The Effect of Ground School Instruction on Participant Perception of Climbing Self Efficacy

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Abstract

Rock climbing is a fast growing adventure sport that sees use in summer camps, university programs, and commercial recreation across the world. Because of its challenging nature, rock climbing is often perceived to be a scary experience for newcomers; but it also seems to have a huge potential for self-growth. In this study we examine if the type of ground school instruction provided to climbers before a climbing experience, as well as the type of climbing system used, has a significant effect on climber's perceived self-efficacy. Climbing is a sport with many educational and recreational applications. To include as many people as possible in the lessons climbing has to offer, facilitators may benefit from using a setup that allows participants to be the most comfortable. In this study we applied two different ground school and climbing system methods to two separate groups of college students. Both groups were administered the same three-part survey to track changes in their self-efficacy score throughout the climbing experience. We found there to be a significant difference between the two groups, with the treatment group experiencing a higher change in efficacy.

Introduction

The purpose of this research is to examine if the type of ground school instruction provided before a climbing experience has a significant effect on the perceived self-efficacy of climbers.

Review of Literature

Self-Efficacy

The idea of self-efficacy is largely attributed to Albert Bandura. Self-efficacy is "people's beliefs about their capabilities to produce designated levels of performance that exercise

influence over events that affect their lives." (Bandura, 1994, p. 1). This is often referred to as 'perceived self-efficacy', as it is the individual's own perceptions of their abilities and performance that it refers to, rather than what they may actually be physically capable of. Higher levels of self-efficacy have been shown to result in higher levels of assurance in one's capabilities as well as actual performance. Bandura states: "People with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided." (Bandura, 1994, p. 2). He goes on to speak about how these individuals tend to continue to make attempts even after failure, and have a tendency to believe they have control over situations that one may perceive as threatening (Bandura, 1994, p. 2). Self-efficacy is not a catch all for performance; an individual does not increase their self-efficacy and experience all around improvements. Self-efficacy is activity specific; climbing may increase your efficacy level for future climbing, surfing may increase your efficacy level for future surfing.

Self-Efficacy Sources

A mastery experience is where an individual succeeds at a task, and because of their success feel more confident about attempting the task again in the future. Being successful goes a long way toward building one's self-assurance, but a failure, especially one occurring before one has built confidence, can lower one's efficacy level. It should also be noted that overcoming obstacles can enhance perceived self-efficacy; if mastery experiences are gained quickly and easily, but are followed by failure, previous efficacy gains will likely be lost. Thus, a key hallmark of high efficacy is the ability to keep trying in the face of failure. (Bandura, 1994, p. 2)

Vicarious experiences refer to the effect that witnessing an individual perform a task has on the observer's efficacy judgments. Watching someone who you perceive to be "like you" succeed can lead individuals to believe they also are capable of the task. On the flip side, if the like individual fails at their task, one's efficacy judgements may be negatively affected, especially if they perceive that individual to be better than they are at the task at hand (Bandura, 1977, p. 197). Verbal persuasion is the verbal ques that in individual may hear while attempting, or associated with the attempt at a task If one is told they are capable, they are far more likely to continue to try and to exert greater effort. Individuals will discard encouragement they perceive to be empty and meaningless (Example: "Good job!" is non-specific and thus likely to be discarded). For verbal persuasion to be successful it must be specific and focused on what the individual is currently doing (Example: "You're really good at keeping your weight centered while you reach for the next handhold.") An important note is that while it is difficult to convince one they are capable through social persuasion, it is extremely easy to persuade one that they are not, even if they are.

Affective states refer to the way physical and emotional reactions are interpreted by the individual.

> "They interpret their stress reactions and tension as signs of vulnerability to poor performance. In activities involving strength and stamina, people judge their fatigue, aches and pains as signs of physical debility. Mood also affects people's judgements of their personal efficacy. Positive mood enhances perceived self-efficacy, despondent mood diminishes it (Bandura, 1994).

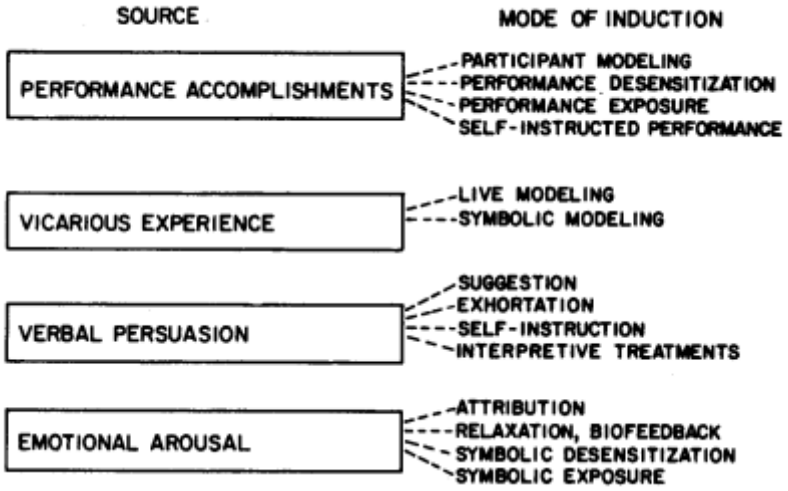

Figure 1: Four sources of personal efficacy information and methods used to enact each (Bandura, 1977 p. 195)

Bandura describes four main sources that an individual draws form to make efficacy judgments: mastery experiences, vicarious experiences, social persuasion, and affective states. These four sources of efficacy information can be manipulated to help guide an individual to increased efficacy. Vicarious experiences can be manipulated quite heavily; picking the specific individual to use can have a huge impact for example. Having a model who is the same age, or even a peer of the group of individuals watching could have a more powerful impact than a model who is twenty years older. A vicarious experience can also be influenced by allowing the watching group to only see positive models; individuals who successfully complete the task with minimal struggling. Another option is to use a few models, showing both successes and failures. Or, one could use only negative models who struggle greatly or fail. Social persuasion also can be managed to produce different effects on efficacy. Similar to vicarious experiences, one could allow only positive persuasion, a mix of positive and negative, or only negative. Another option

is to remove social persuasion completely and see what happens when an individual is all alone with just their own voice for motivation.

Guided Mastery

Bandura suggests that the four sources of efficacy information can be manipulated to help guide an individual to increased efficacy. Bandura explains that of the four sources of efficacy information, a mastery experience is by far the most effective when it comes to enacting a "personality change." (Bandura, 1994, p. 6). The idea of guided mastery comes into play here. "Guided mastery experiences are structured in ways to build coping skills and instill beliefs that one can exercise control over potential threats (Bandura 1994, p. 6)." Bandura suggests that, to create a guided mastery experience that will allow individuals to succeed requires that the activity at hand should be modeled, then the steps of performance should be broken down into smaller manageable steps, and the time spent attempting the task should be limited and graduated. Once an individual has completed the task at hand, the mastery aids must be removed. This allows the individual to attempt a self-guided mastery experience and confirm that their success is a result of their own personal efficacy and not the aids.

Additionally, vicarious experiences can be influenced by presenting a very specific model successfully performing the activity in question. Having a model who is the same age, or even a peer of the group of individuals watching could have a more powerful impact than a model who is twenty years older. A vicarious experience can also be influenced by allowing the individual to only see positive models; models who successfully complete the task with minimal struggling. Beginning with modeling the task being done successfully provides an individual with a vicarious experience that allows them to view the task as possible to accomplish. This also

provides a chance for them to observe ways to deal with the threats that have paralyzed them in the first place.

Social persuasion also can be managed to produce different effects on efficacy. Similar to vicarious experiences, one could allow only positive persuasion, a mix of positive and negative, or only negative.

Looking to affective states, it has been found that the degree of control an individual exercises over stressors has a direct impact on how disabling the stress is when attempting to complete a task (Bandura, 1994, p. 6). If an individual is exposed to something that causes them stress, and they do not believe they have the tools to manage this stress, they experience debilitating symptoms. However, if an individual encounters a stressor they feel equipped to handle they do not experience the same reaction. These stress reactions can be controlled by ensuring the individual in question has adequate instruction prior to attempting the task at hand. Often this instruction will include some of the aforementioned sources of efficacy information, or even guided mastery. For example, using a model to show the individual how to approach and deal with obstacles they can expect to encounter can give them a framework that prevents them from succumbing to negative affective states and crippling self-doubt.

Therefore, it is important to manage an individual's stress and emotional state when they are attempting a new activity to prevent them from becoming frustrated and giving up on the task before efficacy has had a chance to even be established. It is possible for one to have positive affective states as well. Feeling confident and calm can increase performance by influencing your efficacy.

Self-Efficacy and Climbing

In studies that focus on self-efficacy as it specifically relates to climbing, it has been found that overcoming fear is integral to one continuing to rock climb (Gomez, 2007) (Llewellyn, 2008). Overcoming fear directly relates to two of the aforementioned ways to build up self-efficacy; mastery experiences and managing stress and emotional states. Once an individual persists and completes a climbing route they failed previously, their confidence (self-efficacy) increases. The more confident one becomes in their abilities, the more likely they are to continue rock climbing (Gomez, 2007, p. 309).

Dr. Llewellyn of the University of Cambridge created a Climbing Self-Efficacy Scale (CSES) that was administered to rock climbers of highly varying skill levels. The CSES asks them to rate themselves on how confident they feel when thinking about their climbing abilities within the context of the CSES. Some items on the CSES ask climbers to describe how they confident they are in their ability to "Manage my fears and anxieties, perform well, maintain my concentration, and avoid making mistakes" and so on. It was found, perhaps unsurprisingly that those with the highest self-efficacy concerning climbing were those who had the most experience and who climbed the most frequently (Llewellyn, 2008, pg. 2).

Need for this Research

Climbing is a sport that is rapidly growing and has many opportunities for educational application and personal growth. It is seeing growing popularity in the commercial sector as well as in universities and other educational settings. As of 2015, the United States alone has 388 indoor climbing gyms, up from 348 in 2014 (Climbing Business, 2015); that's not even

counting the multitude of outdoor guide services spread around the country. It is also a sport that elicits a fear response in a great many people who decide to give it a try. There are a great many ways to set up a climbing rope system, but there are a few that are used far more than others. One of the most common setups is known as the base managed top roping setup (Tierney, 2009, pg. 33). This is the standard climbing setup used on beginner trips around the world and for good reason; it is simple, safe, and easy to set up and run. However, what if another commonly used setup proved to enhance the confidence and self-efficacy of climbers more than the standard base managed setup? To open up as many people as possible to the lessons climbing has to offer, facilitators might consider using the setup that leaves participants the most comfortable, especially when they are just starting out and beginning to build up their climbing efficacy.

Research Question

Does the type of ground school given before climbing and the type of system used have an effect on climber's self-efficacy?

Methods

We selected two Principles of Outdoor Experiential Education (OEE) classes at Appalachian State University to serve as the pool from which we would acquire participants for the study. Within these classes students self-selected into one of several possible activities/trips. One of these options, was a day long introduction to rock climbing trip. Of the two OEE climbing trips, we selected one to be the control group and one to be the treatment group. The comparison group consisted of 10 individuals and the treatment group consisted of 6, a significant limitation that will be discussed later in the paper.

Materials used for this research consisted of paper and pencil survey that was administered to participants at specific times during the trip. The surveys were administered in three parts; a pretest, posttest one, and posttest two. Each test featured identical questions in order to track changes in comfort and self-efficacy throughout the climbing experience. The tests featured questions that focused on their comfort levels such as "How safe do you perceive rock climbing to be?" and "How comfortable are you with the idea of rock climbing?" The tests also asked questions related to their perceived performance throughout the day, such as "How well can you motivate yourself to keep trying difficult tasks?" and "Please rate how true the following statement is; I believe I performed well today."

The comparison group received a standard Base Managed Top Rope System.

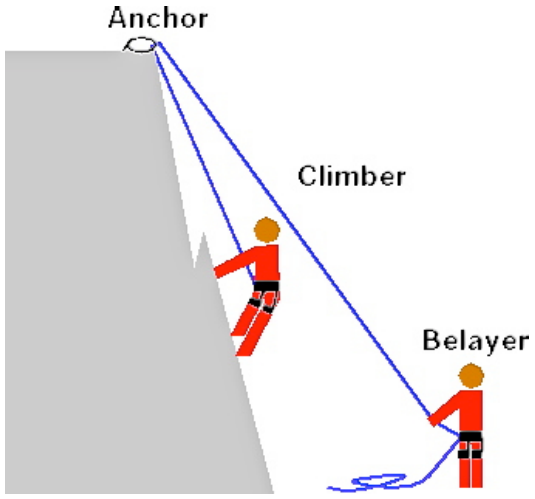

Figure 2: Base Managed Top Rope System

Prior to their arrival at the climbing site, participants completed the pretest. The participants did not see the anchors being set, nor did they see them at any point after. The guides simply set them up on top of the rock face and came back down. Once the system was set up, participants received the standard base managed ground school instruction on how the

system worked. Participants also witnessed two guides demonstrate how to climb and lower using the system and how the system would work. Upon completion of the demo, the first posttest was filled out. After all posttests were completed, participants began climbing. In this system, participants began on the ground with the belayer, climbed up the rock, and then were lowered back down after reaching the top. As each participant completed their first climb of the day, they then filled out posttest two.

The treatment group received a standard Top Managed Top Rope System

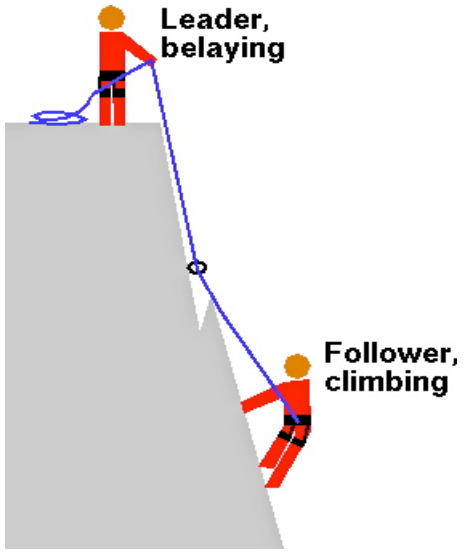

Figure 3: Top Managed Top Rope system

Prior to their arrival at the climbing site, participants completed the pretest. The participants did see the set up anchors prior to climbing on them. On top of the rock face participants received the standard Top Managed ground school instruction on how the system would work. Participants then witnessed two guides demonstrate how to lower and climb using the system and how the system would work. Upon completion of the demo, the first posttest was

filled out. After all posttests were completed, participants began climbing. In this system, participants began on top of the rock face with the belayer, they then got lowered down off the top until they reached the ground. Then, they climbed back up towards the belayer. As each participant completed their first climb of the day, they then filled out posttest two.

After all data was gathered the responses were added up, giving us each participant's total for each of the three tests they took. The data was then entered into SPSS where we ran several paired sample t-tests to determine any changes in efficacy score.

Findings

A paired sample t-test was run to examine change in efficacy scores from the pretest to the second posttest between the comparison group, the treatment group, and the two groups combined. All groups were found to have experienced a significant change with the mean score on the pretest beginning at 63.5 and the mean score for posttest two being a 69, and $P \leq .000$.

Combined Groups	
Pretest Total: M = 63.5 SD = 6.46 T = 39.318	**Posttest Two Total:** M = 69 SD = 7.38 T = 37.375
$P \leq .000$	

A paired sample t-test was run to see the difference between the pretest and the first posttest among all groups. No significance was found in any of the three comparisons.

Comparison Group	**Treatment Group**

Pretest: M = 62.5 SD = 7.35	Posttest One: M = 63 SD = 8.31	Pretest: M = 65 SD = 5.29	Posttest One: M = 63.2 SD = 8.84
P = .0427 **T = -0.832**		**P = .405** **T = 0.931**	

An independent sample t-test was run to analyze the difference between the shift in efficacy between groups. Both the comparison and the treatment group had a significant change in efficacy, as mentioned previously.

The independent sample t-test indicated a significant difference between groups, with the treatment group having a significantly higher increase in efficacy than the comparison group.

Comparison Group		**Treatment Group**	
Pretest: M = 62.5 SD = 7.35	Posttest Two: M = 66.4 SD = 8.09	Pretest: M = 65.17 SD = 73.34	Posttest Two: M = 73.34 SD = 3.14
P = .012 **T = -3.162**		**P $\leq$ .000** **T = -8.635**	

Discussion

When examining the findings, it is apparent that the comparison group, the treatment group and both groups combined experienced a significant increase in self-efficacy scores following the completion of a climbing experience. This in itself is not surprising, but does confirm that climbing can increase self-efficacy.

When we examine the differences found between each of the three tests we see that there was no significant change between the pretest and the first posttest for either group. As the only thing that occurred between the pretest and first posttest were the two versions of ground school

we reason that if ground school has an impact, it is a delayed impact that may not materialize until after the climbing experience has concluded.

It should also be noted that the treatment group actually experienced a slight drop in self-efficacy scores between the pretest to posttest one. The reason for this is unknown, though we speculate watching the demonstration begin with lowering off the rock face and out of sight may have elicited a slight fear response among participants. They still managed to not only make up the lost points, but still end at a much higher score than they began. This may be worth looking at in future research.

Perhaps the most important finding of our study is that a significant difference was found between the treatment and comparison groups final efficacy scores. The treatment group was found to have experienced a higher overall change in self-efficacy scores by the end of the second posttest. This appears to confirm our original question of whether or not a different ground school style has an impact on self-efficacy.

Conclusion

A mastery experience is the best way to enhance one's self-efficacy. When dealing with an individual who may be scared of the task at hand, in this case rock climbing, a guided mastery experience may be set up. A guided mastery experience (which makes use of modeling the task, breaking the task into manageable pieces, graduating the level of challenge, and then removing the aids) allows an individual to complete the task with assistance prior to doing it on their own. Base managed systems are generally easier to set up and run, which is likely why they are so

commonly used. However, top managed systems may provide a better chance of a mastery experience taking place. The sequence of events in a top managed system better lends itself to the idea of graduated challenge, which is an important part of creating a mastery experience. The final step in a top managed belay system, climbing back up, also fulfills the final step of guided mastery; removing all performance aids. The climber must climb to the top under their own power, trusting the system and the belayer.

While it is still unclear what effect the different ground school lessons had on participants, or when this effect kicked in, it is clear that the top belayed treatment group experienced greater overall growth from their experience.

Limitations

The nature of this research, being field research, means we were unable to account for all possible scenarios that may occur. Weather was an uncontrollable variable that resulted in the treatment group being much smaller than originally anticipated. Though this made the sample size smaller, we opted to go ahead with the study and collect what data we could.

Unfortunately, due to circumstances beyond our control, the treatment group and the comparison group ended up climbing at different locations. The locations were of similar difficulty, but it should be noted that this variable may have had an impact on final scores. In the future we need to make certain both groups climb at the same location.

We did collect a prior experience measure and found that we only had two individuals who had not previously rock climbed. We still ran an ANOVA test with experience included, but with such a small sample size it did not account for any real significance. Whether or not

someone had climbed before had a slight effect between the pretest and the first posttest, but not enough to be significant. It also had no visible effect on other efficacy scores. It could be possible this is a significant variable and should be looked at more closely in future research. In the future attempts obtain a better measure of prior experience should be made in order to determine if this has an effect on efficacy gain.

Considerations for Future Research

As mentioned previously, a few members of the treatment group actually reported a lower efficacy score on the first posttest than the pretest. However, they still made up the loss and then some by posttest two. This was not significant in our findings, but that may stem from our small sample size. It may be a significant factor in future studies.

A better measure of climbing experience beyond 'have climbed' and 'have not climbed' should be obtained. Again, this showed no significance with our data but could very well have a significant impact in future research.

The differing climbing sites, though quite similar in difficulty, may have had an impact on efficacy gain. The same location should be used for both treatment and comparison groups in the future.

Lastly, a larger total number of participants should be obtained for any future study. Having a bigger group to examine may help clear up some of the ambiguity surrounding the above considerations.

Citations

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