

## Examining the influence of trekking in nature on adaptive response to stress in individuals

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### ABSTRACT

“Trekking in nature is good, as breathing fresh air helps you become relaxed and less stressful” is a statement most individuals have heard. The statement highlights the physical process (external factor like oxygen) which facilitates management/resolution of stress biologically, as proven by few studies. Studies have suggested a strong correlation between stress and fear of uncertainty i.e, if an individual has high levels of fear of uncertainty; he or she is likely to be more stressful to an event compared to others. There are various psychological processes included in trekking, like primarily, facing uncertainty. Uncertainty to weather conditions, accepting and functioning under lack of control, enhancing tolerance to frustration, even enabling trust within a group. The present study chooses to focus on whether the experience of managing uncertainty while trekking influences an individual's ability to cope with uncertainty in day to day life which in turn leads to lowering of stress levels. In other words to understand the role of trekking in nature in equipping individuals to become adaptive in the way they express and feel stress. A population of 58 trekking individuals from different trekking groups in Bangalore, Karnataka, India were assessed on a standardized quantitative assessment, the Perceived Stress Scale (PSS) to measure perceived stress and asked to respond to a short interview to obtain subjective qualitative information. The assessments were conducted pre, post and follow-up to a trekking expedition. Results derived from the study show that individuals with beginner and intermediate levels of trekking experience scored lower on the stress scale immediately after trekking lower stress levels compared to responses collected on the scale before and a week after trekking. Experienced trekking individuals scores remained constant on the Perceived stress scale across the three trials. The study concludes that experienced trekking individuals are better equipped to handle stress compared to trekking individuals of beginner or intermediate levels of experience.

**Keywords:** *Trekking, Adaptive Response, Stress, Uncertainty, Nature, Stress Resilience, Environmental Psychology*

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A number of papers examining the role of environment or nature on reducing stress in individuals have been published over the years. These papers have looked at different dimensions of nature like space, scenery, oxygen among others. And papers centered on individuals, dimensions relating to physiology like hormones, oxygen to the brain, heart rate, digestion and others have been looked at to explain how nature helps in building resilience to stress. Driver (1976) and Knopf (1987) in their studies have commented that “Stress relief, escaping from civilization, clearing the head, reflecting on important life issues, experiencing beauty, and connecting with nature are among the dominant self-reported motives.” Ulrich (1991) in his research on stress has remarked that “The single most important self-reported benefit of exposure to both nature-rich urban places and wilderness areas, however, is stress mitigation”.

There have also been different theorists who have explained what is stress and differentiated it into categories. Ulrich (1991) has defined stress as “the process by which an individual respond psychologically, physiologically, and behaviorally to a situation that challenges or threatens well-being.” Examining the adaptive effects of nature, Valtchanov, Barton, & Ellard (2010, p. 503) have concluded that nature facilitates “reduction in cognitive fatigue, decreased stress levels, increased focus, increased positive affect, decreased negative affect, and decreased sympathetic nervous system activity”.

Review of literature has shown that there are two prominent theories of nature stress restoration (i) ART, or Attention Restoration Theory developed by Rachel and Stephen Kaplan in their book titled ‘The experience of nature: A psychological perspective’ published in 1980s. According to this theory, individuals by spending more time in nature and concentrating on scenery such as passing clouds or listening to the flow of stream over rocks, where such concentration is termed “effortless attention” can reduce their stress. (S. Kaplan, 2001; R. Kaplan & Kaplan, 1989; S. Kaplan & Talbot, 1983). (ii) The psychophysiological stress reduction framework by Ulrich (1981, 1983, 1984, 1991) which theorizes that due to evolution, individuals place nature as non-threatening environment and produce positive affective and stress-releasing response to nature. Harting (2008) has suggested integration of the two theories by “intertwining of the mechanisms” referring to individuals subjective experience of being drawn to any particular environment based on how much specifically it is restorative for them.

Experiments by Pretty (2003) have concluded that exercise with nature exposure (green exercise) is more beneficial to health than when done in indoor spaces. Active and passive activities when conducted in urban settings (indoors, synthetic) and nature (parks), it was found that positive mental health and well being was highly associated to nature settings when compared to the urban environment. (Bowler, Buyung-Ali, Knight, & Pullin, 2010; Ohly et al., 2016; Thompson-Coon et al., 2011)

Stress reactions include increased blood pressure, reduced melatonin, increased muscle tension and increased pulse (Grahn & Stigsdotter, 2003). Though stress reactions are followed by recovery processes, it can get compromised when the stressor is severe and prolonged (Stults & Bartholomew, 2012). The adaptive capacity for an individual to deal with stressful situation is his/her personal fitness, when this threshold is passed; the individual is at a greater risk of a disease. (Cohen, 1997). But there are also some stressors that are appraised as positive (McEwen, 2007).

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This paper is aimed to examine the underlying psychological process associated with trekking in nature and how it helps in developing an adaptive response to stress. For the purpose of this current study, stress is defined as a process through which specific demands are perceived as exceeding an individual's resources or abilities to control or manage effectively. Trekking or hiking in nature (Mountain/hill/forest) is considered a form of physical activity and is used in studies of restoration as a mode of intervention. Physical activity is defined by Caspersen, Powell and Christenson as "planned, structured, and repetitive and has as a final or intermediate objective the improvement or maintenance of physical fitness"

"Physical activity and exercise have been demonstrated to promote positive changes in one's mental health and ability to cope with stressful encounters" is stated by Salmon in his 2001 study. Studies have indicated the benefits of trekking/hiking in nature and its benefits to mental health and wellbeing. One of the major studies by Morita and Shirakawa (2007) indicate that trekking in nature for an hour a day can help decrease fatigue by 65% and increase energy by 20%. Greenwood & Fleshner, (2011) study concluded that as trekking is a cardiovascular exercise, it is associated with improving mood and helping relax by secreting endorphins in the brain. Research has shown that regular physical exercise (includes trekking/hiking) is associated with a decreased heart rate (Houde & Melillo, 2002)

But all the above studies are looking at one or other physical dimension like either secretion of hormones (endorphine) or decrease in heart beat, which are promoting/ facilitating reduction of stress. In the course of the literature review, there was no research paper found specific to point at psychological process which look into reduction of stress due to exposure to nature.

Thus, to fill this critical gap in our knowledge regarding the psychological process of exposure to nature and its effect on stress, this paper aims to examine the psychological process of trekking in nature and its adaptive response to stress in individuals.

Studies by Averill (1973), Cohen (1978), Glass & Singer (1972), Lazarus (1966, 1977) and Seligman (1975) has indicated that "unpredictability, uncontrollable and overloading", as three major components of stress. And review of literature on hiking/trekking indicate that trekking includes having no control on the climate and terrain of the trek. Nyaupane, Gyan & Lew, Alan & Tatsugawa, Kevin (2014) study states that "The high alpine environment of the Khumbu has placed it at the leading edge of environmental change...climate change, however, is beyond the control of Khumbu residents, making it the single greatest perceived threat to the region." and for its residents who have to trek at regular basis. And lack of predictability is informed by Koslowsky, Kluger & Reich's paper, "The aspect of predictability (or lack of) has ramified in many actual driving situations.....The commuters' daily trek to work across this bridge is responsible for anger and rage and is a major contributor to stress" and Mason's paper (2013) looks at the preparedness of the trekker/hiker and states that "One factor that may help reduce SAR missions is better educated and better-prepared individuals who are able to avoid activating the emergency medical services system. Should an accident occur, a major factor influencing a successful rescue is a hiker's preparation with survival, navigational, and signaling equipment."

Therefore, examining into this psychological aspect, this paper attempts to study if experienced trekking individuals who deal with unpredictability, uncontrollable and overloading nature of treks have built resilience to stress and have reduced levels of stress compared to beginners (trekking individuals). This study used the PSS or the Perceived Stress

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scale developed by Sheldon Cohen, Tom Kamarck and Robin Mermelstein in 1983 and revised since then. This scale measures the levels of stress and was developed based on the principles of unpredictability, uncontrollable and overloading. "PSS items were designed to tap the degree to which respondents found their lives unpredictable, uncontrollable, and overloading. These three issues have been repeatedly found to be central components of the experience of stress." Taylor's study (2015) has confirmed the validity of the scale by concluding that "the findings suggest that inferences made using PSS-10 (Perceived stress scale) scores are valid".

If the results show the above desired outcome, it will imply that as Trekking involves challenging and facing unpredictable future (climate and terrain) and having no control on the same, helps the individuals to build resilience to stress and also practice in other daily routine, wherein when faced with stressful situation (which includes the individuals having no control over the circumstances and unpredictable outcome, for example like exam results where the individual whose, results are unpredictable and are not in the individual's control) are better placed to face the otherwise stressful situation with reduced/low stress (be relaxed compared to others who are stressed and anxious anticipating the results, the individual will likely be comparatively less anxious and stressed). Trekking in nature on a regular basis will help build/develop adaptive response to stress.

The study aims to examine (i) if there is a difference in levels of stress in beginner, intermediate and experienced individuals using the PSS. (ii) if there is significant difference in the scores of levels of stress before trekking and immediately after trekking, and immediately after trekking and post one week to trekking. (iii) if the scores of 2nd trails of Beginners and intermediate is lesser compared to the other two trails (this would signify that immediately after the trek, individuals feel and experience, reduced stress) and to examine if scores of experts/guides in all the trails have similar score (this would signify that these individuals have developed resilience to stress and therefore are in a state of reduced stress and hence, another exposure to trekking will not alter/reduce their stress levels, unlike for the beginner and intermediate trekking individuals).

## **METHODOLOGY**

### *Objectives*

The present study proposed to obtain the following specific objectives:

1. To study the changes in levels of stress across various trekking groups.
2. To understand and examine different environmental factors which stem adaptive behaviors to coping with stress and
3. To examine the difference between experienced trekking individuals and beginners with regards to perception of stress and tolerance to uncertainty.

### *Hypothesis*

Experienced trekking individuals have lesser levels of psychological stress compared to beginner and intermediate level trekking individuals.

### *Literature Review source*

A search for peer reviewed journal articles and reports have been made using Google search and other online internet sources like ScienceDirect, Academia, Researchgate and Jstor. The search terms used were nature, trekking, stress, resilience, reduced stress, hiking, stress scale, perceived stress scale and environment, separately or in combination as a key word.

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The study collected both quantitative and qualitative data. For the quantitative study, 58 healthy (individuals with no medical history of breathing related problems such as asthma and no prior body aches and conditions) trekking adults volunteered to participate in this study. The sample set of subjects were a mix of beginners (level 1) on their first trek and individuals who have been trekking for less than a year (level2). Intermediate (level 3), the ones who had trekked over three to eight times for over a year, experts (level-4) which included individuals with 3+ years of trekking experience and a few among them were guides (level-5) who led trekking expeditions. The treks' duration ranged from a minimum of 2 days to 6 days (2 nights and 3 days on an average).

A set of structured questions were asked to 10 individuals who were part of the study post their trekking experience. This was collected as a part of qualitative data.

### *Tools and Design*

The subjects had to respond to the Perceived Stress Scale (PSS) developed by Sheldon Cohen, Tom Kamarck and Robin Mermelstein to measure perceived stress in individuals for a set of three trails. First trail, before going on the trek, second, immediately upon returning from the trek, and third, a week after the trek. 58 responses were included for statistical analysis.

### *Procedure*

The individuals were randomly selected for this study from 18 different groups scheduled to go to various treks. They were contacted through 4 Trekking Organizations which hosted weekly trekking expeditions in Bangalore, Karnataka, India. The data was collected via Google form whose link was shared with the subjects. Descriptive statistics and T-tests were calculated for each set of scores.

## **RESULTS**

The Perceived Stress Scale (PSS) was administered on a group of 58 trekking individuals (N0=58). Subjects who were participating for a trek for the first time or have been trekking for less than a year, these individuals were classified under Level 1 or Level 2 respectively and were categorised as Beginners (N1=25). They had scored a mean of 22.28, 19.84 and 22.68 scores on the PSS before trekking, immediately after trekking and one week post trekking respectively. The T-tests calculated for this sample showed a significant difference between scores of before trekking and immediately after trekking ( $p<0.01$ ) and immediately after trekking and one week post trekking ( $p<0.01$ ).

A group of 16 individuals with trekking experience of less than 2 years (who have been part of 3-8 treks) have been categorized as intermediates, Level 3 of trekking expertise (N2=16). These individuals have scored a mean of 19.375, 18.0625 and 19.75 scores on the PSS before trekking, immediately after trekking and one week post trekking respectively. The T-tests calculated for this sample showed a significant difference between scores of before trekking and immediately after trekking ( $p<0.05$ ) and immediately after trekking and one week post trekking ( $p<0.05$ ). And 17 individuals with trekking experience of more than 3 years have been classified as Level 4 and among them, if the individuals are guides, they have been categorised as Level 5 (N3=17). Individuals in this category have scored a mean of 16.18, 16.06 and 16.24 scores on the PSS before trekking, immediately after trekking and one week post trekking respectively. The T-test calculated showed no significant difference between the means.

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The hypothesis that experienced trekking individuals have lesser levels of psychological stress compared to beginner and intermediate level trekking individuals was hence proved.

**Table 1: Representation of Trekking Experience Classification**

Grouping	Years of Trekking Experience	Number of Treks attended	Level
<b>Beginners</b>	Less than a year	Less than 3 treks (Includes first time trekking)	Level 1= First time trekking & Level 2= Trekked twice or thrice
<b>Intermediate</b>	More than a year and less than three years	More than three treks and less than eight	Level 3
<b>Experienced Trekkers</b>	More than three years	More than eight treks	Level 4= Trekked for more than three years and has attended more than eight treks & Level 5= Trekked for more than three years and been part of eight treks and led a minimum of three trekking groups

**Table 2: Representation of Means of trials**

Levels/Score	Trial 1 (Before trekking)	Trial 2 (Immediately after Trekking)	Trial 3 (One week post trekking)
<b>Beginners</b>	22.28	19.84	22.68
<b>Intermediate</b>	19.375	18.0625	19.75
<b>Experienced Trekkers</b>	16.17647059	16.05882353	16.23529412

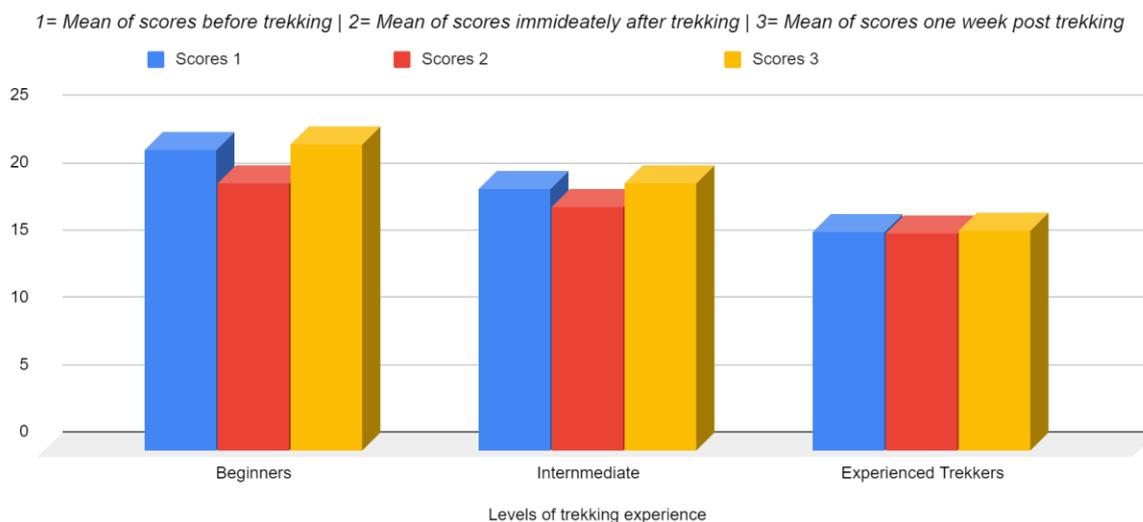
**Table 3: Representation of T-tests**

Levels/Score	Trials 1 & 2	Trials 2 & 3	Trials 3 & 1
<b>Beginners</b>	0.009966583779 ( p < 0.01 level)	0.00891475381 ( p < 0.01 level)	0.5380654542
<b>Intermediate</b>	0.04827183809 ( p < 0.05 level)	0.02911137517 ( p < 0.05 level)	0.4137074369
<b>Experienced Trekkers</b>	0.7562849419	0.6268349223	0.8935756272

**Table 4: Representation of Means of Males and Females for scores on the PSS**

Gender/Means of scores	Beginner	Intermediate	Experienced
<b>Males</b>	21.56	19.06	16.15
<b>Females</b>	21.65	19.84	17.09

**Figure 1: Column chart representation of Means of the groups for scores on PSS**



## DISCUSSION

“...After facing that trek, I think, I can face anything now. I am not worried about other normal day-to-day things....” comment by a subject after completion of his first trek when asked about the experience. This comment raises the question whether such epiphany is unique to an individual or generally a group finding.

From Table-2 and Figure-1, which represents the means of scores on levels of perceived stress, we can deduce that beginners are more stressed compared to intermediate and the experts/guides (as they have scored the maximum scores in all the three trails). Next is the intermediate who have scored lesser than Experts and guides, hence can be deduced to have moderate levels of stress and finally, the Experts/guides scores indicate that they have the least amount of perceived stress (scores of Perceived Stress - beginners > intermediate > experts/guides). Table-6 represents mean scores of males and females on the PSS, it shows, females scores being higher compared men, indicating a higher level of perceived stress.

We can see that scores of trail 2 (immediately after the trek) (Table 2) for Beginners and Intermediate trekking individuals is comparatively lesser than the other trails, 1 and 3 (19.84<22.28(score 1) & 19.84<22.68 (score 3) and 18.0625<19.375 (score 1) & 8.0625<19.75 (score 3) respectively). The scores 1 and 3 were taken a few days before and after the trek respectively. Therefore it can be assumed that these scores represent the individual's stable levels of stress and in this case, beginners have a mean of perceived stress of 19.84 which is interpreted as moderate, but is closer to the score of high level of stress interpretation (with regard to its scoring key and norms: 0-13 - low stress, 14-26 - moderate stress and 27-40 - high levels of stress). The means of experts/guides reflect a mean score of 16 across all trails, whose score is interpreted as moderate, is closer to low stress levels interpretation compared to beginner and intermediate’s scores. This satisfies the question that, such an epiphany of reduced stress is only unique to beginners and intermediate trekking individuals.

From the structured interviews, qualitative data, out of 5 beginner trekking individuals, 80% have reported that they felt that “...trekking in nature has prepared me for normal day to day activities....”, when probed more as what they intend by this, 60% responded that “...initially the trek was difficult, as we were unsure more than half the time as to what to expect and we didn’t have any control over nature, we just went with the flow and after a point, it became

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easy...” This is in line with papers on trekking of Mason, 2013, which mentions the unpredictability and lack of control over nature. This is also in line with the theory of stress Averill (1973), Cohen (1978), Glass & Singer (1972), Lazarus (1966, 1977) and Seligman (1975), which explains that the core part of feeling stressed or anxious is the feeling of uncertainty about the future and no control, hence, after a day or two of trekking, beginners and intermediates alike will get into the flow of trekking without worrying too much about nature's role of being unpredictable. This helps them build a very temporary conditioning “...if I worried too much about the climate and the lack of water in my kit, I could have asked my teammates but wanted to experience the thirst until I reached my destination. If I had taken help and made my life easier, I wouldn't have been able to enjoy the trek. Hence, I forced myself to focus on the nature and its scenery rather than the difficulty of the trek and this helped me going....” stated one of the subjects who was part of a 3 day trek and this was her first time trekking. This line of reasoning indicates a probable affiliation to conditioning oneself to nature's unpredictability, uncontrollable and overloading part and reduce levels of stress and learn better coping, this is brought out by the experts/guides.

From Table-5, T-test for beginners scores on the PSS after the trek, it has shown strong significant difference of  $p < 0.01$  when compared against scores of before trekking and a week after trekking, signifying the nature's strong positive interventional role in reducing the individual's stress, Likewise for intermediate individuals, their scores after the trek show a significant difference of  $p < 0.05$  against scores before and a week after the trek indicating the nature's role in reducing stress.

The rationale for a screening for perceived stress scale post one week to the trek was to analyse if the individuals have retained the positive output of the trek, it was hypothesised that the scores of Beginners and intermediate will be in line with the scores of Trial -1, which was taken before the trek. This assumption was proved by beginners and intermediates because as they had done trekking as one of “exercise, physical activity, leisure or fun sport” they weren't able to carry forward the temporary conditioning as they lost touch with nature and returned to normal day to day activities which forced them to be in situations where they have to deal with uncertainty, overloading and lack of control which induces stress.

Experts/guides' scores for before, immediately after and a week post to the trek indicate a mean of 16 with only a few point differences indicating a stable reduced stress state. A 55 year old man who has been trekking for more than 5 years has stated that “...I am not saying I don't get stressed but I have gained perspective...” Another individual, who is also a guide and an entrepreneur, male reported “If you are asking about the unpredictableness and our lack of control over nature, I agree with you. I have reason to believe that it is this that has helped me prepare better, so whatever come may come, I am prepared from my end. Hence, maybe my stress has reduced. More so because probably that I have been trekking for over four years now and I know it has completely changed me and the way I look at things..I know what can in fact be a distressing scenario and arrive at a more realistic assessment of the current obstacle also,,,” This is in line with Mason's (mason, 2013) study. Another expert has said “...I am more confident now...”

Summersing the points of experts/guides, it is indicative of fact of nature's superior role that individuals on hiking or trekking have to endure and to overcome them, these individuals seem to have built resilience in terms of coping with nature's overloading, uncontrollable and unpredictable attitude with preparedness and confidence when done over a period of time proved by experts and guides' data as their stress levels has indicated that they are in a stable

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and constant state of reduced stress/low stress. The individuals' learnings of coping with nature and its stress over pours into the individual's daily routine and helps him/her become more adaptive when it comes to dealing with stress. A guide has stated that "When one is at our level of experience of trekking, which we have done over a period of time and in my case just over 3.5 years, you learn the hard way that nothing is above mother nature and no matter how confident you are, you must always take the easier path or a trail that has already been laid out to you. Hence, most guides are very mature and I think one becomes mature when dealing with mother nature and become sensible and appear more calm because mother nature has made them so. What you learn on a trek will also help you in your life, for me it has taught to take less stress."

### *Limitations and implications for further studies*

1. The sample size used was only 58 individuals, a more representative and larger sample would give a more accurate picture.
2. Very little research/literature is available on trekking in nature and its impact on stress.
3. There is a need for research on experimental or physiological evidence in the area of nature and stress.

## CONCLUSION

The study highlights that individuals with beginner and intermediate level of trekking experience show higher levels of perceived stress compared the experienced trekking individuals. For the assessment conducted immediately after completing the trek, the means of scores of beginners and intermediate trekking individuals are lesser than their assessments' scores before and week after the trekking and show strong significant difference for the same, indicating that trekking as an intervention has reduced their stress levels temporarily. While for experienced trekking individuals, scores have remained constant for all three trails indicating that they cope better to stress and stressful situations and events. This could be because while trekking done as a sporadic event has temporary benefits, experienced trekking individuals who have made life style changes and included trekking in nature as a part of their routine show a much lesser base line of reduced stress compared to others and show better adaptivity to coping with stress and stressful events or situations in general.

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### **Conflict of Interest**

The authors declared no conflict of interest.

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