

## Risks in adventure sport activity. Which risks are perceived by experienced canyoneers?

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### Abstract:

The canyoning is considered a risky activity, as the practice sites are favorable for the occurrence of incidents / accidents. Based on current literature, we aim to identify the risk factors existing in canyoning practice, according to the perceptions of experienced practitioners. In this study we have developed a risk identification process on canyoning, divided into two phases: first was to identify the state of the art; second phase consisted on the application of a questionnaire to experienced practitioners of two nationalities (Portuguese and Spanish). Participants were asked about their mental representation of risk that they have experienced on Canyoning, as athletes. According to literature, we observed that risk factors are divided into environmental and human factors, on which were identified 3 dimensions in environmental factors and 4 dimensions in human factors. The identification of risks by experienced athletes was carried out based in the theory of social representations applied to risks on canyoning, where 3 dimensions were identified in the environmental factors and 6 dimensions in human factors. This study aimed to strengthen and update the state of the art in this field through literature review and identification of risk factors.

**Key words:** canyoning, risk, risk perception, nature and adventure sport.

### Introduction

Currently a large part of our population already had an experience in adventure and nature sports, thus our society wants to try new things. After the experience, the continuation appears, with an increase of practice at a sport and recreational level, in this kind of activities (Marinho & Inácio, 2007).

Correia (1991, 1997), presentes nature and adventure sport with diferente features because it's free of the time factor, without previously defined spaces from a referee, quite often lived by groups of friends, where adventure is present, the decision taking, dizziness and the risk in line with nature. Walle (1997 ) distinguishes NAS from the remaining activities by the deliberate search of sensations uncertainty of the final result. Marinho & Inácio, (2007) also supports the idea, saying that these experiences before they are performed, are always seen as something unattainable, always seeking for adventure, without knowing for sure the final result, with risk always present, having one very own lifestyle. In this context, according to Bessy, (2005), NAS were only practiced by the most fearless athletes, with the desire to feel the extreme. Today, according to the author, this sport is open to a wide audience, as trekking, climbing, swimming, flying, seeking for a special place in contemporary sport behavior .

Practitioners seek for emotions, self overcoming, intinally connected to the human condition in today's society (Marinho & Inácio, 2007). These new practitioners aim to satisfy ther curiosity, experience new sensations, have a reconciliation with nature or even new experiences (Bentley, Page & Macky, 2007; Mao, 2003). For this reason, in the last two decades NAS has been growing in popularity. Having this in mind, NAS must be understood as a differentiator sport activitie that occupies and exploits places in nature, such as water, land and air, with different modalities, such as surfing, kayaking, rafting, canyoning, mountain climbing, climbing, hang gliding, paragliding , among many other activities, which they have something in common: the challenge and the excitement that this sport provides into the practitioner.

Our study area is nature and adventure sport, particularly canyoning, characterized by a controlled progression in the bed of a mountain river, crossing the vertical obstacles presented by various techniques and the most appropriate equipment for the sport (Paz et al., 2014). Stephanides & Vohra ( 2007) reinforces this ideas, describing this sport and considering that there is a movement of the practitioners, through a descent of narrow canyons along a watercourse, having a combination of outdoor skills such as abseling techniques, water trekking, swimming and climbing. The walk, the swimming, the jumps are all forms of progression in a place by itself rough, with the practitioner constantly assessing dangers and the risk that he is willing to take.

Another way to overcome the obstacles placed by the surroundings, it is by the use of ropes technics and other auxiliary means of safety, in order to carry out the most appropriate technical maneuvers, with rappel as the most frequent.

The École Francaise de Descente Canyon (EFDC & FFE, 1999) defines canyoning as a risky sport, which is linked to the remoteness of the location, difficult access and progression in vertical means. Adding to all this, the progression may be extended as it is performed in an aquatic environment, which is, most often, whitewater with all its inherent risks. In order to practice this risky activity is essential to have a set of skills and mastery of specialized and complex techniques, which ensure a practical with maximum security and lower margin of error, and the training of practitioners and technicians is too important and should at any time, be taken into account. It is important to identify which factors can be classified as dangerous for the practice of canyoning. With the help of literature, we have identified the risks to which practitioners are exposed in this sport. Ayora (2012) tells us that prevention in adventure sport begins when we have physically and technically prepared ourselves for any unforeseen. As part of prevention, we can save ourselves and avoid accidents.

Canyoning routes have by principle a classification that distinguishes the verticality, the aquatic part and the context (FFME & FFS, 2009). Thus, it should take into account several agents: approaches, river obstacles themselves, escape routes and returns.

All accidents of NAS occur when two factors are combined, human and environmental factors. When these combine and interact simultaneously create a potential accident. (Ayora, 2011, 2012; EEAM, 2001; Ennes, 2013). As it is not possible to know, with accuracy these odds, the knowledge of these factors and its assertive judgment can help to assess more accurately, although subjectively, the potential risk (Rosado, 2005).

In the development of our work, we find factors that influence and involve risks in mountain activities in general, and canyoning in particular, due to physical and cognitive practitioners capacities, weather conditions and the geomorphology of the land where it happens (Bayego, 2001).

It is our goal to identify and describe in detail the risks to which the canyoning practitioner is subject, according to what has been identified in literature, lived experiences of the authors of this work and some experienced practitioners canyoning. Environmental factors are characterized by factors that are caused by nature, without action of Man, which may occur in the activity, factors that are characteristic of the practice sites (Ayora, 2011, 2012; EEAM, 2001, 2005; Ennes, 2013; FFME & FFS, 2009).

As regard to human factors, are caused solely by man during the performed activity, and may be associated with practitioners before they put themselves on the field. These factors are characteristic of practitioners (Ayora, 2011; EEAM, 2001, 2005; Ennes, 2013; FFME & FFS, 2009; Lourenço & Cardoso, 2004; Ortega, 2009). In sports world we have knowledge to achieve high performance levels, we have to train at physical, technical and mental level (Pion & Raimbault, 2008). The same is applied to canyoning practitioner, because he must be able in physical, technical, behavioral and emotional terms. All these types of training have something in common. Only by continuous practice of these behaviors, that is, be physically and mentally prepared, we can expect that this behavior will manifest itself clearly and lastingly (Araújo, 2014).

Thus, we believe it is important to have information and data of how the practitioner sees the risk factors to which undergoes. The scarcity of research in this area has led us to look for answers in order to help better understand how practitioners see the risk, and thus be able to present the vision of those in literature.

Based on current literature, we aim to identify the risk factors existing in canyoning practice, according to the perceptions of experienced practitioners.

## **Material & methods**

The risk identification process in canyoning was developed from October 2014 to June 2015, with search in the specific literature area, in electronic databases SPORTDiscus (1960-2015), B-on (1960-2015), ScienceDirect (1960-2015), Google Académico, using combinations of different keywords: canyoning, risks, risk perception, mountain dangers, adventure and nature sport; and also opinion and analysis of experienced practitioners.

As canyoning is a recent sport, with very few studies in the area, we were careful to seek answers to some concerns, specifically the risk problem. Literature in this area is scarce, but as it is an activity on which practice site is the mountain, we have to seek for information regarding the hazards that lie in this geographical area and, with the help of 13 experienced practitioners, it was possible to develop a matrix of risks in canyoning practice. The study protocol was explained to the participants. After that, an informed consent was signed by them. The research complied the ethical standards of Declaration of Helsinki for the study in human beings.

After explaining the objectives of the study, all the research participants complied with the necessary processes, and all the procedures adopted followed the ethical recommendations according to the declaration of Helsinki. The work field phase consisted in collecting data on the mental representation that practitioners have about risks in canyoning, following a qualitative methodology and analyzing data with the support of a software of qualitative and mixed methods search - NVivo10. The objective of this research phase was to perform a survey to a population of 13 practitioners about which risk factors are most important to have into account in canyoning practice, according to the risk they experienced. The sample choice was obtained taking into account

the availability of practitioners to participate in the research. As experienced practitioners, were considered those who had more than 10 years of practice. As Colvin (2010) and Coyle (2009) have considered that an experienced practitioner is when it reaches 10.000 hours of practice and/or a minimum time of 8 to 10 years of practice in the sport. 21 canyoning practitioners were invited, but only 13 agreed to participate or met the inclusion criteria. 5 were not available for developing the task and 3 had not yet 10 or more years of practice. This survey took place between 8 and 29 March 2015. There was a concern to select elements from Portugal and Spain, in order to have a greater representativity. These individuals have indicated gender, age, nationality, district and how many years of experience they had in canyoning practice. An open question was addressed in order to approach the theme: "While canyoning practitioner, identify ten risk factors that are most important in the practice of this sport." For the answer, were presented ten lines of potential responses, in which the subject filled only those he intended to, unnumbered, to prevent the overvaluation or undervaluation of the presented factors, allowing participants to identify the risk factors without any pressure from other practitioners or even researchers.

This technique is according to the social psychological theory, first introduced by Moscovici (2005), who called it as a social representations theory. This theory establishes a knowledge produced by the common sense of everyday social interaction and allows the individual to become intelligible in physical and social context as a practitioner in the sport. This instrument has the advantage of being completely neutral in relation to the subject of study, as the respondent, do it absolutely free, without any response clue.

After this process, it was made the introduction, analysis and interpretation of data using the NVivo10 software, which is a tool for the treatment of data in qualitative research. Three researchers from the field of NAS in a working meeting performed the following tasks: view, organize, edited and linked the information from the questionnaires. Through this process they could create categories, encode, manage, filter and question the data in order to organize the information gathered in an appropriate manner. Among other advantages of this researchers meeting, there was coding consistency, allowing a scientific research, ruled by factual guidelines, devoid of personal interpretations and opinions unsubstantiated as Aranha & Gonçalves (2007) have determined, as there was always debate between the three researchers, in order to reach consensus on the distribution of propositions. The use of NVivo10 gave the possibility of content analysis, facilitating the most complete and reliable statistical analysis proposed by Gonçalves & Aranha (2010).

## Results

Literature shows us which factors can be classified as risk factors for the practice of NAS. We have developed and described in detail the risks to which the sport practitioner of NAS, specifically in canyoning, is subjected, according to what has been identified in literature. The state of the art divides the risk factors into two parts: environmental factors and human factors ( Ayora, 2011; EEAM , 2001; Ennes , 2013; Pereira, 2006; Sofia , 2010). Environmental factors are caused by nature, without human intervention, and it may happen during the activity carried out, being these characteristic of the practice sites. Literature subdivide these factors into geomorphological; weather and climate and biotic. Regarding to human factors, these are caused solely by man, which are present before and/ or during the activity. Literature subdivide them into operational; physiological; emotional and psychological and cognitive . Of the 13 respondents , 61.5 % are Spanish (E1, E2, E3, E4, E5, E6, E7 e E8) and 38.5 % are Portuguese (P1, P2 , P3, P4 and P5), with only one element is female. The group has an average of 44.3 years old and 19.2 years of experience in the sport. Results obtained in content analysis by the three researchers are presented in Table 1. The source is relative to the number of people who had presented at least one proposal for that risk factor.

Table 1. Result of content analysis of the 13 expert practitioners.

Risk factors	Source
Environmental factors	
Geomorphological	69%
Weather and Climate	54%
Fauna e Flora	8%
Human Factors	
Physiological	46%
Operating	23%
Material	92%
Technique	92%
Planning	46%
Emocional and Psychological	38%
Cognitive	85%
Group behavior	31%
Emergency services	23%

According to the state of the art, canyoning practitioners have the same sub-divisions in environmental factors, but in human factors they add the following propositions: "group behavior " and "emergency resources." In "operational" sub- division, they have subdivided into "planning" ; "technique" and "material."

The subdivisions that practitioners gave more importance were "operating", specifically materials and technique, being seen by 92 % of practitioners as the factors to take more attention to this sport practice. The subdivision fauna and flora, was the subdivision, registered by practitioners, with the lowest percentage (8%).

The subdivisions of risk factors that had the greatest number of proposals indicated by practitioners are presented in Table 2, knowing that, in total, 148 propositions were presented and analyzed.

Of 148 proposals we obtained 17% related to environmental factors and the remaining 83 % related to human factors. The dimension with the largest number of propositions was technique, with 20% propositions reported by respondents.

Table 2. Result of content analysis of 148 propositions.

Risk factors	Propositions
Environmental factors	
Geomorphological	10%
Weather and Climate	5%
Fauna e Flora	1%
TOTAL	17%
Human Factors	
Physiological	8%
Operating	5%
Material	16%
Technique	20%
Planning	5%
Emocional and Psychological	5%
Cognitive	18%
Group behavior	4%
Emergency services	2%
TOTAL	83%

## Discussion

The aim of this study was to know the state of the art about risk factors inherent to the practice of canyoning throw literature and experienced practitioners risk perception.

We have not found specific studies in the area, and with this gap we have developed this study, analyzing literature and the experience of practitioners. Of 21 canyoning practitioners, only 13 met the inclusion criteria. The sample consists of 8 Spanish and 5 Portuguese.

Although there are some studies on the risk area and the perception of it (Ayora, 2011; Ennes , 2013; Nichols , 2000), it is still scarce in NAS, especially in such a specific sport as canyoning, this enhance the importance of filling this gap in literature: get to know the true risk factors in canyoning.

With regard to canyoning practitioner, we have studied the risk to which the subject is exposed, which is why in this work, we have split risk factors into two categories: environmental factors, caused by nature; and human factors caused only by man (Ayora, 2011; EEAM , 2001; Ennes , 2013).

By observing environmental factors referenced by the practitioners panel, 83 % have made reference of human factors and only 17% of environmental factors. This discrepancy has to do with the amount of dangers inherent to the human being, having these more variables and relationships between them, especially in the points regarding the technical and equipment dimensions.

Indirectly, these data are confirmed by the project developed by the Aragonese Mountain Federation along with Aragón Government and the Aragón Mountains, which implemented the Safe Mountain Project. This project has started in 1999 and have been identifying and analyzing that accidents/ incidents in canyoning are caused by improper decision making, inappropriate material, gaps in the use of the material and planning, all related to human factors (Ayora, 2011, 2012; Bentley & Haslam, 2001).

Were introduced by our respondents two human factors: "group behavior" and "emergency services" dimensions. Regarding the first, it is important to address the group dynamics theme and present some basic concepts in order to understand the value of team work and group behavior.

Lewin (1948) tells us that the group dynamic is a set of phenomena, mechanisms and psychological processes that emerge and develop within the aggregate of people in action. To speak of group dynamics it takes a set of people interacting with activities and common goals, such as the canyoning practitioners (Maccio, 2010).

Mucchielli (2012) exposes the concept of group dynamics as a group of people who build links between them, putting their cohesion in being together. It also states that throughout the group structure found interactions among group members, emergency rules of conduct, developing of an informal structure, existence of feelings and collective emotions, the presence of a collective unconscious, achieving inner balance and stable relations with the outside.

These concepts, among our team of experts, indicate, such as E1, which speaks about the importance of the companions, E3 presents as a risk factor "lack of common sense"; and reinforcing the idea with E8 saying that "unusual companions" have limitations in their group interactions. Within this perspective, we find that group behavior reveals a certain degree of importance to our work as trainers and canyoning practitioners.

We found out that the interactions between the group and their component members are many and varied. We are facing an interactive system that is difficult to analyze separately. The whole group and subject interact continuously in carrying out its tasks (Aebischer & Oberle, 2012), something that E2 presents us as the "herd effect". From this perspective, the representation of belonging or reference to a group may favor certain attitudes, beliefs or opinions of a person. This influence/group representation can become a constant pressure in the representations and individual actions, especially when it comes to teams who practice nature and adventure sports (Ducasse & Chamalidis, 2006). The group facilitates changes in individual behavior and group attitudes (Ripoll, 2012). All groups create rules that everyone must respect, whatever their form, such as compliance pressures defined by solidarity among the group of canyoning practitioners (Augustinova & Oberle, 2013).

The dimension "emergency services," was presented only by the Portuguese practitioners, saying these that the "distance from emergency services" (P2), "difficulties of access for rescue teams" (P3) and the "search and rescue teams with in range capacity and specific training in canyoning" (P4) are one of the constraints to effective aid in any rescue situation. It is interesting to state that this dimension is only referred by the portuguese respondent. These data, although lacking of a more robust confirmation, may be related to a lack of canyoning sports culture in portuguese society and also because there was no great need of this type of intervention so far. The Spanish do not have this dimension. This discrepancy may be related to the quality of service provided in rescue by the rescue teams in Spain, as this territory has, already, large projects in order to prevent accidents in NAS, such as the aforementioned Safe Mountain Project, implemented in Aragon.

Of those surveyed, 92% were identified as risk factors, the material dimension and, with the same percentage, the technical dimension. In the material dimension, some actors explained that it was in poor condition, or inappropriate for the activity. An example of this are E2, which indicates "not suitable material or lack of material" such as E5 that reinforces saying "inappropriate material"; E8 "inadequate or worn material"; P1 "appropriate personal equipment"; and P2 "inadequate and/or insufficient equipment."

As stated above, the technical dimension was indicated as relevant by most respondents and was the dimension that more references obtained from them, with a total of 20% over 148 propositions presented. It is also important to understand in particular how this dimension is treated by practitioners. This is the case of the E2 that tells us that there is "vertical progression techniques ignorance. The river descent requires descent knowledge techniques (...)", a topic covered in the initiation course of the sport provided by Manual of Canyoning Descent (EFDC & FFE, 1999) and Technical Manual of Canyoning Descent (EFDC & FFE, 2001). This same actor reinforces the importance of knowledge in "vertical progressions, equipment, facilities and self-rescue (...)".

E7 along with E5 reinforce this idea of self-rescue as Montesa & Garcia (2005) which tells us that in any mountain activity, self-rescue is the issue that all practitioners should know because, as careful we may be, there are factors that we can not control. Then, if they are technically prepared, they may have the need to implement these self-rescue knowledge. E5 specifies some problems in some techniques, such as the "lack of technical preparation", "not master reading technique of water movements." It is important to be aware of some general concepts of some aspects of the fluid flowing in riverbeds, such as speed, loading transport and its influence on the flow as well as the phenomena and movement analysis of water, taking decisions to regarding to such observations, as mentioned by Ortega (2009).

E5 also indicates "ignorance of jumping technique" which is cited by E7, as always been seen as a ludic aspect of canyoning descent, allowing to overcome waterfalls without using rope technics (EFDC & FFE, 2001). E6 tells us that "some other accidents that occur, resulting in death by drowning of sportsmen, are caused by rappels with water, due to improper handling of the rope. In many rappels, dynamical systems are not installed, nor the rope with the necessary measures is placed, not giving importance to the large amount of rope that is within the puddle." This idea is shared by P2 and P3 and reinforced with literature by Acerete et al., (2013) in the "Manual of canyoning descent – advanced technics".

Researchers have altered the name of the dimension, replacing "biotic" proposition for "fauna and flora", as some authors also call it (Ayora, 2011; Bayego, 2001; EEAM, 2001).

This dimension was identified only by 8% of our respondents, not being seen as very important for our group of experienced practitioners. We believe that may be because it is not a very representative factor of the geographical area of our respondents.

In any case, E8 says that "by lack of a clean and potable liquid, which can hydrate ourselves, we drink water from the river, which is a very dangerous thing because at any point of the river there may be dead animals or animal excrements, which make that water is not drinkable", reinforcing that it may be contaminated. Another idea for this same respondent is that "in pools with standing water, those may be putrefying, especially in summer times", in which the practitioner should avoid entering or when he must have to enter, be careful not to drink these waters, as they may be contaminated and cause diseases and infections.

It is relevant to see that in Steephanides & Vohra (2007) study, injury patterns in canyoning practitioners in the southwestern United States where studied, abrasions has been identified as a frequent accident, but no effort was made to investigate the incidence of infection of these wounds. However, it may be interesting as regards the treatment of wounds, as practitioners they often find themselves in standing water and other environments where individuals may be easily infected.

In these cutaneous lesions, the spines of cactus are the biggest cause for concern. This states out that the size of "fauna and flora" dimension within the environmental risk factors may be changed by practitioners, depending on the location on the planet where the practitioner performs the activity. This can also be thought to other dimensions, as there may be fluctuations in the importance given to the location from which the practitioner is from.

What resulted from this research and analysis process, provides the scientific community, practitioners, technicians, clubs and companies that organize Canyoning activities, the way practitioners perceive risk in canyoning and how it is described in literature. We think that this study has added knowledge to the state of the art with regard to the risk factors in canyoning. However, this study has some limitations, as our results can not be interpreted as representing the view of all experts from the field of nature and adventure sports, specifically in canyoning, because if the same information is submitted to two or more different panels there is no guarantee that the results are the same. It was only applied to Portuguese and Spanish, knowing that other risk factors may be more relevant in other parts of the world (Bentley & Haslam, 2001; Bentley, Cater, & Page, 2010). Additional research is needed, to provide the feasibility analysis of this evaluation and to adapt and replicate this methodology to other areas of the planet.

## Conclusion

We see this study as something to improve knowledge in risk area. We did not found any study that has gather information in literature and experienced canyoning practitioners.

Although with limitations, mainly the sample representativeness, we think we have made a small contribution to a more systematic knowledge of this sport that has been increasing the number of practitioners/participants in the Iberian Peninsula. Investigations, must necessarily be made to provide a more detailed analysis of this issue and thus contributing to a better practice of this sport of increased risk.

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