

Tell Me How You Feel When You Run, I'll Tell You Who You Are

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Abstract

This study aimed to observe the potential influences of the motivations in 17 trail-runners, on their running velocity (RV), perceived exertion (RPE), and Affective Valence (AV) during a 44-km competition. Before, they performed a maximal graded test to assess Maximal Aerobic Velocity (MAV) and maximal HR. They also completed a sociological questionnaire to determine their motivations, which allowed the identification of three categories: 1) hedonists (HEDO), who enjoy landscapes, 2) resilientists (RESI), who experience pleasure when they overcome an adverse life event, and 3) competitors (COMPET), who like measuring themselves against others. During the competition, we observe no significant differences regarding RV, %MAV, and %HR max among the groups. However, RPE and AV were significantly lower ($p < 0.05$) in RESI compared to HEDO and COMPET. Therefore, the motivations could influence RPE and AV and provide perspectives to understand the motivational means of trail runners.

Keywords

Motivation, Affective Valence, Performance, Trail Running

1. Tell Me How You Feel When You Run, I'll Tell You Who You Are

An interest in the limits of human performance means attempting to understand the functional systems that allow humans to adapt to and interact with their environment. Different models that attempt to explain the causes of exhaustion when an individual performs intense exercise have succeeded one another. The

physiological model of Hill, Long and Lupton (1924) based on the depletion of energy reserves, has long been used as the main hypothesis to explain the reasons why individuals become exhausted. Subsequently, new paradigms have appeared, notably focusing on the perception of effort, such as the psychophysiological model of Noble and Robertson (1996) or the central governor model of Noakes (2012). The central governor would be a higher cerebral function that regulates the level of stress and intensity of effort to preserve homeostasis. Moreover, Marcora (2008) defended a psychobiological model in which he emphasizes the preponderant role of motivation. This author has particularly shown that, with the manipulation of certain conscious or unconscious information, it is possible to influence the length of time that an effort can be maintained until exhaustion. More recently, Baron, Grappe and Gros Lambert (2018) proposed a global model of effort regulation (Global Model of Pacing Process or GMPP), in which they highlight the influence exerted by self-determined (or intrinsic) motivation and, more precisely, perceived pleasure associated with the perception of effort, which would play an active role in maintaining or ending the effort. In the GMPP, the authors also mentioned that non-self-determined (or extrinsic) motivation, including external regulation (reward and/or social recognition); introjected motivation (avoidance behaviours, withdrawing); identified regulation (when a behaviour is going to be accepted as personally important) and integrated regulation (in line with the individual's value system and morals), could influence the level of acceptance of emotional states generated by intense exercise. However, neither the GMPP nor the other models have accurately demonstrated the influence of these different forms of motivation in the effort and pleasure perceived during prolonged and intense exercise.

Competition trail running can be an interesting experimental observation model because it groups at the same time and place people of various ages, levels of education, professions, religions, beliefs, different places of residence, and motivations that push them to engage in events that vary from 1 to 270 km or even further. While numerous studies in sport psychology have reported positive effects of self-determined motivation on the perception of effort in aerobic exercise (Heazlewood & Burke, 2011; Hamilton, Scott, & MacDougall, 2007; Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011; Lerner & Locke, 1995), the effects of non-self-determined motivation on performance for endurance sports remain poorly documented, and contradictory conclusions have been reported (Hulleman, De Koning, Hettinga, & Foster, 2007; Irwin, Scorniaenchi, Kerr, Eisenmann, & Feltz, 2012). However, the research carried out in sociology provides an interesting qualitative approach to understand the motivations in endurance sports.

For Defrance (1985) the engagement in long distance races is a question of class struggle, where the group of runners who occupy dominant positions (in particular in the liberal professions, senior managers, teachers) attempt to impose a model: the medium-level adult participant who has no interest in being under the influence of federal organizations and wants to participate for pleas-

ure. The overrepresentation of the upper classes in endurance racing could be as a result of the imposition of these new dominant moral values by these groups.

In contrast, [Denzler \(1991\)](#) asserts that it is not social position but the place of residence that explains the motivation for long distance races. Indeed, this author shows that 63% of 700 runners questioned in his study reside in a city of more than 20,000 inhabitants. This condition could be the first motivation to engage in endurance racing, allowing these city dwellers to recreate a sociability that is altered in the hassles of everyday urban life.

On another note, [Barthelemy \(2002\)](#) affirms that the motivation for endurance races is mainly a need in the participants to prove their personal capacity to overcome unusual tests and, thus, to reaffirm the certainty that they are in control of their own lives. [Knobé \(2008\)](#) points out that what there are two determining factors that push individuals to engage in endurance race including a sporting history of being a novice or expert, reconverted or a “recommencer”, and/or the social situations that he/she encounters in the context of life (a runner friend, a member of the family, or professional colleagues), or a traumatic event such as the loss of a spouse or a serious illness.

These elements could be the triggers that prompt the individual to enter the endurance race. In their literature review, [Cubizolles, Baron and Lacroix \(2018\)](#) synthesize these different points of view by specifying that engagement in endurance running races is the consequence of a conditioning in which individuals' social coordinates play a primary role.

Therefore, it seems that the motivations of endurance runners are multiple and complex, and the effects on perceptual, physiological responses, and the level of performance in competition have, to the best of our knowledge, never been investigated in transdisciplinary studies, involving psychology, physiology and sociology. Consequently, the aim of this descriptive study is to analyse the influence of different forms of motivation on the perceptual, physiological responses, and levels of performance of trail runners during a 44 km competition through the prism of these three scientific fields. We hypothesize that motivations could influence their perception of effort, affective valence, heart rate responses, and running velocity.

2. Methods

The methodology used in this study is original because it is based on both qualitative (questionnaires, discursive analysis) and quantitative indicators (perceptual rating scales, physiological indices, and objective performance markers) recorded in the field conditions among Reunionese trail runners during a competition.

2.1. Participants

In June 2017, seventeen trained trail runners (six women and 11 men, $M_{age} = 39.7 \pm 6$ years), recruited on social networks, and who had all previously partici-

pated in at least one 60 km race and had resided on the island of La Réunion for at least seven years, volunteered to participate in this experiment. Before participating, each trail runner gave their written consent, and the study was conducted in line with the ethical principles of the Helsinki Declaration (1983) and approved by the local ethics committee. One week before the race, the trail runners completed a maximum graded test of running on a track until exhausted (Leger & Boucher, 1980) to determine their Maximum Aerobic Velocity (MAV) and their maximum Heart Rate (HR). Their level of professional and family fulfilment was measured on a graduated scale from 0 to 5, with the following items 0 (absolutely not happy) and 5 (extremely happy). The anthropometric and physical characteristics and level of professional and family fulfilment of the trail runners are presented in Table 1.

2.2. Design

This observational protocol was conducted during a 44 km competition (corresponding to “S” in the International Trail Running Association, ITRA) with a total elevation gain and loss of 1520 m. To maintain a high level of commitment, the protocol was designed as a trail competition consisting of eight 5.5 km laps, including 1.9 km of hilly terrain, 1.6 km of uphill, and 2.0 km of downhill. The positive drop was 190 m per lap. Participants’ race time was recorded on each lap with an electronic chip and by a manual timekeeper. At the end of each lap, the trail runners had to stop in a paddock for 10 min to assess their feelings with the use of various perceptual scales. The three best male and female trail runners in each category (senior, master 1, 2, 3) were awarded with prizes. All the trail runners started together at 6.00 am in tropical environmental conditions. The average temperature was 25.5°C (extreme values: 20.1°C to 30.5°C, with 68% relative humidity).

Table 1. Mean and standard deviation (\pm) of anthropometric and physical characteristics and level of professional and family fulfilment before the experiment among three typologies of trail runners. BMI = body mass index; MAV = maximum aerobic velocity; HR (heart rate); ITRA rating = points issued by the international trail running association; a: $p < 0.05$ compared to resilient.

Parameters	Variables	Hedonics (n = 3)	Resilients (n = 7)	Competitors (n = 7)	H	<i>p</i>
Anthropometry and physical characteristics	Gender	2W, 1M	4W, 3M	1W, 6M		
	Age (years)	37.30 \pm 7	38.30 \pm 5	40.50 \pm 5	1.30	0.52
	BMI (UA)	0.21 \pm 0.02	0.22 \pm 0.02	0.22 \pm 0.02	.38	0.82
	MAV (km·h ⁻¹)	15.17 \pm 1.76	15.57 \pm 1.48	17.07 \pm 1.51	4.31	0.11
	Maximal HR (bpm)	183.10 \pm 1.76	182.40 \pm 5.13	177.8 \pm 8.8	1.30	0.52
	Training hours per week	10.65 \pm .58	7.88 \pm 3.57	9.75 \pm 2.63	1.45	0.49
	ITRA ranking	488.67 \pm 122.39	629.01 \pm 32.53	624.25 \pm 27.40	1.36	0.50
Level of fulfilment	Professional fulfilment (on 5)	4.67 \pm .58	3.43 \pm 1.26	3.43 \pm .96	4.34	0.11
	Family fulfilment (on 5)	5.00 (a) \pm 0.00	3.71 \pm 1.41	4.71 (a) \pm 0.50	5.77	0.05

2.3. Measures

Quantitative measurement. During the race, HR was continuously recorded with a smartwatch with GPS tracking (Spartan Ultra, Suunto, Vantaa, Finland). Each watch had been set to record data every second. At the end of each lap, the trail runners had to stop in a paddock for 10 min to assess their perception of effort (RPE), using the CR10 from Borg (1990) that makes it possible to assess the perceived intensity of effort on a graduated scale with the following items: 0 (zero effort), 0.5 (extremely weak), 1 (weak), 2 (medium), 3 sustained, 5 (strong), 7 (very strong) and 10 (maximum effort). Feeling was estimated with the Feeling Scale (Hardy & Rejeski, 1989) a scale used to evaluate perceived sensations, ranging from +5 to -5, to measure affective valence (pleasure/displeasure). This scale is supplemented by various adjectives to qualify the sensations related to affective valence: -5 = very bad; -3 = bad; -1 = fairly bad; 0 = neutral; +1 fairly good; +3 = good; and +5 = very good. After each series of tests, and to avoid any influence of hypoglycaemia and/or hyperthermia on the perception of effort and perceived pleasure (Nybo, 1985) trail runners could refuel ad libitum with foods containing mainly carbohydrates, such as energy bars, and drinks. The consumption of water and food during the course was monitored each lap by an experienced trainer to ensure that there were no major problems with energy intake and hydration during the experiment. Due to the large number of trail runners sometimes arriving simultaneously in the paddock, it was not possible to conduct all the tests for all the subjects within 10 min. Therefore, the full results of laps 1, 3, 5, 7, and 8 are presented. Indeed, the priority was to maintain the real conditions of the competition to maintain the highest level of motivation.

Qualitative measurement. A week before the experiment, the participants also completed a sociological questionnaire, comprising 61 questions and consisting of four parts: 1) general information (address, level of studies, current job, etc.); 2) family situation (status marital, children, etc.); 3) experience in trail running (years of practice, duration of training per week, club practice, number of competitions per year, motivations for trail running, perceived feelings during competitions, etc.); and 4) lifestyle (beliefs and religion).

Thereafter, the questionnaire was analysed by themes in a two-step procedure (Braun & Clarke, 2006). First, we identified all of the passages that involved a discussion of motivation for trail running. We then looked for recurring themes in these passages. Themes found in the majority of the answers formulated by the participants were retained. Three types of trail runners were identified from these themes:

1) Hedonists, who are sensitive to the feeling of pleasure and well-being provided by the trail. These trail runners enjoy landscapes, to run in nature, and to meet other trail runners in competitions. *M.*, who is a health practitioner, recounted her motivation for trail running: “I like running in the mountains, sharing wonderful landscapes with other trail runners ... These sensations give me feelings of well-being ... Suffering can be present during the race but quickly disappears in the face of the beauty of nature ...”.

2) Resilient, who experience pleasure when they manage to overcome a signifi-

cant obstacle or cope with an incident in life. In their responses, these trail runners report a difficult life, caused by bereavement, divorce, illness, injury, or stressful work. For them, trail competition is a physical and psychological challenge, a break with a painful past that can help them to cope with life's difficulties and increase self-esteem. *O.*, who had weight problems and had never participated in sport before trail running, said: "After the effort, I feel as light as a feather, rid of all evil spirits, like a new-born ...". *R.*, who has a low-skilled and painstaking job and has to raise his daughter alone, said: "When I cross the finish line, I feel strong and recognized by the public ...". *B.*, who wants to reduce his consumption of alcohol and tobacco, said this about suffering in competition: "... suffering helps me to surpass myself, and I can repeat this later in my everyday life ...".

3) Competitors, who like to measure themselves against others. They attach great importance to their ranking and their running velocity. *N.*, who is one of the best trail runners in the region and also swims and cycles, explained what he prefers in trail running: "Before, as a former soldier, sport always counted enormously in the eyes of my superiors, but what I also personally like in the trail is the feeling of velocity, taming obstacles, and improving my performance by competing with my opponents". He claimed also: "Suffering is inevitable during the race but disappears when I know I am performing well ...".

In addition, we conducted longitudinal monitoring over two years of the trail runners in our study (until the end of 2019) to observe the evolution of their ITRA ranking (<https://itra.run/>). The ITRA ranking, which lists all participants in official trail running events worldwide, indicates whether the trail runners in our study continued participating in competitions.

2.4. Data Analysis

All data are expressed as mean \pm standard deviation (SD). As the results do not meet the conditions for the use of parametric statistics (homogeneity of the variance and normality of the sample distribution), a Kruskal-Wallis test with a *post hoc* Dunn test was used to determine the significant differences for mean age, body mass index, MAV, maximal HR, 2017 ITRA ranking, level of family and professional fulfilment, mean velocity, percentage of MAV, percentage of maximal HR, RPE, and perceived pleasure in the race among the three groups. The level of significance was set at $p < 0.05$. An additional cluster analysis, with the K-mean Euclidian algorithm with two clusters (RPE and perceived pleasure), was performed with MATLAB software. This algorithm aimed to minimize the Euclidian distance between centroid and object point.

3. Results

3.1. Quantitative Analysis

The statistical analysis revealed that there was no significant differences ($p > .05$) among the three groups regarding age, BMI, MAV, HR max, ITRA ranking, and level of professional fulfilment (**Table 1**). However, the level of family fulfilment is significantly lower ($p < 0.05$) in the resilient, compared to the other groups.

During the competition (**Table 2**), no significant difference was observed concerning the mean running velocity, the percentage of use of the MAV, the mean HR, and the percentage HR max among the groups. However, the RPE and the perceived pleasure were significantly lower ($p < 0.05$) in the resilient, compared to the hedonists and competitors.

We also observed (**Figure 1**) a distinct spatial distribution of the resilient in the cluster analysis, with both a centroid perceived level of effort (4.6, corresponding to “sustained” to “strong effort”) during the race and a negative feeling scale (-1.5, corresponding to “fairly bad” to “bad” feeling). However, in the hedonists and competitors, this analysis revealed that a higher level of perceived exertion (4.8) was always linked to a positive feeling scale (2.8, corresponding to “fairly good” to “good” feeling).

3.2. Qualitative Analysis

Gender, mean age, level of studies and socio professional categories in the 3 typologies of trail runners are presented in **Table 3**. **Table 4** shows their place of birth and residence, their sport trajectory and strategy of race management are presented in **Table 5**.

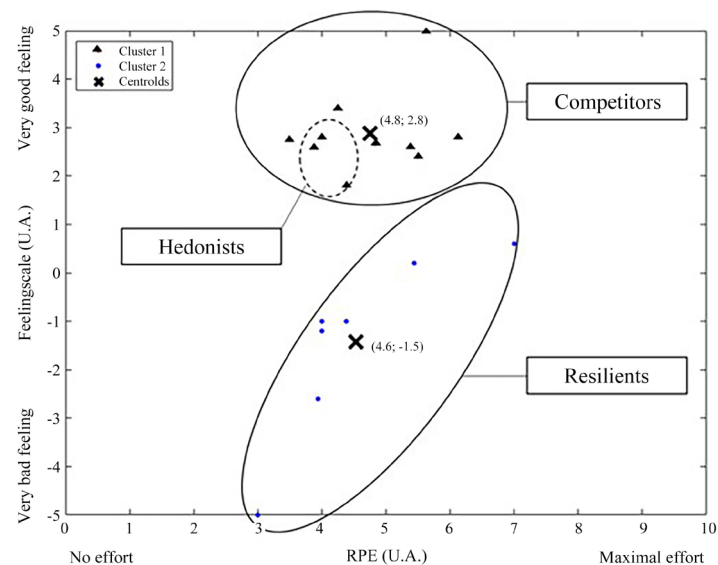


Figure 1. Cluster analysis of the Relationship between perceived exertion and feeling scale

Table 2. Mean and SD (\pm) of trail running performance, heart rate, and perceptual responses recorded among three typologies of trail runners during a 44 km trail competition. a = $p < 0.05$, compared to resilient.

Parameters	Variables	Hedonics (n = 3)	Resilients (n = 7)	Competitors (n = 7)	H	<i>p</i>
Performance	Mean Velocity ($\text{km}\cdot\text{h}^{-1}$)	6.23 \pm 1.1	7.36 \pm 0.8	8.08 \pm 1.3	4.69	0.09
	Percentage de MAV (%)	40.99 \pm 3.9	46.23 \pm 6.2	47.15 \pm 4.8	4.72	0.09
Heart Rate	Mean Heart Rate (bpm)	145.00 \pm 7.1	156.75 \pm 16.7	146.10 \pm 4.2	4.75	0.09
	Percentage of maximal Heart Rate (%)	80.77 \pm 0.4	85.75 \pm 8.4	87.45 \pm 1.2	2.12	0.34
Perceptual Responses	Mean Perceived Exertion (on 10)	4.36 \pm 5	4.03 \pm .8	5.42 (a) \pm 1.1	5.77	.05
	Mean Perceived Pleasure (from -5 to +5)	2.36 (a) \pm .5	-0.78 \pm 2.5	2.46 (a) \pm 1.6	6.01	.04

Table 3. Profile of the participants (percentage).

Gender	Hedonists	Resilients	Competitors	Total
Men	33.33	42.86	85.71	53.97
Women	66.67	57.14	14.29	46.03
Age				
>25 years	0.00	0.00	0.00	0.00
25 - 34 years	33.33	28.57	0.00	20.63
35 - 49 years	66.67	71.43	85.71	74.60
<50 years	0.00	0.00	14.29	4.76
Level of study				
<Bachelor	0.00	28.57	14.29	14.29
Bachelor	0.00	0.00	14.29	4.76
Bachelor + 2 years	0.00	14.29	14.29	9.52
Bachelor + 3 years and more	100.00	57.14	57.14	71.43
Socio-professional categories				
Farmer farmers	0.00	0.00	0.00	0.00
Craftsmen and traders	0.00	0.00	28.57	9.52
Managers and higher intellectual professions	100.00	57.14	42.86	66.67
Intermediate professions	0.00	0.00	14.29	4.76
Employees	0.00	14.29	14.29	9.52
Workers	0.00	28.57	0.00	9.52
retirees	0.00	0.00	0.00	0.00
People without professional activity	0.00	0.00	0.00	0.00

Table 4. Place of birth and residence (percentage).

Variables	Hedonist	Resilients	Competitors	Total
Place of birth				
La Réunion	33.33	14.29	14.29	17.65
Metropole	66.67	71.43	71.43	70.59
Foreign	0.00	14.29	14.29	11.76
Residentialcity				
less than 10,000 inhabitants	0.00	14.29	14.29	14.29
10,000 to 50,000 inhabitant	0.00	42.86	28.57	35.71
>50,000 inhabitants	100.00	42.86	57.14	50.00
Origin of participants				
West coast from Saint Denis to Saint Pierre	100.00	42.86	100.00	71.43
East coast from Sainte Suzanne to Saint Joseph	0.00	42.86	0.00	21.43
The High Land	0.00	14.29	0.00	7.14

Table 5. Sport trajectory and strategy of race management.

Parameters	Variables	Hedonists (n = 3)	Resilients (n = 7)	Competitors (n = 7)
Sport trajectory	Practice in club (%)	33.00	43.00	43.00
	Practice one or more sports in competition before trail running (%)	100.00	70.00	92.00
	Continue to practice trail in competition in 2019 (%)	66.00	73.00	47.00
Strategy of race management	Withdrawing in competition (%)	33.00	57.00	72.00

4. Discussion

The aim of this study was to determine the potential influence of motivations on perceptual, heart rate responses, and the level of performance in experienced Reunion trail runners during a 44 km competition. We hypothesized that motivations could influence perceived effort and pleasure, heart rate responses, and running velocity. The results of our study show that there are no significant differences among the groups regarding their anthropometric and physical characteristics and professional fulfilment. However, there is a significantly lower level of family fulfilment among resilients, which confirms the typology of this group engaging in trail running primarily to deal with life's difficulties.

The most important finding of this study is that the typology of the runner, as linked to their motivations, leads to the creation of significantly different perceptions, even though, statistically, heart rate response and performance remain similar to those of the other runners. Indeed, the trail runners observed in this study have different perceptions of effort and pleasure, according to their typology, while their HR responses and running velocity show few differences.

For the resilients, as [Le Breton \(1991\)](#) and then [Yonnet \(1998\)](#) already mentioned in regard to marathon runners, the trail is an initiation race, a life course, where one finds oneself. This social representation of the event significantly attenuates the perception of effort, compared to the competitors and hedonists. This perceptual response, described as dissociative by [Weinberg, Smith, Jackson and Gould \(1984\)](#) is characterized by a cognitive process of active blocking of the sensations of discomfort and pain generated by intense and/or prolonged physical effort. It is possible, but this remains to be demonstrated, that this cognitive adaptation can be reinvested in real life to deal with daily difficulties. In addition, the perceived pleasure is significantly lower, compared to the other groups. This surprising perception, which consists of experiencing pleasure, but, after having mastered an unpleasant event, is nevertheless consistent with resilience. For them, overcoming the suffering during the race is a way to develop daily resilience. For example, *T.* (who is divorced and has to care for her daughter alone) said after crossing the finish line: "I feel strong, people applaud me for my courage. I did something that not everyone can do ...". In support of this sentiment, [Pousse \(2013\)](#) previously reported that some trail runners, after having

finished “Le Grand Raid de la Réunion”, proudly wore T-shirts with the inscription “I survived”. [Barthelemy \(2002\)](#) who studied trail and ultra-endurance races, indicates a powerful motivational mean that characterizes these men and women who want prove their capacity to overcome unusual hardships in life and be assured that they are complete masters of their own destinies. In sport psychology, this type of motivation could correspond to the integrated regulation described by [Ryan and Deci \(1985\)](#). Indeed, even if the psychological constraints imposed by trail running competition are high (low perceived pleasure), resilient accept them more easily because they feel that this will help them to become better equipped to cope with the difficulties of life. This form of motivation was also recently reported in the finishers of the Barkley ultramarathon trail race by [Berg and Delfosse \(2020\)](#). In addition, this motivation seems to be persistent because, compared to the other groups, the resilient continued, by a very large majority (73%), to participate in trail running competitions at least two years after this experiment, while this percentage is 66% among the hedonists and drops to 47% among the competitors ([Table 5](#)).

For hedonists, in agreement with [Chevallet, Chorier, Suchet and Valero \(2013\)](#) we observed that these trail runners participate in competitions to enjoy nature, discover new trails, appreciate the beauty of the landscapes, and meet other trail runners. Compared to the competitors and the resilient, these trail runners have an intermediate perception of effort (4.36 ± 0.48 out of 10) during the competition. Their perceived pleasure is significantly higher than the resilient because they appreciate the proximity to nature. For example, *M.* said after the race: “I prefer to make a moderate effort because I want to appreciate the beauty of the landscape”. This testimony seems to confirm the study of [Rochedy \(2015\)](#) where the author reported that the idea of engaging in the trail running “... is above all to decelerate a modern oppressive temporality and avoid the cult of urgency dispossessing them from themselves; participating in this sport is a means of consolidating their autonomy in the face of abusive societal norms”. This motivation could be closed to the intrinsic motivation previously, which entails curiosity and exploration ([Ryan & Decy, 1985](#)). In addition, intrinsic motivation is observed when people are free of demands, constraints and homeostatic urgencies. A remarkable point ([Table 5](#)) that should also be noted is that 100% of hedonists (and 92% among competitors) had participated in at least one sport in competition before engaging in trail running (*vs* only 70% among resilient). This result suggests that, for most of the hedonists and competitors, trail running is a natural extension of their sporting trajectory, making them “converted” athletes, to use an expression dear to [Knobé \(2008\)](#). In contrast, resilient are more likely to “break” with their lives “before the trail”, following a traumatic event, and would be more in the category of “beginners”.

Trail runners in the competitors group are more focused on effort with the aim of achieving a good performance and overtaking their opponents. Moreover, the small sample ($n = 17$) at the start of the race and the stop at the paddock after each lap allowed participants to know her/his ranking in real time

throughout the competition. For them, in agreement with Mensch (2016) trail running is a fight against others. In this regard, *N.*, a former soldier, declared at the end of the race: “It was really difficult but, at the same time, pleasant because I knew from the start of the race that I was the first in my category”. After crossing the finish line, *L.* declared: “I went to maximum effort today because it was the first time that I beat *O.*, who is usually better than me, and, just for that, I am proud of my performance ...”. In this context, competitors are in an externally controlled paced task, which increases their perceived effort (Stanley, Pargman & Tenenbaum, 2007). However, although their perception of effort is important (5.42 ± 1.04), their perceived pleasure is also remarkably high (2.46 ± 1.64). These singular and contradictory perceptions could be explained by the fact that competitors accept a high level of effort that provides a good performance time or an honourable ranking. The motivation of these trail runners could correspond to the external regulation previously determined by Ryan and Deci (1985). This form of motivation corresponds to behaviours that are sustained by contingencies overtly external to the individual. In addition, as Faure (1987) rightly reminds us, competition is a means of comparing oneself and objectifying one’s merits. Hence, the reason why bosses, senior managers, and liberal professions compete for the metric of distance and time but also ranking. This culture of measurement and permanent evaluation allows these trail runners to situate themselves objectively (to feed the idea of excellence to which these social categories are attached) and, thus, to compare themselves in the context of performance, as Faure and Suaud (2003) reminds us: “to surpass oneself is to surpass others”. However, this form motivation is not without consequences to the ability of trail runners to invest over time in this type of activity. Longitudinal monitoring (Table 5) showed that only 47% of the competitor group were still participating in trail running competitions two years after the experiment. Another remarkable point regarding the competitors (Table 5) is the high percentage (72%) of runners who gave up during their races since their beginnings in trail running (vs 33% for hedonists and 57% for resilientists). This large difference agrees with a finding of Baron, Moullan, Deruelle and Noakes (2011) that competitors undoubtedly take more risks in the management of their races in an attempt to achieve the best possible performance, sometimes pushing it as far as exhaustion before crossing the finish line.

As presented in Table 3, women were slightly underrepresented in the study. The 46% representation of women in this study does not reflect the usual gender distribution in trail running competitions. In fact, most studies have reported a participation of approximately 22% of women in the “S” category in trail running (Knechtle, Rosemann, Zingg, & Rust, 2015). This discrepancy is undoubtedly linked to the small sample size in our study. However, the average age of the participants (39.7 ± 6 years) and the distribution among the different age groups is in agreement with the observations of other competitions on Reunion Island in the “S” category (e.g., zinfo974.com, 2019). As presented in Table 3, most of the participants (72%) in this study have a high level of education (bachelor plus

three years and more) and most (67%) have a high-level job (managers and intellectual professions). These values are slightly higher than those reported by Chevallet, Chorier, Suchet, and Valero (2013) who found, in a study that included 2000 trail runners, that 51% belonged to higher socio-professional categories. However, this over-representation of higher intellectual classes seems to confirm the thesis of Defrance (1985) who affirms that these social classes wish to appropriate endurance races to impose their values and their representation on the trail outside all federal organizations. In addition, as Table 5 shows, the low percentage of participants licensed to a trail club (33% for hedonists and 43% for resilientists and competitors) seems to confirm this assertion.

However, this model of the class struggle must be qualified because the results of our study also show that participants' place of residence would be another motivational lever (Table 4). Indeed, our results clearly show that the majority (71%) of the trail runners in our study were born in metropolitan France, 50% live in a city of more than 50,000 inhabitants, and 72% live on the west coast between Saint Denis and Saint Pierre. Similar results had already been reported (Faure, 1987; Faure & Suaud, 2003) regarding the Reunion participants in Le Grand Raid in 2000 (Bessy & Naria, 2004). Denzler (1991) had already reported that the majority of marathon runners were city dwellers and, above all, sought a way to escape the hassle of city life in endurance racing. The island of La Reunion, with its thousands of kilometers of trails crisscrossing cirques and vertiginous summits far from all traces of civilization, offers a great playground for these city trail runners, who are mostly from metropolitan France and in search of large open spaces of nature and freedom.

The small number of participants involved in the protocol in this study limits its scope. It should also be noted that the typologies specified in the study are not fixed. Indeed, we observed perceptual responses that can sometimes be marked in some participants but more nuanced in others. Our results also show that some trail runners combine several typologies (*e.g.*, hedonists-competitors, resilient-hedonists or competitors-resilient). Furthermore, it is possible that there is also a migration between typologies, but this remains to be demonstrated in future studies (*e.g.*, hedonists *vs* competitors).

In conclusion, this study reports on the influence of different forms of motivations on the perception of effort and the pleasure felt in competition through an original transdisciplinary methodology combining quantitative and qualitative measures. According to the typologies identified, the motivations are distinct. As shown in Figure 2, hedonists are attracted by nature and the great outdoors, resilientists are looking for solutions to deal with their daily difficulties, and competitors seek to compare themselves and objectify their merits. These results suggest that the motivations influence the perception of effort and pleasure felt in competition, independent of HR responses and running velocity, and could provide interesting perspectives for coaches who seek to understand the motivation that push individuals to engage in trail running. Indeed, trail runners who participate in competitions are not necessarily competitors and therefore could be

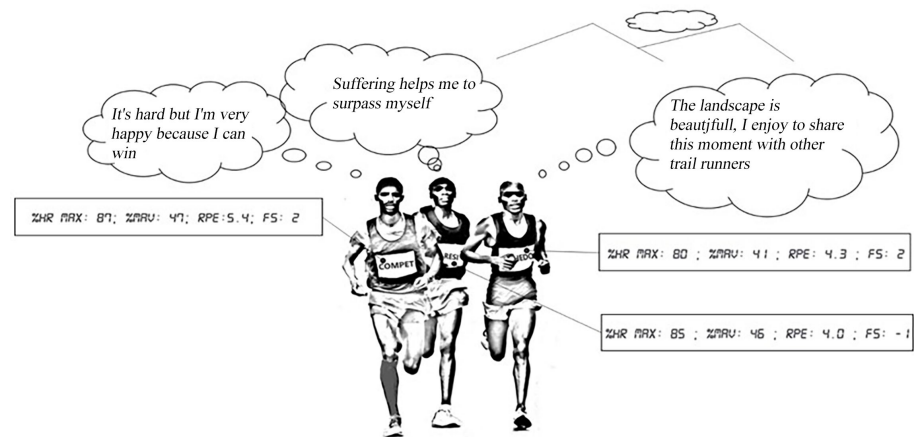


Figure 2. Overview of the main results of the study.

trained differently according to their motivations. For example, the hedonists could often change of training site to discover new landscapes while the competitors prefer training with sparring partners. Whereas it has been reported that intrinsic motivation is a protective factor for injury in marathoners (Chalabaev, Radel, Ben Mahmoud et al., 2017) it appears that the form of integrated motivation found in resilient, who are less sensitive to the intensity of effort in competition, could induce exhaustion. We suggest that further investigations should be conducted into the validation of a short questionnaire to identify the resilient, which could be useful for the trail running coaches, organizers and their medical teams to enhance safety and reduce the risk of adverse events among participants (Hoffman, Khodae, Nikiah, Nudell, & Pasternak, 2020).

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Conflicts of Interest

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