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The Effect of Virtual Reality on Pain in Primiparity Women

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Abstract

The objective of this study was to determine the effect of Virtual Reality using smart phone on pain reduction in primiparity women during labour process. Labor pain experienced in labour is affected by the processing of multiple physiological and psychosocial factors. Perceptions of labour pain intensity vary. Very occasionally women feel no pain in labour and give birth unexpectedly. At the other extreme labour pain has been reported to be the most severe pain that a woman experiences in her lifetime. Non-pharmacological interventions in current use for the management of pain during childbirth. The virtual reality (VR) is a non-pharmacological method for pain relief. Material and methods: This clinical trial was conducted on 30 primiparous parturient women having labor at five public health centers (Puter, Garuda, Ibrahim Adjie, Padasuka, and Pagarsih) during March-April 2016. Samples during labour process were randomly divided into two equal groups. The intervention group received the usual treatment with VR the control group without VR. Pain was measured using the Faces Pain Scale (FPS) and Nonverbal Pain Scale (NVPS) during labour process on 1-3 cm, 4-5 cm, 7-8 cm, and 10 cm of cervix dilatation. Data were analyzed using Chi-square, Mann-Whitney and Point Biserial. Result: The result of this study is there were statistically significant differences the pain score in both groups (P<0,01). Conclusion: Virtual reality is an effective complementary nonpharmacological method to reduce pain during labour process.

Keywords

Virtual Reality, Labor Pain, Primiparity

1. Introduction

Labour pain is nearly a universal experience for childbearing women but threshold of this pain varies between individuals. It may be different from other types of pain as there is an achievement of end product i.e. of having a baby. It can have deleterious effects on the mother, on the foetus and on labour outcome itself. Despite wide spread availability of pain intervention in childbirth, for most women childbirth is associated with Labour pain that exceeds expectation. The pain perception in child birth and satisfaction depends on various pre delivery and intrapartum factors. Pre delivery factors include social status, parity, prenatal education, counseling, while intrapartum factors influencing satisfaction are mode of delivery, duration of labour, medical intervention and personal support [1].

The pain experienced in labour is affected by the processing of multiple physiological and psychosocial factors. Perceptions of labour pain intensity vary. Very occasionally women feel no

pain in labour and give birth unexpectedly. At the other extreme labour pain has been reported to be the most severe pain that a woman experiences in her lifetime [2].

With the use of Chapman's model, a discussion of the nature of labor pain begins with an understanding of the nociceptive stimuli that may be centrally perceived by the parturient and called pain. During the dilatation phase of labor (first stage), visceral pain predominates, with pain (nociceptive) stimuli arising from mechanical distention of the lower uterine segment and cervical dilatation. High-threshold mechanoreceptors in the myometrium may also generate nociceptive stimuli in response to uterine contractions, particularly in long, protracted labors. 10

The increasing intensity of pain commonly observed with the progression of dilatation may be partially attributable to a lowered activation threshold in the mechanoreceptors, and to chemoreceptor stimulation produced by the repeated stimulation of uterine contractions. These nociceptive stimuli of the dilatation phase are predominantly transmitted to the posterior nerve root ganglia at T10 through L1. Similar to other types of visceral pain, labor pain may be progressively referred to the abdominal wall, lumbosacral region, iliac crests, gluteal areas, and thigh [3].

A study of labouring women in the United Kingdom indicated that 93,5% of the women described the pain as severe or unbearable, while in Finland 80% described it as very severe or intolerable. Twenty five percent of primiparous and 9% of multiparous women reported their pain as horrible or excruciating. A separate study reported pain atthree different time points based on the degree of cervical dilatation and found that when the cervix was 2±4 cm dilated the pain was most intense. A similar division of this period of labour into three phases indicated that cervix dilatation of 0±3 cm was distressing, 4±7 cm was horrible and >8 cm was excruciating. Similarly, measurement of pain at 3, 5, 7 and 10 cm dilation and 24 hours postdelivery, indicated that pain intensity increased as labour progressed [4].

Virtual Reality (VR) is a new technology by which a person in the virtual environment feels he/she is in the real world. This technology allows the user to interact with a computer (or other devices), that simulates the reality and the pain is reduced through diverting patient's attention from the real world. It feels as if a person has become an active participant by visual, auditory, and other senses [5, 6]. Originally, VR technology was solely recognized for its entertainment value; however, in the past 10 years, its application has been expanded to a variety of clinical areas, including pain management, physical rehabilitation and the treatment of psychiatric disorders (e.g., phobias, post-traumatic stress disorder and anxiety disorder). It has been most frequently studied in medical settings as a means to attenuate pain perception, anxiety and general distress during painful medical procedures, such as wound care, chemotherapy, dental procedures and routine medical procedures. Virtual reality technology has also been studied with burn patients undergoing physical therapy. Hoffman et al. examined the use of pharmacologic analgesia alone versus VR in addition to analgesia during physical therapy. Patients in the VR group reported lower ratings of pain and an increased range of motion. In another study, Hoffman et al. Compared the use of VR to no distraction during physical therapy. After the VR condition, patients reported decreased pain and a greater range of motion. Sharar et al. reported results across three studies and concluded that VR in addition to standard analgesia reduced pain intensity, unpleasantness and time spent thinking about pain. Carrougher et al. Found similar results among burn patients undergoing physical therapy/rehabilitation, with nonsignificant clinical improvements in range of motion [6]

Nowadays, the interest for using nonpharmacologic methods is increased due to the non-invasive nature and no severe side effects. The use of VR, as a non-invasive and analgesic method without drug addiction and minimum side effects is used in clinics. This study aims at determining the effect of virtual reality on pain in primiparity women during childbirth proccess.

2. Methods and Materials

The sample size was estimated based on the results from a pilot study on 10 parturient women (power: 80%, confidence level: 95%). The estimation led to 22 parturient women; however, the sample size was increased to 30 for a higher level of confidence in each group. Women in the latent phase of labor (dilatation 1-3 cm) were randomly assigned into two groups (30 samples in each group).

The study was a randomized control trial study carried out at five public health centers (Padasuka, Ibrahim Adjie, Puter, Garuda, Pagarsih) in Bandung, West Java, Indonesia from March to April 2016. Informed consent was obtained from each study participant. Pregnant patients at 36 weeks and above attending the five public health centers (Padasuka, Ibrahim Adjie, Puter, Garuda, Pagarsih) in Bandung, West Java, Indonesia with inclusion criteria were recruited.

Sixty (60) patients were selected using simple random sampling and divided into two groups (30 samples in VR group and 30 without VR). Standardized, pretested, structured questionnaire was used to collect information about VR equipment. Other data included sosio demographics (age, economic status, education), pain threshold, anxiety level were collected in the third trimester (at 36 weeks above).

VR interventions carried out three times during labour process, first intervention at latent phase (dilatation 1-3 cm), second and third interventions at active phase (dilatation 4-5 cm and dilatation 7-8 cm). Each intervention given for 10 minutes in order to reliving labor pain. For this study used a VR distraction sequence scenery like river, beach, waterfall, lake, developed by Festivo©, which allows users to glide through a wih 360 degrees video used smartphone lenovo K4 Note VR series.

Pain data taken four times, first data taken at latent phase (dilatation 1-3 cm), second and third data taken at active phase (dilatation 4-5 cm and dilatation 7-8 cm), and the last at 10 cm

dilatation. Pain was measured using the Faces Pain Scale (FPS) and Nonverbal Pain Scale (NVPS). Face pain scales (FPS) were filled by women with selected images to describe the pain with a score of 0 = no pain, 2 = a little pain, 4 = somewhat disturbing, 6 = disrupting activity, 8 = very disturbing, 10 = very painful / unbearable, The last results from this assessment is the score 0-10. The second instrument for the assessment of pain is Adult nonverbal pain scale (NVPS) filled by observers (midwife/ researchers). Number of items in NVPS are 5 statement with each score item 0, 1 and 2. The last results from this assessment is the score 0-10.

2.1. Inclusion Criteria

The inclusion criteria were Indonesian national, low risk of pregnancy without obstetric complication, came to health public services on latent phase.

2.2. Exclusion Criteria

The exclusion criteria was if parturient rejects the VR intervention. The dropout criteria were women came in the active phase of labor before intervention, did not receive the complete intervention, and obstetric complication (rupture, prolonged labour, fetal distress).

2.3. Ethical Considerations

This study was approved by The Health Research Ethics Committee at Medical Faculty, Padjadjaran University with the registration 0316030286. Informed written consent was obtained from each participant after full debriefing about the VR equipment at 37 weeks of pregnancy. Informed consent was obtained from all subjects. The objectives and nature of the study were explained to all subjects. The information about participant's identity was not included with the other data and only the principal investigator had access to this information. All patient information was treated with utmost confidentiality, and no personal identifiers were included in the data.

2.4. Statistical Design and Analysis

Data was collected and edited to exclude errors, re-organized, coded and manipulated with appropriate software for efficient analysis. Data were entered into Microsoft Excel 2007 version for cleaning. Data was then transferred to Strata SE version 11.1 for statistical analysis. The findings were expressed as mean ± standard deviation and/or percentages. Categorical variables were compared using Chi- square test and odds ratio with 95% confidence interval. A p- value of less than 0.05 was considered statistically significant. Data were analyzed using Chi-square, Mann-Whitney and Point Biserial.

3. Results

3.1. Characteristics of the Patients

The total number of patients included in the study was 60 (30 each group), with an overall mean age (± SD) 22 years, ranging from 20 to 24 years. Seventy-seven percent of patients had senior high school education. Majority (65%) of patients had income below minimun wage (≤ 2,3 million rupiah). Pain threshold between two groups (± SD) 2,0 (a little pain) and anxiety baseline between two groups Baseline characteristics between two groups did not show statistically significant differences (P≥0.05) e.g. age, sosio economic status,education, pain threshold and anxiety level).

Table 1. *Distribution of the women according to age, sosiso economic status, education, pain threshold and anxiety level.*

Characteristics	VR (n=30)	Non-VR (n=30)	P
Age			
< 20	6	9	0,63*
20-24	19	17	
25-29	4	4	
30-34	1	0	
Education			
Elementary school	1	0	1,00*
Junior high school	4	5	
Senior high school	23	23	
University	2	2	
Socio economic status			
Below minimum wage	23	16	0,10*
Above minimum wage	7	14	
Anxiety			
Mean (SD)	29,5 (±4,4)	30,8(±4,1)	0,27**
Pain threshold			
Mean (SD)	2,1 (±1,2)	2,6 (±0,9)	0.08**

*Chi Square **Mann Whitney

3.2. Pain Score

Table 2. *Pain Score VR and Non-VR Group (Face Pain Scale).*

Pain measured time	VR (n=30)	Non-VR (n=30)	P*
Latent Phase			
Mean (SD)	3,5 (±1,9)	4,9 (±1,7)	<0,01
Active Phase			
4-5cm servix dilatation			
Mean (SD)	4,7 (±1,4)	5,9 (±1,7)	<0,01
7-8 cm servix dilatation			
Mean (SD)	6,3 (±1,7)	8,0 (±1,4)	<0,01
10 cm servix dilatation			
Mean (SD)	7,7 (±1,6)	9,3 (±1,1)	<0,01

*Mann Whitney

Based on table 2. showed significant differences on patients VR group and control in latent phase and active phase (p<0,01).

This result measurement pain used face pain scale.

Table 3. *Pain Score VR and Non-VR Group (Non verbal pain scale).*

Pain measured time	VR (n=30)	Non-VR (n=30)	P*
Latent Phase			
Mean (SD)	0,7 (±0,8)	1,5 (±1,1)	0,004
Active Phase			
4-5cm servix dilatation			
Mean (SD)	1,7 (±1,1)	2,6 (±1,6)	<0,01
7-8 cm servix dilatation			
Mean (SD)	3,4 (±1,4)	4,6 (±1,1)	<0,01
10 cm servix dilatation			
Mean (SD)	4,1 (±1,1)	4,9 (±0,8)	<0,01

*Mann Whitney

Based on table 3. showed significant differences on patients VR group and control in latent phase and active phase. This result measurement pain used non verbal pain scale.

4. Discussion

The VR system used in this study was simple (used smartphone VR series) and appropriate for use in the delivery room. The results indicate that the clinical use of virtual reality (VR) can reduce pain during childbirth process than those receiving standard care.

Labour is the active process of delivering a foetus and is characterised by regular, painful uterine contractions which increase in frequency and intensity. The pain of labour has two components: visceral and somatic, and its anatomy is well documented. The cervix has a central role in both the first and second stage of labour [1, 2, 3].

Labor pain is unique for every woman. Several factors influence the intensity of pain such as physiological, psychological, emotional, social, cultural and environmental factors [4]. This study of factors that affect labor pain apart from physiological factors such as age, education level, economic status, anxiety or pain threshold subject is not significantly different ($p > 0.05$) between intervention or control group. In this study patients are given virtual reality three times. latent phase, active phase (4-5 cm, 7-8 cm cervix dilatation).

The use of virtual reality (VR) as a non-pharmacological technique to treat pain has focused mainly on distracting subjects' limited attention resources away from the source of discomfort. This strategy has been effective in acute pain; however, in order to increase its effectiveness in chronic pain, this technology may also be able to encourage other coping strategies. An alternative use of VR with chronic pain patients would involve exploring its ability to change cognitions related with pain adjustment. Thisis because cognitions are widely related to pain adjustment, and treatments aimed at changing pain cognitions have been shown to be effective [7].

In 2000, Hoffman et al. reported a case study examining the efficacy of VR compared with a standard video game for two adolescents (16 and 17 years old) undergoing burn wound care [6, 8]. VR was found to decrease pain levels, anxiety and time spent thinking about pain. Das et al. conducted a randomized control trial, comparing standard of care (analgesia) with analgesia plus VR for children (5–18 years old) during burn wound care [6, 9]. Analgesia coupled with VR was more effective in reducing pain and distress than analgesia alone. More recently, a water-friendly VR system was investigated during wound debridement for 11 patients (9–40 years), demonstrating that VR lowered pain ratings and increased fun ratings for those who reported feeling engrossed in the VR game [6, 10].

Melzack and Wall proposed the Gate Control Theory, which suggests that factors such as the level of attention paid to the pain, the emotion associated with the pain and past experience of the pain all play a role in how the pain will be interpreted [11]. Mc Caul and Malott expanded this theory to state that human beings have a limited capacity of attention and an individual must attend to a painful stimulus in order for it to be perceived as painful [12]. Therefore, if the individual is attending to another stimuli away from the noxious stimuli, they will perceive the painful stimulus as less intense. Wickens proposed the Multiple Resources Theory, which states that resources in different sensory systems function independently [13]. This supports the nature of VR technology, which is based on integrating multimodal (visual, auditory, tactile and olfactory) sensory distractions. Recently, Gold et al. hypothesized that VR analgesia originates from intercortical modulation among signaling pathways of the pain matrix through attention, emotion, memory and other senses (e.g., touch, auditory and visual), thereby producing analgesia [14]. An overall decrease of activities in the pain matrix may be accompanied by increases of activity in the anterior cingulate cortex and orbitofrontal regions of the brain.

This study has limitations, VR equipment maybe is not video 360 degrees in this study only provided five videos scenery (lake, river, beach, waterfall and garden) and maybe not necessarily suitable for the reception of patients. In addition to the physiological aspects of pain as something that can not be eliminated as a whole, increasing the intensity of labor pain by dilating the cervix bigger and correlated l with the intensity, duration and frequency of uterine contractions. The longer the pain will be felt more strongly, the peak of the pain will occur in the active phase at the time of the full opening of 10 cm.

5. Conclusion

There is the influence of virtual reality with labor pain primipara evidenced by pain score at latent and active phase significantly different ($p < 0.05$) between VR and Non-VR grop. From this it appears that the pain in all stages is reduced.

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