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Mini Review

Hikes and Trails Systematization of the Types of Obstacles/Adaptations in Pedestrian Routes

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Abstract

Hikes and trails are increasingly popular activities, in the field of tourism, but also at the level of recreational activities. With this work, we intend to create an integrative vision of the activity that includes the Situation / Context / Individual, which allows the development of instruments in order to enable an intervention, with a functional character, in this type of activities. To this end, we have systematized a set of adaptations requested from individuals, characteristics in the pedestrian paths, using the existing bibliography and an analysis of the obstacles identified in the activities. With this structure of knowledge, it is intended to create a conceptual basis that allows the characterization of the routes, the quantification of the adaptations for each individual, how to train their efficiency and also the design of personalized tourism products.

Keywords: Active Tourism, Nature Sports, Hikes and Trails, Adaptation.

Introduction

In a type of recreation activity, tourist or not, in which there is no defined objective at the outset for its realization (as in the more traditional activities, get farther, perform in the shortest possible time, etc.) the motivations of the consumer gain prominence. In this framework, it is the intentionality with which each individual sets out for the experience that counts, and this can be distinct and varied for the same activity. It is necessary to consider not only the differences regarding individual characteristics [1], but also the different personal motivations that may exist [2]. Thus, it is up to those who guide the activity to direct the experience to respond to the expectations of those who perform it. An experience that, as described by Selstad (2007), is a complex and multifaceted phenomenon and that, due to the diversity of explanatory models, depending on the areas of study, is nothing more than an "ambiguous social construction" [3]. From the point of view of the field of sport, to stimulate the experience involves understanding the activity and its participants, that is, identifying the different factors in play and the inherent variables, so that we can make the adjustments according to the objectives we want to achieve. A functional vision that allows us to go beyond the standardized ways of acting and personalize the activity [4], creating adjusted and individualized experiences.

It is verified that the trend of the various studies carried out in this area, and also in its practical application to situations, such as the definition of the difficulty of the routes or trails, are still very focused on factors such as distance, terrain conditions, weather conditions, cargo transported, among others [5-13], considering in isolation the Situation / Context / Individual. Authors such as [14], propose a classification system based on parameters such as unevenness, altitude, distance, duration of the route, landscape, orientation, access to drinking water, that they presented to some experts and from which they concluded that the more valued was the unevenness. This proposal, although it already presents some integration of factors from different scopes, still seems to us to fall short of the more global perspective that we have been advocating here. As a strategy to understand the different factors in the activity, it is acceptable to isolate these three aspects (Table 1), but only if this perspective does not lead us to lose the global vision of its functioning. Otherwise, we will be distorting all the interpretations we can draw from it.

Table 1: Examples of context, situation and individual factors that influence walking activity.

Context	Situation	Individual
Slope variation	Type of technique used to progress, and equipment used.	Psychological factors
Uneven floor		Physiological factors
Slippery floor		Cultural factors
Obstacles		Social factors
Weather conditions		Others.
Other.		

A strategy to overcome this type of conditioning of the partial visions that we can have through the analysis of each of these types of factors in isolation, is to systematize the types of adaptations that a course can provide and that consider in an integrated way the Situation / Context / Individual [15,16]. Adaptation results from responding to stimuli "… is a process that can respond to the effects of stimulus / aggression. Sometimes for the same set of stimuli different adaptations are possible, so that it meets the defined objectives. It is often necessary to look for and try to create the most appropriate stimulus matrix for the situation, the individual and the context. On the other hand, it is also difficult to isolate an adaptation. As a rule, there are always "collateral" adaptations that must be managed in such a way that they do not overlap with the main adaptation or do not hinder the intended evolutionary direction. It is possible to distinguish various types of adaptations, the punctual or fleeting ones when they tend to disappear with the absence of the aggression (however 'something' can remain, i.e., 'experience', knowledge', whatever), or the permanent ones that last beyond the direct effect of the aggression." [17]. Based on this framework, in a synthetic way, we can outline an adaptation considering the figure below (Figure 1) [15].

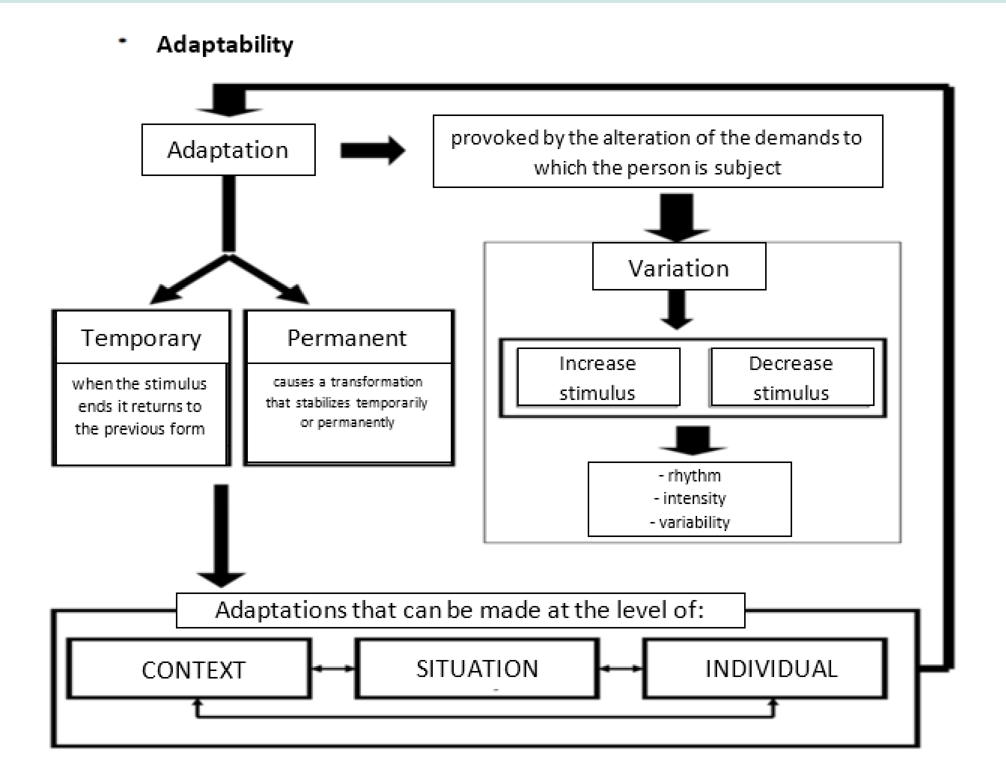

Figure 1: Adaptability (Fernando, 2005).

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This approach, centered on adaptations, allows us to perceive the interactions between the context, the individual and the situation; If we understand how these affect the experience, then we can take a more holistic view of this type of problem. Naturally, aware that there may always be other interactions that at the light of current knowledge we cannot identify and that the concept of adaptation fits into a more global process of a cycle that includes "aggression » reaction » adaptation » transformation" [17].

Development

Performance Strategy

With this work it is intended, through the systematization of a set of adaptations that the paths can offer to those who perform them, a structuring of knowledge that encompasses the phenomenon in its totality (context / situation / individual) and in a more functional way. This systematization will allow to characterize the routes based on the requested adaptations, giving the chance to everyone to choose the product that best fits their expectations, or on the other hand, allow those who guide the activity to select the challenges most appropriate to their customers. The identification of the adaptations in which the individual is less proficient, also allows to identify what everyone must train to improve his performance, or to enhance his experience. We believe that this type of approach, based on the adaptations, can allow a customization of the products related to the hiking that can be an added value for consumers, but also for those who offer this type of activities.

Types of Adaptations

The obstacles along a pedestrian path condition the ability of everyone to progress and his experience in carrying out the activity, but also, and above all, the adaptations everyone has to make to create strategies that allow to overcome them. We will define a set of adaptations that can be identified in a hiking situation.

Uneven Terrain: The irregularities of the terrain whether they are caused by vegetation, stones, terrain curves, etc., lead to the individual's gait not being automated, since this strategy is not the most efficient. To be successful, it is necessary, on the contrary, a constant reading of the terrain, decision of where to place the next support and the operationalization of this strategy through its motor outputs. This constant adaptation has energy costs at the motor level, but also at the nervous level [1].

Unstable terrain: When the terrain by its instability does not allow the individual to have a solid and stable support will lead the individual, before passing the weight to the support that will perform, to make sure that this is feasible (in case, for example, of existing loose stones or other materials that may not be completely fixed), which means that he have to use a different kinetic chain from the one he is usually use in his gait, also using a set of muscles that allow him to stabilize the performed movement (such as when the floor is soft and deformable, such as sand). Another example is when the support on the ground is not fixed and the individual has to manage this movement in the sequence of supports that he performs in order to be able to maintain his balance (for example, on the sloping ground with sand or small stones where the slide of the support is taken for granted and it is necessary to maintain the vertical projection of the center of mass within the limits of the support base dynamically and continuous). The expenditure of energy in this type of situation will also be affected. Walking on grass or sand, according to [18], changes energy expenditure (increases by 16% on grass and 33% on sand).

Sloped terrain (going up/down): When we face an ascent in the terrain the energy consumption increases, a consequence not only of the increase in the intensity of the force that the individual has to perform to displace his center of mass, but also by the fact that the inclination of the terrain conditions, the positioning of the kinetic chain forcing the movement to be carried out in joint amplitudes are different from those that we are accustomed to work [19,20]. On the other hand, the descents, although they do not imply an increase in the intensity of the force, some authors argue that the constant need to deceleration the movement implies constant impacts on the joints that can cause discomfort and even injuries [21]. Other authors, such as [22], when analyzing walking on downhill slopes, it becomes evident that despite humans tending to choose walking patterns that minimize energy costs, they also tend to consider the importance of stability to prevent falls. Taking advantage of gravity to reduce the necessary muscle activity would be the theoretically most profitable model to descend a slope, however, when several individuals are tested in this situation, asking them to perform a "relaxed" gait it is verified that they do not take advantage of the totality of the gravity propulsion preferring a more expensive gait pattern energetically, but also more stable. This study highlights the importance of training this type of adaptation to achieve the goals in a cost-effective way.

Terrain with elevation changes or steps: In this type of terrain, we observe an increase in energy expenditure like sloped terrain, due to the greater intensity of the forces required for an individual to displace their center of mass. The joint conditioning and kinetic chain alteration are varied, but predominantly at the level of the hip and knee joints. Even when there are steps it is common, in a natural context, that these are not standardized in their dimensions, which leads to a constant adaptation of the movement, which, naturally, increases when the unevenness comes from natural obstacles where the variability is even greater. The frequency of the unevenness, the height, the distance between them and the variability of these, are some of the variables that naturally influence the effort required for progression.

Slippery terrain: For the slipping force to be zero, all the force applied in the support will have to be perpendicular to the ground; some equipment's such as clamps or piolets, among others, are used to overcome this type of conditioning. Many times, we use the strategy of avoiding slippery areas by choosing the supports, a strategy that already entails some energy costs since it involves constant attention, analysis of the terrain, sometimes even change in the way we move. When avoiding slippery areas is not at all possible, we must play with the direction of the force we apply, so that it is applied to the ground in a direction close to the perpendicular, the limit of the precision that we must control increases the less friction that the contact surfaces have (footwear and terrain). Constantly trying to make very precise forces has, of course, also implications for our energy consumption.

Terrain without visibility: Progressing in a terrain without visibility or with reduced visibility, as for example in the caves, in water or in high vegetation, forces us to change our more usual adaptation strategy, which privileges the visual stimuli, to start to use predominantly the proprioceptive stimuli, that is, to privilege the "feeling with the feet", verifying the conditions of the terrain and where we can place the supports through what we can feel with them and not only by what we can visualize [2,23].

Regular terrain: The regularity of the terrain leads to a kind of automated and undisturbed gait, which implies to attention levels naturally dropping. When there are no changes in the context nothing happens, but if something unforeseen occurs, the individual's ability to adapt is lower than in circumstances where he is naturally attentive to the specificities of the terrain. Just as on roads a straight stretch should not be prolonged for a long distance, as it impairs the driver's attention and may increase the likelihood of accidents, extreme regularity, i.e., absence of stimuli on the terrain, can also increase the likelihood of accidents for the hiker.

Terrain with narrow passages: The narrow passages require greater control of lateral oscillations of the center of mass, since there is little room to make adjustments with the supports. In a functional way, we can use two types of strategies to maintain balance: a) the displacement of the supports, to through the balance of forces maintain the vertical projection of the imaginary line that passes through the center of mass within the base of support or, b) the compensation of the oscillations of the center of mass through a set of forces that we exert with the different body segments (head, upper limbs, trunk, etc.). When moving in a narrow passage, the lateral oscillations of the center of mass tend to be compensated through the strategy described in b). The greater or lesser familiarity of the individual with this type of strategy (b) and the conditionings proper to the context (for example, if there is a wall on one side, if the floor is regular, etc.) it will influence their adaptation and the energy costs inherent in the process.

Precipice Terrain: Regardless of the different variables that may exist on a course, towards a precipice this becomes the center of the question, or not. It is important to mention here the concept of real risk vs perceived risk and the individual management of this synergy. In a simplified way, we can define the real risk as one that exists. In the concrete case of a precipice the real risk is to fall, but to evaluate this risk it is necessary to perceive variables such as, is or not sealed the path where the precipice exists, the passage is narrow, the floor is slippery, there are obstacles that can hinder the march, etc. It is this set of factors that help us determine the actual risk of falling. In relation to the perceived risk, what counts is the assessment that the individual himself makes of the risk, and that can be over or undersized in relation to reality. Of course, the ability to perceive the risk of everyone will depend on their experience, the ability to evaluate, the knowledge of their abilities, the knowledge of the context and the situation, and that can be influenced by fears and phobias, such as vertigo. In short, in the extremes we can have the individual who blocks in the face of this type of situation even if the real risk is small and the individual who faces a dangerous passage acts carelessly as if he were on a walk on the beach. In any of these situations the costs of adaptation for the two individuals will be different (in the first case we must consider the psychological, energy, motor, nervous, etc. costs) and the consequences in the way they adapt as well. We have focused on the extremes to illustrate this problem, but most situations are managed in a balance between these two facets. Emotions influence the movement and posture of the individual. Studies show that individuals invest more in their movements when they feel threatened. That is, in stressful situations they tend to take conscious control of the movement by altering their performance [24]. When, for example, standing on a raised platform, they tend to be more concerned with posture and make more adjustments to maintain balance than in the same situation at ground level [25].

Altitude: The increase in altitude implies a decrease in the barometric pressure and in the partial pressure of oxygen in the atmospheric air, these changes lead to a decrease in the arterial content of oxygen and consequently lead to a decrease in the oxygen supplied to the tissues. In a generic way, altitude can cause ventilatory adaptations (increased ventilation), cardiovascular adaptations (increased activity of the sympathetic autonomic nervous system that leads to an increase in cardiac frequency (Heart Rate - HR), cardiac output at rest and in submaximal exercises, as well as alteration of blood flow by selective vasoconstriction) and hematological adaptations (the decrease in arterial oxygen content stimulates the increased release of erythropoietin) [2]. More specifically, at the level of HR, altitude causes an increase of about 15 bpm in the mean value of HR max, with no significant difference in HR min, and that in mean HR there is a difference of about 4 bpm [26]. It has also been studied that altitude can alter glucose regulation, which makes it important to take special care in performing this type of activities in individuals with diabetes [27]. Understanding the adaptations that altitude raises is fundamental, not only for the training of these activities, but also for their realization in a safe and controlled way.

Temperature: Walking with high temperatures leads the body to have to equate two contradictory tendencies: on the one hand, the need to dissipate the metabolic heat generated, on the other, the maintenance of adequate muscle blood perfusion. Heat induces changes in the body such as an increase in cardiac frequency and lactate concentration. The adaptation to this type of circumstances, in addition to energy consumption, can also influence the performance of the individual. Knowing how to manage these constraints is essential to maintain the necessary balances. Low temperatures also decrease the overall performance of the individual, because the priority of the body is to restore body temperature, imply a set of other effects that are fundamental to consider in a walk. However, the delay in the conduction of nerve impulses and neuromuscular transmission may have implications for muscle coordination, muscle weakness and rigidity, sensitivity to adjust and cognitive functions. In addition to some basic principles for managing this type of adaptation and the possibility of training some of them, it is important to understand the adaptability of everyone in these circumstances.

Weather conditions (rain, snow, snow, wind, hail, humidity, etc.): An important part of considering this type of adaptation is to understand the implications that these may have on other types of adaptations. For example, the wind affects the thermal sensation accentuating the sense of cold, the rain when in contact with the body increases the loss of heat, the humidity hinders the ability to breathe, among other effects. In addition to these effects, weather conditions can also influence visibility, displacement capacity, ground friction, floor characteristics, and even cognitive ability and decision [28]. In a real situation what happens is not always these isolated adaptations, but rather a combination of adaptations happening simultaneously. Given these circumstances, it is important to understand the interactions that are established and how everyone adapts to the whole, provided by the real context.

Reflection

Research has shown the complexity of guiding the practice of this type of adaptation activities to the environment or nature, especially by the characteristics in terms of variability (“open” and “hyper dynamics”) of the contexts in which they take place [29]. There are even those who argue that the fact that there are multiple interrelated factors in this type of activity is “perverse” [30]. Doesn’t this characteristic also influence a part of its attractiveness? Another difficulty also evidenced is the organic evolution of the interactions between the environment, the participant, their goals, and objectives of participation as the activity unfolds, which makes those who guide are under pressure and before a great cognitive load [18]. To face the set of difficulties pointed out, involves organizing knowledge to allow more efficient responses on the part of those who guide them and a structuring of knowledge that facilitates its use in a functional and intentional way. The work we have carried out aims to contribute to this objective and to the quality of the training of those who guide these activities. Through the bibliographic research, we have identified some types of adaptations that we consider to be frequent in pedestrian routes and systematized them in a functional way. Aware that concepts and conceptual frameworks are constantly evolving, this is an exploratory work, in essence, the creation of a conjecture that we consider to be already defined so that it can be refuted.

Some of the adaptations identified are mentioned in previous studies, in the form of terrain obstacles, where the costs that each type of context variation has in terms of energy are defined, others are not yet studied. On this basis, we intend not only to study the adaptations not yet referenced in the bibliography, but also to encompass another perspective of analysis of this phenomenon. In most studies in this area, samples of individuals are usually used to characterize the average costs to a given variation in the context, however, when we start to face this problem based on the concept of adaptation, we understand that this type of data certainly does not reveal the individual cost that adaptation has for a given individual. In a previous study [1]. we found that the constant need for adaptation caused by the need to choose the terrain to tread, in addition to implying an increase in energy costs in all individuals, did not affect them homogeneously. The individuals with the best results in terms of energy costs in the realization of the situation in which there was no conditioning, did not coincide with those who obtained less energy costs in adapting to the situation with conditioning. This difference in results is possibly related to the efficiency of adaptation (management of sensory inputs, central treatment, and motor output), a process that can be improved through the training of the technique used in these circumstances. Just as in this type of adaptation this heterogeneity between individuals happened, it is expected to be repeated in another type of adaptations. With this work we intend to create a conceptual basis that allows us to characterize different paths [31-33]. The use of a functional form where the type of adaptations required is explicit to the individual who intends to carry it out, and to establish measuring instruments appropriate to these adaptations, whether in a laboratory context or in an ecological context, identify possibilities for training the different adaptations, characterize consumer preferences to be able to offer differentiated products. Only in this way can we have personalized products that meet the expectations and motivations of each consumer.

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