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# IMPROVING HEALTH LITERACY UTILIZING THE HEALTH BELIEFS MODEL: PERCEIVED OBSTACLES IN HIV/AIDS PREVENTION VIA VIRTUAL REALITY APPLICATION AMONG ADOLESCENTS IN PANGKAJENE AND THE ISLANDS REGENCY

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## ABSTRACT

**Introduction:** In an era marked by rapid change, enhancing health literacy among adolescents, particularly in the context of HIV/AIDS prevention, holds significant importance. The integration of virtual reality applications has the potential to alter adolescents' perceptions of risk and precautionary measures, catering to the needs of a generation increasingly immersed in technology during this digital age. **Method:** This study adopts a time-series non-equivalent control group

design, with a substantial sample size of 44 individuals in both the intervention and control groups, totaling 88 participants. The sampling technique employed is consecutive sampling. The Health Literacy questionnaire for HIV/AIDS prevention incorporates a Virtual Reality-based Health Belief Model (HBM) approach. The study spans approximately 2 months, from June to August 2023. **Results:** The findings indicate a significant impact of the health literacy model utilizing virtual reality on perceived severity and susceptibility regarding HIV/AIDS among adolescents in Pangkajene Regency and Islands. Additionally, there is an observed increase in positive perceptions of the Health Belief Model, specifically in the perceived obstacles of HIV/AIDS prevention within the intervention group (VR), surpassing levels in the control group. **Conclusions:** This study underscores the positive influence of Health Literacy and virtual reality media in enhancing perceptions related to perceived obstacles in HIV/AIDS prevention among adolescents. Such insights carry substantial implications for modifying behaviors related to disease prevention.

**Keyword:** Health Belief Model (HBM), Virtual Reality, HIV/AIDS, and adolescence

## Introduction

In the rapidly evolving contemporary world, the importance of health literacy is crucial, especially in the domains of health promotion and disease prevention. Health literacy refers to an individual's ability to access, comprehend, evaluate, and apply health information to make informed decisions about their well-being. However, improving health literacy among adolescents, particularly in the context of HIV/AIDS prevention, presents a significant challenge. Cultivating health literacy becomes imperative for active and informed engagement in health promotion and disease prevention initiatives [1].

A report from the South Sulawesi Provincial Health Office reveals that the cumulative number of HIV/AIDS cases from 2005 to 2022 reached approximately 26,000 cases [2]. Pangkajene and Islands (Pangkep), located in South Sulawesi Province, have documented cases of HIV/AIDS. Data from the Pangkep Regency Health Office in 2019 showed 65 new HIV cases, increasing to 154 cases and 18 AIDS cases in 2021. Notably, a majority of these cases are within the age group of 15-49 years [3]. The rise in HIV/AIDS cases is attributed, in part, to engaging in unsafe and high-risk sexual behavior.

The use of virtual reality applications emerges as a promising strategy to enhance health literacy among adolescents, particularly in the realm of HIV/AIDS prevention. Virtual reality technology provides an immersive and engaging environment for effectively conveying health information and driving behavioral change. Drawing from the Health Belief Model [4], which explains how individual beliefs and perceptions influence health-related behaviors, integrating virtual reality can be tailored to address adolescents' specific beliefs and perceptions regarding HIV/AIDS prevention. Aligned with the Health Belief Model, virtual reality applications can target adolescents' perceptions of susceptibility to HIV/AIDS, views on disease severity, perceived benefits and barriers of preventive behaviors, and self-efficacy in performing those behaviors. By incorporating these elements into virtual reality interventions, adolescents can develop a more comprehensive understanding of HIV/AIDS and the importance of preventive measures.

Furthermore, virtual reality applications provide interactive and experiential learning opportunities, allowing teenagers to explore various scenarios and outcomes related to HIV/AIDS prevention.

The integration of virtual reality technology into HIV prevention programs also addresses the evolving needs of adolescents in the digital age. With the widespread use of technology and the internet among the younger generation, online platforms can serve as accessible and convenient means for delivering sexual health education and interventions. The application of website-based VR technology (Web-VR) has demonstrated positive contributions to learning, as evidenced by its efficacy in enhancing the learning process across various disciplines, including health [5]. This study aims to investigate the impact of health literacy using a Virtual Reality-based Health Belief Model (HBM) approach, specifically focusing on the dimensions of perceived obstacles in HIV/AIDS prevention.

**Method**

The intervention study employed a time series non-equivalent control group design, encompassing multiple rounds (4 times) of pre-tests and post-tests within two groups. Notably, the sampling process did not involve randomization in either group [6,7]. The groups were delineated as follows:

Group 1: Students exposed to the HIV/AIDS Application Model utilizing the Virtual Reality-based Health Belief Model (Intervention Group: Education delivered through websites and Virtual Reality-based Videos).

Group 2: Students subjected to counseling using audiovisual media pertaining to HIV/AIDS (Control Group: Education delivered through the website).

Each group underwent pre-testing four times, with a one-week interval between consecutive pre-tests. Following the completion of the last pre-test (4th), both groups received education (intervention) on HIV/AIDS. Subsequent evaluation in the form of post-tests was conducted four times after the intervention, with a one-week interval between each post-test.

This research, conducted over a period of approximately 2 months from June to August 2023, took place at SMA Negeri 4 and SMK Negeri 6 in Pangkep Regency. The study population comprised all students enrolled in SMA Negeri 4 and SMK Negeri 6 in Pangkep Regency, with the sample consisting of Class X and Class XI high school students. Sample selection adhered to inclusion criteria, ensuring participants were willing and had provided signed informed consent. Inclusion criteria involved Class X and XI high school students willing to sign the informed consent and participate in activities scheduled 2-3 times. Exclusion criteria encompassed students facing illness and those who relocated from the research location. Drop-out criteria applied to students withdrawing for personal reasons.

Both the intervention and control groups comprised 44 individuals each, determined through consecutive sampling where all eligible population members were selected as research samples. Various research instruments, including questionnaires and HIV/AIDS applications utilizing a virtual reality-based Health Belief Model approach, were employed in this study.

The research focused on educational media for HIV/AIDS prevention, employing a Health Belief Model approach through Virtual Reality technology. Measurement of the application was conducted among high school students in Class X and Class XI. HBM variables in both intervention and control groups were assessed eight times (four pre-tests and four post-tests). Statistical analyses involved the use of Anova Repeated Measures Test and the independent t-test. Furthermore, ethical clearance for this study was obtained from the Research Ethics Committee of the Faculty of Public Health UNHAS, under No.: 3808/UN4.14.1/TP.01.02/2023.

**Result**

## Summary of the Health Belief Model's perception dimension: Adolescents' Perceived Obstacles to HIV/AIDS prevention

Table 1 Summary of the Health Belief Model's perception dimension: Adolescents' Perceived Obstacles to HIV/AIDS prevention in the intervention and control groups

| Variable HBM | Intervention Group | | | | Control Group | | | |
|---|---|---|---|---|---|---|---|---|
| | *Pretest* | | *Posttest* | | *Pretest* | | *Posttest* | |
| | f | % | f | % | f | % | f | % |
| ***Perceived barriers*** | | | | | | | | |
| Positive | 5 | 11,4 | 44 | 100 | 4 | 9,1 | 17 | 38,6 |
| Negative | 39 | 88,6 | 0 | 0 | 40 | 90,9 | 27 | 61,4 |

Based on the information provided in Table 1, it is noticeable that both groups initially held negative perceptions within the Health Belief Model (HBM) concerning the dimension of perceived obstacles before undergoing the HIV/AIDS prevention health education (pretest). Following the intervention (posttest), all respondents (100%) in the intervention group exhibited a positive shift in their perceptions. In contrast, the control group experienced a positive perception change in only 29.5% of the respondents after the intervention.

## Impact of Health Literacy Utilizing the Health Belief Model for HIV/AIDS Prevention through Virtual Reality Applications in the Intervention and Control Groups

Table 2. Disparities in Pre-Posttest Variables of the Health Belief Model (HBM): Adolescents' Perceived Obstacles within the Intervention Group

| Variable | | *Mean* | *p* |
|---|---|---|---|
| *Perceived obstacles* | *Pre* | *13,20* | 0,000 |

| | | | |
|---|---|---|---|
| | *Post* | *18,31* | |

*Paired sample t-test*

The paired sample t-test results from the pre-posttest analysis in the intervention group indicate a p-value of 0.000 for all variables. This value is below the significance threshold of 0.05, signifying a significant difference. Furthermore, the substantial disparity in average scores between the pre-test and post-test categories is evident.

Table 3. Disparities in Pre-Posttest Variables of the Health Belief Model (HBM): Adolescents' Perceived Obstacles within the Control Group

| **Variable** | | ***Mean*** | ***p*** |
|---|---|---|---|
| *Perceived obstacles* | *Pre* | 13,36 | 0,000 |
| | *Post* | 16,94 | |

*Paired sample t-test*

According to the paired sample t-test outcomes presented in Table 3 for the pre-post-test analysis in the Control Group, all variables exhibit a p-value of 0.000, indicating significance below the threshold of 0.05. This implies that significant differences are evident. Additionally, there is a notable contrast in average scores between the pre-test and post-test categories for all variables.

Table 4. Disparities in Health Belief Model (HBM) Variables: Adolescents' Perceived Obstacles within the Intervention Group

| **Variable** | | **Group Intervention** | |
|---|---|---|---|
| | | **F** | ***p*** |
| ***Perceived obstacles*** | | | |
| ***Variable*** | *Pretest[1], Pretest[2], Pretest[3], Pretest[4]* | 0,122 | 0,943 |
| | *Posttest[1], Posttest[2], Posttest[3], Posttest[4]* | 24,30 | 0,000 |

*repeated Measures Anova*

According to the outcomes of the Repeated Measures Anova test in Table 4 for the Intervention group, it is evident that there were no significant differences in the variables between pretest 1 to pretest 4 within each group, with a p-value exceeding 0.05. However, following the

intervention (post-test), both groups exhibited a noteworthy increase in average scores, demonstrating statistical significance with a p-value less than 0.005.

Table 5. Disparities in Health Belief Model (HBM) Variables: Adolescents' Perceived Obstacles within the Control Group

| **Variable** | | **Group Control** | |
|---|---|---|---|
| | | **F** | ***p*** |
| ***Perceived obstacles*** | | | |
| ***Variable*** | *Pretest[1], Pretest[2], Pretest[3], Pretest[4]* | 1,403 | 0,248 |
| | *Posttest[1], Posttest[2], Posttest[3], Posttest[4]* | 48,85 | 0,000 |

*Repeated Measures Anova*

According to the outcomes of the Anova Repeated Measures test in Table 5 for the Control group, there were no significant differences in the variables between pretest 1 to pretest 4 within each group, as indicated by a p-value exceeding 0.05. However, subsequent to the intervention (post-test), both groups exhibited a substantial increase in average rankings, demonstrating statistical significance with a p-value less than 0.005.

To observe the contrast or variance in mean ratings between the pretest and post-test, a comparison between the intervention group and the control group is presented in Table 6:

Table 6. Disparities in Health Belief Model (HBM) Variables: Adolescents' Perceived Obstacles in HIV/AIDS Prevention between the Intervention and Control Groups

| **Variable HBM** | ***Group*** | ***Mean*** | | | ***p*** |
|---|---|---|---|---|---|
| | | ***Pre*** | ***p*** | ***Post*** | |
| *Perceived obstacles* | *Intervention* | 13,20 | 0,956 | 18,31 | *0,000* |
| | *Kontrol* | 13,20 | | 16,49 | |

*Independent sampel t test*

Table 6 indicates a notable distinction ($p < 0.05$) in the variances between the pretest and post-test dimensions, revealing the effectiveness of Health Belief Model (HBM) benefits in both groups. The average ratings for all variables in the intervention group were observed to be higher than those in the control group. The results from the statistical tests, employing independent sample t-tests, revealed non-significant outcomes in the control group. In contrast, the intervention group yielded significant results, with a significance value of 0.05.

## Discussion

### The Impact of Health Literacy Utilizing Virtual Reality on Adolescents' Perceived Barriers in Executing HIV/AIDS Prevention

The results showed that the use of Virtual Reality has an effect on reducing perceive barriers in adolescents in preventing HIV / AIDS. Environment In this study, VR presents a more explicit understanding of the benefits, severity and barriers that may be felt by respondents with the ultimate goal of encouraging preventive behavior. According to Monteiro et al. (2020) Providing accurate and evidence-based information reduces barriers felt by patients and stimulates confidence in the magnitude of the benefits of healthy behaviors. VR offers personalized and individualized experiences, and arranges interventions tailored to individual needs (Ng et al., 2018).

A decrease in the perception of barriers is likely to occur, if the aspects of benefit and severity offered are greater (McVay et al. 2018; Fitriani et al. 2022). In this study, on the aspect of perceive severity", there is a statement "HIV / AIDS disease causes death". Furthermore, on the "perceive barrier" there is a statement "I think it's too much trouble to have sex using a condom". From these two statements, of course, respondents will feel better about using condoms than being infected with HIV / AIDS and ending in death. Affirmation on the seriousness of the disease and obstacles that are not proportional to the health obtained, are expected to help respondents in getting rid of perceived obstacles. Previous findings stated that the use of VR as an educational medium increases confidence and confidence to carry out health measures (Ng et al., 2018).

## Conclusion

The findings from this research reveal that Health Literacy plays a role in shaping perceptions of the benefits associated with HIV/AIDS prevention following health education. The noteworthy contrast in average ratings between the group utilizing VR media and video underscores the efficacy of VR media in enhancing the perceived benefits. Enhancing these perceptions is crucial, particularly in light of the elevated instances of sexually transmitted diseases, including HIV/AIDS, among adolescents. The incorporation of VR media in health education holds promise for instigating positive behavioral changes, necessitating thoughtful planning and thorough evaluation of its effectiveness

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