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BRCA genetic result disclosure for women with Breast Cancer: influence of +/- predisposition genetic mutation

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Abstract

Background: Albeit the genetic testing/counseling is increasing progressively in oncological clinical practice, psychological impact of BRCA genetic testing has been an under-researched area in oncological population; few studies have examined a wide range of possible predictive individual factors for psychological adaptation after genetic testing for hereditary cancer. Aim of the study was to examine the implication of clinical psychological in BRCA genetic result post-disclosure dealing with the emotional health of patients undergoing genetic testing depending to the personal resources.

Methods: Participants were composed of n = 32 female patients in range age 30 - 55 years, who have a BC diagnosis and who underwent BRCA mutation testing. Psychological battery was applied after genetic testing.

Results: Our finding highlighted the psychological influence of genetic testing on wellbeing of BC patients, and more drawing clinical perspective for positive/negative disclosure regarding the predictors for psychological distress.

Conclusion: Genetic testing needs to be integrated by psychological counseling to manage better the impact of result disclosure (whatever the outcome is) in order to manage better the physical and mental health of patients into efficient personalized medicine toward to the improvement of patient compliance and adherence into well-being perspective and Quality of Life maintaining. Sample size and lack of longitudinal data could be limits of the study.

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1. Introduction

Pathogenic germline variants in Breast Cancer, named BRCA, are inherited in an autosomal dominant manner and underlie hereditary Breast and Ovarian Cancer (HBOC) syndrome (Dwyer et al., 2022). Due to the relevance of pathogenic in medical management of patients, genetic testing has become integral to the care of cancer patients in order to tailor the surgical management (Tung et al., 2020), pharmacological treatment, and survivorship monitoring (Konstantinopoulos et al., 2020). As the genetic information disclosed in BRCA1/2 genetic testing is about probabilities and not certainties, complex distress issues may arise. Confirmation of carrier status is described by many women as overwhelming and, indeed, constitutes a life-changing event. Previous studies showed that women might experience short and long-term distress after the disclosure for their predisposition for BRCA1 or BRCA2 mutation (Bosch et al., 2012a). Though distress often decreases over time, women evidenced high levels of distress in the long-term (Caputo et al., 2022; Graves et al., 2012; Rahnea-Nita et al., 2019). Defense mechanisms of suppression, repression, dissociation, displacement and omnipotence moderated cancer diagnosis, suggesting that a repressive and apparently self-confident defensive functioning is characteristic of people who developed malignant tumors: higher use of neurotic defenses and lower use of obsessional defenses characterized cancer patients, indicating a specific defensive profile of cancer (Di Giuseppe et al., 2020). Relevant factor could influence over the time the emotional regulation dealing with the cancer experience: dispositional optimism appears to be an important factor in terms of how cancer patients perceive and experience their illness and adjust to the treatment process (Akıncı et al., 2021): self-efficacy in maintaining activity and independence domain might favor the dispositional optimism toward to the indirect effect on physical well-being and depressive symptoms associated with medical condition (Frisone et al., 2021; Popoviciu et al., 2022). Specifically, optimistic patients felt more self-efficacious in maintaining their daily activities and independence, favoring the increasing of physical well-being and simultaneously to decreasing depression signs (Akıncı et al., 2021). More, fighting spirit for adjusting to cancer could make to perceive higher social support levels (Faraci et al., 2021). The perceptions of the efficacy of a physical rehabilitation course after surgery by organizational aspects of the structure and aspects of emotional attention as well as the professional competence could contribute to the perceptions of well-being, efficacy of, and satisfaction with a physiotherapy treatment in cancer rehabilitation (Rania et al., 2018).

More, studies highlighted that genetic testing could be associated with psychological benefits in negative disclosure and has no substantial adverse psychological consequences for positive disclosure (Bosch et al., 2012b; Manchanda et al., 2015). Predictive factors for psychological

well-being influence after genetic testing results might be: having young children (Barchetta et al., 2021; Vicario et al., 2022), having lost a relative due to breast/ovarian cancer, doubting of the validity of the result and having a high level of cancer risk perception, but being BRCA1/2 carrier was not (Myles & Merlo, 2022; van Oostrom et al., 2003).

Considering the scenario, the topic still needs to be investigated as the literature on the emotional impact of BRCA test results didn't provide solid conclusions. Even few, studies highlighted the genetic testing could not be considered stressing event for Breast Cancer women affecting their Quality of Life (Cabrera et al., 2010).

Moreover, limitations of several studies about the psychological impact of BRCA genetic counseling are related to experimental design issues as heterogeneous samples based on BRCA1/2 mutation with and without personal history of cancer, using not specific instruments, general well-being scales, non-standardized measures; results should be interpreted with caution, and they cannot be generalized to this clinical population.

Albeit the genetic testing/counseling is increasing progressively in oncological clinical practice, psychological impact of BRCA genetic testing has been an under-researched area in oncological population; few studies have examined a wide range of possible predictive individual factors for psychological adaptation after genetic testing for hereditary cancer (Voorwinden & Jaspers, 2016).

Aim of the study was to examine the implication of clinical psychological in BRCA genetic result post-disclosure dealing with the emotional health of patients undergoing genetic testing depending to the personal resources.

2. Materials and Methods

2.1 Ethics Statement

The study has been approved by the Institutional Review Board (IRB) of the University of L'Aquila, Italy (Prot. No. 123775/2020). Informed consent was obtained from each participant, and the study adhered to the guidelines outlined in the Declaration of Helsinki (World Medical Association, 2008).

2.2 Sample

Participants were composed of $n = 32$ female patients in range age 30 - 55 years, who have a BC diagnosis and who underwent BRCA mutation testing. Eligible participants were approached to be enrolled in the study at the Medical Oncology Division (Director Prof. E.

Ricevuto) of S. Salvatore Hospital ASL1 Abruzzo in L'Aquila (Italy). We contacted 38 eligible patients, of whom 32 provided written informed consent.

The participants were divided into two groups based on BRCA mutation testing result: the BRCA+ group, composed of 16 patients who tested positive for a fault (mutation) on 1 of the BRCA genes (BRCA1 or BRCA2), and the BRCA- group, composed of 16 patients who tested negative for a fault (mutation) on BRCA genes (BRCA1 and BRCA2).

Table 1 reported the demographic and clinical characteristics of the participants.

The inclusion criteria were as follows: (a) Breast Cancer (BC) diagnosis in TNM cancer stage I-III; (b) BRCA genetic testing; (c) age = 30 –55 years; (d) signed informed written consent.

Exclusion criteria were: (a) psychiatric disorders; (b) alcohol or substance abuse; (c) recurrent or metastatic cancer; and (d) mood modifying medications.

2.3 Measures

2.3.1 Sociodemographic Variables

Two types of participant information were also collected. First, demographic data were collected through participants' self-reports. Second, clinical data were obtained from participants' medical records regarding BC stage, treatments, therapies, and BRCA genetic testing result.

2.3.2 Psychological Measurement

The psychological battery was composed of 5 self-reports that measure emotional (depression, anxiety, psychological distress, post-traumatic stress) and personality traits, detailed as follows.

Impact of Event Scale-Revised (IES-R) (Weiss D.S., Marmar C.R., 1997) (italian version Craparo et al., 2013). It is a 22-item self-report questionnaire to measure the subjective response to a specific traumatic event, especially in the response sets of intrusion (intrusive thoughts, nightmares, intrusive feelings and imagery, dissociative-like reexperiencing), avoidance (numbing of responsiveness, avoidance of feelings, situations, and ideas), and hyperarousal (anger, irritability, hypervigilance, difficulty concentrating, heightened startle), as well as a total subjective stress IES-R score. Scores higher than 33 are of concern; the higher the score the greater the concern for post-traumatic stress and associated health and well-being consequences. Italian version was applied.

Depression, Anxiety, and Stress Scale (DASS-21) (Bottesi et al., 2015). The DASS-21 is a clinical assessment that measures the three related states of depression, anxiety and stress. It has 21 questions and takes about 3 min to complete. Each subscale measuring the emotional traits is composed of 7 items. Italian version was applied.

Difficulties in Emotion Regulation Scale-20 (DERS-20) (Lausi et al., 2020) The DERS is a test to assess individual differences in the ability to identify, accept and manage emotional experiences; the test is composed of 6 indexes: a) Non acceptance, b) Goals, c) Impulse, d) Awareness, e) Strategies, f) Clarity. Italian version was applied.

Multidimensional Impact of Cancer Risk Assessment (MICRA) (Cella et al., 2002). MICRA is a 25-item instrument designed to assess the specific impact of result disclosure after genetic testing. It assesses both negative and positive responses to testing experience. Each item is measured on a 4-point Likert-scale. It is composed by three subscales: Distress, Uncertainty and Positive Experience. Except for Positive Experience, higher scores indicate more genetic test-related distress. Italian version was applied.

Big Five Inventory-10 (BFI-10) (Guido et al., 2015). The BFI-10 evaluates the five personality dimensions on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree), each with two items: openness (OP), conscientiousness (CO), emotional stability (ES), extraversion (EX), and agreeableness (AG). Italian version was applied.

2.4 Procedure

Medical staff in the Medical Oncology Division ASL1 L'Aquila (Director Prof. E. Ricevuto) identified eligible patients, who were then enrolled during a scheduled follow-up by medical protocol. Genetic testing was executed in the Medical Genetics Unit of ASL1 L'Aquila (Director Prof. F. Brancati). Participation in this study was voluntary, and the submission of a signed informed consent form was mandatory. The participants took approximately 30 minutes to complete the psychology battery. Participants completed the measures during their scheduled follow-up. Data were collected anonymously. The psychological evaluation was conducted in a quiet dedicated room. The tests were administered by trained psychologists who were blinded to the objectives of the study. Independent clinical psychologists scored the tests.

2.5 Study design

In this observational study, the participants were divided into two groups based on BRCA genetic testing result (i.e., BRCA+ and BRCA- groups).

Descriptive statistics were computed to examine their characteristics. One-way analysis of variance (ANOVA) and correlation analysis were conducted using the data collected from participants.

All statistical analyses were conducted using Jamovi (The jamovi project, 2022). All the tests were two-tailed, and the level of statistical significance was defined as $p < 0.05$. Post-hoc tests (with Tuckey correction) were conducted to further examine significant group differences.

3. Results

Participants were BC patients having mean age of 45.2 ± 5.41 years; most patients (63%) had a localized cancer (TNM I cancer stage), 65,62% of tumors were invasive lobular carcinoma, 40,7% were Luminal A molecular subtype. 62,5% of the patients undergone a lumpectomy surgical intervention, 37,5% undergone mastectomy prior to genetic counseling and testing. Most patients (62,5%) were in hormonal therapy.

Demographic and clinical data are reported in Table 1.

Table 1. Demographic and clinical data of the sample

Demographic indexes	BRCA+ Group (N. 16)	BRCA- Group (N. 16)	Total (N. 32)
Age (M \pm SD)	44.3 \pm 5.31	46.1 \pm 5.52	45.2 \pm 5.41
Education (%)			
<i>No high school</i>	12,5	6,25	9,4
<i>High school degree</i>	43,75	37,5	40,6
<i>Undergraduate degree</i>	43,75	56,25	50
Marital status (%)			
<i>Married/ with partner</i>	81,25	81,25	81,25
<i>Single/ divorced</i>	18,75	18,75	18,75
Occupation (%)			
<i>Unemployed</i>	18,75	25	21,9
<i>Employed</i>	68,75	50	59,4
<i>Self-employed</i>	12,5	25	18,7
Number of children (%)			
0	18,75	18,75	18,75
1	25	31,25	28,1
2	50	43,75	46,8
>2	6,25	6,25	6,25
Clinical indexes			
TNM stage (%)			
0	6,25	6,25	7,4
I	56,25	50	63
II	12,5	18,75	18,5
III	6,25	12,25	11,1
Histological subtype (%)			
<i>DCIS</i>	12,5	6,25	9,37
<i>IDC</i>	56,25	75	65,62
<i>ILC</i>	0	12,5	6,25
Molecular subtype (%)			
<i>Luminal A</i>	18,75	50	40,7
<i>Luminal B</i>	25	25	29,6
<i>HER2+</i>	0	6,25	25,9
<i>TN</i>	25	18,75	3,7
Primary surgical treatment (%)			
<i>Mastectomy</i>	37,5	37,5	37,5
<i>Lumpectomy</i>	62,5	62,5	62,5
Pharmacological treatment* (%)			
<i>Hormonal therapy</i>	56,25	68,75	62,5
<i>Radiotherapy</i>	43,75	56,25	50
<i>Chemotherapy</i>	56,25	50	53,12

Note. * = drugs are not mutually excluding, TNM = tumor, nodes, metastases, IDC = invasive ductal carcinoma, ILC = invasive lobular carcinoma, DCIS = ductal carcinoma in situ, TN = triple negative

The psychological evaluations of the study highlighted interesting emotional patterns.

Firstly, we wanted to detect the emotional dimensions in BC patients distributed in BRCA+/BRCA- subgroups.

The non-parametric One-way ANOVA (Kruskal-Wallis test) was performed comparing the IES-R, DASS-21, DERS and MICRA scores by BRCA+ and BRCA- groups. Statistical analyses showed a significant difference in IES-R score ($\chi^2 = 4.0$; $\epsilon^2 = 0.12$; $p = 0.04$), evidencing the higher PTSD risk and higher hyperarousal in the BRCA+ than BRCA- group ($\chi^2 = 4.7$; $\epsilon^2 = 0.15$; $p = 0.02$); DERS test showed significant differences: impulse index appeared higher in BRCA- than BRCA+ group ($\chi^2 = 4.8$; $\epsilon^2 = 0.15$; $p = 0.02$); even MICRA test showed significant differences: higher distress index ($\chi^2 = 7.4$; $\epsilon^2 = 0.24$; $p = 0.006$) and lower positive experiences index in BRCA+ than BRCA- group ($\chi^2 = 6.9$; $\epsilon^2 = 0.22$; $p = 0.009$). In Table 2 and Figure 1 are represented detailed data.

Table 2. Raw score and non-parametric one-way ANOVA (Kruskal-Wallis test)

		χ^2	df	p	ϵ^2
IES-R		4.0003	1	0.045*	0.12904
	<i>Avoidance</i>	3.6472	1	0.056	0.11765
	<i>Intrusion</i>	2.7780	1	0.096	0.08961
	<i>Hyperarousal</i>	4.7948	1	0.029*	0.15467
DASS-21		0.4121	1	0.521	0.01329
	<i>Depression</i>	0.7660	1	0.381	0.02471
	<i>Anxiety</i>	0.0722	1	0.788	0.00233
	<i>Stress</i>	0.3438	1	0.558	0.01109
DERS-20		0.0804	1	0.777	0.00259
	<i>Non acceptance</i>	0.0518	1	0.820	0.00167
	<i>Awareness</i>	0.8684	1	0.351	0.02801
	<i>Goals</i>	0.4455	1	0.504	0.01437
	<i>Clarity</i>	1.0093	1	0.315	0.03256
	<i>Impulse</i>	4.8291	1	0.028*	0.15578
MICRA		8.7644	1	0.003*	0.28272
	<i>Distress</i>	7.4882	1	0.006*	0.24156
	<i>Uncertainty</i>	2.8923	1	0.089	0.09330
	<i>Positive experiences</i>	6.9240	1	0.009*	0.22335

Note. * $p < .05$

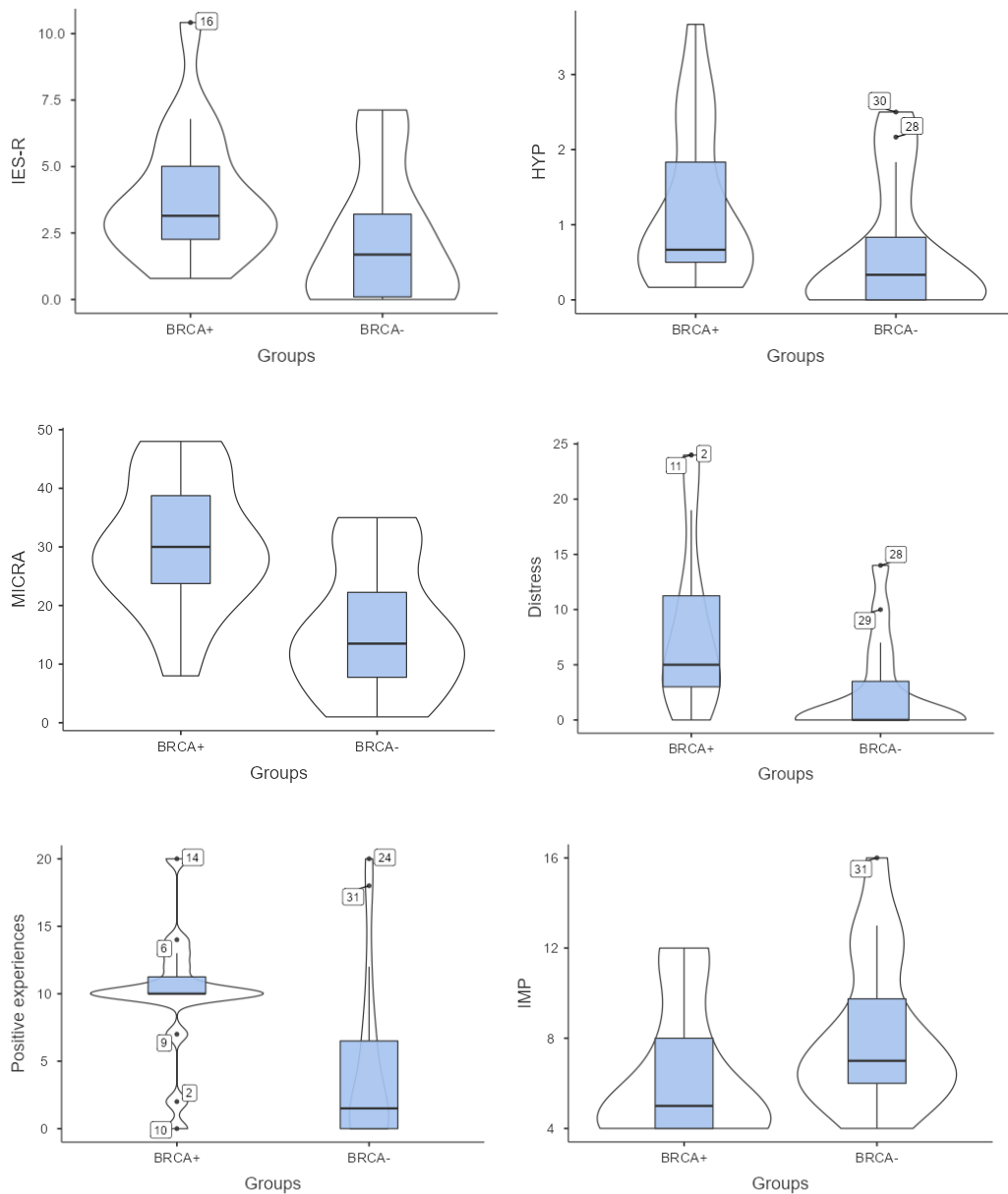


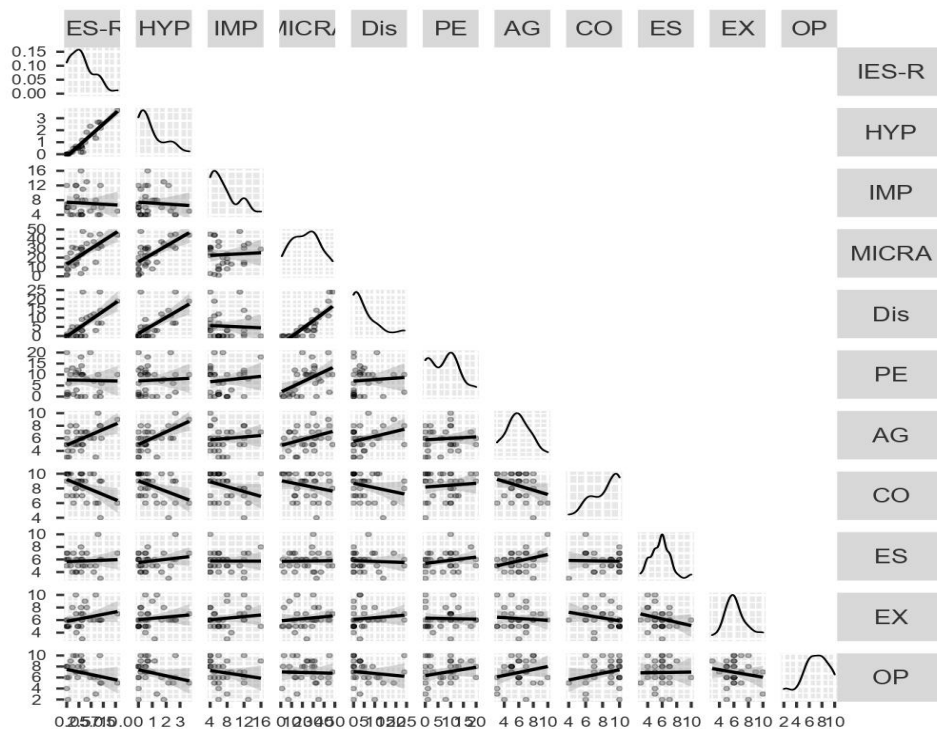
Figure 1. Violin Plots for IES-R, DERS and MICRA scoring in BRCA groups

Then, we wanted to examine the correlation between emotional dimensions (PTSD risk, hyperarousal and impulse) and personality traits. Pearson’s correlation evidenced the Hyperarousal index (IES-R) and Agreeableness trait (BFI-10) were positively correlated ($p < .001$), MICRA score and Agreeableness trait (BFI-10) were positively correlated ($p = 0.044$), and the Hyperarousal index (IES-R) and Conscientiousness trait (BFI-10) were negatively correlated ($p = 0.016$). Table 3 reported the Pearson’s correlation matrix.

Table 3. Correlation Matrix (Pearson's r) of emotional dimensions of the sample

		IES-R	HYP	IMP	MICR A	Dis	PE	AG	CO	ES	EX	OP
IES-R HYP	Pearson's r	0.938*	—									
	p-value	<.001	—									
DER S-20 IMP	Pearson's r	-.005	-.007	—								
	p-value	.750	.684	—								
MIC RA	Pearson's r	0.654*	0.644*	0.058	—							
	p-value	<.001	<.001	.753	—							
Dis	Pearson's r	0.690*	0.636*	-.005	0.837*	—						
	p-value	<.001	<.001	.788	<.001	—						
PE	Pearson's r	-.009	0.052	0.110	0.505*	0.077	—					
	p-value	.918	.778	.548	.003	.675	—					
BFI- 10 AG	Pearson's r	0.500*	0.582*	0.111	0.359*	0.324	0.083	—				
	p-value	.004	<.001	.545	.004	.071	.653	—				
CO	Pearson's r	-.044*	-.044*	-.0326	-.0236	-.0250	0.092	-.0304	—			
	p-value	.016	.016	.069	.193	.168	.617	.091	—			
ES	Pearson's r	0.056	0.182	0.002	0.023	0.057	0.218	0.317	0.028	—		
	p-value	.759	.318	.992	.900	.755	.230	.078	.081	—		
EX	Pearson's r	0.249	0.131	0.133	0.135	0.123	-.0031	-.0078	-.0245	-.0237	—	
	p-value	.170	.475	.466	.461	.503	.865	.672	.076	.092	—	
OP	Pearson's r	-.0221	-.0251	-.0175	-.0029	-.0115	0.210	0.211	0.236	0.013	0.161	—
	p-value	.225	.167	.337	.873	.532	.249	.247	.093	.043	.078	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, AG = Agreeableness, CO = Conscientiousness, ES = Emotional Stability, EX = Extraversion, OP = Openness, HYP = Hyperarousal, IMP = Impulse, IES-R = Impact of Event Scale-Revised, MICRA = Multidimensional Impact of Cancer Risk Assessment, Dis = distress, PE = positive experiences



Note. AG = Agreeableness, CO = Conscientiousness, ES = Emotional Stability, EX = Extraversion, OP = Openness, HYP = Hyperarousal, IMP = Impulse, IES-R = Impact of Event Scale-Revised, MICRA = Multidimensional Impact of Cancer Risk Assessment, Dis = distress, PE = positive experiences

Figure 2. Correlation matrix plot for IES-R, impulse, MICRA and personality traits.

4. Discussion

Study aimed to examine the psychological dynamics following the genetic testing for BRCA mutation in women after BC diagnosis dealing with the emotional health related to the personal resources. Scope was to investigate the adaptive strategies to BRCA genetic testing results disclosure comparing positive/negative oncological patients in emotional features and their correlation with personality traits.

As expected, positive genetic mutation women presented genetic testing-related distress, especially in the response sets of hyperarousal (anger, irritability, hypervigilance, difficulty concentrating, heightened startle) and a less positive experience. Mild to strong correlations emerged between PTSD risk and personality traits: highly agreeable women, who prioritize family members’ feelings in their health-related decision making and women low in conscientious that have low self-control and consider most health-related decisions quickly, are at high risk of PTSD and hyperarousal after genetic testing results disclosure (Murdaca et al., 2022). Also, correlation between concerns that are very specific to the high-risk cancer clinical setting and personality traits emerged: highly empathetic women, who naturally identify with

the emotional experiences of others (i.e., family members) presented elevated concerns about personal and family vulnerability and these concerns can have an impact on health care decision making.

Unexpectedly, negative mutation women showed higher difficulties in emotion regulation, mostly affected the maintaining control behavior when feeling negative emotions. We hypothesize that it could be caused by limited awareness about the origin of their illness, and this could have an impact on emotion regulation abilities and long-term management of clinical pathway. In literature, the emotional regulation seemed to be involved in the healthy/unhealthy adaptive behaviors and related negative outcome for health (Di Giacomo et al., 2019; Ranieri et al., 2021) (Wierenga et al., 2017a); dispositional optimism, as well defensive responses to stressful life events could be related to the outcome of emotional dimensions (Akinci et al., 2021; Di Giuseppe et al., 2020).

Clinical aspects and personality traits in disease treatments appeared correlated to the coping strategies for emotional regulation (Blanchard-Fields et al., 2004; Wierenga et al., 2017b). A study highlighted how the coping strategies in facing stressful situations and traumatic experiences connected to cancer diagnosis would be associated with the perceived social support derived from different sources.

According to the literature (Bjørnslett et al., 2015; McCuaig et al., 2021; van Oostrom et al., 2003), our finding confirmed the psychological influence of genetic testing on wellbeing of BC patients, and more drawing clinical perspective for positive/negative disclosure regarding the predictors for psychological distress.

The BRCA counseling could be a stressing step in oncological clinical practice featuring the psychological health of patients; BRCA+/- results disclosure impact the emotions dimensions of patients and paving the way for tailored psychological setting toward to reinforce adaptive behaviors and coping strategies for better compliance and adherence to pharmacological treatments. Evidence from systematic reviews illustrates that a genetic counseling intervention does not appear to increase distress and therefore could improve the accuracy of individuals' perceptions of their personal risk (Katapodi et al., 2004).

Longitudinal study highlighted the positive mutation did not show higher levels of anxiety or depression over time (short/long term follow up); on contrary, the most powerful predictor of mid and long term pathological anxiety level was the level of anxiety at baseline (Bosch et al., 2012a): our finding allows to explain better this outcome figuring out the emotional regulation in BRCA+ as key psychological factor. Negative emotions into hyperarousal dimension, as well

anger, irritability, hypervigilance, difficulty concentrating, heightened startle seemed influence massively the adaptive behaviors of BC patients.

Further strength of our finding is related to emotional impact for BRCA-: genetic testing is a stressor that could influence the mental health of BC patients by the impulsivity behaviors: tendencies to act without thinking, low level of concentration, restlessness, and high risk for aggressive behavior as well psychosocial disorders. Bakos's study showed that informing women that they are not at high cancer risk may not suffice to lower their elevated risk perception or change their self-image (Bakos et al., 2008). The transition required to redefine one's self-image requires time, emotional support, multiple opportunities for clarification and a profound change in awareness. Mutation-negative women may require additional help in redefining their cancer risk perception.

The Genetic testing integrated by psychological counseling into personalized medicine is becoming urgent: our research strongly highlighted the protective influence of conscientiousness traits for negative emotions (hyperarousal index); on contrary women having high level of agreeableness personality traits have tendency to be exposed to the higher psychological distress for genetic result disclosure and related perceived stress: usually, individuals with high agreeableness have the tendency to put others needs before their own and in genetic testing the fear of risk of cancer for own sons for disease risk as well low Quality of Life and well-being.

The clinical practice amplified and improved the relevance of genetic testing into oncological medical cure to manage the risk for cancer and to tailor better surgical/pharmacological treatments; at same time, our finding spotted the risk for mental disease and psychosocial deficits in genetic results disclosure making the oncological care affecting the Quality of Life of patients. Adherence and compliance are fundamental for intensive oncological treatments and for that the collaboration and active engagement of the patients are necessary: negative psychological signs during the caring could compromise the efficacy of personalized medicine paradigm (Lemmo et al., 2022, 2023; Vallone et al., 2022).

5. Conclusions

Our study featured the psychological influence of BRCA genetic testing result disclosure: it is a relevant oncological clinical practice for better health management of BC patients by medical approach. Both, negative and positive BRCA result disclosure need to deal with the emotional regulation in genetic testing; coping strategies as well personal resource, personality traits and social/family support influence the Quality of Life for oncological care, However, genetic testing needs to be integrated by psychological counseling to manage better the impact of result

disclosure (whatever the outcome is) in order to manage better the physical and mental health of patients into efficient personalized medicine toward to the improvement of patient compliance and adherence into well-being perspective and Quality of Life maintaining.

Our study has some limitations. First, the sample size of the study is small: we need to enlarge the data to consolidate our finding.

Second, the lack of longitudinal data to verify the trend of performance as well the ability of patients to manage the own mental health.

Our study is ongoing and we are going to overcome those limits making our primary data consolidated outcome for solid clinical practice.

Ethical approval

The study has been approved by the Institutional Review Board (IRB) of the University of L'Aquila, Italy (Prot. No. 123775/2020). Informed consent was obtained from each participant, and the study adhered to the guidelines outlined in the Declaration of Helsinki (World Medical Association, 2008).

Informed Consent Statement

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Conflicts of Interest

The authors declare no conflict of interest

Conflict of interest statement

The authors declare no conflict of interests

Authors' Contribution

Conceptualization, DDG and JR; methodology, FG; data curation, EC; FB and ER, supervision; writing—review and editing, All Authors approved the final version of the paper.

References

1. Akıncı, İ., Akyüz Yılmaz, C., & Bozo, Ö. Z. L. E. M. (2021). Dispositional Optimism and Well-being in Cancer Patients: The Role of Cancer-Related Self-Efficacy. *Mediterranean Journal of Clinical Psychology*, 9(3). <https://doi.org/10.13129/2282-1619/mjcp-3229>
2. Bakos, A. D., Hutson, S. P., Loud, J. T., Peters, J. A., Giusti, R. M., & Greene, M. H. (2008). BRCA mutation-negative women from hereditary breast and ovarian cancer families: A qualitative study of the BRCA - negative experience. *Health Expectations*, 11(3), 220–231. <https://doi.org/10.1111/j.1369-7625.2008.00494.x>
3. Barchetta, S., Martino, G., Craparo, G., Salehinejad, M. A., Nitsche, M. A., & Vicario, C. M. (2021). Alexithymia Is Linked with a Negative Bias for Past and Current Events in Healthy Humans. *International Journal of Environmental Research and Public Health*, 18(13), 6696. <https://doi.org/10.3390/ijerph18136696>
4. Bjørnslett, M., Dahl, A. A., Sørebo, Ø., & Dørum, A. (2015). Psychological distress related to BRCA testing in ovarian cancer patients. *Familial Cancer*, 14(4), 495–504. <https://doi.org/10.1007/s10689-015-9811-2>
5. Blanchard-Fields, F., Stein, R., & Watson, T. L. (2004). Age Differences in Emotion-Regulation Strategies in Handling Everyday Problems. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 59(6), P261–P269. <https://doi.org/10.1093/geronb/59.6.P261>
6. Bosch, N., Junyent, N., Gadea, N., Brunet, J., Ramon y Cajal, T., Torres, A., Graña, B., Velasco, A., Darder, E., Mensa, I., & Balmaña, J. (2012a). What factors may influence psychological well being at three months and one year post BRCA genetic result disclosure? *The Breast*, 21(6), 755–760. <https://doi.org/10.1016/j.breast.2012.02.004>
7. Bosch, N., Junyent, N., Gadea, N., Brunet, J., Ramon y Cajal, T., Torres, A., Graña, B., Velasco, A., Darder, E., Mensa, I., & Balmaña, J. (2012b). What factors may influence psychological well being at three months and one year post BRCA genetic result disclosure? *The Breast*, 21(6), 755–760. <https://doi.org/10.1016/j.breast.2012.02.004>
8. Bottesi, G., Ghisi, M., Altoè, G., Conforti, E., Melli, G., & Sica, C. (2015). The Italian version of the Depression Anxiety Stress Scales-21: Factor structure and psychometric properties on community and clinical samples. *Comprehensive Psychiatry*, 60, 170–181. <https://doi.org/10.1016/j.comppsy.2015.04.005>
9. Cabrera, E., Blanco, I., Yagüe, C., & Zabalegui, A. (2010). The impact of genetic counseling on knowledge and emotional responses in Spanish population with family history of breast cancer. *Patient Education and Counseling*, 78(3), 382–388. <https://doi.org/10.1016/j.pec.2009.10.032>
10. Caputo, A., Vicario, C. M., Cazzato, V., & Martino, G. (2022). Editorial: Psychological Factors as Determinants of Medical Conditions, Volume II. *Frontiers in Psychology*, 13, 865235. <https://doi.org/10.3389/fpsyg.2022.865235>
11. Cella, D., Hughes, C., Peterman, A., Chang, C.-H., Peshkin, B. N., Schwartz, M. D., Wenzel, L., Lemke, A., Marcus, A. C., & Lerman, C. (2002). A brief assessment of concerns associated with genetic testing for cancer: The Multidimensional Impact of Cancer Risk Assessment (MICRA) questionnaire. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, 21(6), 564–572.

12. Craparo, G., Faraci, P., Rotondo, G., & Gori, A. (2013). The Impact of Event Scale & Revised: Psychometric properties of the Italian version in a sample of flood victims. *Neuropsychiatric Disease and Treatment*, 14(27). <https://doi.org/10.2147/NDT.S51793>
13. Di Giacomo, D., Jessica Ranieri, Federica Guerra, Enrico Perilli, Montserrat Gea Sánchez, Domenico Passafiume, Katia Cannita, & Corrado Ficorella. (2019). Survivorship in young women after early breast cancer: A cross-sectional study of emotional traits along 3-years perspective. *Rivista Di Psichiatria*, 2019 July-August. <https://doi.org/10.1708/3202.31798>
14. Di Giuseppe, M., Miniati, M., Miccoli, M., Ciacchini, R., Orrù, G., Lo Sterzo, R., Di Silvestre, A., & Conversano, C. (2020). Defensive responses to stressful life events associated with cancer diagnosis. *Mediterranean Journal of Clinical Psychology*, Vol 8, No 1 (2020). <https://doi.org/10.6092/2282-1619/mjcp-2384>
15. Dwyer, A. A., Hesse-Biber, S., Shea, H., Zeng, Z., & Yi, S. (2022). Coping response and family communication of cancer risk in men harboring a *BRCA* mutation: A mixed methods study. *Psycho-Oncology*, 31(3), 486–495. <https://doi.org/10.1002/pon.5831>
16. Faraci, P., Bottaro, R., & Craparo, G. (2021). Coping strategies and perceived social support among cancer patients: A cross-sectional analysis. *Mediterranean Journal of Clinical Psychology*, 9(1). <https://doi.org/10.6092/2282-1619/mjcp-2892>
17. Frisone, F., Sicari, F., Settineri, S., & Merlo, E. M. (2021). Clinical Psychological Assessment of Stress: A narrative review of the last 5 years. *Clinical Neuropsychiatry*, 18(2), 91–100. <https://doi.org/10.36131/cnfioritieditore20210203>
18. Graves, K. D., Vegella, P., Poggi, E. A., Peshkin, B. N., Tong, A., Isaacs, C., Finch, C., Kelly, S., Taylor, K. L., Luta, G., & Schwartz, M. D. (2012). Long-Term Psychosocial Outcomes of *BRCA1* / *BRCA2* Testing: Differences across Affected Status and Risk-Reducing Surgery Choice. *Cancer Epidemiology, Biomarkers & Prevention*, 21(3), 445–455. <https://doi.org/10.1158/1055-9965.EPI-11-0991>
19. Guido, G., Peluso, A. M., Capestro, M., & Miglietta, M. (2015). An Italian version of the 10-item Big Five Inventory: An application to hedonic and utilitarian shopping values. *Personality and Individual Differences*, 76, 135–140. <https://doi.org/10.1016/j.paid.2014.11.053>
20. Katapodi, M. C., Lee, K. A., Facione, N. C., & Dodd, M. J. (2004). Predictors of perceived breast cancer risk and the relation between perceived risk and breast cancer screening: A meta-analytic review. *Preventive Medicine*, 38(4), 388–402. <https://doi.org/10.1016/j.ypmed.2003.11.012>
21. Konstantinopoulos, P. A., Norquist, B., Lacchetti, C., Armstrong, D., Grisham, R. N., Goodfellow, P. J., Kohn, E. C., Levine, D. A., Liu, J. F., Lu, K. H., Sparacio, D., & Annunziata, C. M. (2020). Germline and Somatic Tumor Testing in Epithelial Ovarian Cancer: ASCO Guideline. *Journal of Clinical Oncology*, 38(11), 1222–1245. <https://doi.org/10.1200/JCO.19.02960>
22. Lausi, G., Quagliari, A., Burrai, J., Mari, E., & Giannini, A. M. (2020). Development of the DERS-20 among the Italian population: A study for a short form of the Difficulties in Emotion Regulation Scale. *Mediterranean Journal of Clinical Psychology*, 8(2). <https://doi.org/10.6092/2282-1619/mjcp-2511>
23. Lemmo, D., Martino, M. L., & Freda, M. F. (2022). Cancer Prevention Sense Making and Metaphors in Young Women's Invented Stories. *Healthcare*, 10(11), 2179. <https://doi.org/10.3390/healthcare10112179>

24. Lemmo, D., Martino, M. L., Vallone, F., Donizzetti, A. R., Freda, M. F., Palumbo, F., Lorenzo, E., D'Argenzio, A., & Caso, D. (2023). Clinical and psychosocial constructs for breast, cervical, and colorectal cancer screening participation: A systematic review. *International Journal of Clinical and Health Psychology, 23*(2), 100354. <https://doi.org/10.1016/j.ijchp.2022.100354>
25. Manchanda, R., Loggenberg, K., Sanderson, S., Burnell, M., Wardle, J., Gessler, S., Side, L., Balogun, N., Desai, R., Kumar, A., Dorkins, H., Wallis, Y., Chapman, C., Taylor, R., Jacobs, C., Tomlinson, I., McGuire, A., Beller, U., Menon, U., & Jacobs, I. (2015). Population Testing for Cancer Predisposing BRCA1/BRCA2 Mutations in the Ashkenazi-Jewish Community: A Randomized Controlled Trial. *JNCI: Journal of the National Cancer Institute, 107*(1). <https://doi.org/10.1093/jnci/dju379>
26. McCuaig, J. M., Thain, E., Malcolmson, J., Keshavarzi, S., Armel, S. R., & Kim, R. H. (2021). A Comparison of Patient-Reported Outcomes Following Consent for Genetic Testing Using an Oncologist- or Genetic Counselor-Mediated Model of Care. *Current Oncology, 28*(2), 1459–1471. <https://doi.org/10.3390/curroncol28020138>
27. Murdaca, G., Paladin, F., Casciaro, M., Vicario, C. M., Gangemi, S., & Martino, G. (2022). Neuro-Inflammaging and Psychopathological Distress. *Biomedicines, 10*(9), 2133. <https://doi.org/10.3390/biomedicines10092133>
28. Myles, L., & Merlo, Em. manuele. (2022). Incongruities between perceived control and desire for control: Accounting for depressive symptomology in adolescence. *Psychiatria i Psychologia Kliniczna, 22*(1), 40–44. <https://doi.org/10.15557/PiPK.2022.0005>
29. Popoviciu, M. S., Marin, V. N., Vesa, C. M., Stefan, S. D., Stoica, R. A., Serafinceanu, C., Merlo, E. M., Rizvi, A. A., Rizzo, M., Busnatu, S., & Stoian, A. P. (2022). Correlations between Diabetes Mellitus Self-Care Activities and Glycaemic Control in the Adult Population: A Cross-Sectional Study. *Healthcare, 10*(1), 174. <https://doi.org/10.3390/healthcare10010174>
30. Rahnea-Nita, R. A., Paunica, S., Motofei, C., & Rahnea-Nita, G. (2019). Assessment of anxiety and depression in patients with advanced gynaecological cancer. *Mediterranean Journal of Clinical Psychology, 7*(2). <https://doi.org/10.6092/2282-1619/2019.7.2214>
31. Rania, N., Migliorini, L., Vidili, M. G., Bianchetti, P., Forno, G., & Cavanna, D. (2018). Exploring well-being and satisfaction with physiotherapy efficacy: an Italian study of cancer patients. *Mediterranean Journal of Clinical Psychology, 6*(2). <https://doi.org/10.6092/2282-1619/2018.6.1841>
32. Ranieri, J., Fiasca, F., Guerra, F., Perilli, E., Mattei, A., & Di Giacomo, D. (2021). Examining the Post-operative Well-Being of Women Who Underwent Mammoplasty: A Cross-Sectional Study. *Frontiers in Psychiatry, 12*, 645102. <https://doi.org/10.3389/fpsyt.2021.645102>
33. The jamovi project. (2022). *Jamovi (Version 2.3)*. <https://www.jamovi.org/about.html>
34. Tung, N. M., Boughey, J. C., Pierce, L. J., Robson, M. E., Bedrosian, I., Dietz, J. R., Dragun, A., Gelpi, J. B., Hofstatter, E. W., Isaacs, C. J., Jatoi, I., Kennedy, E., Litton, J. K., Mayr, N. A., Qamar, R. D., Trombetta, M. G., Harvey, B. E., Somerfield, M. R., & Zakalik, D. (2020). Management of Hereditary Breast Cancer: American Society of Clinical Oncology, American Society for Radiation Oncology, and Society of Surgical Oncology Guideline. *Journal of Clinical Oncology, 38*(18), 2080–2106. <https://doi.org/10.1200/JCO.20.00299>

35. Vallone, F., Lemmo, D., Martino, M. L., Donizzetti, A. R., Freda, M. F., Palumbo, F., Lorenzo, E., D'Argenzio, A., & Caso, D. (2022). Factors promoting breast, cervical and colorectal cancer screenings participation: A systematic review. *Psycho-Oncology*, *31*(9), 1435–1447. <https://doi.org/10.1002/pon.5997>
36. van Oostrom, I., Meijers-Heijboer, H., Lodder, L. N., Duivenvoorden, H. J., van Gool, A. R., Seynaeve, C., van der Meer, C. A., Klijn, J. G. M., van Geel, B. N., Burger, C. W., Wladimiroff, J. W., & Tibben, A. (2003). Long-Term Psychological Impact of Carrying a BRCA1/2 Mutation and Prophylactic Surgery: A 5-Year Follow-Up Study. *Journal of Clinical Oncology*, *21*(20), 3867–3874. <https://doi.org/10.1200/JCO.2003.10.100>
37. Vicario, C. M., Martino, G., Lucifora, C., & Felmingham, K. (2022). Preliminary evidence on the neural correlates of timing deficit in post-traumatic stress disorder. *European Journal of Psychotraumatology*, *13*(1), 2008151. <https://doi.org/10.1080/20008198.2021.2008151>
38. Voorwinden, J. S., & Jaspers, J. P. C. (2016). Prognostic Factors for Distress After Genetic Testing for Hereditary Cancer. *Journal of Genetic Counseling*, *25*(3), 495–503. <https://doi.org/10.1007/s10897-015-9894-9>
39. Weiss D.S., Marmar C.R. (1997). *Impact of Events Scale—Revised (IES-R)*. https://www.svri.org/sites/default/files/attachments/2016-01-13/Impact_of_Events_Scale_-_Revised_IES-R_.pdf
40. Wierenga, K. L., Lehto, R. H., & Given, B. (2017a). Emotion Regulation in Chronic Disease Populations: An Integrative Review. *Research and Theory for Nursing Practice*, *31*(3), 247–271. <https://doi.org/10.1891/1541-6577.31.3.247>
41. Wierenga, K. L., Lehto, R. H., & Given, B. (2017b). Emotion Regulation in Chronic Disease Populations: An Integrative Review. *Research and Theory for Nursing Practice*, *31*(3), 247–271. <https://doi.org/10.1891/1541-6577.31.3.247>
42. World Medical Association. (2008). *WMA DECLARATION OF HELSINKI*. <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>



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