DOI: http://dx.doi.org/10.22122/ijbmc.v9isp.418 Published by Vesnu Publications

International Journal of Body, Mind and Culture

The Effectiveness of Semantic Therapy on Death Anxiety, Pain Catastrophizing, Chronic Pain Acceptance, and Pain Intensity in Patients with Breast Cancer

Nathera Hussin Alwan[1], Kahtan A. Mohammed[2], Abdullah Shakir[3], Mohammed Kadhim Abbas Al-Maeeni[4], Mostafa Hsan Elwan[5], Nazar Abd-al-gaffar Rsen[6], Maytham T. Qasim[7]

[1] Department of Nursing, Al-Zahrawi University College, Karbala, Iraq
[2] Department of Medical Physics, Hilla University College, Babylon, Iraq
[3] College of Dentistry, The Islamic University, Najaf, Iraq
[4] Al-Nisour University College, Baghdad, Iraq
[5] Department of Pharmacy, Ashur University College, Baghdad, Iraq
[6] Al-Esraa University College, Baghdad, Iraq
[7] Department of Anesthesia, College of Health and Medical Technology, Al-Ayen University, Thi-Qar, Iraq

Corresponding Author: Nathera Hussin Alwan*; Department of Nursing, Al-Zahrawi University College, Karbala, Iraq*
Email: natherahussin.alwan@g.alzahu.edu.iq

Quantitative Study

Abstract

Background: Breast cancer is the most emotionally and psychologically affecting cancer among women, causing the patient to experience profound emotional and psychological difficulties. The present study aimed to examine the effectiveness of semantic therapy on death anxiety, pain catastrophizing, chronic pain acceptance, and pain intensity in patients with breast cancer.

Methods: The current study was a quasi-experimental research with a pre-test, post-test, and follow-up and a control group. All patients with breast cancer referred to King Fahad General Hospital in Jeddah, Saudi Arabia, in 2019, comprised this study's statistical population of 218 individuals. Simple random sampling was used to select the statistical sample. Thus, 60 individuals were selected and divided into two groups. The experimental group was administered the intervention via semantic therapy. Two months after the post-test, the groups underwent a follow-up examination. The repeated measures analysis of variance (ANOVA) was performed using SPSS software.

Results: Semantic therapy positively affected dependent variables, including death anxiety ($F = 52.067$, $P < 0.001$), pain catastrophizing ($F = 124.569$, $P < 0.001$), chronic pain acceptance ($F = 46.034$, $P < 0.001$), and pain intensity ($F = 156.413$, $P < 0.001$).

Conclusion: Semantic therapy decreases death anxiety, pain catastrophizing, and pain intensity, while increasing chronic pain acceptance.

Keywords: Semantics; Breast cancer; Anxiety; Pain catastrophizing

Citation: Alwan NH, Mohammed KA, Al-Maeeni MKA, Elwan MH, Rsen NA, Qasim MTI. **The Effectiveness of Semantic Therapy on Death Anxiety, Pain Catastrophizing, Chronic Pain Acceptance, and Pain Intensity in Patients with Breast Cancer.** Int J Body Mind Culture 2022; 9(Special Issue): 72-81.

Received: 01 June 2022
Accepted: 26 June 2022

Introduction

The nature of breast cancer is such that it jeopardizes the personality and identity of women with the disease. It also exposes them to issues such as stress and anxiety, depression, hopelessness, feelings of social isolation, fear of the spouse's reaction if married, worries about marriage if single, fear of death, and dread of infertility (Bauer, Wehland, Infanger, Grimm, & Gombocz, 2018). Breast cancer is the most prevalent and emotionally and psychologically impactful cancer among women, causing profound emotional and psychological difficulties for the patient and her family (Du et al., 2021). According to research, cancer causes psychological distress in these patients, which affects their immune status and treatment duration. Up to a year after diagnosis, many patients with cancer exhibit a negative or depressed mood and a lack of or decrease in positive emotions (Shi et al., 2020). Chemotherapy drugs, like other drugs used to treat patients with cancer, are associated with various side effects, including weakened bone marrow, oral mucosa, hair loss, and nausea. These complications induce severe emotional stress in patients, disrupting their social, physical, and other activities. Given the far-reaching effects of cancer on all aspects of patients with cancer, attention must be paid to death anxiety, pain catastrophe, pain acceptance, and pain intensity in patients undergoing treatment (Nemoto et al., 2020).

Patients with cancer experience chronic stress, multiple physical, psychological, and social disorders, and diminished psychological traits. Consequently, one of the therapeutic aspects for patients with cancer is to focus on improving their psychological states (Wang, Chang, Sheu, & Tsai, 2018). Over the past few decades, treating chronic physical ailments, such as cancer, has shifted from economically viable physical and pharmacological therapies to multidimensional physical-psychological perspectives and therapies. To combat cancer, people with this disease must undergo positive changes, which, among other treatments, can be referred to as therapy in this area (Mihaylov, Nisheva-Pavlova, & Vassilev, 2019).

Semantic therapy aims to enable the patient to discover his life's unique meaning and define his limits, powers, and liberties (Sanchez et al., 2013). The results of chronic pain research indicate that the various treatments used for patients have not been particularly effective, with most statistics about biologic therapies such as surgery or drug therapies (Jebahi, Sharma, Bloss, & Wright, 2021). In fact, in addition to the lack of efficacy of these treatments, the side effects of drug use and the risk of drug addiction resulting from their continued use are additional problems associated with their application (Jebadas, Sivaram, Vidhyasagar, & Kannan, 2022). Patients with chronic pain sometimes insist on locating a method of pain management (Baskici, Atan, & Ercil, 2019).

Fear of the unknown and instinctive fear of death is a natural reaction that contributes significantly to the continuation of human life. Death anxiety is an abnormal and severe fear of death in which a person experiences apprehension, worry, or fear associated with death and dying (Kim et al., 2018). As a result, contemplating death is an essential part of human life, and people's intellectual preoccupation with it has been accompanied by fear and anxiety about it. Death anxiety is typically caused by inexperience, which is why humans seek to suppress and deny it (Daowd, Barrett, Abidi, & Abidi, 2021). Although death anxiety is a general phenomenon, social and religious sociological conflicts and individual worldviews play a role in intensifying or decreasing it (Hoar et al., 2021).

Pain is the most prevalent symptom of cancer that can impair a patient's

performance and quality of life. According to research, psychological interventions can reduce chronic pain, coping strategies, destructive behaviors, and stress levels. Depending on the type and stage of cancer, 70% of patients experience excruciating pain (Alonso-Calvo et al., 2017). Pain is a distressing sensory and emotional experience associated with the possibility of harm. The function and quality of life of patients with cancer are impacted by cancer-related pain. For better and more optimal performance, patients with cancer also require pain management skills (Datta, Bernstam, & Roberts, 2019). Pain management skills affect various aspects of a person's life, including personal fear interactions, mental health, and physical health, making individuals more realistic and effective. Included in this variable are pain catastrophe, pain acceptance, and pain intensity (Wu et al., 2019).

Catastrophizing is an exaggerated focus on the intensity of pain, psychological helplessness, and its negative outcomes. As an intermediate variable, catastrophizing plays an important role in chronic pain (Shahbazi, Moraveji, Keramati, Ghobadi Davod, & Noor, 2020). Cognitive definitions of catastrophic mechanism as the first active mechanism in patients with pain experience appear useful for interpreting the function of other pain-related variables, such as pain intensity (Menzies, Zuccala, Sharpe, & Dar-Nimrod, 2018). In actuality, catastrophizing as a negative and exaggerated thought process in response to actual or anticipated pain causes the development of pain and disability (Ing et al., 2018).

The use of psychological and psychotherapeutic interventions to improve the psychological status of women with breast cancer is necessary due to the global prevalence of breast cancer and the extensive impact on all aspects of these patients' lives. The current study aimed to examine the effectiveness of semantic therapy on death anxiety, pain catastrophizing, chronic pain acceptance, and pain intensity in patients with breast cancer.

Methods

The current study was a quasi-experimental research with a pre-test, post-test, and follow-up and a control group. The statistical population for this study consisted of 218 individuals, including all patients with breast cancer referred to King Fahad General Hospital in Jeddah, Saudi Arabia, in 2019. Sixty people were selected by simple random sampling and divided into two groups. The intervention was administered to the experimental group via semantic therapy. Two months following the post-test, the groups were subjected to a follow-up. Breast cancer and its confirmation by a clinical specialist based on laboratory findings, no other interfering or aggravating physical illness, having at least a diploma, and no major psychiatric disorder were all inclusion criteria. The exclusion criteria were the absence of more than two sessions in treatment sessions and the emergence of an interfering physical or psychological disorder in the research results. Individuals were divided into two experimental groups (thirty people) and a control group (thirty people) after explaining the plan, obtaining consent, and completing the consent form based on a random list. As part of this study's ethical considerations, the information about these people was kept secret after the samples were chosen. It was explained during a meeting that this information would remain confidential until the end of the work, and written consent was obtained from patients.

Semantic therapy was used as an independent variable in this study, and death anxiety, pain catastrophe, pain intensity, and pain acceptance were used as dependent variables. Following a pre-test for both groups, semantic therapy was

considered for ten sessions, each lasting 60 minutes for the experimental group. The control group received no intervention. Following the sessions, all participants were re-evaluated and completed questionnaires in the post-test phase. Both groups were given a two-month follow-up to evaluate the treatment.

The Death Anxiety Questionnaire is most commonly used to assess death anxiety (Templer, Ruff, & Franks, 1971). This questionnaire has fifteen questions with two answers: correct or incorrect. It gives a score between zero and one; the higher the score, the greater the level of death anxiety. Tang et al. (2011) reported a 0.76 validity for the questionnaire and a 0.30 to 0.74 correlation for each question with the total test score, with an average of 0.51 for the elderly and 0.44 for students. The internal consistency of the questionnaire was investigated in this study by calculating Cronbach's alpha, which was equal to 0.76 for the entire questionnaire. Furthermore, the correlation between the questionnaire questions and the total score ranged from 0.31 to 0.62.

The Pain Catastrophizing Scale consists of thirteen questions that are scored on a five-point scale and measure the three subscales of mental rumination, magnification, and helplessness (0 to 52) (Sullivan, Bishop, & Pivik, 1995). According to Akbas et al. (2021), rumination accounted for 4% of the total variance, magnification accounted for 10%, and helplessness accounted for 8% of the total variance. Cronbach's alpha coefficients for mental rumination, magnification, and helplessness subscales were 0.83, 0.62, and 0.76, respectively. The total Cronbach's alpha coefficient in this study was 0.77.

The Chronic Pain Acceptance Questionnaire (CPAQ-20) is a 20-item questionnaire with a Likert scale of 7 points (Vowles, McCracken, McLeod, & Eccleston, 2008). This questionnaire assesses chronic pain acceptance through two subscales: activity involvement (eleven phrases) and pain tendency (nine phrases). The questions are graded on a scale from zero (not at all) to six (extremely involved). Furthermore, the total score of chronic pain acceptance, calculated by adding the scores from the full scale, can range from 0 to 120, with higher scores indicating greater pain acceptance. Cronbach's alpha was reported to be 0.87 in Xu et al. (2019) study, and the retest coefficient was reported to be 0.72. Convergent validity has also been confirmed in the study of pain self-efficacy correlation and divergent validity by calculating the correlation with physical disability, depression, anxiety, pain intensity, and catastrophe. In this study, Cronbach's alpha was 0.79, and the retest coefficient was 0.71.

The Multidimensional Pain Inventory is based on the cognitive-behavioral pain theory, supported by numerous studies (Kerns, Turk, & Rudy, 1985). This questionnaire is divided into three sections, each containing several subscales. The first section contains twenty terms, five of which are pain intensity including, daily dysfunction, life control, emotional distress, and social support subscales. The second section contains fourteen phrases in which the patient evaluates the reaction of those around him who play a role in his life to the pain he is experiencing in the form of three subscales of negative reaction, diverting attention from pain, and showing compassion. The third section contains eighteen terms, four subscales, and the frequency of patient activities such as housekeeping, home maintenance, and outdoor activities. Questions are scored on a Likert scale of 0 to 6. Zaza et al. (2000) reported the internal reliability of its subscales based on Cronbach's alpha coefficients ranging from 0.74 to 0.89. Cronbach's alpha coefficient was 0.79 in this study.

It is also worth noting that the current study used SPSS software (version 21, IBM Corporation, Armonk, NY, USA) for the repeated measures analysis of variance (ANOVA).

Results

The mean ± standard deviation (SD) of age of the experimental group was 48.71 ± 5.83, while that of the control group was 49.61 ± 6.37. The information in table 1 pertains to the demographic characteristics of the groups.

Table 2 displays the values of the variables at various stages for each group.

As shown in table 2, the experimental and control groups had different levels of anxiety about death and pain catastrophes and levels of acceptance of pain and its intensity. Table 2 shows that the experimental group's intervention positively affected the dependent variables. Pre-test, post-test, and follow-up stages were identical in the control group.

Table 3 displays the outcomes of the repeated measures ANOVA for the variables under study.

According to table 3, semantic therapy positively affected dependent variables, including death anxiety, pain catastrophizing, chronic pain acceptance, and pain intensity. Therefore, it can be stated that due to the application of independent variables (intervention by semantic therapy), there was a significant difference between the experimental and control groups regarding the value of dependent variables.

Bonferroni post-hoc test was done for comparing the time, and the results are presented in table 4.

According to table 4, the pre-test phase differed significantly from the post-test and follow-up phases for all variables studied. Moreover, a comparison of the post-test and follow-up phases revealed that none of the aforementioned factors differed significantly.

Discussion

The current study aimed to assess the impact of semantic therapy on death anxiety, pain catastrophizing, chronic pain acceptance, and pain intensity in patients with breast cancer. The results demonstrated a significant difference between the experimental and control groups after that semantic therapy was administered to the experimental group. Therefore, it can be concluded that semantic therapy reduces death anxiety, pain catastrophizing, and pain intensity in patients with breast cancer, while increasing the variable of chronic pain acceptance. In recent years, other researchers have conducted numerous studies consistent with the findings of the study (Alonso-Calvo et al., 2017; Badve & Nakshatri, 2012; Jebadas et al., 2022; Oyelade, Obiniyi, Junaidu, & Adewuyi, 2018; Sanchez et al., 2013).

Patients with chronic diseases, such as women with breast cancer, experience increased pain, suffering, loneliness, and reliance on others as the disease progresses.

Table 1. Comparison of groups' demographic characteristics

Demographic variables		Experimental group [n (%)]	Control group [n (%)]
Marital status	Single	4 (13)	2 (7)
	Married	26 (87)	28 (93)
Age category (year)	40-45	5 (17)	4 (13)
	46-50	16 (53)	15 (50)
	51-55	9 (30)	11 (37)
History of cancer (year)	< 5	11 (37)	7 (23)
	5-10	14 (46)	17 (57)
	> 10	5 (17)	6 (20)
Education level	Diploma	18 (60)	21 (70)
	Undergraduate	12 (40)	9 (30)

Table 2. The results of death anxiety, pain catastrophizing, chronic pain acceptance, and pain intensity

Variable	Group	Pre-test (mean ± SD)	Post-test (mean ± SD)	Follow-up (mean ± SD)
Death anxiety	Experimental group	12.17 ± 1.39	5.82 ± 1.19	6.71 ± 1.28
	Control group	12.43 ± 1.54	12.04 ± 1.13	11.49 ± 1.62
Pain catastrophizing	Experimental group	42.19 ± 2.58	34.73 ± 2.18	35.41 ± 2.64
	Control group	44.06 ± 2.79	44.57 ± 2.51	42.84 ± 3.17
Chronic pain acceptance	Experimental group	89.47 ± 6.42	96.72 ± 6.59	95.43 ± 6.63
	Control group	87.13 ± 6.19	86.54 ± 5.73	86.19 ± 6.74
Pain intensity	Experimental group	92.75 ± 6.41	83.29 ± 5.76	83.54 ± 5.82
	Control group	91.93 ± 6.13	92.51 ± 6.48	91.48 ± 6.27

SD: Standard deviation

Death elicits both fear and excitement, and because no one has ever experienced or touched death, contemplating it causes anxiety. Fear, threat, worry, sadness, and other anxiety-related negative emotional reactions that affect mental health and hope are examples of death anxiety (Martial et al., 2019). Death anxiety is a negative emotional response triggered by the prediction of a person's death. This type of anxiety is a natural phenomenon influenced by social and cultural events in life and without which, human life is jeopardized; however, when it exceeds its normal range, the person becomes helpless (Menzies et al., 2018). As a result, because these patients are usually alone with death and consider death with them, they believe that their treatment is not producing the desired results. As a result, in addition to being frustrated and depressed by their treatment, they seek spiritual solutions for relaxation. People who can establish a safe and enjoyable spiritual relationship have less fear and anxiety about death and experience less depression (Datta et al., 2019). Death anxiety is accompanied by emotions such as panic or dread when contemplating the dying process or what occurs after death. Finding death's meaning and understanding it can help patients overcome their fears and improve their mental health (Cho & Cho, 2022). This study demonstrates that semantics can reduce death anxiety in patients with breast cancer.

Catastrophizing is a significant factor in the experience of pain. Pain catastrophizing beliefs are thoughts that constantly focus on physical symptoms and avoidance of physical activity, which increase a person's pain and discomfort (Shahbazi et al., 2020). Moreover, according to the evaluation model, magnification and mental ruminating make the evaluation of pain extremely threatening, and the feeling of helplessness also evaluates the inability to manage pain (Inoue, 2019).

Table 3. Results of repeated measures analysis of variance (ANOVA) for the studied variables

Variable	Source of changes	SS	Df	MS	F-value	P-value	Effect size	Test power
Death anxiety	Pre-test	48.272	1	48.272	37.512	0.671	0.79	1
	Group	231.647	1	231.647	52.067	< 0.001		
	Error	3618.324	48	78.382				
Pain catastrophizing	Pre-test	214.038	1	214.038	17.204	0.513	0.73	1
	Group	162.483	1	162.483	124.569	< 0.001		
	Error	5237.813	48	109.121				
Chronic pain acceptance	Pre-test	1057.309	1	1057.309	83.529	0.716	0.82	1
	Group	1664.291	1	1664.291	46.034	< 0.001		
	Error	1409.028	48	29.355				
Pain intensity	Pre-test	983.764	1	983.764	21.238	0.694	0.74	1
	Group	6429.728	1	6429.728	156.413	< 0.001		
	Error	9701.557	48	202.116				

SS: Sum of squares; Df: Degree of freedom; MS: Mean squares

Table 4. Bonferroni post-hoc test for comparing pre-test, post-test, and follow-up stages

Variable	Paired comparison	Mean difference	Mean deviation	P-value
Death anxiety	Pre-test vs. post-test	6.35	1.27	0.005
	Pre-test vs. follow-up	5.46	1.03	0.001
	Post-test vs. follow-up	-0.89	0.14	0.492
Pain catastrophizing	Pre-test vs. post-test	7.46	1.76	0.004
	Pre-test vs. follow-up	6.78	1.59	0.001
	Post-test vs. follow-up	-0.68	0.24	0.536
Chronic pain acceptance	Pre-test vs. post-test	-7.25	1.51	0.002
	Pre-test vs. follow-up	-5.96	1.37	0.007
	Post-test vs. follow-up	1.29	0.32	0.728
Pain intensity	Pre-test vs. post-test	9.46	2.64	0.006
	Pre-test vs. follow-up	9.21	2.87	0.001
	Post-test vs. follow-up	-0.25	0.07	0.613

According to the findings of this study, semantic therapy can reduce pain catastrophizing and prevent the cognitive processes of evaluation and threat in catastrophic pain, thereby reducing the return of attention to sensory information (Gonzalez-Hernandez et al., 2021).

The current study also revealed significant differences in the therapeutic effect of semantic therapy on increasing chronic pain acceptance in patients with breast cancer. The two components of chronic pain acceptance, namely the desire for pain and the commitment to activity, are completely at odds with these patients' beliefs. Therefore, a person experiencing pain is expected to abandon ineffective efforts to alleviate pain and continue with daily activities despite the pain. Finding a meaning for pain enables the patient to accomplish a crucial goal (Daowd et al., 2021).

The present study demonstrated that semantic therapy effectively reduced pain intensity in patients with breast cancer. Most patients with chronic pain believe that pain is an indication of injury and should be avoided. Because of this, they attempt to reduce pain and avoid activity, although chronic pain is one of the leading causes of physical and social disability, and chronic pain acceptance is associated with increased activity and decreased drug use. According to the present study, semantic therapy reduces negative thoughts about pain and its transmission, thereby decreasing pain intensity (Jebahi et al., 2021).

Cancer crises cause physical and mental imbalances and exacerbate hopelessness and severe stress of a patient with cancer. The rapid progression of cancer and the severe physical and psychological consequences for patients with cancer are caused by anxiety. After receiving a cancer diagnosis, women with breast cancer experienced severe psychological stress, equated cancer with death, and feared the impending death (Kim et al., 2018). In the semantic therapy approach, pursuing meaning in life encourages effort and action by emphasizing the impermanence of human existence rather than pessimism and isolation. This perspective also asserts that what hinders humans is not their pain and undesirable nature but rather the tragic meaninglessness of life. The individual's actions generate a meaningful mental state, vitality, and happiness. Semantic therapy is most beneficial for those who use meaning to alter their negative perceptions and mentality (Trabelsi Ben Ameur, Sellami, Wendling, & Cloppet, 2019).

Among the limitations of the current study are its application to hospitalized patients only and the age range of 40 to 55. Among the other limitations of this study is the small sample size; therefore, it is recommended that this study be conducted on a larger population. This method is also recommended for use in other types of

cancer and in other cities. Additionally, it is suggested that other psychological methods be used to improve the variables examined in this study.

Conclusion

The current study demonstrated that semantic therapy increased chronic pain acceptance and decreased death anxiety, pain catastrophizing, and pain intensity in patients with breast cancer. Due to the high prevalence of breast cancer in Saudi Arabia and around the world, this treatment can be used in the oncology and radiotherapy departments with a psychologist's assistance to expedite patients' recovery.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

In the end, the directorship of King Fahad General Hospital in Jeddah, Saudi Arabia, and The Faculty of Medicine at King Abdul Aziz University are gratefully acknowledged.

References

Akbas, A., Dagmura, H., Daldal, E., Dasiran, F. M., Deveci, H., & Okan, I. (2021). Association between Shoulder Range of Motion and Pain Catastrophizing Scale in Breast Cancer Patients after Surgery. *Breast.Care (Basel.)*, *16*(1), 66-71. doi:10.1159/000506922 [doi];brc-0016-0066 [pii]. Retrieved from PM:33716634

Alonso-Calvo, R., Paraiso-Medina, S., Perez-Rey, D., Alonso-Oset, E., van, S. R., Yu, S. et al. (2017). A semantic interoperability approach to support integration of gene expression and clinical data in breast cancer. *Comput.Biol Med*, *87*, 179-186. doi:S0010-4825(17)30169-5 [pii];10.1016/j.compbiomed.2017.06.005 [doi]. Retrieved from PM:28601027

Badve, S., & Nakshatri, H. (2012). Breast-cancer stem cells-beyond semantics. *Lancet Oncol*, *13*(1), e43-e48.

Baskici, C., Atan, S., & Ercil, Y. (2019). Forecasting of innovation in the light of semantic networks. *Procedia Comput Sci 158*, 443-449.

Bauer, J., Wehland, M., Infanger, M., Grimm, D., & Gombocz, E. (2018). Semantic analysis of posttranslational modification of proteins accumulated in thyroid cancer cells exposed to simulated microgravity. *Int J Mol.Sci*, *19*(8). doi:ijms19082257 [pii];10.3390/ijms19082257 [doi]. Retrieved from PM:30071661

Cho, S., & Cho, O. H. (2022). Depression and quality of life in older adults with pneumoconiosis: The mediating role of death anxiety. *Geriatric Nursing*, *44*, 215-220.

Daowd, A., Barrett, M., Abidi, S., & Abidi, S. R. (2021 Aug 9-12). A framework to build a causal knowledge graph for chronic diseases and cancers by discovering semantic associations from biomedical literature. *Proceedings of the 2021 IEEE 9th International Conference on Healthcare Informatics (ICHI)*; Victoria, BC, Canada.

Datta, S., Bernstam, E. V., & Roberts, K. (2019). A frame semantic overview of NLP-based information extraction for cancer-related EHR notes. *J Biomed Inform.*, *100*, 103301. doi:S1532-0464(19)30221-7 [pii];10.1016/j.jbi.2019.103301 [doi]. Retrieved from PM:31589927

Du, D., Gu, J., Chen, X., Lv, W., Feng, Q., Rahmim, A. et al. (2021). Integration of PET/CT radiomics and semantic features for differentiation between active pulmonary tuberculosis and lung cancer. *Mol.Imaging.Biol*, *23*(2), 287-298. doi:10.1007/s11307-020-01550-4 [doi];10.1007/s11307-020-01550-4 [pii]. Retrieved from PM:33030709

Gonzalez-Hernandez, E., Campos, D., Diego-Pedro, R., Romero, R., Banos, R., Negi, L. T. et al. (2021). Changes in the semantic construction of compassion after the Cognitively-Based

Compassion Training (CBCT((R))) in women breast cancer survivors. *Span.J Psychol, 24*, e34. doi:10.1017/SJP.2021.31 [doi];S1138741621000317 [pii]. Retrieved from PM:34024294

Hoar, D., Lee, P. Q., Guida, A., Patterson, S., Bowen, C. V., Merrimen, J. et al. (2021). Combined transfer learning and test-time augmentation improves convolutional neural network-based semantic segmentation of prostate cancer from multi-parametric mr images. *Comput.Methods Programs.Biomed, 210*, 106375. doi:S0169-2607(21)00449-1 [pii];10.1016/j.cmpb.2021.106375 [doi]. Retrieved from PM:34500139

Ing, N., Li, J., Salemi, H., Arnold, C., Knudsen, B., Gertych, A. et al. (2018 Mar 6). *Semantic segmentation for prostate cancer grading by convolutional neural networks.* Proceedings of SPIE 10581, Medical Imaging 2018: Digital Pathology; Houston, TX, US.

Inoue, K. (2019). Semantic segmentation of breast lesion using deep learning. *Ultrasound in Medicine & Biology, 45*, S52.

Jebadas, D. G., Sivaram, M., M, A., Vidhyasagar, B. S., & Kannan, B. B. (2022). Histogram distance metric learning to diagnose breast cancer using semantic analysis and natural language interpretation methods. In P. Johri, M. J. Div+ín, R. Khanam, M. Marciszack, & A. Will (Eds.), *Trends and Advancements of Image Processing and Its Applications* (pp. 249-259). Cham, Switzerland: Springer International Publishing.

Jebahi, F., Sharma, S., Bloss, J. E., & Wright, H. H. (2021). Effects of tamoxifen on cognition and language in women with breast cancer: A systematic search and a scoping review. *Psychooncology., 30*(8), 1262-1277. doi:10.1002/pon.5696 [doi]. Retrieved from PM:33866625

Kerns, R. D., Turk, D. C., & Rudy, T. E. (1985). The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain, 23*(4), 345-356. doi:10.1016/0304-3959(85)90004-1 [doi];00006396-198512000-00004 [pii]. Retrieved from PM:4088697

Kim, W. H., Kim, H. J., Lee, S. M., Cho, S. H., Shin, K. M., Lee, S. Y. et al. (2018). Preoperative axillary nodal staging with ultrasound and magnetic resonance imaging: predictive values of quantitative and semantic features. *Br.J Radiol, 91*(1092), 20180507. doi:10.1259/bjr.20180507 [doi]. Retrieved from PM:30059242

Martial, C., Cassol, H., Charland-Verville, V., Pallavicini, C., Sanz, C., Zamberlan, F. et al. (2019). Neurochemical models of near-death experiences: A large-scale study based on the semantic similarity of written reports. *Conscious.Cogn, 69*, 52-69. doi:S1053-8100(18)30535-X [pii];10.1016/j.concog.2019.01.011 [doi]. Retrieved from PM:30711788

Menzies, R. E., Zuccala, M., Sharpe, L., & Dar-Nimrod, I. (2018). The effects of psychosocial interventions on death anxiety: A meta-analysis and systematic review of randomised controlled trials. *J Anxiety Disord, 59*, 64-73. doi:S0887-6185(18)30251-2 [pii];10.1016/j.janxdis.2018.09.004 [doi]. Retrieved from PM:30308474

Mihaylov, I., Nisheva-Pavlova, M., & Vassilev, D. (2019). An approach for semantic data integration in cancer studies. In J. M. F. Rodrigues, P. J. S. Cardoso, J., Monteiro, R. Lam, V. V. Krzhizhanovskaya, M. H. Lees, J. J. Dongarra, & P. M. A. Sloot (Eds.). *Computational Science ICCS 2019* (pp. 60-73) Cham, Switzerland: Springer International Publishing.

Nemoto, T., Futakami, N., Yagi, M., Kunieda, E., Akiba, T., Takeda, A. et al. (2020). Simple low-cost approaches to semantic segmentation in radiation therapy planning for prostate cancer using deep learning with non-contrast planning CT images. *Phys Med, 78*, 93-100. doi:S1120-1797(20)30220-9 [pii];10.1016/j.ejmp.2020.09.004 [doi]. Retrieved from PM:32950833

Oyelade, O. N., Obiniyi, A. A., Junaidu, S. B., & Adewuyi, S. A. (2018). ST-ONCODIAG: A semantic rule-base approach to diagnosing breast cancer base on Wisconsin datasets. *Inform Med Unlocked, 10*, 117-125.

Sanchez, E., Toro, C., Artetxe, A., Gra+¦a, M., Sanin, C., Szczerbicki, E. et al. (2013). Bridging challenges of clinical decision support systems with a semantic approach. A case study on breast cancer. *Pattern Recognit Lett, 34*(14), 1758-1768.

Shahbazi, G., Moraveji, M., Keramati, S., Ghobadi Davod, R., & Noor, M. (2020). Comparison of the effectiveness of cognitive-behavioral and semantic therapy in a group

manner on reducing perceived stress and improving the meaning of life in patients with breast cancer. *Med J Mashad Univ Med Sci*, *63*(4), 2633-2642.

Shi, R., Chen, W., Yang, B., Qu, J., Cheng, Y., Zhu, Z. et al. (2020). Prediction of KRAS, NRAS and BRAF status in colorectal cancer patients with liver metastasis using a deep artificial neural network based on radiomics and semantic features. *Am.J Cancer Res*, *10*(12), 4513-4526. Retrieved from PM:33415015

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The Pain Catastrophizing Scale: Development and validation. *Psychol Assess*, *7*(4), 524-532.

Tang, P. L., Chiou, C. P., Lin, H. S., Wang, C., & Liand, S. L. (2011). Correlates of death anxiety among Taiwanese cancer patients. *Cancer Nurs.*, *34*(4), 286-292. doi:10.1097/NCC.0b013e31820254c6 [doi]. Retrieved from PM:21242771

Templer, D. I., Ruff, C. F., & Franks, C. M. (1971). Death anxiety: Age, sex, and parental resemblance in diverse populations. *Dev Psychol.*, *4*(1, Pt.1), 108.

Trabelsi Ben Ameur, S., Sellami, D., Wendling, L., & Cloppet, F. (2019). Breast cancer diagnosis system based on semantic analysis and Choquet integral feature selection for high risk subjects. *Big Data Cogn.Comput.*, *3*(3), 41.

Vowles, K. E., McCracken, L. M., McLeod, C., & Eccleston, C. (2008). The Chronic Pain Acceptance Questionnaire: Confirmatory factor analysis and identification of patient subgroups. *Pain*, *140*(2), 284-291. doi:00006396-200811300-00006 [pii];10.1016/j.pain.2008.08.012 [doi]. Retrieved from PM:18824301

Wang, C. N., Chang, S., Sheu, C. Y., & Tsai, J. P. (2018 Jan 31-Feb 2). Application of semantic computing in cancer on secondary data analysis. *Proceedings of the 2nd IEEE International Conference on Robotic Computing (IRC)*: Laguna Hills, CA, USA.

Wu, W., Pierce, L. A., Zhang, Y., Pipavath, S. N. J., Randolph, T. W., Lastwika, K. J. et al. (2019). Comparison of prediction models with radiological semantic features and radiomics in lung cancer diagnosis of the pulmonary nodules: a case-control study. *Eur Radiol*, *29*(11), 6100-6108. doi:10.1007/s00330-019-06213-9 [doi];10.1007/s00330-019-06213-9 [pii]. Retrieved from PM:31115618

Xu, X., Ou, M., Xie, C., Cheng, Q., & Chen, Y. (2019). Pain acceptance and its associated factors among cancer patients in Mainland China: A cross-sectional study. *Pain Res Manag.*, *2019*, 9458683. doi:10.1155/2019/9458683 [doi]. Retrieved from PM:30906486

Zaza, C., Reyno, L., & Moulin, D. E. (2000). The multidimensional pain inventory profiles in patients with chronic cancer-related pain: an examination of generalizability. *Pain*, *87*(1), 75-82. doi:00006396-200007010-00008 [pii];10.1016/S0304-3959(00)00274-8 [doi]. Retrieved from PM:10863047