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Research Article

Living Harmoniously Through Virtual Reality
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Abstract.
Many people prefer to stay close to the nature and enjoy its beauty to boost their psychological well-being. It is also common among college students whose lives are very likely full of stress due to the academic pressure, high expectations, and developmental tasks-related problems as someone who is in a transition between adolescent and adult, and other possible factors. Recently, there has been a development of technology called virtual reality which is a simulated experience that gives users an immersive feel of a virtual world. The purpose of this study was to determine the effect of using virtual reality by presenting videos of natural scenery on college student's psychological well-being. Two experimental studies using control-group design were conducted. Each experiment measured the impact on one variable, and thus each used measurement that matched with each aim. There were 40 students in total. Data were analyzed using the Wilcoxon test followed by the Mann-Whitney test. The result demonstrated that the presentation of natural scenery through virtual reality could increase positive effect although it does not have a significant impact on students' psychological well-being. Therefore, it provides evidence of the positive impact of living harmoniously with the nature, even if it is through an artificial scenery.

Keywords: virtual reality, nature relaxation, positive effect, psychological well-being, student

1. BACKGROUND
Many people agree that breathing fresh air while surrounded by lush, green trees could help us feel calmer. This is the reason why most people would choose to go on vacation to a beach, sea, mountain, or pine forest in order to directly appreciate the beauty of nature. This is in line with a study [1] that involved 12 participants who reported various non-psychotic mental health issues who were given the opportunity to visit a natural setting. The participant described that they felt closer to themselves when they got closer to the nature. Additionally, they claim that being in nature could be a helpful metaphor for therapy and relaxation.
As a result, a lot of innovations have been made in the form of creation of natural parks that serve both recreational and psychotherapeutic spaces in many places. For instance, there is a rehabilitation park in Alnarp, Southern Sweden, where natural parks are used as a means of specific rehabilitation interventions for people who are experiencing

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Living Harmoniously Through Virtual Reality

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Research Article

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Abstract.

Many people prefer to stay close to the nature and enjoy its beauty to boost their psychological well-being. It is also common among college students whose lives are very likely full of stress due to the academic pressure, high expectations, and developmental tasks-related problems as someone who is in a transition between adolescent and adult, and other possible factors. Recently, there has been a development of technology called virtual reality which is a simulated experience that gives users an immersive feel of a virtual world. The purpose of this study was to determine the effect of using virtual reality by presenting videos of natural scenery on college student's psychological well-being. Two experimental studies using control-group design were conducted. Each experiment measured the impact on one variable, and thus each used measurement that matched with each aim. There were 40 students in total. Data were analyzed using the Wilcoxon test followed by the Mann-Whitney test. The result demonstrated that the presentation of natural scenery through virtual reality could increase positive effect although it does not have a significant impact on students' psychological well-being. Therefore, it provides evidence of the positive impact of living harmoniously with the nature, even if it is through an artificial scenery.

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1. BACKGROUND

Many people agree that breathing fresh air while surrounded by lush, green trees could help us feel calmer. This is the reason why most people would choose to go on vacation to a beach, sea, mountain, or pine forest in order to directly appreciate the beauty of nature. This is in line with a study [1] that involved 12 participants who reported various non-psychotic mental health issues who were given the opportunity to visit a natural setting. The participant described that they felt closer to themselves when they got closer to the nature. Additionally, they claim that being in nature could be a helpful metaphor for therapy and relaxation.

As a result, a lot of innovations have been made in the form of creation of natural parks that serve both recreational and psychotherapeutic spaces in many places. For instance, there is a rehabilitation park in Alnarp, Southern Sweden, where natural parks are used as a means of specific rehabilitation interventions for people who are experiencing

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stress and depression. The theory of a supportive environment was used in both garden design and therapeutic treatment theory [2]. Similar hot springs can be found in other locations, most notably in Cibuni Rengganis, West Java, where the design of the location was inspired by the idea of healing space. It made hot spring tourism, which offers stunning natural scenery, become popular leisure places in West Java [3].

The effects of nature are not only felt directly, it has been discovered that even the mere sound of rushing water has positive effects on mental health. It was discovered that stroke patients who were exposed to natural sounds for 10 minutes, especially the sound of birds and gurgling water, experienced less anxiety [4]. This study is also in line with [5], who found that postoperative laparotomy patients experienced less pain after listening to nature sounds for 10 to 15 minutes.

College students also frequently enjoy the nature to enhance their psychological conditions. According to the initial interviews that were conducted with some students of University of Muhammadiyah Malang as the respondents, they believe that going outside to enjoy the nature is one of the ways to deal with stresses they felt during the lectures. In addition, they believe that taking a deep breath and listening to the sound of the waves and the rivers current could help them to relax. These students also prefer beaches and mountains for their favorite vacation spots.

Even being a student can be stressful. A student must first go through a transitional period from high school to university. Both the environment and the learning process need time to adjust during this transition process. Independence and responsibility are essential aspects of being a student, especially for those who live away from their families and play roles that require them to be independent and responsible.

Moreover, in terms of development, students are late adolescents who are growing up or commonly called emerging adults. As an emerging adult, a student usually experiences a process of adaptation to a new environment. The ages of emerging adults range from 18 to 25 years old and there are five characteristics of emerging adults [6]. Some of the characteristics of emerging adults are identity exploration, self-focused, feeling in-between, and age of possibilities. At that age, students are generally exploring and experiencing instability in the world of career, education, and romance. There are five characteristics of emerging adults, namely identity exploration, self-focused, feeling in-between, and age of possibilities [6]. Furthermore, being a student also means that they have to be prepared for high academic demands, starting from the many assignments, exams, to the preparations they have to make for their future careers.

To face all the challenges to be a college student, a maintained positive affective conditions and psychological well-being are very important for students. Positive affect is found in various studies to have benefits for the mental health of individuals in various age ranges. For instance, older people aged over 55 who report high positive affect have a lower risk of death [7]. Additionally, adolescents who have high positive affect can add stability to themselves when carrying out tasks [8]. This is in line with a study reported that positive affect is believed to be specifically involved in processing information in better adolescents [9].

Psychological well-being, on the other hand, is a concept that is related to something that is felt by individuals for every activity carried out, and the expression of feelings that are felt as a result of life insight that they have experienced [10]. Psychological well-being has six aspects in it, namely, self-acceptance, personal growth, positive relations with others, autonomy, purpose in life, and environmental mastery. In addition, psychological well-being has several factors, including age, gender, education level, social network, personality, and spirituality [11].

Psychological well-being could encourage positive emotions in individuals, feel content and happy in their lives, reduce tendencies to negative behavior, and make it easier to control their emotions [12]. A person with a high level of psychological well-being may feel content with their lives, experience positive emotions, be able to move past traumatic events that have occurred in their lives, be able to relate to others positively, be able to control their environment, have clear life goals, and find it relatively easy to develop themselves [13].

An individual will be considered to have more benefits due to high psychological well-being because psychopathology and psychological well-being are believed to be related and may prevent mental health issues [14]. Psychological well-being has been identified as having diagnostic utility or the level of treatment of strong emotional, psychological, and behavioral mechanisms in predicting broad psychological outcomes in various populations [15], [16]. Therefore, psychological well-being has a high priority for use as an investigation and intervention for students [17].

According to the results of a research, 16% of students belong to the high level of psychological well-being category [18]. Students who have a high level of psychological well-being could be characterized by having self-acceptance, independence, good control of the environment, being able to relate positively to others, having clear goals in life, and being able to develop themselves in a good direction. There are 46% of students who have a moderate level of psychological well-being, and 38% of students

have a low level of psychological well-being. Students who have low psychological well-being can be characterized by individuals who lack self-confidence, are dependent on other people, difficult to have positive relationships with others, less purpose in life, and find it difficult to be open to new experiences.

High psychological well-being may help people develop existential self-defense when faced with challenges [13]. For students to have the best possible psychological functioning, psychological well-being is further considered to be crucial [19]. In a different study, the majority of the results indicated that student psychological well-being fell into the medium range [20]. This demonstrates that students are believed to need some level of environment adaptation. For students participating in this study, aspects of good interpersonal relationships are crucial.

A lot of things in today technological advancements can also make our lives easier. Virtual reality, a 3-dimensional tool that can display visualizations that are quite real, is one of the innovations that is currently gaining popularity. Through virtual reality, which shows 3D videos with the feel of the outdoors and is accompanied by audio, it may provide users the impression that they are walking through nature without having to travel directly to the destination. In order to restore healthy affection and psychological well-being, virtual reality can thus be developed to become a means of recreation and relaxation.

Virtual reality has been used to treat psychological issues due to the way it represents nature in many studies. Virtual reality of natural scenery may reduce the frustration of cancer patients who are going through the treatment process [21]. Moreover, activities like deep sea diving, sitting on the beach, solving mysteries, exploring art museums, and going on zoo tours can all be used to switch off attention, help them to relax, and relieve their stress [21]. Additionally, using virtual reality may rapidly elevate people moods and have a positive impact on their psychological well-being. In order to increase students positive affect and psychological well-being, this study aims at exploring the effectiveness of using virtual reality that simulates the natural world [22]. All in all, the objective of this research was to discover alternative interventions that could support preserving student psychological well-being.

2. RESEARCH METHODS

2.1. Variables or concepts studied

As the outcome variable in the first experiment was positive affect. It is a state in which individuals feel positive emotions in themselves such as happiness, joy, satisfaction, serenity, which in turn greatly affect individual activities [7]. While the s variable in the second variable was psychological well-being. It was defined as to what extent an individual feel positive emotionally as a result of life insight that they have experienced [10].

2.2. Sampling Method

Participants were recruited using the purposive sampling technique, since there are specific considerations to be made when selecting sample members from the population [23]. The criteria for the first experiment were students who show positive affect in the medium or low category. While in the second experiment, the researchers recruited those who had low psychological well-being values. The positive affect and psychological well-being scores which were then used as pre-test values were obtained from screening of 148 students who voluntarily registered and filled out online questionnaires that were previously distributed.

2.3. Research subject

Participants consisted of 20 current students from the University of Muhammadiyah Malang. In each experiment, after getting 10 research subjects, the researcher contacted the subjects and made an agreement. Subjects who have made an agreement will be divided randomly into the experimental group and the control group. The number of each of the experimental group and control group was 10 subjects.

As for the demographic data of the first experiment, it was dominated by women with a percentage of 85% (17 participants) while men were only 15% (3 participants). Participants in this study were >18 years old, where participants aged 21 years were the most participants, namely 40% (8 participants). Meanwhile, the age of 19 and 20 years old were the least participants with a percentage of 10% for each age (2 participants), and 15% (3 participants) were 22 years old and the youngest was 18 years old with 5 participants (25%). While the demographics of experiment 2 were also mostly women with a percentage of 60% and male participants by 40%. The ages of the participants

involved in this study were dominated by students aged 21 years with a percentage of 70%, 18, 20 and 22 years had a percentage of 30%.

2.4. Research Instruments

⁷ The Positive Affect Negative Affect Schedule (PANAS), developed by [24], was used in this study to measure the level of positive affect. The 20 items that make up the PANAS scale were split into two aspects: 10 items cover the positive affect aspect and 10 items cover the negative affect aspect. The positive affects Cronbach alpha coefficient ranges from 0.86 to 0.90 [24]. Participants only responded to 10 items on the positive affect section of this scale. Each of the 10 questions has 5 possible answers: ⁷ 1 (very slightly or not at all), 2 (a little), 3 (moderately), 4 (quite a bit), and 5 (extremely).

A modified version of Psychological Well-Being Scale [25] with a total of 42 items and 18 shortened items was used to test the psychological well-being variable. This scale measures psychological well-being along six dimensions: autonomy, self-acceptance, positive relationships with others, purpose in life, environmental mastery, and personal growth. This scale uses a Likert scale with seven potential results, ranging from 1 (strongly agree) to 7 (strongly disagree). The internal reliability of the Indonesian version of the Ryff Psychological Well-Being Scale which was used in this study was 0.764, indicating that the scale is reliable.

The two measuring instruments were translated into Indonesian by the Language Center translator at the University of Muhammadiyah Malang. The tools used in this variable were virtual reality (VR) devices with visual audio provided in the form of natural scenery which was expected to make the subject relax when watching and hearing sounds as if they were in the real world. The use of VR requires a VR set that supports the connection of the VR device with the video to be presented. The VR equipment needed is a personal computer, HTC Vive Pro, Steam application, and videos of natural scenery.

During the research that would be carried out for three sessions, different videos were needed, namely Mallorca VR Relaxation 360° video for the first session, Get Lost with Luke in Nature "After a Humid Rainshower in Waterville Valley New Hampshire" for the second session, and Get Lost with Luke in Nature "Rafe Chasm, Gloucester, Massachusetts" for session three. The duration used in each session was \pm 10–12 minutes. Progressive Muscle Relaxation was used in Minens research [26], which lasted 11 minutes, and the results were successful in getting the subject to use less headache (migraine) medication. Additionally, wellys research from 2021 [27] used the Emotional

Freedom Technique (EFT) relaxation method for 10–15 minutes to lower anxiety levels. Therefore, the time period used in this study was between 10 and 12 minutes.

2.5. Research design

The research method used in this current study was experimental research, namely research conducted to find out the response elicited from a treatment on the independent variables on research subjects [23]. This research consists of two experiments, where the first experiment examines the effectiveness of virtual reality that presents nature to positive affect, and the second study examines the effectiveness of virtual reality that presents nature to psychological well-being.

2.6. Data Collection Procedures

The first stage was *participant screening*, this stage has 2 main objectives, there were the implementation of the PANAS Scale dissemination which only took the aspects of the *positive affect item*, and the second was the dissemination of the Psychological Well-Being Scale to get participants according to the research criteria. Each experiment, 20 participants who suited the criteria were recruited and the data obtained from the selected participants was used as a pretest. After the participants have been collected, the researcher contacted them to make an agreement and a treatment schedule.

At this stage, the researcher divided 20 randomly selected participants into 2 groups where each group contained 10 participants. That groups were the experimental group and the control group. Furthermore, the experiment was carried out by giving treatment to the experimental group individually by presenting natural scenery through a virtual reality device with a duration of approximately 12 minutes. The treatment lasted for 3 sessions with a duration of approximately 12 minutes per session, each session was having a one-day break. However, the control group was not given any treatment yet. Moreover, the day after ⁶the experimental group was received the last treatment, both the experimental and control groups were given a posttest according to the objectives of each experiment.

2.7. Data analysis technique

This study used non-parametric statistics namely the Wilcoxon test and the Mann-Whitney test as the data analysis technique. Wilcoxon test was explained as non-parametric statistic that is used to test variable conditions in 2 samples or to test before and after research [28]. In this study, the Wilcoxon test was used to find out the differences before and after the experiment and to find out the differences between the two experimental groups (experimental and control) which would later obtain a final conclusion from the experiments that had been carried out. However, the Mann-Whitney test is a non-parametric statistical technique to test and identify whether there are differences between variable caused by independent variables [29].

3. RESULTS

3.1. Experiment 1

Descriptive analysis to identify the general condition of the subject results as follows:

TABLE 1: Descriptive Statistics Data.

Subject Total				Experimental Group				Control Group			
Pretest		Post test		Pretest		Post test		Pretest		Post test	
x	SD	x	SD	x	SD	x	SD	x	SD	x	SD
26.50	3.517	34.45	6.557	25.20	3.706	37.00	5.735	27.80	2.936	31.90	6.590

Generally, the condition of all subjects initially had a low positive affect, this can be seen from the overall total subject where the average score of initial treatment obtained was 26.50 with a standard deviation of 3.517, while the average score of post-treatment was increased to 34.35 with a standard deviation of 6.557. The experimental group obtained a pretreatment average score of 25.20 with a standard deviation of 3.706 and then it increased to 37.00 with a standard deviation of 5.735 for post-treatment. However, the increasing score also occurred in the control group which was not given any treatment. The pretest average score was 27.80 with a standard deviation of 2.936 and the post-test average score was 31.90 with a standard deviation of 6.590.

The results above showed that the pretest conditions had a difference between the experimental and control groups. Therefore, the homogeneity test was carried out before the treatment was given. As a result, the difference between the experimental and control groups was not significant. It can be seen from the sig value >0.05, which

was 0.525, it means that the initial conditions of both groups were not significantly different.

Moreover, the Wilcoxon test and Mann-Whitney test data analysis were used to see the effectiveness of virtual reality on student positive affect. The Wilcoxon test was used to measure the difference score of each group. Whereas, the Mann-Whitney test was used to identify the significance of the difference in post-test scores of the Experimental and Control group.

TABLE 2: Wilcoxon Pretest and Post-test by the Experimental Group and the Control Group.

Group(s)	Pretest		Post test		Z	P
	M	SD	M	SD		
Experimental	25.20	3.706	37.00	5.735	-2.812	.005
Control	27.80	2.936	31.90	6.590	-1.994	.046

The results of the data obtained from Wilcoxon test were that both groups experienced a significant effect. The increasing of positive affect on experiment group was significant, indicated by $Z = -2.812$, $p = 0.005$. The results of the p value of 0.005 indicated that the treatment given had significant effect on increasing students positive affect. In addition, the average pretest and post test scores for the experimental group increased from 25.20 to 37.00.

Interestingly, a significant increase of the positive affect also occurred to the control group (Z value of -1.994 with a p value of < 0.05 or 0.046) even though they did not receive any treatment. The average pretest and post-test scores for the control group increased from 27.80 to 31.90.

TABLE 3: Mann-Whitney Test by the Experimental Group and the Control Group.

Group(s)	N	Mean of Ranks	Z	P
Experimental	10	12.55	-1.554	.120
Control	10	8.45		

The results obtained in testing the significant differences between the post-test value of both groups using Mann-Whitney test showed a p value of > 0.05 or 0.120. This number means that there was no significant difference between the Experimental Group and the Control Group.

3.2. Experiment 2

The general condition of the subject can be seen through the results of the following descriptive analysis:

TABLE 4: Descriptive Statistics Data.

Subject Total				Experimental				Control			
Pretest		Posttest		Pretest		Posttest		Pretest		Posttest	
X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
52.20	7.084	48.50	9.144	53.60	9.788	45.40	8.325	50.60	2.608	51.60	9.737

Based on the results in Table 4, the final average scores of all subjects before and after being given a treatment were both in the low category. Furthermore, as in Experiment 1, the hypothesis test was carried out through Wilcoxon test continued with Mann-Whitney test. The results are described as follows:

TABLE 5: Wilcoxon Pretest and Post-test by the Experimental Group and the Control Group.

Group(s)	Pretest		Posttest		Z	p
	M	SD	M	SD		
Experimental	53.60	9.788	45.40	8.325	-1.219	0.223
Control	50.60	2.608	51.60	9.737	-0.135	0.893

The Wilcoxon test showed that there was no significant effect occurred in the experimental group. The level of psychological well-being experienced by subjects from the experimental group between pretest and post-test has a Z value of -1.219 with a p value of (Asymp. Sig 2 tailed) > 0.05 or 0.223. The p value obtained indicated that there was no effect of treatment in increasing psychological well-being. The average value of pretest and post-test for the experimental group decreased from 53.60 to 45.40. The same thing happened to the control group which did not receive any treatment (Z = -0.135 and p = 0.893).

TABLE 6: Mann-Whitney test by the Experimental Group and the Control Group.

Group(s)	N	Mean of Ranks	Z	P
Experimental	5	4.50	-1.048	0.295
Control	5	6.50		

The results of Mann-Whitney test showed a probability value = 0.295. This result indicated that there was no significant difference in the experimental group and the control group.

4. DISCUSSION

This study aims to examine the effect of virtual reality on increasing positive affect and psychological well-being of students. The results were not fully in accordance with the hypotheses that were formulated. Virtual reality was found to be able to increase the

positive affect of participants in the experimental group significantly. However, the same thing happened to the control group. The significant difference of the increasing in both groups was not happened. Furthermore, the second experiment showed a result that virtual reality had no effect on student psychological well-being.

Despite the results indicated that this research required a further study, the subjects of this study gave their point of view that they felt more relaxed, calm, comfortable, and peaceful after watching the video. This was found from the interview results of the researchers with the research subjects. One of the subjects of the study said that he was receiving a feeling of emotion or affected after watching the scenery scene from the video presented because he was in the midst of the complexity of life at that time.

Using virtual reality as a relaxation alternative provided the advantage of being able to display the desired scenery without travel anywhere. Despite the use of a virtual device, it did not hinder the user visibility since the video was displayed 360°. This was also in accordance with the subject opinion after being given a treatment. The subjects felt more relaxed post-treatment since the video displayed a wide view so that the eyes could see around the nature.

The results of the study were in line with the findings of several researchers who tested the effectiveness of nature as a means of relaxation. This statement was in accordance to research that reported the perception of tourists who experience psychological pressure, economic pressure, or work pressure just by looking at natural scenery which could make us felt more relaxed since it could refresh our mind [30]. Furthermore, it was reported that the subject feelings of comfort, calm, and relax increased significantly after being displayed to a forest video through virtual reality (VR), these feelings were measured using semantic differential method [31].

However, there was no change in psychological well-being as a result of the provision of virtual reality could occur due to several things. One of them was that psychological well-being is a complex variable with six aspects, namely self-acceptance, personal growth, positive relations with others, autonomy, purpose in life, and environmental mastery [10]. With a broad coverage of the six aspects, relaxation techniques using virtual reality were less able to help improving student psychological well-being. This was in line with a statement that psychological well-being did not only have positive-negative impacts and life satisfaction, but there was also a multi-dimensional construct [32]. In addition, it is stated that several factors could affect the level of psychological well-being in individual; there were age, gender, social status, social support, religiosity, and personality [10].

The use of video in this study could also affect the research findings. The video used for this study was ocean scenery with the sound of waves crashing, as well as waterfalls with birds chirping sound. According to [33], a meadow or flower scene with a green atmosphere could help presenting sustained attention. The sound of the video also built an excitement to a natural place and gave the feeling of being in the video. In this case, it was also possible that the subjects were also disturbed by somethings in the video that shown. Several subjects admitted in the interview session that the music of the video besides the natural sounds bothered them and they preferred a realistic sound so that they could feel they were there. However, the rest subjects prefer the presence the additional music as a medium for relaxation.

When the scene of the video showed a cliff, several subjects also feel fear since they also felt like they were at a height and numbers of subjects had acrophobia (a phobia of heights). There were two videos that only showed a 360° view and only stay in one location which could affect the research findings since most of the scenes in virtual reality were static without any transitions, it could cause boredom and affect the relaxation effect [34]. In addition, the forest-themed video made several subjects felt tense and a little scared since the atmosphere was quite dark.

This research is a breakthrough for the development of psychology research in Indonesia, considering that there is slight research on the use of virtual reality in the field of psychology in Indonesia. However, the results of the study and the discussion above showed that there is still a need to design experimental research to make better virtual reality used. As the example, the nature video election that were more capable of having a positive effect and not causing negative affect such as the emergence of anxiety due to the choice of natural settings like a dark forest.

5. CONCLUSION

This study proved that the nature harmony provides positive benefits even if it is only through technology that presents nature artificially, namely virtual reality that presents and brings participants as if they were in the open nature. The increasing of the positive affect becomes one of the positive impacts of the nature harmony, even though it does not increase psychological well-being. The results of this study also showed that research This study proved that the nature harmony provides positive benefits even if it is only through technology that presents nature artificially, namely virtual reality that presents and brings participants as if they were in the open nature. The increasing of the positive affect becomes one of the positive impacts of the nature harmony, even

though it does not increase psychological well-being. The results of this study also showed that research and the use of virtual reality in the field of psychology still have very broad and interesting development opportunities.

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