

A Case Study of Video See-Through HMD in Military Counseling Service

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Abstract

In Korea, the military has been conducting counseling for the preemptive detection of psychologically unstable soldiers to prevent unexpected accidents and to help them adapt to military life. However, several soldiers feel anxious about face-to-face counseling with military officers and they have difficulty expressing themselves. Video See-Through HMD is a state-of-the-art mixed reality device that converts the user's real view into a digital view, which leads users to feel the actual situation as the virtual. To validate its usefulness as a new psychological counseling aid, we investigated 11 army soldiers who are under the counseling program in barracks. During the counseling conversation, participants were asked to wear or take off the Video See-Through HMD repeatedly. All conversations were recorded for behavioral observation. As a result, 80% of the soldiers showed a relatively stable state of mind when wearing the Video See-Through HMD, which leads them to be innocent and frank about their concerns. This method could improve the effectiveness of counseling to prevent unexpected accidents caused by unnoticeable psychological instabilities of the clients.

Keywords: *Military Counseling; Virtual Reality; Mixed Reality; Exposure Therapy; Video See-through HMD; Behavioral Observation.*

1. Introduction

Compared to normal society, the military has the characteristics of being controlled and constrained in a group. There have been various incidents of human resources such as suicide, shooting, and deviance. Recently in Korea, fortunately, such problems have continued to decrease. The number of suicides in 2017 decreased by half in 2011, and the social problems and accidents inside the military continue to decrease as well [1]. This is because of the improvement of the welfare service such as military counseling service in barracks. However, a number of young people with social anxiety and emotional problems still belong to the military. Most of them experienced various social maladjustments such as social anxiety, anger disorder, group bullying. In addition, despite the lower suicide rate in the military than in the whole population, there is a social prejudice that they attribute responsibility for the accidents to the military office. The military has been putting a lot of effort into understanding the psychological state of the soldiers for group management. The main purpose of counseling is to prevent accidents by early detection of the psychological problems and internal conflicts of the soldier. However, the counseling room is located in battalions or regiments, in which client soldiers have

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difficulty in the free expression of their innocent feelings. The psychological stability of the client is very important for successful counseling so that the counselor can effectively understand the difficulties of the client. Various techniques have been explored to stabilize the client's psychology, but there is still a large gap between counselors and clients in the military.

This study proposes a new utility of the virtualization technique, which could reduce mental discomfort during stressful situations in the real world. The Video See-Through HMD(VSHMD) is a kind of Head Mounted Display(HMD) that has a digital camera set attached to the front. As shown in Figure1, VSHMD captures real scene(object) in front of a wearer and displays them through an HMD in digital form, so the wearer experience digitalized real world. This technique can provide effective augmented reality throughout a wide vision range with relatively low heterogeneity in rendering between virtual objects and real scenes[2]. Here we found that the digitalized real-world generate desensitization. Desensitization is known as psychological treatment or process that diminishes emotional responsiveness to a negative, aversive or positive stimulus after repeated exposure to it. VSMD especially provides desensitized visual stimuli to the wearer in the real presence, which relieves the anxiety of reality. This feature could relieve the client's anxiety during uncomfortable counseling.

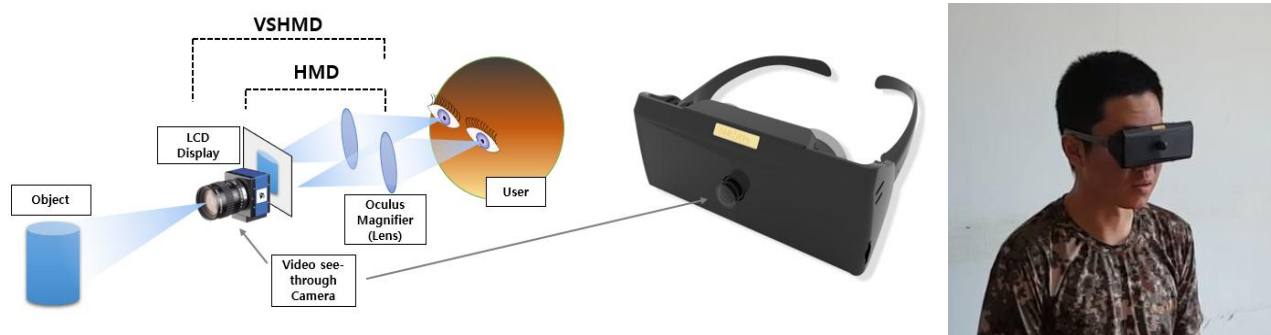


Figure 1. The basic structure and the form of VSHMD

2. Background and Previous works

In modern society, adapting to different types of groups is essential. Communication skills and interpersonal relationships become basic requirements for social roles. However, an increasing number of people are unable to adapt to a society suffering from social instability due to rapid social changes such as high-stress competition, family dissolution, and isolation. Social anxiety is one or more social activities that are so unfamiliar that others may notice. It is a significant and persistent fear of being humiliated or embarrassed by others. Social anxiety comes from worrying about others' evaluation of oneself. This mental problem usually develops during adolescence. Presentation anxiety is a common symptom that 20% of college students and the general public have and is a major symptom of social anxiety disorder [3]. When a person is in a state of social anxiety, they believe they are receiving negative evaluation or attention from others, which may lead them to stutter or speechlessness and avoid continuous social interaction. Anxious behaviors in announcement and communication are often found in many Korean young people, who are engaged in school, military, and ordinary social environments. Previous researches revealed that it is effective to approach such social anxiety from a multidimensional perspective of cognition, behavior, and physiology rather than treating it as a fragmentary and single system [4].

Virtual reality exposure therapy(VRET) is the use of virtual reality technology for psychological therapy. VRET isolates patients from their surrounding sensory inputs and instead gives the illusion of immersion inside a computer-generated, interactive virtual environment. Patients receiving VRET navigate through digitally

created environments and complete specially designed tasks often tailored to treat a specific ailment. Since the mid-2000s, VRET has been addressing mainly anxiety disorders, eating disorders, other psychotic disorders, and fear and anxiety [5]. A representative example of psychotherapy in the military is the virtual Vietnam in 1997, which focused on the treatment of the post-traumatic stress disorder of Vietnam veterans. Virtual Vietnam exposes the war situation to a VR environment, and despite the limitations and limited scenarios of graphic technology at that time, it was effective for all participants [6][7].

Augmented reality or mixed reality is a technology that provides a world in which the real world and virtual worlds are mixed. VSHMD is a promising vehicle for futuristic immersive display, bringing a user into a realistic virtual world or a mixed world on demand. Unlike a general HMD, VSHMD includes a camera to mix and show virtual information with the real world in front. The VSHMD wearers view the real and virtual world in digital form without heterogeneity between the real and the virtual, which provides an immersive mixture of perspectives with a wide viewing angle. However, several drawbacks, such as low display resolution or time delay in see-through displays, have impeded its success [8][9]. Moreover, psychological and psychophysical safety issues related to these shortcomings require thorough investigation to avoid accidents [10][11]. As the main drawback, VSHMD generates deterioration of quality of view caused by restricted low display resolution and display delay, which leads users to recognize the difference from the real view seen by bare eyes. However, because of this drawback, VSHMD has another advantageous feature - Virtualization of the Real. VSHMD wearers experience optical illusion that the real view in front seems to be virtual as if it is a dream. Real-time image filtering such as gray-scale conversion or cartoon rendering may inflate their illusion. VSHMD has the possibility to be a new device for desensitization in psychological therapy. Military counseling service was the case study in this work. During the counseling, VSHMD may decrease the sense of reality, which helps the client feel convenient, safe or restful as if it is not real. It would help the counselor detect potential anomalies that could trigger the accident or impulsive behavior of the client in advance.

3. Experiment

We imported the cartoon render filter the in the VSHMD. It is the one of real-time image transforming algorithm. As shown in figure 2, the cartoon render filter distort the source image into cartoon-like image so that the viewer feel like it is a cartoon scene. VSHMD wearer feels more unsubstantial sense of realism, which increase desensitization.

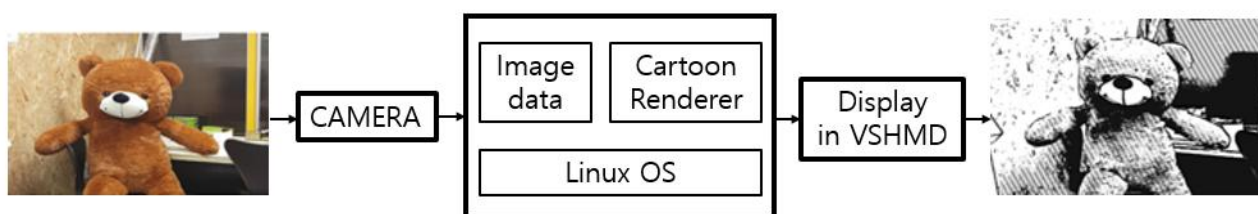


Figure 2. Cartoon Render image filter decreases sense of realism

We followed a focus group interview paradigm in the presence of counseling officers of the Korean Army. The participants were preliminary diagnosed as those in need of in-depth counseling among the soldiers in the military division. We selected eleven soldiers who agreed to participate in this study, and 1 to 1 individual counseling took place for each of them. All participants had a depression test through Beck's Depression Scale before counseling. The topic of the consultation was about the worries and conflicts that they have been experiencing recently. All participants had engaged in the experiment without any former introduction to the

effects of VSHMD. We notified the personal confidentiality of the research in advance and obtained the consent for the research. In order to provide an ordinary environment the clients can concentrate on counseling, they took off their nameplates when they entered the counseling room. They did not give official statements and started counseling comfortably. The consultation time was 30-60 minutes.

Counseling process was composed of the state of normal condition and the state of wearing VSHMD. The experimenter alternately put on and take off VSHMD at intervals of 5-10 minutes during the consultation. After the counseling process, we had an in-depth interview with the participants. The in-depth interview took place in the next room about the satisfaction of the counseling including the feeling and emotion of counseling when wearing a VSHMD such as comfort, and immersion in counseling etc. We recorded all the contents of the counseling on video, and we investigated and analyzed every speech, actions, gestures, facial expressions and other behaviors. Voice recording data were used for counting the number of utterances of both participants and a counselor. The experimental environment is shown in Figure 3.



Figure 3. Application of VSHMD to military counseling service in barracks

We collected the data to be suitable for the criteria of the experiment and reflected it in the research results, which were compared and reviewed comprehensive analysis results. According to the analysis process suggested by Yin of Case Study Research-Design [12], first, cases and contexts were basically described, second, specific topics and categories were explained, and third, the analysis was concluded with direct interpretation.

4. Result

4.1 The quantitative analysis – Speech per minute

We counted the number of words of the counselor and the participants. Clients tend to keep silent if they are in stressful situations. In this case, the counselor efforts to alleviate their emotional defense through ice-breaking tricks. We found that the conversation frequency (that is Speech per minute) of the participants when wearing the VSHMD was higher than other conditions shown in Figure 3. In the normal condition (baseline) that is ordinary counseling situation, average speech per minute of the counselor was 30.2% higher than that of participants. The counselor needed to spend more time leading the topics to make participants comfortable because the participants could not get into the main point of counseling. On the other hand, when wearing VSHMD, participants spoke more. Compared to the counselor, the participant's speech per minute was 23.6% higher. Total increase of the speech per minute of the participants was 58.6% compared to the baseline, while the speech per minute of counselor decrease 15.4%.

As a result of the video-recorded behavioral observation, we found the concentration of counseling also increased and the clients showed psychologically stable posture and counseling attitude when wearing the VSHMD. Their body movements decreased and eye contact occurred more frequently. Their number of speeches significantly increased right after wearing VSHMD. We found many cases where they begin to talk about one's own psychological inner self from that moment. The topics of the conversation also contained very personal stories that were difficult to share in a regular situation.

On the VSHMD condition, the participants reported that anxiety about the counselor in front reduced and that they could be under natural conversation moods. In the interview, 80% of the participants preferred to wear the VSHMD. Before the counseling, the counselor had a distrust of VSHMD because it might hinder eye contact with the client, which deteriorates rapport.

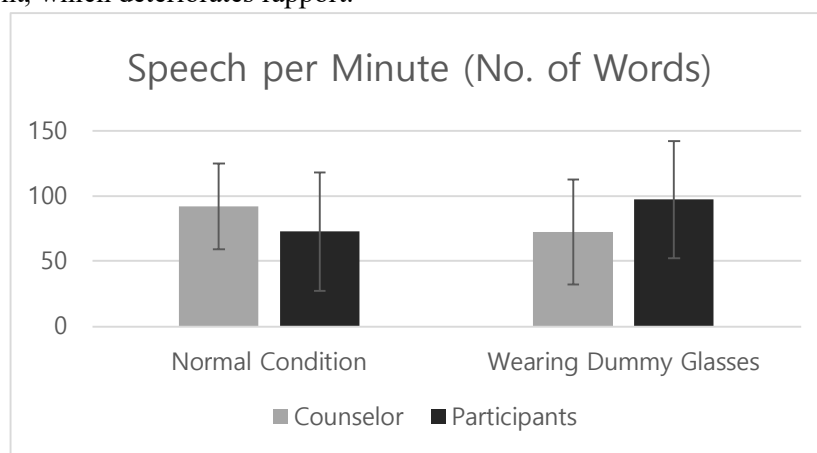


Figure 4. The comparison of Speech per minute across VSHMD wearing conditions

4.2 In-depth interview with participants

In the interview, one participant confessed that he can hardly see the other person's eyes well, but if he put VSHMD on, he could see the other person's eyes better. Some of them said that they thought wearing glasses makes their eyes more daring because others cannot see their eyes. It seems to be a similar effect to sunglasses. However, contrary to the sunglasses, VSHMD generates unreal viewing environment. The cartoon render filter provided a new viewing experience that the wearer feels dream-like emotions, which cannot be provided by sunglasses. Most of the participants could gaze a new counselor without hesitation and felt more comfortable when talking, which helped them express themselves honestly.

4.3 In-depth interview with the counselor

The client's reaction was different from the counselor's initial prediction. After wearing the VSHMD, the distraction of hands and gestures of participants decreased and the attention to the counseling increased. 80% of participants were surprising that they were able to express themselves much more comfortably when wearing VSHMD. During the counseling, some participants said that it felt like watching the counselor on TV or VR world that is in remote, so that it was less burdensome, and they could be truthful better in counseling as if they belong to a safe area such as games. They said it was especially impressive to gaze counselor's eyes with no fear. They said it was better to wear it when you need eye contact and when you are talking in-depth about your personal history. VSHMD provided another unexpected advantage when the counselor wore it. VSHMD helped the counselor keep calm when the client had an abysmal attitude such as no eye contact and distraction and showed a strong rejection of counseling. It was a special experience for the counselor as it can

be a means of preventing the counselor from exhausting himself.

5. Discussion

Among the residential soldiers in the military base, several individuals cannot adapt to military life or have personal problems. These are inherent risks that can cause various accidents on the military base. To prevent such accidents, the military provides regular counseling and various psychological services. However, some soldiers have difficulty in military life. This study proposes that VSHMD can improve effectiveness of counseling services to them. 80% of the participants showed improvement in the quality of counseling. First, we found a mentally stabilizing effect that calmed wearers during counseling. Excessive hand movements and distracted body movements decreased significantly. They were showing a stable appearance when wearing VSHMD. The defensive posture (folding arms, Crossing legs, touching mouth, etc.) decreased. Moreover, there were many cases of showing favor to the counselor. They tend to talk more in detail rather than keep listening to the counselor's story. Second, the VSHMD wearer did not aware of the change in their attitude before and after wearing the VSHMD. This was found during the post-counseling interview. It means that there was no intentional switching of their attitude. Third, VSHMD wearers delivered many personal story that was difficult to confess to a new counselor. We observed this behavior through a quantitative analysis that the number of speeches increased on VSHMD condition as the conversation progressed. There were more intervals between words as well. It is a substantial evidence that VSHMD provides wearers comfortable state of mind. Fourth, there were many cases of lowering the tone of voice and speaking more coherently. The gaze movement decreased and the eye contact period was longer. The participants revealed that they could easily focus on the counselor's speaking and stare at the counselor's face because they thought they were safe.

While most VR technologies try to make virtual reality look real, this study focused on turning reality into virtual. The real world viewed through VSHMD appears digital image. Digitally converted real-world images have inevitably lower quality than the real. We discovered that this deterioration makes wearers consider reality to be virtual. We named this 'Reality Virtualization'. Reality Virtualization is defined as a phenomenon in which an actual situation or object is perceived as a virtual situation or object that does not exist. In this study, we verified that the Reality Virtualization has a psychological stabilizing effect. According to the behavioral observation, the psychological change caused by Reality Virtualization operates at a low level of the cognitive process. At the cognitive level, the scenes shown through video see-through are self-evident real worlds, whereas, at the unconscious level, the distance from reality becomes loose. This allows them to believe in their illusion to defend themselves psychologically and physically against threatening stimuli such as anxiety or mental tension in real world. Interestingly, users tend not to be aware of these changes within themselves.

Based on these discussions, we propose practical applications as follows. First, VSHMD can be selectively useful for several individuals who feel uncomfortable with the counselor in psychological counseling or who have anxiety and unstable mental state in social interaction. Face-to-face conversation could dump excessive anxiety in some people. VSHMD can contribute to the improvement of individual concentration, comfort, and mental stability in various cases of social interactions. Second, VSHMD can be applied to various VR therapy programs especially for desensitization. There are many traditional treatment methods for people with psychological and behavioral disorders such as cognitive behavioral therapy, drug therapy etc. However, there are still limitations in practical use in daily life. VSHMD could allow people to immediately take care of their mental health at any stressful situations by wearing the simple device and to keep receiving counseling service without constraints of mental instability.

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