

# The Effect of Humorous Stimuli on Alleviating Pain during Mammography: A Preliminary Study

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## Abstract

Mammography is widely performed as a standardized procedure for breast cancer screening; however, women often feel some degree of pain during this procedure. Currently, there are limited options available for alleviating pain related to mammography. A non-medicinal approach to the alleviation of pain involves the effects of laughter on physical and psychological wellbeing. We therefore examined the possibility that humorous stimuli would alleviate the physical burden on women undergoing mammography. We assessed 29 women, 15 women received only conventional mammography (neutral group), while 14 women (humor group) watched a funny video during the same examination. The intensity of pain experienced during mammography was assessed by visual analogue scale (VAS) and the VAS results showed a statistically significant difference ( $P = 0.007$ ) between the two groups, with the humor group experiencing less pain. In an additional experiment, 14 women in the humor group also underwent conventional mammography without exposure to the funny video and pain was assessed by VAS. We found that the pain experienced during conventional mammography without the funny video was significantly greater than the pain experienced during the same mammography but with the funny video ( $P = 0.047$ ). These findings suggested the possibility of alleviating pain during mammography by humorous stimuli.

## Keywords

Mammography, Pain Alleviation, Humorous Stimuli, Visual Analogue Scale

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## 1. Introduction

Mammography screening, which is considered to be of the greatest benefit for the early detection of breast can-

cer, is widely performed as a standardized procedure [1] [2]. Mammography is a radiological test during which the breast is compressed by parallel plates to make the breast tissue as even and thin as possible. However, it is well known that mammography screening is physically taxing. Along with compression of the breast, positioning during mammography such as twisting the neck and keeping the arms elevated is burdensome. Many women feel the physical burden during mammography as pain [3]-[7], which may contribute to a woman's feeling of anxiety about the examination [6] [7]. Appropriate techniques for radiography and management of the mammography device to obtain accurate images have been established. This has made it possible to obtain good radiographic images of the breast [8]-[11]. However, studies are lacking on objective methods to measure the physical burden on women and the alleviation of pain during the examination, such studies are needed in the future [12].

Assessments of pain experienced during mammography were made by Sharp *et al.* [13] using a visual analog scale (VAS) [14] [15] and by Hafslund *et al.* [6] using the McGill pain questionnaire (MPQ) [16]. The MPQ could be considered as the most famous pain assessment tool. However, the VAS is perhaps the most widely used instrument for the measurement of pain intensity because it is a simple, robust, sensitive, and reproducible instrument in such a way that it can be given a numerical value to the pain intensity. Furthermore, whereas the VAS takes only a few minutes to be understood and filled in, MPQ administration requires about 15 minutes [17]. Both the VAS and MPQ are methods for subjectively assessing pain. Conversely, Uchiyama *et al.* [18] [19] objectively quantified the physical burden on female subjects by measuring the electrical potential generated by the activation of certain muscle groups, including the trapezius and sternocleidomastoid muscles, which are associated with positioning during mammography. In addition, Uchiyama *et al.* [20] assessed the level of psychological stress by measuring heart rate variability. As to the alleviation of pain, Tabar *et al.* [21] and Markle *et al.* [22] reported on the usefulness of radiolucent cushions, but because these cushions are single-use, their use is debatable because of the high cost. Patient-controlled compression was tested by Kornguth *et al.* [23] as a method to alleviate pain. With this method, one of the breasts was compressed by a radiographer and the other was compressed by the participant. In 71% of the participants, self-compression resulted in significantly less pain than compression by a radiographer without a difference in the adequacy of the image quality and compression of the breast. There are limited options currently available for alleviating pain related to mammography and further research will be needed to address this problem.

As an alternative, non-medicinal approach was reported by Cousins in the 1970s [24], who examined the effects of laughter on physical and psychological wellbeing and the alleviation of pain. Cousins had an incurable disease, which had only a 1 in 500 chance of a full recovery through the medical care available at that time. However, when he had a good laugh by watching a funny film for 10 minutes, he could sleep well without pain for at least 2 hours. Since then, the effects of laughter on the mind and body have been discussed [25] [26]. For example, Adams *et al.* [27] showed that the quality of life improved in the elderly living in a day care facility when they watched humorous films. Rotton *et al.* [28] reported that dosages of drugs to relieve pain were reduced in patients who watched a funny video after surgery. Nove *et al.* [29] and Weisenberg *et al.* [30] showed that pain tolerance, which was measured by the cold pressor test, was significantly increased among patients who viewed a humorous film. These studies indicate that laughter is good medicine for pain.

We therefore considered that the physical burden on women associated with mammography might be alleviated by humorous stimuli and we performed a preliminary study to investigate this possibility. Here we described the experimental method and outcome to validate the hypothesis that humor stimuli could reduce pain sensation during mammography.

## 2. Methods

Volunteers were solicited for this study through poster advertisements, leaflets, and a website. From those who contacted us, we chose 29 healthy women, whose mean age  $\pm$  standard deviation (SD) was  $33.4 \pm 6.5$  years, height was  $158.4 \pm 5.3$  cm, weight was  $53.5 \pm 9.1$  kg, and body mass index was  $21.2 \pm 3.5$  kg/m<sup>2</sup>. Ten of the 29 women had previously experienced mammography, and the remaining 19 had not. The participants were given an explanation of the study objectives, methods, and safety, and their informed consent was obtained. This study was conducted with the approval of the research ethics committee at Graduate school of Health Sciences, Niigata University.

Observation in the study began when the right breast was in final position, which included compression but

excluded X-ray irradiation, for mediolateral oblique (MLO) imaging. Participants were divided into two groups according to whether or not they viewed a video of humorous clips during the procedure. Fifteen participants were designated as the neutral group and 14 were designated as the humor group. The mean force of breast compression was  $122 \pm 12$  N.

We collected some funny clips and then edited them to make a video. It had been confirmed previously that, using the same video, pain tolerance significantly increased when subjects underwent the cold pressor test [29] [30]. Study participants in the humor group watched the video for 2 min on a head-mounted display (Wrap 1200 Video Eyewear, VUZIX, Rochester, NY) at rest and then continuously watched the video during mammography.

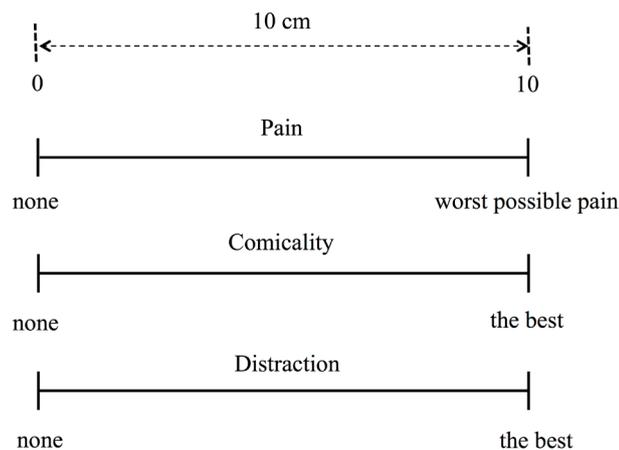
The degree of pain during the mammogram was measured by a VAS shortly after the examination. In the humor group, comicality of the video and distraction along with pain were also measured by VAS. **Figure 1** shows the VAS designed for this study. The VAS was used to assign a score from 0 on the left extreme (no pain) to 10 on the right extreme (worst possible pain) with a possible score of 10 for each element examined. The Mann-Whitney U test was used to determine if differences between the two groups were statistically significant.

### 3. Results

**Table 1** shows the VAS results, and the box-and-whisker plot obtained from the VAS scores indicates the degree of pain (**Figure 2**). The VAS scores indicating the degree of pain in the neutral group and humor group were  $7.3 \pm 2.6$  and  $4.9 \pm 2.2$ , respectively (**Table 1**). The VAS scores indicating the degree of distraction and comicality of the video in the humor group were  $5.8 \pm 2.8$  and  $5.4 \pm 2.1$ , respectively (**Table 1**). Although the difference in pain between the neutral and humor groups was statistically significant ( $P = 0.007$ , **Figure 2**), the Spearman's rank correlation coefficient for pain and comicality was  $\rho = 0.15$ , and the difference between pain and comicality was therefore not statistically significant ( $P = 0.61$ ). Likewise, the Spearman's rank correlation coefficient for pain and distraction in the humor group was  $\rho = 0.19$ , and the difference between pain and distraction in the humor group was not statistically significant ( $P = 0.51$ ).

### 4. Discussion

In general, the funnier the video, the more frequently do people laugh. Our participants appeared to be distracted

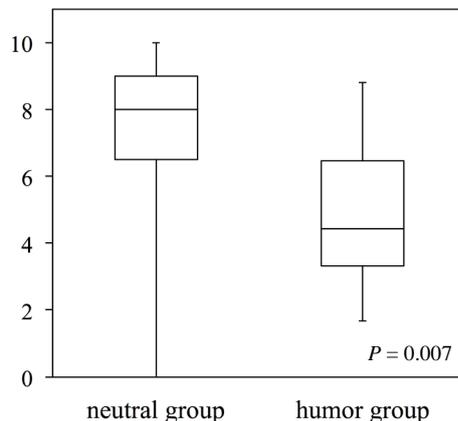


**Figure 1.** Visual analog scale designed for this study.

**Table 1.** Visual analog scale findings in the neutral and humor groups.

	Pain	Comicality	Distraction
Neutral group	$7.3 \pm 2.6$		
Humor group	$4.9 \pm 2.2$	$5.4 \pm 2.1$	$5.8 \pm 2.8$

Values are presented as mean  $\pm$  standard deviation (SD).



**Figure 2.** Box-and-whisker plot obtained from visual analog scale scores indicating the degree of pain in the neutral and humor groups.

by laughing frequently and focusing on the funny video. With regard to the pain experienced during mammography, the difference between the neutral and humor groups was statistically significant, suggesting the possibility of alleviating pain by humorous stimuli. However, we did not find a significant correlation between pain and comicality nor was there a correlation between pain and distraction. One reason for these negative results could be that only one type of video was prepared. We note that this observation is based on the assumption that the degree of pain relief depends on the strength of the stimulus of the humor. In order to prove this assumption, further study is needed. However, it may be that the strength of the humorous stimuli and the degree of pain relief are not correlated such that even a low stimulus level could be sufficient to alleviate pain effectively.

As an additional experiment, 14 women of the humor group also underwent conventional mammography (MLO of the right breast excluding X-ray irradiation) without exposure to the funny video and pain was assessed by VAS. The VAS score was  $5.7 \pm 2.2$ . In the humor group, pain experienced during conventional mammography without the funny video was weighed against pain experienced during the same mammography with the funny video. According to the Student's t-test, the difference between the two was statistically significant ( $P = 0.047$ ). Results of this additional experiment suggest more strongly that humorous stimuli were effective in alleviating pain during mammography.

This study has several limitations. Participants had no choice regarding the type of comical clips they preferred to view and the sense of humor among individuals was not considered. Further, the number of subjects might have not been sufficient to power all of the statistical analyses. We performed the sham mammography by using only MLO of the right breast. Therefore, several independent examinations would be needed to overcome these limitations and they would provide stronger evidence of the effects of humorous stimuli in alleviating pain during mammography.

## 5. Conclusion

We examined the possibility that humor stimuli would alleviate the physical burden on women undergoing mammography. We found that the intensity of pain experienced during mammography was significantly reduced for patients who watched a funny video. Therefore, our findings suggested the possibility of alleviating pain during mammography by humorous stimuli.

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