

# Context Factors in the Lack of Positive Valence System in Women Suffering from Breast Cancer: Therapy Protocol Based on RDoC Framework Domains

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## Abstract

**Introduction:** Breast cancer is one of the diseases which is mostly affected by negative emotions. However, the context factors that leads to lack of positive valence in these patients is not clear. The current study aimed to identify the context factors in the lack of positive valence system in women suffering from breast cancer.

**Method:** Research method was qualitative grounded theory and data was obtained from in-depth interviews with patients at the Motamed Jihad University Cancer Research Institute during 2022. Participants were voluntarily and purposefully selected and sampling continued until data saturation. At the end, 10 individuals participated. Data were coded in three levels according to the Strauss and Corbin method.

**Results:** In relation to the positive valence system, we extracted three theoretical, nine axial and 24 open codes. The theoretical codes contained reward response (with axial codes of reward prediction, initial response to reward and reward saturation), reward learning (with axial codes of prediction error and reward habit) and reward valuation (with the axial codes of uncertainty of risk, delay in reward valuation, frustrated non-reward and attempt to value rewards). Theoretical, axial and open codes were evaluated by experts to obtain internal and structural validity as well as conceptual framework model and therapy protocol that were designed by extracted codes.

**Conclusion:** The possibility of decreasing or increasing the incidence of cancer depends on the presence or absence of the positive valence system. The suggested therapy protocol represented that the positive valence factors enhancement might limit the possibility of breast cancer.

**Keywords:** Breast Cancer, Positive Valence System, Research Domain Criteria, Therapy Protocol

## Introduction

Cancer is one of the major problems and common diseases of human societies and one of the three main causes of death in the world [1]. According to studies, the number of cancer patients are increasing and it is predicted this number will increase to more than 28 million by 2030, with a 50% increase [2]. Cancer is not simply an event with a definite end, but it is an ambiguous permanent situation with the late effects whilst its related psychological issues seem uncertain [3]. People with cancer have characteristics such as denial, suppression, and the emergence of negative emotions, especially anger, lack of expression, and being defensive. These negative emotions have an effect on cognitive abilities by increasing negative coping styles and decreasing problem solving power [4]. This indicates that most cancer patients have a significant level of neuroticism [5,6].

Cancer creates an emotional challenging situation that requires high mental and physical

strength to deal with. Side effects can significantly valence the cancer patient's health and overall quality of life caused by treatment such as changes in body image and fear of recurrence [7]. Therefore, positive emotion regulation is considered as a basic principle in starting, evaluating and organizing adaptive behavior as well as preventing negative emotions and maladaptive behaviors. The role of emotional regulation has been identified in the development and persistence of some diseases, including mental diseases and psychosomatic diseases. Inability to regulate emotions or dysfunctional emotion regulations can lead to worsening health problems [8,9]. In addition, new hypotheses such as emotional-excitement regulation suggest that emotional inhibition can intensify pain or a small discomfort so that even the lack of expression of emotions may facilitate the development of cancer [10]. It seems that the use of incompatible strategies in the regulation of emotions causes the occurrence of some psychological problems such as depression, anxiety, aggression and violence, and in this way, the person would be susceptible to diseases by affecting the amount of stress received and reducing the efficiency (immune system). Actually, it leads them to acute and chronic physical diseases such as cancer.

The theoretical framework has been introduced to investigate emotional disorders as a complementary diagnostic system in the field of Research Domain Criteria (RDoC) [11]. The RDoC domains include negative valence, positive valence, cognitive, social processing, arousal regulation, and sensory/motor systems [12]. The positive valence system has the structure of responding to reward, valuing reward and learning reward [13,14]. In this regard, the streaks of negative valence system (neurotic/behavioral inhibition) and positive valence system (extroversion/behavioral activation) are probably biological vulnerability factors in the development of emotional disorders [15].

Emotional disorders, such as negative and positive valence systems, are health-debilitating outcomes in cancer patients. Doctors and nurses seek to treat any negative psychological structure that is created in patients in order to increase their optimism, resilience, self-acceptance and cheerfulness [16]. The hypothesis that psychological factors related to stress have effects on the initiation and progression of cancer has been the focus of many researchers for a long time. Depressed mood is one of the important issues in cancer patients, which is associated with feelings of hopelessness and despair, lack of motivation towards life, and reduced ability to cope with diseases, including cancer. Also, the presence of a stressful factor can affect the functioning of the body's immune system in a different way. Acute stress can activate stress-related hormones by warning threats to increase the body's function, whereas chronic stress causes depression, exhaustion, suffering and illness [6,17,18]. The research concern in this study was to investigate the underlying factors in the lack of the positive valence system in cancer patients that have not been properly represented. Based on previous studies, we know so far that cancer sufferers face an increase in the

negative valence system and a decrease in the positive valence system, and these factors are effective in aggravating the disease by themselves [19]. However, the question of how people with cancer have lived in terms of positive and negative valence systems in the last few years of their lives, is in an area of ambiguity. According to literature, many studies have revealed that cancer sufferers have been involved in stress and tension for a long period of time. But how have these people identified and learned internal and external rewards during life? How have they valued the reward? How do they respond to it? How do they expect it and hope to get it? The response to all these questions are still unclear. We currently have various positive treatments such as resilience, optimism, hope, etc. in positive psychology approaches, and we randomly use them to improve the psychological state of people with cancer. However, the issue that needs to be addressed is the precise identification of the underlying factors in the lack of positive emotion so that a specific treatment model can be provided for these patients.

Suffering from cancer raises many challenges. Cancer is one of the chronic and life-threatening diseases and causes emotional and psychological disorders and a significant decrease in the quality of mental health in patients. Therefore, the diagnosis and treatment of cancer leads to the question of whether underlying factors cause the lack of positive valence system in sufferers. Reflecting on the points raised, positivity training will not go anywhere without paying attention to the positive valence system context factors that is emphasized in the RDoC framework. Previous studies have not determined the underlying factors of the lack of positive emotions in people with cancer (lack of reward, lack of hope and lack of value, etc.) before getting cancer. Therefore, the special treatment protocols based on the extracted dimensions is necessary for the treatment of emotional problems of cancer sufferers. This study attempted to explore the underlying factors in the lack of positive valence system in women suffering from breast cancer, and in this regard, the researchers aimed to design a therapy protocol based on the extract conceptual framework.

## Method

The current research was qualitative with a grounded theory approach based on the main concepts of the Strauss and Corbin method [20]. The data was obtained through in-depth interviews based on the underlying factors of the lack of positive valence system in women suffering from breast cancer who referred to the Motamed Jihad University Cancer Research Institute in Tehran Province during 2022. Participants were selected purposefully and the interviews continued until the data saturation (Ten participants participated in the study). The entry criteria of the research included women between the ages of 30 and 50 years old, medical diagnosis of breast cancer, and low positive valence system score. Considering data saturation, a sample of ten patients finally participated in this study. Although the data reached saturation from the sixth interviewee onwards;

however, the interviews continued until the tenth participant.

In the discussion of the ethical considerations of the research, the factors were observed such as the consent of the interviewees, confidentiality of their personal information, ensuring that the participants were protected from any life and moral risks, and finally presenting the research results if each of the participants wishes.

In regards to ethical considerations, this research has been approved by the ethics commission of the ministry of health at Al-Zahra University numbered 1400.080.IR.ALZAHRA.REC.

The tool used in this study is as follows:

Multi-dimensional Emotional Disorders Questionnaire (MEDI): This questionnaire was developed by Rossellini to obtain self-reported information on emotional disorders [20]. The MEDI has 55 items and a cut point of 220. The participants had to answer the questionnaire with an eight-point Likert spectrum, so that scores were between "never matches = zero" and "completely matches = 8". One of the MEDI's subscales is positive affect with 23 cut-off point. In the validation study, the convergent validity between the list of mental disorders symptoms based on DSM5 and MEDI was 0.63 for depression, 0.67 for anxiety and 0.43 for OCD. The convergent validity between MEDI and Maudsley's obsession, Beck's depression and Spielberg's anxiety questionnaires were 0.72, 0.75, and 0.78 Respectively in Iran. Cronbach's alpha coefficient was also reported to be 0.85 [21].

The data including open, axial and theoretical codes were extracted in three levels through triangulation validation process in relation to the positive valence system. After extracting the three-level codes and validating them, a conceptual framework model was extracted and validated. During the research process, the method of content validation was used to check the validity of the three-level codes and the conceptual model. They were presented alternately to six experts in the field of psychology, family counseling and cancer psychology (two experts from each area) to measure their credibility. At each stage, the six experts were asked to select the options "completely relevant", "relevant but need to revision", "requires major revision" and "completely irrelevant" based on the evaluation list. The Content Validity Index (CVI) was obtained above 0.83 based on the Lavshe model for three-level codes and conceptual model in the role of positive valence system in the probability of getting cancer. In the following formula,  $ne$  is the number of evaluators who have chosen completely relevant and related options but need to be revised, and  $N$  is the total number of evaluators. When the obtained result is higher than 0.79, it will have high validity [22]. It was approximately 0.83 for three level codes, 0.78 for conceptual framework and 0.75 for therapy protocol according to the formula:  $CVI = ne/N \Rightarrow 5/6$

## Results

The mean of participants' age was 42.35. Their positive mental capacity was lower than the cutoff point 23 measured by MEDI questionnaire. Three participants had

a diploma, five had a post-graduate diploma, and two had a bachelor's degrees. The results obtained in the three-level codes show the main codes of the positive valence system in women suffering from breast cancer have been presented in Table 1.

The above model has been extracted and designed based on the three-level codes through in-depth interviews of open, axial and theoretical codes related to context factors of the lack of positive valence system in women with cancer.

Table 2 represents there is a possibility of reducing the incidence of cancer by increasing positive mental capacity according to the extracted conceptual model.

## Discussion

The present study was purposed to underlay the factors of the lack of positive valence system in women suffering from breast cancer. The results of this study were gathered by extracting and analyzing the data obtained from the in-depth interview. Researchers have tried to identify the underlying factors of the lack of positive valence system in women suffering from breast cancer through in-depth investigations. At the same time, findings lead us to extract a therapy protocol to improve the positive valence system. This protocol is important to improve the quality of life, mental and physical health and simultaneously to improve the social, personal, and family relationships of cancer patients. The finding of this study have been listed as below:

Firstly, the theoretical codes of the positive valence system included reward response, reward learning and reward valuation. Regarding the axial codes related to the positive valence system's theoretical codes, mostly conflicting open codes were seen. For example, in the case of reward response, axial codes were determined including reward anticipation, initial response to reward, and reward saturation, which showed complete alignment with Cuthbert's findings [14]. Those who predicted the reward correctly and were satisfied with it, had a better psychological state. This finding was seen in participants five, two and six, who had more hope for treatment and even their physical symptoms were better than other participants after each chemotherapy session. In line with Boullis et al.'s study, biological injuries were affected by emotional disorders. Actually, people with positive emotions show fewer physical problems [15]. In contrast, reward prediction error, failure to respond to reward, and lack of satisfaction with reward were the underlying factors of pressure and stress in the participants. According to participants three, seven and one, we realized deep stress when defining the life situation of participants. We can explain that patients may fail to evaluate small rewards and encouragements of their environments. They had marital discords, lack of fun, hardworking and gradually, metastasizing cancer. It seems that living in a stressful and negative environment, can involve people with cancer to a greater extent. In line with this finding, Michalczyk et al. also confirmed that negative emotions affect the amount of received stress and damages the immune system [10]. Indeed, the

immune system in cancer patients is one of the most important treatment priorities. The abundance of T cells in the immune system can be a good predictor for the destruction of cancer cells and can actually control them in the condition of metastasis. Reciprocally, stress plays an

important role in reducing these type of cells [23]. Therefore, it seems necessary to have a high immune system through the promotion of positive valence by training to respond, to learn and to evaluate the small rewards of life.

**Table 1.** Three-level Codes Related to Positive Valence System in Women with Breast Cancer

Theoretical code	Axial code	Open code	Sentences	Interviewee	
Reward Responsiveness	Reward prediction	Positive reward prediction	It makes me feel better when I play with my daughter. Because for a few minutes I become like my children.	5	
		Wrong reward prediction	This year's checkup, I found out that my cancer has metastasized to my spine, those hard periods of treatment came again.	3	
	Early response to reward	Positive answer to reward	Sometimes a kind word makes me feel better.	2	
		Failure to respond to rewards	I had many disagreements with my wife; I had and still have a stressful life.	1	
	Reward saturation	positive rewards saturation	I don't expect the people will be grateful to me, but they are always kind with me.	6	
		Lack of reward saturation	I felt neglected, like a tool or a device that had to work all the time	7	
	Reward learning	Reward prediction error	Support prediction error	Sometimes my family make me feel good in chemotherapy, but they are busy with their own work. It is not continuous	6
Respect prediction error			In life, I felt that no one paid attention to my personality.	8	
Predicting future risk			Since the end of my treatment, I am afraid that my cancer will come back.	7	
Pity prediction error			I am afraid that others will sympathize with me and do something for me out of pity.	3	
Body image error			I didn't like being with my wife anymore because I felt like my face was ugly, my body was thin and my skin was ruined due to chemotherapy.	5	
reward habit		Positive reward habit	I expect to be admired; Even if it's a small thing that I do in a situation.	10	
		Lack of reward habit	I didn't feel like going somewhere alone to get myself out of this state of mind.	4	
Reward valuation		Uncertainty of risk	Uncertainty of disease's cause	I said to myself, with all these problems in life, I don't know what this disease was that I got?	3
			Uncertainty of death	What will happen to the children, if I die in this condition?	1
			circumstances	You have to constantly worry that the next time the answer will be positive?	7
	Delay in reward valuation	Delayed getting money	I had the financial problems in my life.	1	
		Delayed obtaining treatment	I don't have time to go to counseling because the treatment of this disease takes a lot of energy.	3	
		Delayed access to recreation	I no longer have time and money for fun and travel.	9	
	Frustrated non-reward	Loss	I felt lonely, I didn't have a good wife to give me energy.	5	
		Failure	I was frustrated because of all the problems that made me unable to control my life.	3	
	Attempt to value rewards	Extrinsic rewards strive	I always try to be good even in difficult situations, so that others can be happy with me.	6	
		Intrinsic rewards strive	I want to go back to work. I want to be active again.	5	
Failure to valuation		I went to a psychiatrist and took sedative pills, but it doesn't have much effect on my mood.	8		

Note. The theoretical codes of the positive valence system are "reward responsiveness, reward learning and reward valuation".

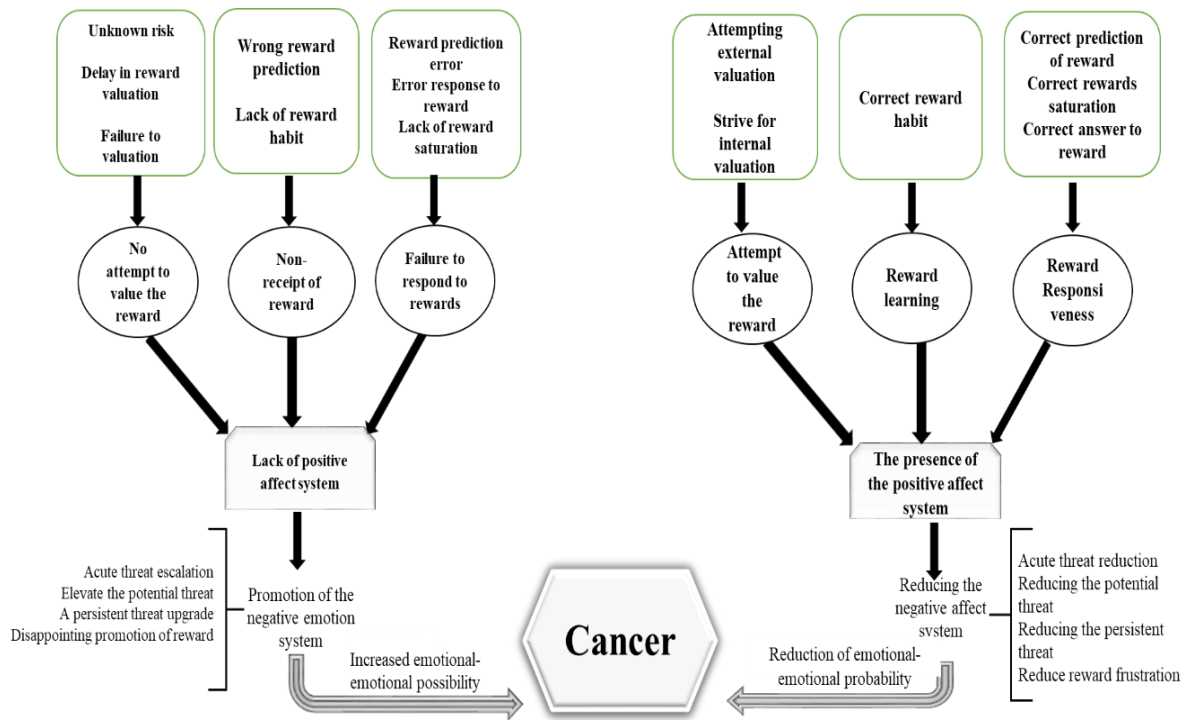


Figure 1. Conceptual framework model: The role of positive and negative valence systems in the affective-emotional probability of cancer.

Table 2. Therapy Protocol for Treatment of Positive Valence System in Breast Cancer

Session	Title	Purpose	Techniques	Exercise
1	Getting Familiar with affective system Getting to know the levels of the positive and negative valence systems	Finding reward predictors	Examining affect symptoms and levels of positive and negative valence system, Review and explanation of reward predictors	Mindfulness in reward anticipation
2	Learning to predict rewards and reward response	Promote responding to reward	Investigating aspects of reward prediction that have enlightened life. Strengthening positive present patterns	Mindfulness in response to reward. Designing a lack of optimism table. Focusing on self-positive roles in daily life
3	Promotion of reward learning	Review the response to the reward Searching for sources of reward saturation	Saturating and informing the clients in patterns of creating rewards	Mindfulness of creating saturated images of happiness, friends, family,... etc.
4	Eliminate reward learning errors	Learning the right rewards	Teaching the emotional and mood causes of cancer, Brain function, rumination and negative thoughts. Training in finding sources of respect and support Focusing on possible positive factors in the future	Focusing on and listing the context of healthy thoughts, positive future, supportive resources and respect
5	Finding habits	Promoting the reward habits, Finding and solving wrong and negative habits	Identifying the cycle of wrong habits, the habits of paying attention to the sources of admiration and affection and being caressed, paying attention to pleasant and correct situations	Reverse habit exercises Meditation and visualization to reverse habits
6	Probability of searching reward	Increasing the reward probability, enhancing the reward probability valuation	Create and list resources to enhance the positive valence system or reduce the negative valence system	Completing the list of bonus resources
7	Valuing resources probability of intrinsic reward	Reviewing the list of possible sources Learning to don't have delay in reward valuation	Valuing the list of potential reward sources and developing the hope for gaining reward	Listing the possible sources of extrinsic and intrinsic rewards
8	Establishing a close connection between sources of internal and external rewards	Create a documented plan in the medical record	Checking the process of changes in affective-emotional symptoms	Close connection between internal and external sources of reward Developing self-commitment to do the exercises



Reward learning, the next theoretical code, is considered to be one of the main codes in the promotion of positive valence. Its axial codes were reward prediction error and reward habit. We observed that participants made large errors in predicting support, respect, pity, body image, and danger as reward prediction errors. This represents that patients struggle with negative feelings of rejection and avoidance. They constantly assess that they are not accepted as a lovely person. This negative view activates the possibility of negative emotions such as severe worries about the future. Whereas, in the open code of "lack of reward habit", we observed that some participants did not mention it is their right to be praised and unfortunately it seems that they are not used to being praised. On the contrary, there was an opposite perception in participant number ten. She attended all the chemotherapy sessions very elegantly and regularly. When the doctor interviewed her, she explained with a smile and carefully, and she reacted with joy and happiness to any praise given to her. One of the statements that was heard from her several times was: "I expect to be noticed and approved even in the smallest cases, and I do the same to others". Getting used to reward habit, as opposed to forgetting the reward throughout life, plays an important role in creating and sustaining positive emotions. She was also in a better state in terms of treatment status. This shows that a person should be able to increase the expectation of being encouraged and not to be disappointed. This finding is in line with the findings of previous studies that cancer sufferers have a sharp drop in positivity and are overwhelmed by a lot of despair after enduring difficult conditions of treatment [4-6].

Reward valuation as a theoretical code, which included four axial codes of uncertainty of risk, delay in reward valuation, frustrated non-reward and effort to reward valuation showed aspects of reward valuation of cancer sufferers. Regarding the uncertainty of risk, the extracted open codes declared that cause of illness, death, and future experiences were deeply unclear among the different issues that attracted the attention of the sufferers. Waiting for death and waiting to receive worse news about the illness causes a lot of stress in patients. In the meantime, patients who focused more on these areas endured a worse condition during their treatment. This is while the right thing to do in this situation is to shift the attention point from the uncertainty of risk to more positive and reasonable experiences, such as paying attention to progress, focusing on spirituality, finding ways of positive communication for peace and love etc. In line with this finding, Alcalá et al. [24] suggested that focusing on past negative events reduces the level of mental health in women suffering from breast and cervical cancer. When the uncertainty of risk is combined with the delay in reward valuation, it creates worse psychological effects in sufferers. Factors such as delay in getting money, treatment, and lack of entertainment seriously threaten the mental health of cancer sufferers all together with other problems in daily life. In underdeveloped countries, where proper and adequate services are not

available to citizens in terms of medical and support services, this fear becomes a big challenge in cancer patients, which significantly reduces the level of mental peace and positive energy [25]. In the meantime, people who appreciate every internal and external reward are considered to have hardiness traits and can face unexpected challenges more than others [26]. This phenomenon was seen more in participants five and six. Compared to participant eight, who showed a gross failure in valuing, these two participants would do anything even as simple, applying make-up on the hospital bed, joking and laughing, praying and meditating to become happy. Subsequently, they were not comparable with participant number eight in terms of treatment progress, who was completely sad, without energy, fell on the bed and kept in deep silence. Consistent with this finding, Moeinvaziri [17] confirmed that positive thinking training reduces perceived stress and death anxiety among women with breast cancer, which is completely related to the effort to obtain internal and external rewards against the feeling of failure. According to the conceptual model, two strategies have been presented to increase or decrease the probability of cancer in people. In terms of reducing the probability of getting cancer, we are faced with people who have the positive prediction of encouragement, the positive saturation of encouragement in their lifestyle, and positive answering to rewards. The presence of all the extracted codes together indicates the possibility of positive valence system in a person's lifestyle. Also, there is no response to reward in people's lives before getting cancer. They are not emotionally provided and approved, and they do not properly receive love and encouragement in their lifestyle. In general, the prevalence of these cues indicates the lack of a positive valence system or it has faded in the life of these patients. According to literature, the probability of getting cancer in these type of individuals seems to be increased. Therefore, we have tried to design a positive valence system training protocol in the treatment of emotional disorders caused by cancer by using the above conceptual model.

This research faced some limitations. For example, we encountered the lack of similar qualitative studies according to the RDoC domains regarding emotional disorders of people with cancer. Moreover, this research was only conducted on women suffering from breast cancer, and it was not possible to examine patients specially men who had other types of cancer. It is suggested that the future pilot studies on the effect of positive valence system training should be carried out specifically for cancer sufferers and the life experience of them should be studied in the follow-up stages after the training period. This is due to the fact that the lack of positive mental capacity is one of the factors that has a negative effect on the treatment process of cancer patients. Certainly, more studies regarding the development of positive valence system training for cancer sufferers are needed to enrich the results of the present study.

## Conclusion

The possibility of decreasing or increasing the incidence of cancer depends on the presence or absence of the positive valence system. In this regard, we extracted three theoretical, nine axial and 24 open codes. The theoretical codes contained reward response (with axial codes of reward prediction, initial response to reward and reward saturation), reward learning (with axial codes of prediction error and reward habit) and reward valuation (with the axial codes of uncertainty of risk, delay in reward valuation, frustrated non-reward and attempt to value rewards). It can be concluded that, those who predicted the reward correctly and were satisfied with it, had a better psychological state. In contrast, patients may fail to evaluate small rewards and encouragements of their environments. Reward prediction error, failure to respond to reward, and lack of satisfaction with reward might be the underlying factors of pressure and stress in the participants. Whereas shifting the attention point from the uncertainty of risk to more positive and reasonable experiences, such as paying attention to progress, focusing on spirituality, finding ways of positive communication for peace and love may increase positivity in breast cancer patients. The suggested therapy protocol represented that the positive valence factors enhancement might limit the possibility of breast cancer.

## Conflict of Interest

The authors declare that they have no conflicts of interest and no financial benefits from this study.

## Ethical Approval

All ethical considerations were applied in this study.

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