the sporting life courses of track and field athletes who have been found guilty of doping violations with others who have not, we expected to characterize (1) the specific properties of the activity linked to the use of these prohibited substances and (2) the trajectory of the

sporting life course that led to them. Finally, in line with situated activity research, we expected that the results would provide elements to enhance the efficiency of educational programmes in the battle against doping.

## 2. Method

### 2.1. Participants

Ten male elite track and field athletes between the ages of 24 and 34 years volunteered to participate in this study. Five of them had been sanctioned for doping violations (doping athletes) and five others had not (non-doping athletes). All had more than 20 years of sport practice and were on the same high level of performance as international competitors. Informed consent was signed by all participants.

### 2.2. Data acquisition

Two types of data were collected to progressively build an activity database for each participant: (1) traces of past activity and (2) verbalizations regarding these traces elicited during self-confrontation interviews.

Traces of past activity were collected by diverse forms of enquiry, such as searches on national federation websites and in newspapers or books. This information was expected to provide a biographical sketch or a skeleton of the sporting life course (evolution in performances, selections, results, medals, teams and so on). Face-to-face semi-directive interviews also served to collect information on the meaningful sporting life and events for each athlete. Interviews were recorded and lasted 1:30 to 2 hours. A specific guide was followed, which included questions related to family, substance use, type of training, performance results, particular events such as injuries and so on. The enquiries and semi-directive interviews provided complementary documentation and ensured a precise description of the situations and actions that each athlete had experienced. This description corresponded to elements of *Actual states* (e.g. How did you train? What was the level of your performance? What substances did you use and how?). This interview provided meaningful traces of the different periods of each athlete's sporting life and was represented in a specific form, as shown in Table I.

A second interview was conducted with the verbalizations from these self-confrontation interviews obtained by confronting each athlete with the representation of the meaningful traces of his/her past activity. This interview consisted of provoking the re-emergence of elements from past experience when the participant was bodily face to face with traces of his/her own activity. The athletes were asked to show, tell about and comment on their experience. In doing so, they revealed how they handled it on-line by building new meanings (re-enactment process) or activating pre-existing ones (remembering process). Verbal prompts were designed to collect further meaningful information about each athlete as the traces of the presented *Actual states* unfolded: (1) *Potential states* (e.g. What was your aim in acting here? What were you concerned about?) and (2) *Virtual states* (e.g. What were you feeling? What did it provoke? What were you thinking about your training, performance, etc.?). Thus, these prompts elicited descriptions of actions and events as they were experienced by the athletes. Requests for *a posteriori* interpretations and generalizations were avoided. Each interview was recorded and transcribed for further analysis.

Table I. Example of the representation of meaningful traces of activity.

Activity	Period 4 1997	Period 5 2001
Life	Change in home town. Junior high school grades not too bad: It was enough for me. I looked older than the other children because I had stayed back 2 years.	Poor grades in high school: not working. A lot of time spent commuting. Not eating well.
Training	Physical Education: a lot of different sports and also track and field every year. Soccer after school with my friends.	Begin training in track and field.
Performance		Jogging on the weekend After three months of training, 11.96 s (100-m) and 23.36 s (200-m). Best performer in my club at the end of the year: 11.08 s (100-m).
Substance use		Vitamins (occasionally). Mg (curative).

### 2.3. Data encoding

The coding system gathered the two types of data to describe the organization of activity in relation to substance intake for each year and this constituted each athlete's life course database (Table II).

Five modalities of *Potential states* were observed and taken into account: (1) undetermined (U), which corresponded to physical activity without any preference for a specific sport; (2) oriented (O), which corresponded to a choice of direction towards one or more sports, leading to specific involvement; (3) open focus (OF), which corresponded to increased involvement in the direction of a specific sport but which was nevertheless still moderate because the athlete was staying open to other concerns; (4) closed focus (CF), which corresponded to the commitment of time and energy to a specific sport and reduced time for other life events; and (5) addictive focus (AF), which corresponded to excessive involvement in a single sport with concomitant detrimental effects on other parts of life.

Three elements that composed the *Actual states* of the athletes were considered: (1) the type of substances used, from either the prohibited lists of the World Anti-Doping Agency (2010) or the diverse legal substances, like vitamin supplements, currently used in elite sports. A distinction of the form of use was also made [i.e. occasional (O), short-term curative (CU) or continuous (CO)]; (2) the evolution in performance [i.e. increase (C), stable (S), irregular (I) or decrease (R)]; and (3) characterization of training changes [i.e. an increase in type or quantity or a change in place (C), stable (S) or a reduction in quantity (R)].

Three elements of *Virtual states* were considered: (1) discovery of knowledge (D) (e.g. self, events, sport techniques); (2) reinforcement of knowledge (R) (e.g. identity); and (3) distress, disorientation, enquiries or search for new solutions (I).

### 2.4. Data analysis

Two dynamics were analysed: (1) the local dynamics, such as the relations between *Actual*, *Potential* and *Virtual states* for each year; and (2) the global dynamics, such as the organization of changes year after year, presented as individual athletes' databases in tables, as seen in Table I.

Table II. Example of an athlete's database (each modality by year).

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19
Potential states	I	I	I	O	O	O	O	OF	OF	CF	CF	CF	AF	AF	AF	AF	AF	AF	AF
Actual states																			
Vitamins				O	O	O	O	CU	CU	CU	CU	CU	CU	CO	CO	CO	CO	CO	CO
fe/mg													CU	CU	CU	CU	CO	CO	CO
Creatine													CU	CU	CU	CU	CO	CO	CO
Other complements													CU	CU	CU	CU	CU	CO	CO
Anabolic steroids																	CU		
Peptide hormones																		CU	CU*
Performance	CU	CU	CU	CU	CU	CU	CU	CU	CU	CU	CU	I	CU	CU	CU	I	R	I	R
Training	S	S	S	S	S	S	CU	CU	CU	CU	S	S	CU	S	CU	S	CU	CU	CU
Virtual states	D	D	D	R	R	R	R	R	R	R	R	I	D	R	I	I	I	I	I

Notes: *Potential states*: U, undetermined; O, oriented; OF, open focus; CF, closed focus; AF, addictive focus. *Actual states*: the type of substance use; O, occasionally; CU, short-term curative; CO, continuous; \*, increase in dose; the evolution in performance: C, increase; S, stable; I, irregular; R, decrease; characterization of training changes: CO, increase in type or quantity or a change in place; S, stable; R, reduction in quantity. *Virtual states*: D, discovery of knowledge; R, reinforcement of knowledge; I, distress, disorientation, enquiries or search for new solutions.

To characterize the local dynamics, the percentages of occurrence of elements that characterized the activity of doping athletes during the periods when they used prohibited substances were compared with other periods when no prohibited substances were used. Chi-square analysis with the Yates correction was used to compare these distributions.

For the characterization of the global dynamics, athletes' life course databases were compared year by year to determine the periods of doping and the type and form of substances taken before the doping violation. The number of years spent in each component of activity during the athletes' careers was compared with the Student's *t*-test. A short-term analysis for 5 years preceding doping was also performed.

### 3. Results

The results are presented in three parts that characterize (1) the activity during doping, (2) the global organization of doping athletes' sporting life course and (3) the short-term dynamics of doping athletes' sporting life course.

#### 3.1. Activity during doping

The percentage of occurrence of each activity component characterizing periods of doping in comparison with non-doping is presented in Table III. This showed that no component alone was sufficient to characterize the activity linked to performance-enhancing substance use. For example, although "addictive focus" was closely linked to doping activity, it was also linked to non-doping activity in 50% of the cases. The same observations could be made for other components that seemed implicated in doping activity such as "irregular" evolution in performance or a "decrease", or the experience of a period of personal

Table III. Components of activity and their relations to prohibited substance use (percentage of occurrence) for doping and non-doping athletes.

	Doping	Non-doping	$\chi^2$	<i>p</i>
Potential states				
Undetermined	0.00	100.00		
Oriented	0.00	100.00		
Open focus	0.00	100.00		
Closed focus	9.38	90.62	8.09	<0.01
Addictive focus	50.00	50.00	56.01	<0.001
Actual states				
Evolution in performance				
Increase	0.88	99.10	2.02	NS
Decrease	20.00	80.00	22.27	<0.001
Irregular	28.60	71.40	45.49	<0.001
Stable	10.30	89.70	10.96	<0.001
Training mode				
Change	7.15	92.85	5.48	<0.02
Decrease	0.00	100.00		
Stable	6.17	93.8	4.47	<0.05
Virtual states				
Discovery	0.00	100.00		
Reinforcement	0.00	100.00		
Disturbed	19.60	80.40	19.78	<0.001

Note: NS, nonsignificant.

Table IV. Ranking of activity pattern observed with doping athletes.

Potential states	Patterns			Doping period (%)	$\chi^2$	<i>p</i>
	Performance	Training	Virtual states			
Addictive focus	Decrease	Change	Disturbed	100.00		
	Irregular			100.00		
	Stable			100.00		
Closed focus		Stable		100.00		
	Irregular	Change	Disturbed	50.00	56.01	<0.001
	Increase	Stable		40.00	50.03	<0.001
	Stable			33.33	40.31	<0.001
	Decrease	Change		20.00	22.27	<0.001

“distress”. However, when these distributions of activity components in periods of doping and non-doping were compared with a theoretical distribution of zero-doping risk, statistically significant effects emerged. The major component was the “addictive focus” mode of involvement ( $\chi^2 = 56.01$ ,  $df = 1$ ,  $p < 0.001$ ). The other factors were “irregular” and a “decrease” in the evolution of performance (28.6% and 20% of the sporting life course of doping athletes, respectively) ( $\chi^2 = 45.49$ ,  $df = 1$ ,  $p < 0.001$ ;  $\chi^2 = 22.27$ ,  $df = 1$ ,  $p < 0.001$ ) and the experience of ongoing “distress” in life (19.6% of the sporting life course of doping athletes) ( $\chi^2 = 19.78$ ,  $df = 1$ ,  $p < 0.001$ ). Finally, two factors were also statistically significant with a lower risk of error: the “closed focus” mode of involvement (9.09% of the sporting life course of doping athletes;  $\chi^2 = 8.09$ ,  $df = 1$ ,  $p < 0.01$ ) and “change” or “stable” in the mode of training (7.23% and 6.17% of the sporting life course of doping athletes, respectively) ( $\chi^2 = 5.48$ ,  $df = 1$ ,  $p < 0.02$ ;  $\chi^2 = 4.47$ ,  $df = 1$ ,  $p < 0.05$ ).

Table IV presents the ranking of the association of different components of activity during periods of doping. Four patterns specifically linked to prohibited performance-enhancing substance activity emerged (i.e. exclusively corresponding to these periods). They included the following elements: “addictive focus”, three modalities of evolution in performance (i.e. “stable”, “irregular” and “decrease”), two modalities of training (i.e. “changes” or “stable”) and perturbations (i.e. “distress”) in life experiences. The other patterns were not specifically linked to prohibited substance activity but emerged as statistically significant in comparison with a theoretical distribution of zero-doping risk. They were composed of a potential “closed focus”, the four modalities of the evolution in performance (i.e. “increase”, “decrease”, “stable”, “irregular”), two modalities of training (i.e. “changes” and “stable”) and one modality for experience (i.e. “distress”).

### 3.2. Global organization of doping athletes’ sporting life course

The observation of the doping athletes’ sporting life course showed that prohibited substance use began after 17 and 19 years of sport practice (mean = 17.6, SD = 89). All of the doping athletes were regular consumers (i.e. “curative” or “continuous”) of legal substances such as vitamins and supplementary substances for no fewer than 2 years before doping activities. However, these patterns were also noted in the non-doping athletes. Table V compares the organization of doping athletes’ and non-doping athletes’ sporting life course corresponding to the years before the first use of prohibited substances in relation to the number of years characterized by each component of activities. The results



Table V. Number of years experienced for each component of activity during the whole sporting life course for doping and non-doping athletes.

Components of activity	Mean		SD		<i>t</i>
	Doping	Non-doping	Doping	Non-doping	
Potential states					
Undetermined	3.8	2	1.30	2.12	1.44
Oriented	3.4	3.75	1.34	2.27	0.26
Open focus	3	6.5	1.87	1.5	2.91*
Closed focus	6	4.75	3.24	1.47	0.7
Addictive focus	1.4		2.19		1.27
Actual states					
Evolution in performance					
Increase	11.6	13.75	2.88	2.27	1.17
Decrease	1.6	0.75	0.89	0.95	1.29
Irregular	1.4		1.94		1.43
Stable	3.6	2.5	3.78	1.5	0.54
Training mode					
Change	7.2	9.72	1.78	1.47	2.19
Decrease	1.5		0.7		1.34
Stable	9	7.25	2.82	1.47	1.19
Virtual states					
Discovery	3.6	5.25	0.54	1.92	0.65
Reinforcement	9.2	8.4	0.44	2.06	0.66
Disturbed	4.8	3.5	0.44	1.5	1.66

Note: \* $p < 0.02$ .

showed that during their sporting life course, doping athletes transformed their mode of involvement, spending an average of 3–4 years at the moderate state of sporting concerns (i.e. “undetermined”, “oriented”, “open focus”), 6 years with closed concerns and more than 1 year with an addictive one. One major difference with non-doping athletes’ life courses was the time spent at the state “open focus” ( $t = 2.91$ ,  $p < 0.02$ ). The shift to exclusive involvement in a sport appeared faster for doping athletes than for non-doping athletes. The data also indicated that doping athletes were the only ones who experimented with extreme forms of involvement (i.e. “addictive focus”) before this involvement was associated with the use of prohibited substances.

The time spent on other components of the sporting life course did not show any significant differences between the two groups. One component related to a change in the form of training near the significant level of 0.05 should also be noted ( $t = 2.19$ ).

### 3.3. Short-term organization of activity that led to doping

Table VI presents the characteristics of doping athletes’ activity 5 years before the use of prohibited substances. The results indicated that these athletes experienced perturbations for two consecutive years ( $t-1$  and  $t-2$ ) associated with an “addictive” or “closed focus”. They also changed their modes of training (e.g. increased load, change in method) 2 years before the use of doping substances. In addition, the evolution in performance appeared distributed over all the modalities (i.e. “increase”, “decrease”, “stable”, “irregular”). The data indicated that the organization of the activity changed progressively in the direction of

Table VI. Characteristics of the athletes' activity every 5 years before the use of prohibited substances.

	<i>t</i> -5	<i>t</i> -4	<i>t</i> -3	<i>t</i> -2	<i>t</i> -1
Potential states					
Oriented focus	20.00		20.00		
Closed focus	80.00	80.00	60.00	80.00	60.00
Addictive focus		20.00	20.00	20.00	40.00
Actual states					
Evolution of performances					
Increase	60.00	40.00	40.00	20.00	40.00
Decrease			40.00	20.00	40.00
Irregular	20.00	20.00	20.00	20.00	
Stable	20.00	40.00	0.00	40.00	20.00
Modes of training					
Change	60.00	80.00	20.00	100.00	60.00
Decrease			40.00		
Stable	40.00	20.00	40.00		40.00
Virtual states					
Discovery		40.00			
Reinforcement	80.00	20.00	40.00		
Disturbed	10.00	40.00	60.00	100.00	100.00

more specific focusing. The distribution of the diverse modalities concerning the evolution in performance changed year after year, suggesting that the athletes experienced periods of modification in states. Their modes of training also changed during these 5 years (i.e. 80% changed at *t*-4, 60% changed at *t*-1 and *t*-5). Finally, the distress level appeared increasingly greater following these 5 years (from 10% at *t*-5 to 100% at *t*-1).

#### 4. Discussion

The aim of this study was twofold: to characterize the activity components that were specifically linked to a period of use of prohibited performance-enhancing substances and to identify the trajectory that led to this use. The results showed that the period of doping could be characterized as a specific period in the sporting life course organized with different and specific types of coherence between the elements that link meaningful experience. During the periods of prohibited substance use, doping athletes appeared closed to all external environmental offers except training and performance (i.e. "addictive focus", "closed focus"). They experienced changes in their sporting results (i.e. "decrease", "irregular") and their daily life experiences could be characterized as distressful. These results first suggest that doping athletes are suffering athletes. The suffering could be associated with the specific way that sporting activity is experienced. Athletes are highly committed to their sport, which requires a wide range of resources. The need to mobilize these resources appeared linked to their use of prohibited drugs, as suggested by other research that linked doping to the search for the best performance (e.g. Queval, 2004). The results demonstrated that their meaningful world was specifically (and sometimes in an exaggerated fashion) structured around training and performance, with limited possibilities for other activities. Because this organization was linked to distress and doping, we can argue that their suffering could not be reduced by small opportunities for psychological recovery through diversion, relaxation, studies or work. The instability in the sporting results experienced

by these athletes at the time that they decided to use prohibited substances could also be associated with the suffering.

These results agree with what many athletes have expressed after receiving doping sanctions. For example, the famous cyclist Tyler Hamilton was diagnosed with depression in 2003 in reaction to several events that were meaningful to him – the revelation of his mother’s cancer, a separation from his wife and a sports career that seemed in decline. He was put on the antidepressant “Celexa”, but he himself doubled the dose to cope with his problems. He has said of his ordeal with depression: “I should’ve been on top of the world and from the outside, it looked like I was”, but then described feeling as if he was falling apart. “Sometimes I felt like I put on a suit everyday to be somebody I’m not; it was a facade.” “When I should have been on top of the world, on cloud nine, I was the most depressed” (Lequipe, 2009). Over the years, this athlete often tested positive for a variety of prohibited substances, served a 2-year suspension from racing for doping and then in February 2009 was banned from competition for life after testing positive for an anabolic steroid. Our results emphasized doping activity linked to suffering, characterized not only by psychological states like depression but also by feelings of tiredness. They described a typical signature of activity that sustained the link between suffering and doping. In reference to other research, this doping signature is probably one of several diverse signatures that can be encountered in high-level sports. For example, in their study of the discursive management of taking prohibited substances, Lamont-Mills and Christensen (2008) identified a form of use linked to ignorance rather than deliberate deception. This other signature observed in a sport other than track and field (i.e. cricket) could also be seen as a one-off event and not reflective of systematic drug usage.

The results showed several possible trajectories of the sporting life course that may lead to doping activity. The life course before prohibited substance use could be characterized by (1) a specific length (i.e. 17 years before use), (2) a specific path (i.e. a shorter time spent in “open focus” during their life course compared with non-doping athletes), (3) high consumption of legal substances for no fewer than 2 years before doping whereas only some non-doping athletes showed this activity, (4) changes in the modes of training 2 years before doping activity and (5) a period of distress before doping. From a dynamical perspective, these characteristics could be interpreted as a collection of conditions that describe the trajectory before the shift to doping activity. The length of this trajectory averaged 17 years. After this point, the risk of a shift towards doping was high. No other study has signalled this critical period. Another mark was also identified: the rapid commitment to an elite level of specific sport activity for the doping athletes. This mark could be interpreted as a distal initial condition for a later drift to doping (Maturana & Varela, 1987). Because the consequence of this early involvement is a longer time spent focused exclusively on training and the search for high performance, the doping athletes could be seen as having been more exposed to the negative effects of a long period of high-level commitment. Although research on expertise and elite performance has shown that no one can attain high performances without a high level of commitment (e.g. Ericsson, 1996), several investigations have shown that many athletes abandon the system of elite performance during their careers because of the difficulties they experience (e.g. Sinclair & Orlick, 1993; Fraser-Thomas et al., 2005). These distal initial conditions could be seen as provoking much later effects that facilitate the shift to the use of prohibited performance-enhancing substances. During no fewer than 2 years before the shift to doping, the consumption of diverse substances, changes in the training mode and a period of disturbance could be considered as the proximal initial conditions that led to

doping. These conditions could reflect high instability in elite athletes' activity organization. When this instability lasts too long, a bifurcation to a new organization is needed. Other researchers have pointed out that the consumption of legal substances increases the risk of using prohibited substances (Dodge & Jaccard, 2006; Hoffman et al., 2007; Litt & Dodge, 2008). Our results confirmed this finding but also indicated that the form of consumption (i.e. "curative" or "continuous") and the length of use (more than 2 years) should also be considered.

Diverse limitations of the study should be examined. In a methodological consideration, the difficulties and challenges in relation to retrospective design could be underlined. In a general way, limitations are due to the process of building new meaning when someone has to explain his past history. However, in an enactive and situated paradigm, the new method that was set in this research offers different possibilities to limit the weakness of traditional verbal reporting. First, the collection of indicators that characterized paths and shifts in athletes' history was done using enquiries with diverse sources such as federation website or journals that were followed and completed by interview to build a coherent organization of development of athletes' life course. In doing so, personal recall that could be weak or false was compiled after and in relation to the results of the enquiries. Second, this first collection of data served as a basis for developing a simulating situation. The self-confrontation interview is a process where traces of past activity were presented to participant to stimulate a re-enactment process (Hauw, 2009). During this interview, participants were in a retrospective dynamical situation supported by the presentation of trace of their past activity. They were invited to re-experience and describe the stream of past experience. In doing so, they re-enacted their past experience. The traces of activity were used to facilitate this process as well as to situate precisely how experience emerged in relation to the situation. The athletes were also expected to adopt a specific stance that consists of reliving the flow of their own past experience although deliberately ignoring the outcome. In doing so, the confrontation to each trace of period and shift of athletes' life course should be considered as a new situation although the new meaningful experience built has many similarities with the one that was lived in their own past. Hence, considering that the psychological process was more an assisted incentive process than a simple recall, the problem of false memory moves to the possibility to provoke a sufficient re-enactment to understand past experience. Thus, the collected data are not comparable to those obtained with traditional retrospective reports of earlier cognitive processes (Ericsson & Simon, 1984/1993; Theureau, 2003). Third, these diverse steps used for the data collection (enquiries, first interview, self-confrontation interview) allowed building a progressive and complementary description of the past history. According to the data collection, the coherence of the information gained consistency and the doubts concerning various periods or shifts in the sporting life course can be examined and deleted.

Another limitation could also be indicated concerning proof for the "clean" athletes. It is true that the absence of positive control does not guarantee the absence of taking prohibited substance. It is the reason for which the analyses of patterns were realized by considering the risk zero. Therefore, when a pattern of organization of the activity appeared with the doping and non-doping athletes, the possibility that the non-doping athletes lied was left open. Nevertheless, the five non-doping athletes who participated for this research presented high guarantees for anti-doping attitudes. First, their sport results were known for several years and their progress did not undergo any sudden transformations suggesting the absence of use of Performance-enhancing drugs. Furthermore, each of them underwent on

average more than 20 doping tests during the last 4 years of their career supplying an additional guarantee. Besides, they presented limited risk factors of doping with (1) a professional career parallel to their sporting career, (2) not showing typical extreme behaviour of risk personality such as “sensation seeking”, for example, and (3) an environment family attached to the sports educational values. Even if the interest of this study in a situated and dynamic approach is to consider that the activity is not pre-determined by a series of factors but emerged according to a local and historic context, these indications strengthen the credibility of our results.

## 5. Conclusion

To conclude, doping activity could be considered as a possible state when daily life experience characterized as distressful persists. All athletes experience difficulties during their career and apparently many events are shared by all of them. The results showed that despite these important similarities, specific distal and proximal initial conditions were able to provoke the bifurcation towards this new form of organization even after 17 years of sporting career. These findings suggest many possibilities for implementing educational programmes. Four major outcomes could be underlined. First, specific attention should be given to critical periods in the athlete’s career so that other healthier bifurcations can be introduced with psychological support. Along the same line of intervention, specific attention should be focused on periods of instability, indicated by inquietude, suffering, turning inwards or tiredness. Second, strategies for reaching elite performance can be analysed with regard to the proximal and distal effects on the stability or instability of the athletes’ development. Early specialization can be questioned in relation to the athletes’ development and their compatibility with the search of performance. Multiple activities in parallel to those aimed at performance enhancement should also be organized to generate space for physical and psychological recuperation or compensation. Situated knowledge could also be expressed and shared with other members of the sports academy (i.e. coaches, administrators, managers, physiologists, other athletes) to improve elite performance educational programmes. Third, the use of legal substances like nutritional supplements should be limited and controlled. Specific attention should be directed towards self-medication, which can lead to the use of substances that are not under limited access (e.g. internet, sports supermarket). Fourth, information should be given to the athletes to facilitate their requests for help when the need arises in the course of their career, such as the French national anti-doping phone-help service (Bilard et al., in press).

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