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Κοκαρίδας Δημήτριος, Αναπληρωτής Καθηγητής, ΤΕΦΑΑ –ΠΘ

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Διγγελίδης Νικόλαος, Καθηγητής, ΤΕΦΑΑ –ΠΘ

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Μπονώτης Κωνσταντίνος, Επίκουρος Καθηγητής Ιατρική Σχολή Π.Θ.

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## Abstract

The effect of counseling and exercise on the quality of life of cancer patients.

(Under the supervision of Associate Professor D. Kokaridas)

**Background:** Cancer diagnosis and therapy imposes a great deal of stress on patients. Psychological distress is a multidimensional concern affecting patients' ability to cope with cancer, its physical symptoms and treatments. Psychological interventions and physical activity may reduce depression and help cancer patients to develop stress coping mechanisms.

**Objective:** The purpose of the present study was to examine the effect of exercise program and a group psychotherapy program on the general health of cancer patients, their mood profile and their quality of life.

**Methodology:** The sample consisted of 39 cancer patients (10 males and 29 females), assigned randomly in three groups of 13 patients each group, that is, a control, an exercise and a psychotherapy group. The patients of the psychotherapy group received a 10 weeks' supportive–expressive group therapy, at a frequency of one time per week, of 90 minutes each meeting. The duration of the training program for the individuals of the physical activity (PA) group was 10 weeks at a frequency of two sessions per week, 60 minutes each session. Control group individuals did not participate in any program and they just filled the questionnaires administered. The following questionnaires were used: The quality of life SF-36 questionnaire, the General Health Questionnaire (GHQ)-28 questionnaire and the POMS questionnaire (short form) for mood state evaluation.

**Results:** Regarding the general health status, a statistically significant difference (improvement) was observed in the PA group,  $p=0.031$ . As for quality of life, improvement in “vitality” ( $p = .006$ ) and mental health subscale ( $p = 0.011$ ) was statistically significant between pre and post measures in the supportive therapy group. All other domains exhibit no significant changes. In the exercise group, physical functioning, and emotional role values were also improved but not to the point to generate statistically significant results. Regarding mood state, post hoc analysis

revealed an anger reduction, as regards to the supportive therapy group producing statistically significant results from both the control group (-6.91 units drop in anger subscale score,  $p < 0.001$ ) and the exercise group (-4.75 units drop in anger subscale score,  $p = 0.007$ ). Regarding total POMS score, results also favored the supportive therapy group as compared to the control group ( $p = 0.001$ ). Post intervention values were also improved for the exercise group, but not to the extent to produce statistically significant results.

**Conclusions:** The findings of this study strongly support the beneficial effect of psychological intervention on mood and quality of life of patients with cancer, followed in less extent by the beneficial effect of the exercise program. The positive impact is particularly obvious in the domains of anger, vitality and mental health. On the other hand, physical activity exerts major favorable effect on psychiatric morbidity of cancer patients, especially in the field of anxiety and insomnia, fields in which psychological intervention had a negligible effect. Screening cancer patients for psychological disturbances may be helpful to determine treatment intervention programs tailored to their needs in order to achieve the best possible rehabilitation outcomes.

**Key words:** Quality of life, cancer survivors, exercise, group psychotherapy, mood, general health



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**Abstract.....vii**

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(Moreno-Smith, Lutgendorf & Sood, 2010).

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Karnofski, (Crooks et al., 1991).

Katz (Katz et al, 1963).

Spitzer, (Spitzer et al.,1981).

McGill, (Melzack, 1975).

Nottingham, (Wicklund, 1990).

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1995; Samarel, Fawcett & Tulman, 1993; Spiegel, Bloom, Kraemer & Gottheil, 1989).

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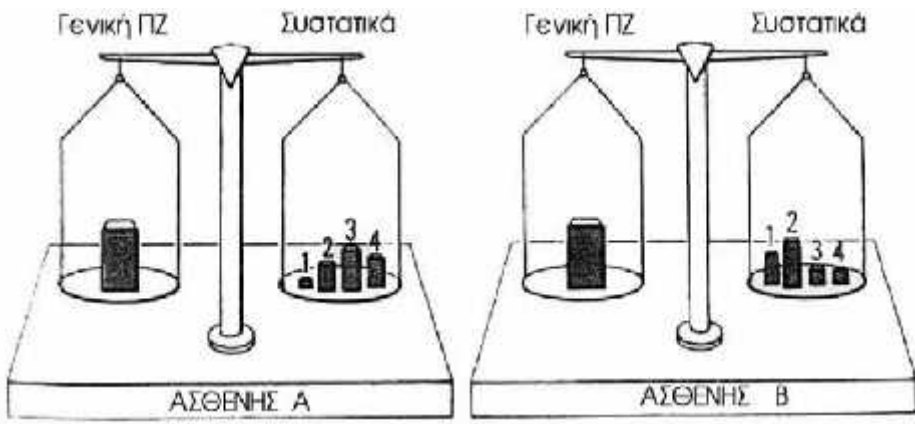


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(National Comprehensive Cancer Network, 2016)

(Carlson & Bultz, 2003).

(Gerritsen & Vincent, 2016; Galway et al., 2012).

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 Osborn, Demoncada & Feuerstein (2006),  
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 (Riebe et al., 2015). H  
 (Holmes, Chen, Feskanich, Kroenke & Colditz, 2005;  
 Meyerhard et al., 2006; Sternfeld et al., 2009; Richman et al., 2011).  
 (Fairey, Courneya, Field & Mackey, 2002). Dhabhar, (2002)

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 ACTH  
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### 3.4.

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	10	25,6
	29	74,4
	39	100,0
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	2	5,1
	4	10,3
μ	3	7,7
	16	41,0
	14	35,9
	39	100,0
μ	24	61,5
μ	5	12,8
	3	7,8
μ	7	17,9
	39	100,0
μ		
	3	7,7
	22	56,4
	8	20,5
3	6	15,4
	39	100,0
μ	10	25,6
μ	8	20,5
	13	33,3

	5	12,8
	3	7,7
	39	100,0
	19	48,7
μ	7	17,9
	4	10,4
-	2	5,1
	7	17,9
	39	100,0

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	Cronbach's							
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
	0,88	0,92	0,919	0,935	0,933	0,931	0,758	0,863
μ	0,93	0,93	0,911	0,914	0,761	0,748	0,652	0,580
	0,85	0,87	0,925	0,934	0,810	0,875	0,855	0,855
	0,92	0,92	0,905	0,925	0,943	0,840	0,875	0,866
	0,91	0,92	0,871	0,933	0,837	0,715	0,862	0,878
	0,9	0,90	0,986	0,859	0,743	0,914	0,897	0,858

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4.  $\mu$   $\mu$   $\mu$   $\mu$   $\mu$  (SF-36)  
 $\mu$   $\mu$   $\mu$   $\mu$   $\mu$

	$\mu$ ( $\mu$ ) $-\mu$ )	$\pm$	<b>P</b>
$\mu$	SEGT ( )	63,64 $\pm$ 27,26	0,397
	SEGT ( $\mu$ )	58,18 $\pm$ 23,69	
	( )	75,42 $\pm$ 17,90	0,736
	( $\mu$ )	77,08 $\pm$ 18,02	
$\mu$	( )	61,36 $\pm$ 27,39	0,541
	( $\mu$ )	59,09 $\pm$ 30,32	
Paired sample t-test			

5.  $\mu$   $\mu$   $\mu$   $\mu$   $\mu$  (SF-36)  
 $\mu$   $\mu$   $\mu$   $\mu$   $\mu$

	$\mu$ ( $\mu$ ) $-\mu$ )	$\pm$	<b>P</b>
$\mu$	SEGT ( )	65,38 $\pm$ 36,14	0,721
	SEGT ( $\mu$ )	61,54 $\pm$ 39,02	
	( )	68,75 $\pm$ 44,11	0,909
	( $\mu$ )	70,96 $\pm$ 35,01	
$\mu$	( )	38,46 $\pm$ 41,60	1,000
	( $\mu$ )	38,46 $\pm$ 45,20	
Paired sample t-test			

6.  $\mu$   $\mu$   $\mu$   $\mu$   $\mu$  (SF-36)  
 $\mu$   $\mu$   $\mu$   $\mu$   $\mu$

	$\mu$ ( $\mu$ ) $-\mu$ )	$\pm$	<b>P</b>
$\mu$	SEGT ( )	78,79 $\pm$ 37,34	0,258
	SEGT ( $\mu$ )	60,61 $\pm$ 41,68	
	( )	63,89 $\pm$ 45,97	0,748
	( $\mu$ )	69,44 $\pm$ 41,34	
$\mu$	( )	58,33 $\pm$ 40,51	0,137
	( $\mu$ )	44,44 $\pm$ 35,77	
Paired sample t-test			

7.  $\mu$   $\mu$   $\mu$  (SF-36)  $\mu$

	$\mu$ ( $\mu$ ) $-\mu$	$\pm$	<b>P</b>
Paired sample t-test	SEGT ( $\mu$ )	<b>59,23 ±21,20</b>	<b>0,006</b>
	SEGT ( $\mu$ )	<b>77,31 ±9,92</b>	
	( $\mu$ )	65,83 ± 15,93	0,940
	( $\mu$ )	65,42 ± 17,77	
	$\mu$ ( $\mu$ )	61,67 ± 26,31	0,570
	$\mu$ ( $\mu$ )	63,33 ± 27,33	

8.  $\mu$   $\mu$   $\mu$  (SF-36)  $\mu$

	$\mu$ ( $\mu$ ) $-\mu$	$\pm$	<b>P</b>
Paired sample t-test	SEGT ( $\mu$ )	<b>65,09 ±27,37</b>	<b>0,011</b>
	SEGT ( $\mu$ )	<b>89,64 ±9,42</b>	
	( $\mu$ )	70,55 ± 21,04	0,251
	( $\mu$ )	59,27 ± 28,39	
	$\mu$ ( $\mu$ )	74,33 ± 26,50	0,891
	$\mu$ ( $\mu$ )	74,00 ± 25,67	

9.  $\mu$   $\mu$   $\mu$  (SF-36)  $\mu$

	$\mu$ ( $\mu$ ) $-\mu$	$\pm$	<b>P</b>
Paired sample t-test	SEGT ( $\mu$ )	63,46 ±17,49	0,531
	SEGT ( $\mu$ )	59,62 ±23,05	
	( $\mu$ )	71,11 ± 18,33	0,938
	( $\mu$ )	71,67 ± 13,92	
	$\mu$ ( $\mu$ )	57,73 ± 26,21	0,821
	$\mu$ ( $\mu$ )	58,18 ± 25,72	

10.  $\mu$   $\mu$   $\mu$   $\mu$   $\mu$  (SF-36)

	$\mu$ ( $\mu$ - $\mu$ )	$\pm$	<b>P</b>
$\mu$	SEGT ( $\mu$ )	70,00 $\pm$ 23,10	0,229
	SEGT ( $\mu$ )	60,91 $\pm$ 28,09	
	( $\mu$ )	80,23 $\pm$ 20,26	0,641
	( $\mu$ )	76,82 $\pm$ 18,68	
	$\mu$ ( $\mu$ )	67,71 $\pm$ 32,64	0,406
	$\mu$ ( $\mu$ )	69,38 $\pm$ 32,14	
Paired sample t-test			

11.  $\mu$   $\mu$   $\mu$   $\mu$   $\mu$  (SF-36)

	$\mu$ ( $\mu$ - $\mu$ )	$\pm$	<b>P</b>
	SEGT ( $\mu$ )	76,04 $\pm$ 21,62	0,339
	SEGT ( $\mu$ )	66,67 $\pm$ 26,83	
	( $\mu$ )	72,92 $\pm$ 27,09	0,845
	( $\mu$ )	75,00 $\pm$ 26,11	
	$\mu$ ( $\mu$ )	70,83 $\pm$ 33,43	0,615
	$\mu$ ( $\mu$ )	72,92 $\pm$ 30,07	
Paired sample t-test			

12.  $\mu$   $\mu$   $\mu$   $\mu$   $\mu$  (SF-36)

	$\mu$ ( $\mu$ - $\mu$ )	$\pm$	<b>P</b>
$\mu$ $\mu$	SEGT ( $\mu$ )	264,06 $\pm$ 88,16	0,239
	SEGT ( $\mu$ )	236,56 $\pm$ 98,71	
	( $\mu$ )	302,19 $\pm$ 81,71	0,906
	( $\mu$ )	298,94 $\pm$ 36,53	
	$\mu$ ( $\mu$ )	222,22 $\pm$ 128,53	0,171
	$\mu$ ( $\mu$ )	228,89 $\pm$ 128,04	
Paired sample t-test			

13. (SF-36)

	$\mu$ ( $\mu$ )	$\pm$	P
$\mu$	SEGT ( )	271,91 $\pm$ 101,32	0,400
	SEGT ( $\mu$ )	243,85 $\pm$ 92,32	
	( )	278,65 $\pm$ 93,17	0,685
	( $\mu$ )	265,03 $\pm$ 102,40	
$\mu$	( )	247,43 $\pm$ 120,91	0,543
	( $\mu$ )	237,20 $\pm$ 106,84	

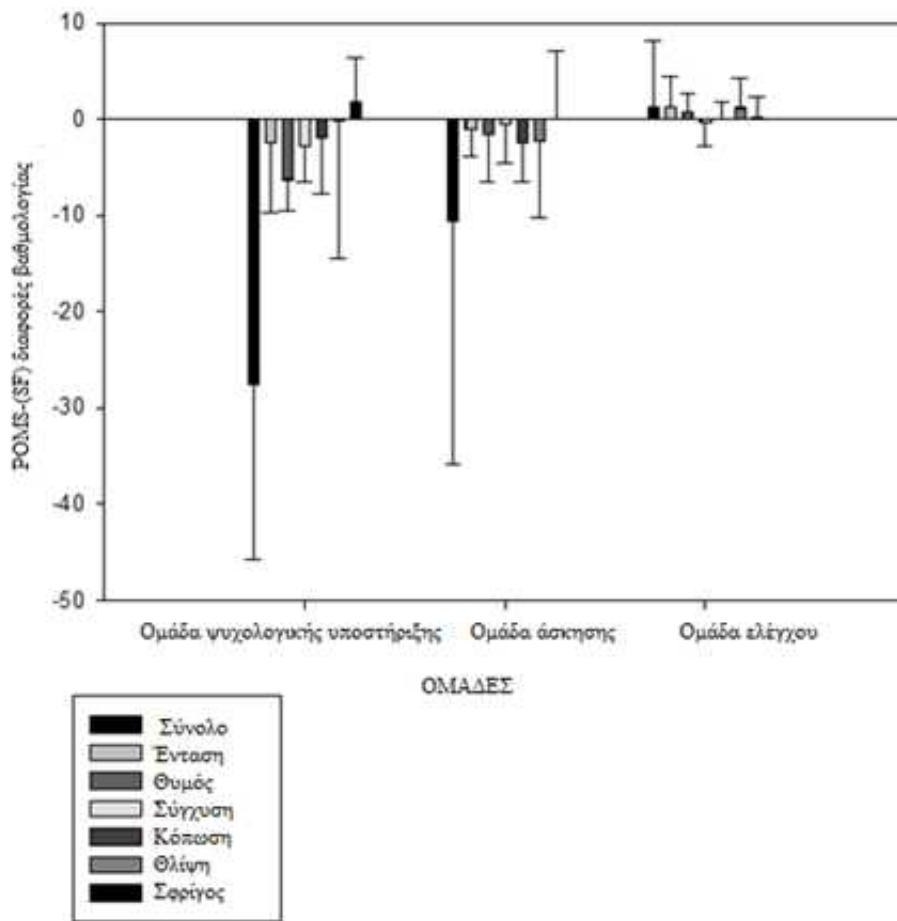
Paired sample t-test

$\mu$  POMS  $\mu$  «  $\mu$  ».  $\mu$   
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 $\mu$  (p = 0,005),  
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]. post-hoc  $\mu$   $\mu$   
 $\mu$  ( -  
6,91  $\mu$  , p < .001)  $\mu$  (-4.75  $\mu$  , p = .007).  
 $\mu$  POMS,  $\mu$   
 $\mu$  (-28.95, p = .001).  
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	μ ( )	-μ	±	t	df	p
	μ ( )		9,22±4,52	-0,826	8	0,433
	(μ )		6,78±5,87			
	μ ( )		5,55±4,52	-1,038	10	0,324
	μ (μ )		4,55±4,18			
	μ ( )		4,00±4,65	1,278	11	0,228
	μ (μ )		5,25±6,65			
Paired sample t-test						

15.

«  $\mu$  » $\mu$ 

	$\mu$ $\mu$ ( ) ( )	$\pm$	t	df	p
$\mu$	( )	9,25±5,37	-4,048	7	0,005
	( $\mu$ )	3,00±2,45			
	$\mu$ ( )	2,83±4,41	-0,974	11	0,351
	( $\mu$ )	1,33±1,87			
	$\mu$ ( )	4,08±6,46	1,076	11	,305
	( $\mu$ )	4,75±7,45			
Paired sample t-test					

16.

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	$\mu$ $\mu$ ( ) ( )	$\pm$	t	df	p
	( )	12,11±4,43	0,944	8	0,373
	( $\mu$ )	13,89±4,43			
	$\mu$ ( )	16,00±5,13	0,039	11	0,969



	$\mu$ ( $\mu$ )	16,08±5,99			
	$\mu$ ( $\mu$ )	16,42±6,82	0,257	11	0,802
Paired sample t-test					

17.

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	$\mu$ ( $\mu$ )	$\pm$	t	df	p
	( $\mu$ )	8,44±5,55	-1,810	8	0,108
	( $\mu$ )	5,67±2,60			
	$\mu$ ( $\mu$ )	5,50±5,23	-0,416	11	0,686
	( $\mu$ )	5,00±4,90			
	$\mu$ ( $\mu$ )	4,25±4,18	-0,456	11	0,658
	( $\mu$ )	3,9±4,85			
Paired sample t-test					

18.

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$\mu$

	$\mu$ ( $\mu$ )	$\pm$	t	df	p
	( $\mu$ )	9,00±4,29	-,944	9	0,370
	( $\mu$ )	7,00±4,45			

	$\mu$ ( )	4,90±4,79	-1,667	9	0,130
	$\mu$ ( $\mu$ )	2,40±2,07			
	$\mu$ ( )	4,89±5,23	,000	8	1,000
Paired sample t-test					

19.

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	$\mu$ $\mu$ ( - $\mu$ )	$\pm$	t	df	p
	( )	11,80±8,40	-,019	9	0,985
	( $\mu$ )	11,70±10,08			
	$\mu$ ( )	6,90±7,80	-,744	9	0,476
	$\mu$ ( $\mu$ )	4,70±5,96			
	$\mu$ ( )	6,08±7,57	1,246	11	0,239
	$\mu$ ( $\mu$ )	7,25±9,77			
Paired sample t-test					

20.  
μ

POMS

μ

	MT±TA	p	MT±TA	p	MT±TA	P
μ	6,78±5,87	0,433	4,55±4,18	0,324	5,25±6,65	0,228
	9,22±4,52		5,55±4,52		4,00±4,65	
μ μ	<b>3,00±2,45</b>	<b>0,005</b>	1,33±1,87	0,351	4,75±7,45	0,305
μ	<b>9,25±5,37</b>		2,83±4,41		4,08±6,46	
μ	13,89±4,43	0,373	16,08±5,99	0,969	16,58±6,54	0,802
	12,11±4,43		16,00±5,13		16,42±6,82	
μ	5,67±2,60	0,108	5,00±4,90	0,686	3,9±4,85	0,658
	8,44±5,55		5,50±5,23		4,25±4,18	
μ	7,00±4,45	0,370	2,40±2,07	0,130	4,89±4,48	1<0,001
	9,00±4,29		4,90±4,79		4,89±5,23	
μ	11,70±10,08	0,985	4,70±5,96	0,476	7,25±9,77	0,239
	11,80±8,40		6,90±7,80		6,08±7,57	
ANOVA						

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μ ( 38%, 46% 84%), p = 0,031. ( . 21)  
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μ , 15 %. ( . 22)  
21.  
μ GHQ-28 μ μ μ μ μ μ

μ	« »		« »		P
	7	8	6	5	1,000
μ	6	11	7	2	0,031
μ	10	10	3	3	1,000
Mc Nemar test					

22.  
μ μ μ μ μ μ μ μ  
μ μ GHQ-28 μ μ μ μ μ μ

Group	“ ”		“A& ”		“ ”		“ ”	
μ μ	5	5	6	8	8	5	10	11
μ μ	8	7	7	5	7	8	3	2
p	0,625		0,508		0,625		1,000	
* : μ *A& : * : * : Mc Nemar test								

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 $\mu$   $\mu$   $\mu$   
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 $\mu$  (p<0,05)  $\mu$   
 , , (  $\mu$   $\mu$   
 p=0,058),  $\mu$   $\mu$   
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23.

μ

=39,		μ	μ							μ					μ	
μ	r	0,691	0,647	0,701	0,545	0,550	0,726	0,708	-0,414	-0,381	-0,466	0,184	-0,464	-0,250	0,751	0,893
	p	<0,001	<0,001	<0,001	,001	,001	<0,001	<0,001	0,023	0,041	0,008	0,321	0,015	0,175	<0,001	<0,001
μ	r		0,743	0,497	0,398	0,400	0,579	0,584	-0,359	-0,242	-0,227	0,031	-0,515	-0,200	0,679	0,863
	p		<0,001	,001	,016	,017	<0,001	<0,001	,034	,168	,189	,858	,003	,250	<0,001	<0,001
μ	r			0,587	0,630	0,489	0,456	0,656	-0,461	-0,409	-0,485	0,104	-0,491	-0,329	0,889	0,749
	p			<0,001	<0,001	0,003	0,004	<0,001	0,005	0,016	0,003	0,553	0,005	0,054	<0,001	<0,001
	r				0,806	0,719	0,667	0,666	-0,524	-0,511	-0,512	0,390	-0,508	-0,324	0,885	0,773
	p				<0,001	<0,001	<0,001	<0,001	0,001	0,002	0,002	0,021	0,004	0,057	<0,001	<0,001
	r				0,667	0,479	0,603	0,603	-0,681	-0,584	-0,622	0,264	-0,567	-0,504	0,845	0,634
	p				<0,001	0,003	<0,001	<0,001	<0,001	<0,001	<0,001	0,138	0,001	0,003	<0,001	<0,001
	r						0,657	0,583	-0,487	-0,511	-0,508	0,334	-0,464	-0,414	0,710	0,786
	p						<0,001	<0,001	0,005	0,003	0,004	0,067	0,013	0,021	<0,001	<0,001
	r						0,652	-0,461	-0,402	-0,431	0,377	-0,575	-0,284	0,622	0,845	
	p						<0,001	0,006	0,020	0,011	0,028	0,001	0,104	<0,001	<0,001	
	r								-0,267	-0,213	-0,398	0,240	-0,362	-0,141	0,863	0,791
	p								0,121	0,227	0,018	0,165	0,045	0,420	<0,001	<0,001
	r									0,926	0,839	-0,320	0,674	0,902	-0,564	-0,482
	p									<0,001	<0,001	,065	<0,001	<0,001	,001	,013
	r										0,890	-0,356	0,617	0,887	-0,519	-0,426
	p										<0,001	,042	<0,001	<0,001	,002	,034
μ	r											-0,337	0,563	0,681	-0,582	-0,493
	p											0,048	0,001	<0,001	<0,001	0,010
	r												-0,117	-0,208	0,289	0,241
	p												0,532	0,230	0,103	0,237
	r													0,678	-0,580	-0,548
	p													<0,001	0,001	0,007
	r														-0,429	-0,376
	p														0,013	0,058
MCSPRE	r															0,833
	p															<0,001

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	r	0,869	-0,247	0,820	0,907	0,663	-0,246	-0,087	-0,397	-0,369	-0,384	-0,423	-0,265	-0,361	-0,274	-0,595
	p	<0,001	0,153	<0,001	<0,001	<0,001	0,161	0,625	0,027	0,035	0,027	0,014	0,150	0,042	0,159	0,001
μ	r		-0,081	0,719	0,861	0,669	-0,336	-0,033	-0,208	-0,230	-0,237	-0,327	-0,144	-0,233	-0,213	-0,395
	p		0,642	<0,001	<0,001	<0,001	0,052	0,852	0,261	0,197	0,184	0,063	0,440	0,200	0,275	0,041
	r			-0,263	-0,262	-0,216	0,227	0,347	0,441	0,517	0,332	0,462	0,530	0,540	0,490	0,542
	p			0,121	0,129	0,212	0,190	0,041	0,012	0,002	0,055	0,006	0,002	0,001	0,007	0,003
	r				0,833	0,693	-0,245	-0,231	-0,371	-0,393	-0,455	-0,427	-0,293	-0,456	-0,328	-0,797
	p				<0,001	<0,001	0,156	0,182	0,037	0,022	0,007	0,012	0,104	,008	0,083	<0,001
	r				0,790	-0,274	-0,056	-0,308	-0,318	-0,253	-0,382	-0,341	-0,428	-0,281	-0,647	
	p				<0,001	0,112	0,751	0,086	0,067	0,149	0,026	0,056	0,013	0,140	<0,001	
	r					-0,393	-0,205	-0,237	-0,403	-0,197	-0,544	-0,622	-0,494	-0,501	-0,604	
	p					0,019	0,230	0,191	0,018	0,265	0,001	<0,001	0,003	0,005	0,001	
μ	r						0,576	0,494	0,538	0,234	0,711	0,658	0,589	0,841	0,633	
	p						<0,001	0,003	0,001	0,163	<0,001	<0,001	<0,001	<0,001	<0,001	
μ	r							0,748	0,510	0,356	0,598	0,556	0,557	0,839	0,710	
	p							<0,001	0,001	0,033	<0,001	0,001	0,001	<0,001	<0,001	
μ	r								0,549	0,467	0,456	0,507	0,607	0,625	0,824	
	p								0,001	0,006	0,008	0,003	<0,001	<0,001	<0,001	
	r									0,747	0,654	0,634	0,751	0,657	0,755	
	p									<0,001	<0,001	<0,001	<0,001	<0,001	<0,001	
	r									0,414	0,281	0,534	0,337	0,627		
	p										0,012	0,107	0,001	0,059	<0,001	
	r											0,756	0,619	0,880	0,693	
	p											<0,001	<0,001	<0,001	<0,001	
	r												0,737	0,854	0,712	
	p												<0,001	<0,001	<0,001	
	r													0,704	0,872	
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# Exercise, supportive group therapy, and mood profile of Greek cancer patients: intervention effect and related comparisons

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## Abstract

**Purpose** The purpose of this study was to examine the effect of exercise program and a group psychotherapy program on mood profile of Greek cancer patients as well as to make the necessary comparisons.

**Methods** The sample consisted of 39 cancer patients (10 males and 29 females), randomly assigned to the three following groups: control, exercise and psychotherapy groups (13 patients in each group). The duration of the training program for the individuals of the exercise group was 10 weeks with two sessions per week, lasting 60 min each. The patients of the psychotherapy group received 10 weeks of supportive–expressive group therapy, once a week, 90 min long. The Profile of Mood States (POMS) questionnaire was administered to examine the short-term effect of both programs before and after intervention in terms of distinct mood states. Control group individuals did not participate in any program and they just filled in the POMS questionnaire before and after intervention.

**Results** Post hoc analysis revealed an anger reduction, as regards the supportive therapy group presenting statistically significant results from both the control group (−6.91 units drop in anger subscale score,  $p < .001$ ) and the exercise group (−4.75 units drop in anger subscale score,  $p = .007$ ). Regarding total POMS score, results also favored the supportive therapy group as compared to the control group (−28.95 units drop in total POMS score,  $p = .001$ ). Post-intervention values were also improved for the exercise group, but not to the extent to produce statistically significant results.

**Conclusions** The findings of this study strongly support the beneficial effect of psychological intervention on anger and total mood score of patients with cancer, followed by the positive effect of the exercise program but not to the same extent as in the case of supportive therapy intervention.

**Keywords** Cancer · Exercise · Group psychotherapy · POMS

## Introduction

Cancer creates a new reality and brings people face to face with dilemmas and problems that before might seemed remote possibilities. The psychological needs of these patients have their origins in the concern about the nature of the disease, the perspectives and the family burden [36]. Psychological needs are more frequent than the biological ones and unfortunately

health professionals treat them less effectively, especially at the beginning of the diagnosis [27].

Patients often experience a significant reduction in physical activity, partly due to the medicalization of their life and their desire to avoid any stressful situation or to retain some “disability” benefits. The mental and physical discomfort leads to social isolation and ultimately a vicious cycle of gradual resignation from life itself [44]. It is clear that not all cancer patients are a priori “impending death candidates” since a significant proportion of cancers has a favorable prognosis in the early stages, such as breast cancer and prostate cancer, while in many others there are long periods of recession [11].

Mental and physical health of cancer patients might have a tremendous effect on the course of the disease and their quality of life. Several psychosocial factors associated with key elements of the metastatic cascade in both animal and human

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models [35] have been proposed as risk factors for cancer progression by researchers over the last 30 years. These include stress, chronic depression, and lack of social support [1].

Psychological well-being not only improves quality of life but also protects against disease progression and self-harm. Patients' emotions may improve in several ways, with a special role being reserved for physical and social activity. There is a growing body of research in cancer patients showing dramatic improvements in their physical and psychological functioning due to physical exercise and psychological interventions [15, 38]. Exercise, especially when supervised, is associated with reduced pain, fatigue, and depression, and quality of life improvements among cancer survivors [15, 21]. Specific exercise has significant mental and physical benefits, even for patients with advanced disease who receive chemotherapy. Although fatigue is a common constraint, most patients are positive about increasing physical activity and would be willing to feel active again and take part in interventions that would help them overcome all obstacles related to physical activity participation [12].

Psychological support, stress coping mechanisms and physical activity can indeed enhance patients' vitality and eventually survival and quality of life. Nevertheless, there is mixed evidence for the efficacy of group psychotherapies and definite conclusions are yet to be drawn. A clear pattern of psychological outcomes could not be discerned since the seven existing randomized controlled trials on group psychological interventions used a variety of outcome measures and durations of follow-ups, with the three studies [17, 18, 40] involving application of cognitive behavioral therapy and the four studies [9, 23, 24, 41] including supportive-expressive group therapy. However, the overall effect of the psychological interventions across these studies, on one-year survival, favored the psychological intervention group.

Overall, in the case of group psychotherapy and physical activity interventions, reviewing the literature seems that no researchers have been conducted yet showing their positive psychological effect on cancer patients. The purpose of this study was to examine the effect of an exercise program and a group psychotherapy program on mood profile of cancer patients and to proceed to related comparisons. The study appears the first of its kind, since no studies have proceeded yet to conduct similar comparisons.

## Material and methods

The randomized control trial study and its procedures were reviewed and approved by the Ethics Committee Board of the DPESS of the University of Thessaly.

## Sample

The sample consisted of 39 Caucasian Greek patients (10 males mean age  $57.8 \pm 15.98$ , 9 and 29 females mean age  $58.3 \pm 9.05$ ), with cancer, any type, regardless of previous kind of treatment (surgery alone, or with adjunct therapy-chemotherapy/radiation) as diagnosed by their oncologist, all able to carry on normal activity with minor signs or symptoms of disease according to the Karnofsky performance scale [3]. Nineteen patients had breast cancer, seven colorectal cancer, three ovarian cancer, and six various other types (respiratory, hematological, and other malignancies). All patients were volunteers and registered members of the Larissa Cancer Patients Association, Greece.

A meeting preceded the initiation of the program. The great importance of health and its relation to physical activity and group psychotherapy for cancer patients were discussed and information was provided concerning the content and safety of intervention procedures. Thus, all participants were aware of any risks associated with participation in the program and had the option to consent to have their information used for research purposes.

Afterwards, the sample was randomly assigned into three groups (a control group and two experiment groups—that is, the exercise group and the psychotherapy group—each one consisted of 13 patients). All participants agreed to sign the consent form of participation and completion of Profile of Mood State (POMS) instrument before and after intervention. The study protocol was approved by the Bioethics Committee of the University of Thessaly.

## Procedure

### Psychotherapy group

The patients received a 10 weeks' supportive-expressive group therapy (SEGT) that provides several psychosocial advantages at a frequency of one time per week, of 90 min duration, with the researcher who is also a certified psychologist specialized in supportive group therapy, along with an extra therapist present.

Supportive-expressive group therapy is a non-structured, cognitive, intensive form of group psychotherapy that has been applied primarily to women with metastatic breast cancer but also to early stage breast cancer, spouses of patients with prostate cancer, AIDS patients, and other conditions. Its orientation is existential, encouraging emotional expression, communication, improvement of coping strategies and patient support network in order to provide support in addressing their concerns arising from the threats and losses caused by the disease [13].

Studies suggest that the implementation of this form of psychotherapy is accompanied by improvement in indicators such as mental discomfort, anxiety disorders, depression, physical symptoms, quality of life, and survival of patients,

although some contradictory results in certain parameters are found in the international literature [10, 28].

Moreover, engaging in supportive group therapies, members teach each other coping strategies, share mutually beneficial ideas and create a setting for self-disclosure and bonding opportunities which can serve to reduce confusion and fear. SEGT has been found to reduce many psychological symptoms of cancer, having a significant and moderate reduction in emotional suppression. Therefore, supportive-expressive group therapy has a special character as it has been designed and applied to cancer patients [28, 30].

In this study, SEGT intervention was designed to encourage communication with physicians and nurses and deal directly with existential concerns such as fears of dying and death, changes in self and body image, making meaning out of the illness, feelings of isolation, and reordering life priorities [13]. Special attention was paid to the expression of emotion with the therapists using emotion as a marker for what may be important to focus on in that session.

All participants were informed that they had the right not to take part in two meetings and more than two absences will result in the exclusion of their data in the study. No dropouts occurred during sessions.

### Exercise group

The duration of the training program for the individuals of the exercise group was 10 weeks at a frequency of two training sessions per week, of 60 min each. Since there is no sufficient evidence supporting precise guidelines for exercise prescription for each different type of cancer [3] let alone for this sample of patients with heterogeneous types, this study followed the general recommendations of exercise. These include duration of 20 to 60 min per session, at a moderate intensity of exercise that does not interfere with conversation and a training frequency of two times per week that is better tolerated for deconditioned populations [39], as compared to 3–5 days per week training recommended for healthy individuals.

Each training session included a 5-min warm-up period of respiratory and flexibility exercises followed by 10 min of walking, 35 min of aerobic exercises, balance and coordination activities and a cool-down period of 10 min of breathing and relaxation exercises. Overall, the purpose was to provide a training program that takes moderate physical effort to perform. According to ACSM guidelines, moderate intensity exercise sessions of between 20 and 60 min duration are generally recommended for cancer patients and survivors [39], with modifications as needed.

Since this study focused exclusively on the psychological effects of exercise and not physical ones, the overall intention was to examine whether participation in the exercise program could lead to positive psychological outcomes for cancer patients with moderate intensity of training described as the

physical effort that makes participants breathe somewhat harder than normal [25]. The exercise intervention was group-based and supervised, although special attention was given to individualized needs when needed and all individuals managed to participate successfully despite minor performance differences. As any medication affects heart rate, the Borg Scale of perceived exertion [8] was used as a subjective mean of estimating intensity of exercise with 12 and 14 (from “fairly light” to “somewhat hard”) on the Borg scale specified as the desired intensity in each session. Water activities were also included in one session following patients’ desire.

A medical clearance for exercise was provided by their physician prior to commencing of the program, to ensure the absence of general contraindications to exercise participation such as cardiovascular insufficiency, acute infectious diseases, metabolic diseases, anemia (Hemoglobin <10 g/dl), absolute neutrophil count less than  $0.5 \times 10^9 \mu\text{l}$  and platelet count less than  $50 \times 10^9 \mu\text{l}$ , mental or physical impairment leading to inability to exercise, significant peripheral neuropathies and use of indwelling catheter [39]. Furthermore, all participants of the exercise group were informed that they could be absent in no more than two training sessions otherwise their data will be excluded. No dropouts occurred during sessions.

### Control group

Control group individuals did not participate in any supportive therapy or exercise program and they just filled in the POMS questionnaire twice, before and after intervention.

### Instruments

The POMS questionnaire [5, 6] was administered to examine the short-term effect of the exercise program before and after intervention in terms of distinct mood states. POMS is a measure of subjective feelings of mood and it has been utilized in previous research related to a wide range of disorders [33, 37], including cancer [26] and has demonstrated adequate psychometric properties [2]. The questionnaire consists of 37 mood-related adjectives. They form the basis of six mood states, that is, tension–anxiety, fatigue–inertia, depressed–dejected, anger–hostility, confusion–bewilderment, and vigor–activity. Participants are instructed to rate these adjectives on a five-point scale ranging from “not at all” (0) to “extremely” (4). The first five factors are scored negatively (higher scores correspond to more negative emotions). The sixth factor (vigor–activity) is scored positively (higher scores correspond to greater vigor). A total mood disturbance score is calculated by summing the five negative mood states, subtracting the vigor score.

## Statistical analysis

Statistical analysis included the use of Statistical Package of Social Sciences (SPSS 22.0). Cronbach's  $\alpha$  reliability analysis was included to examine internal consistency of POMS variables. Shapiro-Wilk analysis was used to examine normality of sample distribution [20]. The null distribution of this statistic test is calculated under the null hypothesis that the samples are drawn from the same distribution. Since sample distribution was normal according to analysis, parametric tests (paired sample  $t$  test, ANOVA) were applied to examine differences between groups and pre–post intervention. Post hoc analysis (Bonferroni  $t$  test) was applied when appropriate. Changes in POMS scores were recorded using pre values subtracted from post values and resulted difference for each subscale further tested among the three groups. There were no missing data or data transformations. Statistical significance was set at  $p = .05$ .

## Results

According to Shapiro-Wilk analysis test distribution was normal [22], since no significant results for all variables were noticed and criterion value was high with the exception of “anger” in the control group. Cronbach's  $\alpha$  reliability analysis revealed a high to excellent internal consistency in pre- and post-intervention values, ranging from 0.80 to 0.94.

The reduction in anger was particularly evident and statistically significant in the psychotherapy group ( $p = .005$ ), while confusion component was also diminished, although pre-post difference was not statistically significant ( $p = .108$ ). Although post intervention values were also improved in the exercise group, no statistically significant difference emerged. No such tendency was traced in control group either (Table 1).

When the post–pre difference in POMS values were estimated among between the groups, statistically significant difference was detected in the total POMS score and the anger subscale [ $F(2,36) = 8.125$ ,  $p = .001$  and  $F(2,36) = 11.782$ ,  $p = .001$ , respectively). Post hoc analysis revealed that in the case of anger the psychotherapy group differed statistically significantly from both the control group ( $-6.91$  units drop<sup>1</sup> in this POMS subscale score,  $p < .001$ ) and the exercise group ( $-4.75$  units drop in this POMS subscale score,  $p = .007$ ). Regarding total POMS score, the supportive therapy group differed significantly from the control group ( $-28.95$  units drop in total POMS score,  $p = .001$ ). These differences are schematically depicted in Fig. 1.

<sup>1</sup> I–J differences in Bonferroni test

## Discussion and conclusions

The findings of this study support the beneficial effect of psychological intervention on mood of patients with cancer. The exercise program also improved patients' mood profile, but not to the extent that statistically significant results were produced, compared to the effect of the supportive therapy program group.

Although an overall effect on mood profile was obvious, the most significant effect relates to the anger subscale. Anger is certainly a common feeling experienced by people following cancer diagnosis with the initial stage of shock and denial having a great impact on patients' perceptions of their prognosis and goals, shaping thought process [31]. In general, anger-prone participants endorse more pessimistic perceptions of prognosis, an association maintained after accounting for potential confounders [20]. It seems that the supportive therapy program applied in this study helped to effectively engage patients feeling angry in goals of care discussions, leading to reduce their overall tendency to become angry across situations [42].

Several studies addressed management of health-related psychological distress and anger as a response to specific situational stressors such as cancer. Despite the possibly burdensome and lengthy adjustment process for cancer survivors, psychological interventions [1] produce significant quality-of-life gains and in agreement with our findings, earlier studies support such an assumption. Marchioro et al., [32] compared individualized cognitive psychotherapy and added family counseling with no treatment for women with breast cancer. The intervention group reported fewer depressive symptoms due to the effect of the cognitive-psychotherapy program that changed dysfunctional coping behaviors and depressive thoughts. In the study of McQuellon et al. [33], a brief orientation for patients newly admitted to a medical oncology clinic compared with no orientation treatment in a heterogeneous sample of cancer patients revealed significant effects. The intervention group patients reported lower state anxiety, less mood disturbance, and fewer depressive symptoms. Yeh et al. [45], in their systematic review reported that psychological interventions had a positive effect on reducing symptoms of psychological distress. The most often employed interventions included cognitive behavioral therapy and complementary therapy. Meetings with a psychologist keeping written records and peer counseling was of help, too.

Nevertheless, exercise contribution to the reduction of psychological stress should not be underestimated since psychological stress and physical activity (PA) are reciprocally related [34, 43]. Randomized controlled trials have shown that physical activity improves physical and psychological outcomes among patients with solid tumors [16, 19]. A large study of the

**Table 1** Paired samples analysis: pre and post-intervention POMS scores

Variables	Group (pre- or post-test)	<i>N</i>	Mean ± SD	<i>T</i>	df	<i>P</i>
Tension	Psychol. support (pre)	13	9.22 ± 4.52	-.826	8	.433
	Psychol. support (post)	13	6.78 ± 5.87			
	Physical activity (pre)	13	5.55 ± 4.52	-1.038	10	.324
	Physical activity (post)	13	4.55 ± 4.18			
	Control (pre)	13	4.00 ± 4.65	1.278	11	.228
	Control (post)	13	5.25 ± 6.65			
Anger	Psychol. support (pre)	13	9.25 ± 5.37	-4.048	7	.005
	Psychol. support (post)	13	3.00 ± 2.45			
	Physical activity (pre)	13	2.83 ± 4.41	-.974	11	.351
	Physical activity (post)	13	1.33 ± 1.87			
	Control (pre)	13	4.08 ± 6.46	1.076	11	.305
	Control (post)	13	4.75 ± 7.45			
Vigor	Psychol. support (pre)	13	12.11 ± 4.43	.944	8	.373
	Psychol. support (post)	13	13.89 ± 4.43			
	Physical activity (pre)	13	16.00 ± 5.13	.039	11	.969
	Physical activity (post)	13	16.08 ± 5.99			
	Control (pre)	13	16.42 ± 6.82	.257	11	.802
	Control (post)	13	16.58 ± 6.54			
Confusion	Psychol. support (pre)	13	8.44 ± 5.55	-1.810	8	.108
	Psychol. support (post)	13	5.67 ± 2.60			
	Physical activity (pre)	13	5.50 ± 5.23	-.416	11	.686
	Physical activity (post)	13	5.00 ± 4.90			
	Control (pre)	13	4.25 ± 4.18	-.456	11	.658
	Control (post)	13	3.9 ± 4.85			
Fatigue	Psychol. support (pre)	13	9.00 ± 4.29	-.944	9	.370
	Psychol. support (post)	13	7.00 ± 4.45			
	Physical activity (pre)	13	4.90 ± 4.79	-1.667	9	.130
	Physical activity (post)	13	2.40 ± 2.07			
	Control (pre)	13	4.89 ± 5.23	.000	8	1.000
	Control (post)	13	4.89 ± 4.48			
Depression	Psychol. support (pre)	13	11.80 ± 8.40	-.019	9	.985
	Psychol. support (post)	13	11.70 ± 10.08			
	Physical activity (pre)	13	6.90 ± 7.80	-.744	9	.476
	Physical activity (post)	13	4.70 ± 5.96			
	Control (pre)	13	6.08 ± 7.57	1.246	11	.239
	Control (post)	13	7.25 ± 9.77			

American Cancer Society concluded only 30–47% of cancer patients meet the minimum physical activity criterion of mild intensity exercise for 30 min a day [7]. However, such recommendation is no longer enough for cancer that requires as much exercise as possible to prevent disease progression [29].

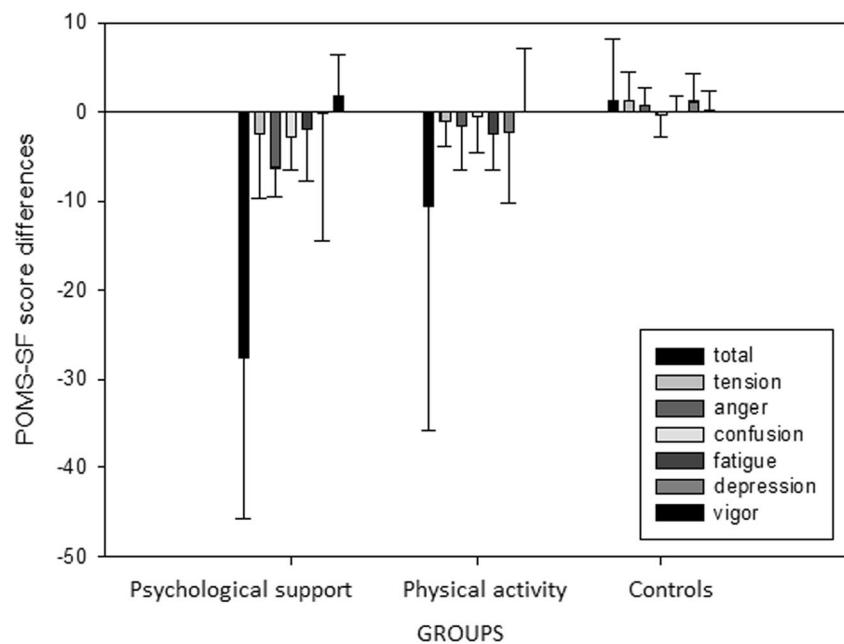
Physical inactivity has been found to exert a negative effect on mood state of cancer survivors. In the study of Ariza-Garcia et al. [4], the higher fitness level of the physically active group of cancer patients related with lower anger, fatigue, depression, confusion, and mood disturbance levels compared to the inactive group. Similarly, in Craft et al.'s study [15], exercise had positive effects on depressive symptoms of cancer patients, with larger effects reported for individuals participating

in exercise programs of at least 30 min in each session fully or partly supervised.

Cormie et al.'s [14] study, reviewing a total of 100 studies involving thousands of individuals with any type of cancer whose exercise behavior was assessed, showed that patients who exercised regularly following a diagnosis of cancer had lower relative risks of cancer mortality and recurrence and experienced less severe adverse effects compared to patients who did not exercise. Significant improvement was also reported in terms of psychosocial distress-related outcomes (psychosocial distress, anxiety, depression, stress, emotional well-being, mental health) in a total of 12 meta-analyses, including different diagnoses. Overall, positive changes in inflammation, immunity,



**Fig. 1** Pre- and post-intervention differences in POMS scores



and oxidative stress, as well as in metabolic and sex hormones may inhibit cancer progression, while positive emotional effects may further contribute to avoidance of comorbid conditions, such as cardiovascular disease [14].

The present study underlines the effect of a supportive-expressive therapy program on improving cancer patients' mood profile and supports the priority to focus on psychological interventions without neglecting exercise contribution. Psychosocial group therapy appears to produce psychosocial benefits and health professionals should care for wider distress screening and earlier palliative care intervention, focusing especially on anger assessment in clinical cancer settings. Willingness to explore and address patient needs will allow an empathetic convey of realistic optimism and provide a motive to cancer patients to change their living and substantially take control of their disease outcome. Future studies should consider optimizing such interventions and POMS scale could be incorporated into elements of screening programs for measuring unfulfilled needs, desire for assistance, clinical response, and longitudinal outcomes.

The study appears the first of its kind regarding the examination of mood profile of cancer patients making the related comparisons between exercise, supportive-expressive therapy and no treatment groups, so it is inevitable limited by its exploratory nature. Future researches with larger samples and longer intervention periods are needed to further verify whether additional psychosocial improvements could be evident for cancer patients with high distress and poorest coping mechanisms who might gain most from SEGT-taught coping strategies and/or exercise.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflicts of interest.

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# INTERVENTION EFFECT OF SUPPORTIVE GROUP THERAPY AND PHYSICAL EXERCISE ON THE QUALITY OF LIFE OF CANCER PATIENTS

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<sup>A</sup> Study Design; <sup>B</sup> Data Collection; <sup>C</sup> Statistical Analysis; <sup>D</sup> Manuscript Preparation

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**Abstract** Psychological distress is a multidimensional concern affecting patients' ability to cope with cancer, its physical symptoms, and treatments.

This study examined the effect of an exercise program and a group psychotherapy program on the quality of life of Greek cancer patients.

The sample consisted of 39 cancer patients (10 males and 29 females), assigned randomly in three groups of 13 patients each group, that is, a control, an exercise and a psychotherapy group. The duration of the training program for the individuals of the exercise group was 10 weeks at a frequency of two sessions per week, 60 minutes each session. The patients of the psychotherapy group received a 10 weeks' supportive-expressive group therapy, at a frequency of one time per week, of 90 minutes each meeting. The quality of life SF-36 questionnaire was administered to examine the short-term effect of both programs prior and after intervention on quality of life. Control group individuals did not participate in any program and they just filled in the SF-36 questionnaire prior and after intervention.

Improvement in "vitality" ( $p = 0.006$ ) and mental health subscale ( $p = 0.011$ ) was statistically significant between pre and post measures in the supportive therapy group. All other domains exhibit no significant changes. In the exercise group, physical functioning, role functioning and emotional role values were also improved but not to the point to generate statistically significant results. The findings of the present study support the positive impact of psychotherapy intervention on vitality and mental health component of patients with cancer, followed in less extent by the beneficial effect of the exercise program.

**Key words** quality of life, cancer survivors, exercise, group psychotherapy

## Introduction

Cancer is a chronic disease threatening the life and physical integrity of the patient that extends over time and raises issues of psychological significance for the individual. As such, cancer diagnosis is a psycho-traumatic event, while treatment and progression of the disease compose a complex and extremely stressful experience for the

patient that alleviates over time and affects both in short- and long- term the overall functionality level of sufferers (Trudel-Fitzgerald et al., 2017).

Emerged clinical phenomena that characterize the development of post-traumatic syndrome include constant disease engaging, intrusive thoughts of death and refusal or avoidance of anything that recalls the disease including available therapeutic options. Furthermore, relapses of the disease may be even more traumatic than its initial attack and consequent arising anxiety psychologically disrupts patient's quality of life (Stanton, Bower, 2015).

Quality of life is a subjective and multidimensional concept and health-related quality of life concerns the subjective assessment of disease incidence and its treatment at the physical, psychological and social level of functionality and well-being. Therapeutic interventions that are often ambulatory and adjuvant therapies such as chemotherapy and radiotherapy, affect patients at a physical, psychological, social and mental level, resulting in anxiety, depression and quality of life reduction (Naughton, Weaver, 2014).

Psychological distress is a multidimensional concern affecting patients' ability to cope with cancer, its physical symptoms and treatment consequences (Gundelach, Henry, 2016) and if untreated, may lead to lowered quality of life, reduced coping and compatibility with the disease and even suicide (Klaassen et al., 2017). Appropriate interaction with cancer patients is necessary for dealing with side effects of cancer therapy and improving their quality of life (QoL) (Badger et al., 2013).

Psychological interventions exert beneficial effects on patients' mood and further on their quality of life. Yeh et al in their systematic review reported that these interventions had a positive effect that improved psychological distress and several QoL domains (Yeh, Chung, Hsu, Hsu, 2014) and supported a potential bio-behavioral pathway relevant to cancer survivorship (Wenzel et al., 2015). Furthermore, exercise interventions are associated with reduced depression, pain and sense of fatigue, leading cancer survivors to the development of stress coping mechanisms, vitality enhancement and quality of life improvements even for patients who receive chemotherapy (Craft, Vaniterson, Helenowski, Rademaker, Courneya, 2012; Gerritsen, Vincent, 2015).

Nevertheless, psychological outcomes in research efforts including both psychological and exercise interventions in their design are yet to be drawn. This study examined the effect of a supportive group therapy program and an exercise program on the quality of life of Greek cancer patients.

## Methods

This study and its randomized control trial protocol and procedures were reviewed and approved by the DPSS University of Thessaly bioethics committee.

### Sample

The sample consisted of 39 patients (10 males and 29 females, with mean age of  $57.8 \pm 15.98$  and  $58.3 \pm 9.05$  respectively) with cancer, any type (19 with breast cancer, 7 with colorectal cancer, 3 with ovarian cancer and 6 with other types of respiratory, hematological and other malignancies), regardless of previous kind of treatment (surgery alone, and/or adjunct therapy – radiation/chemotherapy) as diagnosed by their oncologist. All patients were registered members of the Larissa cancer patients association, they volunteered to participate in the study and they were all able to keep on normal activity with minor symptoms of the disease according to the Karnofsky performance scale (Azevedo, Viamonte, Castro, 2013).

Pre-intervention phase included a meeting prior initiation of the program with information provided by the researcher regarding benefits, content and safety of exercise and group psychotherapy intervention procedures. Thus, all patients were aware of any possible risks associated with their participation and they agreed to sign the consent form of participation in the study, to complete the SF-12 instrument prior and after intervention and to have their information used for research purposes. Next, the sample was assigned randomly into three groups (a control group, an exercise group and a psychotherapy group, of 13 patients each one).

## Procedure

### Psychotherapy (SEGT) group

Supportive-expressive group therapy (SEGT) is a non-structured intensive form of group psychotherapy that provides several psychosocial advantages, applied mainly to women with metastatic breast cancer and other cancer conditions too. SEGT orientation is existential and cognitive, encouraging communication, emotional expression, sharing of mutual beneficial ideas, development of coping strategies and network support of cancer patients so as to address their arising concerns caused by the disease (Butler et al., 2009).

Studies suggest that SEGT implementation affects positively indicators such as physical symptoms, depression and anxiety, mental discomfort, emotional suppression, quality of life, and survival rate of patients, although few contradictory results has also been reported in research studies (Azevedo et al., 2013; Butler et al., 2009). Engaging in SEGT provides bonding opportunities among patients and creates a setting for self-disclosure that reduces fear and confusion, thus, SEGT has a special feature designed for application to cancer patients (Butler et al., 2009; Hill, Amir, Muers, Connolly, Round, 2003).

In this study, a 10 weeks' supportive-expressive group therapy (SEGT) was applied to patients of the psychotherapy group at a frequency of one session (meeting) per week of 90 minutes each session, with the researcher and a specialized psychologist present. In each meeting, SEGT intervention was designed to use emotions as a marker for what may be important to focus so as to encourage communication and deal with isolation feelings, changes in self and body image, reordering of life priorities and fear concerns of dying and death. No drop outs occurred during sessions.

### Exercise group

Individuals of the exercise group received a 10 weeks training program, at a frequency of two (2) training sessions each week, of 60 minutes per session. Since this sample of patients had heterogeneous types of the disease and there are no precise guidelines for exercise prescription for each different type of cancer (Azevedo et al., 2013), this study followed general exercise recommendations that include duration of 20 to 60 minutes per session at a moderate exercise intensity recommended for cancer patients, described as the physical effort that makes participants breathe somewhat harder than normal but does not interfere with conversation (Clark et al., 2007). Furthermore, the Borg Scale (Borg, 1982) was used a subjective mean of exercise intensity, with 12 and 14 (from "fairly light" to "somewhat hard") specified as the desired perceived exertion in each session. Training frequency was 2 times per week that is better tolerated for de-conditioned populations (Schmitz et al., 2010) as compared to training frequency of 3–5 sessions per week suggested for healthy participants.

Each session included a 5-minute warm-up period of flexibility and respiratory exercises followed by 10 minutes of walking, 35 minutes of balance, co-ordination and aerobic activities and a 10 minutes cool-down

period of breathing and relaxation. The exercise intervention was supervised and group-based with modifications as needed according to individualized needs and performance, leading all participants to successfully complete the exercise program. A swimming session was also included following patients' request. Finally, a medical clearance was provided by their physician prior the start of the program to ascertain that no general contraindications to exercise participation were present (Moreno-Smith, Lutgendorf, Sood, 2010).

### **Control Group**

Control group individuals did not participate in any exercise or supportive therapy program or and they just filled in the SF 36 questionnaire prior and after intervention.

### **Instruments**

The Greek version (Pappa, Kontodimopoulos, Niakas, 2005) of the SF-36 Health Survey (Ware, Sherbourne, 1992) was used to assess health-related quality of life. Good psychometric properties of the SF-36 were previously documented in cancer patients (Bunevicius, 2017; Treanor, Donnelly, 2015) and in cancer survivors (Reulen et al., 2006). The SF-36 examines individual perceptions regarding quality of life in relation to eight different items of functioning that is, physical functioning, bodily pain, role limitations due to physical problems and general health that are summarized into a physical component score, and social functioning, energy/vitality, role limitations due to emotional problems and mental health that constitute a mental component score. Scores range from 0 (worse) to 100 (best) possible range with higher scores indicating a better health related quality of life.

### **Statistical Analysis**

The Statistical Package of Social Sciences (SPSS 22.0) was used for statistical analysis. Normality of sample distribution was examined using Shapiro-Wilk analysis (Ghasemi, Zahediasl, 2012). Since sample distribution was normal, parametric tests (paired sample t test, ANOVA) were applied to examine differences between groups in pre and post measures. No missing data or data transformations were noted. Statistical significance was set at  $p = 0.05$ .

### **Results**

A normal test distribution was noted using Shapiro-Wilk analysis (Reulen et al., 2006), since no significant results were observed for all variables and criterion value was high. An increase of vitality score was statistically significant ( $p = 0.006$ ) in post measures for the psychotherapy (SEGT) group while mental health component was also improved at a statistically significant level ( $p = 0.011$ ). In the exercise group, post intervention values in physical functioning, role functioning and emotional role were improved but not to the extent to produce statistically significant results.

No such differences were noted in control group either (Table1).

**Table 1.** Pre and post-intervention SF-36 scores

Variables	Group (pre-post-test)	Mean $\pm$ SD	p
1	2	3	4
Physical Functioning	SEGT (pre)	63.64 $\pm$ 27.26	0.397
	SEGT (post)	58.18 $\pm$ 23.69	
	Exercise (pre)	75.42 $\pm$ 17.90	0.736
	Exercise (post)	77.08 $\pm$ 18.02	
	Control (pre)	61.36 $\pm$ 27.39	0.541
	Control (post)	59.09 $\pm$ 30.32	
Role Functioning	SEGT (pre)	65.38 $\pm$ 36.14	0.721
	SEGT (post)	61.54 $\pm$ 39.02	
	Exercise (pre)	68.75 $\pm$ 44.11	0.909
	Exercise (post)	70.96 $\pm$ 35.01	
	Control (pre)	38.46 $\pm$ 41.60	1,000
	Control (post)	38.46 $\pm$ 45.20	
Role Emotional	SEGT (pre)	78.79 $\pm$ 37.34	0.258
	SEGT (post)	60.61 $\pm$ 41.68	
	Exercise (pre)	63.89 $\pm$ 45.97	0.748
	Exercise (post)	69.44 $\pm$ 41.34	
	Control (pre)	58.33 $\pm$ 40.51	0.137
	Control (post)	44.44 $\pm$ 35.77	
Vitality	SEGT (pre)	59.23 $\pm$ 21.20	0.006
	SEGT (post)	77.31 $\pm$ 9.92	
	Exercise (pre)	65.83 $\pm$ 15.93	0.940
	Exercise (post)	65.42 $\pm$ 17.77	
	Control (pre)	61.67 $\pm$ 26.31	0.570
	Control (post)	63.33 $\pm$ 27.33	
Mental Health	SEGT (pre)	65.09 $\pm$ 27.37	0.011
	SEGT (post)	89.64 $\pm$ 9.42	
	Exercise (pre)	70.55 $\pm$ 21.04	0.251
	Exercise (post)	59.27 $\pm$ 28.39	
	Control (pre)	74.33 $\pm$ 26.50	0.891
	Control (post)	74.00 $\pm$ 25.67	
General Health	SEGT (pre)	63.46 $\pm$ 17.49	0.531
	SEGT (post)	59.62 $\pm$ 23.05	
	Exercise (pre)	71.11 $\pm$ 18.33	0.938
	Exercise (post)	71.67 $\pm$ 13.92	
	Control (pre)	57.73 $\pm$ 26.21	0.821
	Control (post)	58.18 $\pm$ 25.72	
Bodily Pain	SEGT (pre)	70.00 $\pm$ 23.10	0.229
	SEGT (post)	60.91 $\pm$ 28.09	
	Exercise (pre)	80.23 $\pm$ 20.26	0.641
	Exercise (post)	76.82 $\pm$ 18.68	
	Control (pre)	67.71 $\pm$ 32.64	0.406
	Control (post)	69.38 $\pm$ 32.14	

1	2	3	4
Social Functioning	SEGT (pre)	76.04 ±21.62	0.339
	SEGT (post)	66.67 ±26.83	
	Exercise (pre)	72.92 ±27.09	0.845
	Exercise (post)	75.00 ±26.11	
	Control (pre)	70.83 ±33.43	0.615
	Control (post)	72.92 ±30.07	
Physical Health Subscale	SEGT (pre)	264.06 ±88.16	0.239
	SEGT (post)	236.56 ±98.71	
	Exercise (pre)	302.19 ±81.71	0.906
	Exercise (post)	298.94 ±36.53	
	Control (pre)	222.22 ±128.53	0.171
	Control (post)	228.89 ±128.04	
Mental Health Subscale	SEGT (pre)	271.91 ±101.32	0.400
	SEGT (post)	243.85 ±92.32	
	Exercise (pre)	278.65 ±93.17	0.685
	Exercise (post)	265.03 ±102.40	
	Control (pre)	247.43 ±120.91	0.543
	Control (post)	237.20 ±106.84	

## Discussion

In this study, findings support the positive effect of SEGT implementation on vitality and mental health of cancer patients, referring to less sense of fatigue and improved energy levels, less anxiety and depression symptoms and recovery of emotional control, leading to an improved psychological wellbeing and quality of life perception. As for exercise, scores in all SF-36 domains did not change substantially compared to SEGT application, although individuals of the experiment group improved their post scores in relation to less limitations experienced due to physical or mental health difficulties caused by the disease. Nevertheless, pre-post differences were not statistically significant.

Comparisons with previous intervention studies for cancer patients including exercise in their design are challenging due to differences in their methodological design. J.K. Gerittsen and A.J. Vincent (2015) in their systematic review and meta-analysis of randomized control trials (RCTs) concerning exercise and quality of life of cancer patients, showed that only 6 out of 16 of these researches had a duration of less or equal to 10 weeks that is comparable to ours, with 3 of them producing statistically significant results. Two of these studies included mixed cancer patients population like our study, receiving, however, either a high-intensity cardiovascular and heavy resistance training combined with relaxation and body awareness training of 9 hours weekly for 6 weeks (Andersen et al., 2013) or a combined walking and strength training program for five days per week for six weeks (Samuel et al., 2012) compared to the medium intensity exercise program twice per week of our study. Of the three aforementioned studies, only S.R. Samuel et al. (2012) used the SF-36 questionnaire along with 3 other studies out of the 16 RCTs included in the systematic review of J.K. Gerittsen and A.J. Vincent (2015).

Overall, most studies reported a significant improvement in terms of fatigue. Nevertheless, although exercise especially when supervised exerts beneficial effects on fatigue and depression with improvements in the relevant quality of life fields among cancer survivors (Gerittsen, Vincent, 2015), beyond these areas, exercise contribution

to total quality of life improvement needs further investigation in short-term interventions (Monga et al., 2007; Hejazi, Bahrami, Keshvari, Alavi, 2017). The most recent meta-analysis of L.M. Buffart et al. (2017) concluded that exercise effects on QOL were significant, but small in general. According to L.M. Buffart et al. (2017) exercise, especially when supervised, improves quality of life and physical function of cancer patients with different clinical or demographic characteristics during and following treatment, thus, there is consistent evidence to support exercise implementation as part of cancer care. Nevertheless, issues such as patient's motivation to participate, the duration of the program and the subjective evaluation of quality of life (Korstjens et al., 2008) require further investigation. In our sample of participants with different cancer types, all patients were in the after treatment period where only intense aerobic exercise such as cycling or rowing for at least 12 months in certain cancer groups has been reported to have a significant effect (Gerritsen, Vincent, 2015).

On the other hand, psychological interventions are less time consuming and demand minimal physical effort from cancer patients. In this regard, patients of any age could attend intervention sessions and some early results might be obvious within a couple of weeks. Even a 3-week communicational program consisting of distributing educational booklets, practices, and phone follow-ups may have positive impact on psychological distress (Hejazi et al., 2017). The randomized clinical trial of L. Wenzel et al. (2015) in 204 survivors of cervical cancer examining the effect of psychosocial telephone counseling on QOL domains and its association with biomarkers confirmed mood and quality of life benefits related to positive bio-indicator changes, supporting in this way a potential bio-behavioral pathway relevant to cancer survivorship.

A. Torre-Luque et al.,(2016) in their meta-analysis noted that psychological treatments promote greater QoL for survivors, with a noteworthy effect on reducing somatic anxiety, sleep problems or other symptomatology as a consequence of medical treatments, although these benefits tend to reduce in patients under active treatment. As patients recover from cancer they have to adapt to different daily conditions than before. In this transition phase, the physical and psychological consequences could be efficiently managed within the context of psychological support. Nevertheless, psychological interventions effect size is rather small regarding improvement of QOL and reduction in depressive symptomatology, thus, strategies towards these goals should be included in future psychological treatments (Knobf, Thompson, Fennie, Erdos, 2014).

Unique survivor characteristics should always be considered when recommending different interventions that might improve psychological QOL (Badger et al., 2013), such as the exercise and SEGT interventions used in our study, to further recommend appropriate care for cancer patients. Variables related to the individual's pre-morbid psychological characteristics and the manner in which this individual copes with the cancer are more related to QOL scores than to cancer-related variables such as treatment types and cancer severity (Brunault et al., 2016). Future studies should consider optimizing such interventions, by taking into account patients' unique needs.

Overall, this study underlines the effect of a SEGT program on improving mental health and vitality of cancer patients leading to an improved quality of life perception. The small sample size, the mixed population of cancer patients and the relatively short duration of intervention all constitute limitations. In this context, it seems that for the cancer patients of our study sharing their experience with others through a SEGT approach was more effective to improve their QOL perceptions compared to individual efforts to cope with the disease through physical effort. Exercise seemed to have a small but not significant effect in post mental health scores but only psychotherapy enhanced QOL domains of cancer patients. Future researches with larger samples and longer periods of intervention



in selected patients (e.g. specific age groups, non-mixed population) are needed to further verify QOL gains derived from exercise and/or SEGT strategies.

## Implications for Practice

The results of this study support the importance of supportive-expressive group therapy (SEGT) as an effective intervention tool that improve vitality and mental health of cancer patients leading to an enhanced quality of life perception. Furthermore, it provides in detail the design of psychotherapy and exercise procedures that could be applied in everyday nursing practice or adopted by future studies. Finally, it recommends that exercise should not be overlooked as a potential mean to improve psychological wellbeing of cancer patients, creating the need for future everyday practices and research efforts to combine psychotherapy and exercise interventions so as to maximize psychological benefits.

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## Original Article

## Exercise Effect on General Health Status of Greek Cancer Patients: Intervention Effect and Related Comparisons

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### Abstract

**Background:** Cancer diagnosis and therapy imposes a great deal of stress on patients. Psychological interventions and physical activity may reduce depression and help cancer patients to develop stress coping mechanisms.

**Objective:** The purpose of the present study was to examine the effect of exercise program and a group psychotherapy program on the general health of cancer patients.

**Methodology:** The sample consisted of 39 cancer patients (10 males and 29 females), assigned randomly in three groups of 13 patients each group, that is, a control, an exercise and a psychotherapy group. The patients of the psychotherapy group received a 10 weeks' supportive-expressive group therapy, at a frequency of one time per week, of 90 minutes each meeting. The duration of the training program for the individuals of the physical activity (PA) group was 10 weeks at a frequency of two sessions per week, 60 minutes each session. The GHQ-28 questionnaire was administered to examine the general health status of the participants. The binary scoring (0/1) was applied, with any score above 4 indicating the presence of "caseness", i.e. strong possibility of psychiatric morbidity.

**Results:** A statistically significant difference was observed in the PA group, where the "no cases" category was raised to 11 cases at post-intervention level in comparison with the 6 cases before intervention (38% increase, from 46% to 84%),  $p=0.031$ . In the same group and in the anxiety/insomnia subscale, 6 vs 8 persons were classified as "asymptomatic" before and after intervention respectively.

**Conclusions:** Physical activity exerts a favorable effect on psychiatric morbidity of cancer patients, especially in the field of anxiety and insomnia, while psychological intervention had a negligible effect. Screening cancer patients for insomnia and anxiety may be helpful to determine treatment intervention programs tailored to their needs

**Key words:** General health, cancer survivors, exercise, group psychotherapy.

### Introduction

Cancer diagnosis imposes a great deal of stress on patients, especially at disease onset, as future strategies and outcomes are yet to be determined. As time goes by, the affected person adapts and accommodates self in a better way with the

situation and consequently reduces morbidity and suffering.

Among non-pharmacological treatments, physical activity (PA) is considered safe and well tolerated by cancer patients and survivors, improving physiologic and psychosocial

outcomes for most patients. PA as defined as any bodily movement produced by skeletal muscles that results in energy expenditure may be unstructured and include everyday life activity, as well as exercise comprising pre-arranged, deliberate and repetitive activity and sports (Courneya et al., 2000; Burr et al., 2012).

However, in cancer patients some precautions are necessary due to PA side effects, depending on cancer characteristics and treatment options that require careful selection and monitoring during training, since, for example, patients with lung cancer or bone lesions might be at particular risk due to increased risk of cardiovascular events and bone fractures respectively. In this case, these patients should be offered preliminary medical exams prior exercise to attend PA programs prescribed for other cancer patients (Burr et al., 2012).

Psychological distress commonly appears among cancer patients, since cancer is a life-threatening disease imposing serious limitations. Distress may develop in any cancer stage affecting treatment outcome and the quality of life (QoL) of patients (Zabora et al., 2001; Yi et al., 2017).

It is estimated that at least one third of cancer patients worldwide suffer from some kind of serious distress, with its prevalence varying among cancer patients with lung, pancreatic, head and neck, Hodgkin's disease, and brain cancer patients reported as being more distressed (Carlson et al., 2004).

PA has a beneficial effect on psychological distress via multiple neuroendocrine pathways, involving the production of cytokines and endorphins (Feroli et al., 2018). Furthermore, psychological interventions also reduce depression and help cancer patients to develop stress coping mechanisms and handle pain, supporting a feasible bio-behavioral route that is relevant to cancer survival (Yeh et al., 2014). Nevertheless, research outcomes concerning the effect of exercise and psychological interventions on health of cancer patients are yet to be drawn.

The purpose of the present study was to examine the effect of an exercise and a group psychotherapy program on the general health of cancer patients and especially to the dimensions of anxiety and insomnia, depression, somatization and social dysfunction, according the GHQ-28 research tool.

## Material and methods

### Sample

The sample consisted of 39 patients (10 males and 29 females) with cancer, any type, regardless of previous kind of treatment (surgery alone, or with adjunct therapy-chemotherapy/radiation) as diagnosed by their oncologist and able to carry on normal activity with minor signs or symptoms of disease according to Karnofsky performance scale (Azevedo et al., 2013). All patients were volunteers and registered members of the Larissa cancer patients association, Greece. A meeting preceded the initiation of the program. The great importance of health and its relation with physical activity and group psychotherapy for cancer patients were discussed and information was provided concerning the content and safety of intervention procedures. Thus, all participants were aware of any risks associated with participation in the program and had the option to consent to have their information used for research purposes. The sample was randomly assigned into three groups (a control group and two experiment groups – that is, the exercise group and the psychotherapy group- each one consisted of 13 patients). All participants agreed to sign the consent form of participation and completion of POMS instrument prior and after intervention. The study protocol was approved by the University of Thessaly bioethics committee.

### Procedure

#### Supportive therapy group

The patients received a 10 weeks' supportive-expressive group therapy (SEG) that provides several psychosocial advantages (Grassi et al., 2010), at a frequency of one time per week, of 90 minutes each meeting, with the researcher and a therapist present. Engaging in supportive group therapies, members teach each other coping strategies, share mutually beneficial ideas and create a setting for self-disclosure and bonding opportunities which can serve to reduce confusion and fear. SEG has been found to reduce many psychological symptoms of cancer, having a significant and moderate reduction in emotional suppression (Kissane et al., 2007; Ho et al., 2016). This psychotherapy intervention followed an unstructured pattern, designed to encourage expression of emotion, enhance symptom control and communication with

physicians and nurses and deal directly with existential concerns such as fears of dying and death, changes in self and body image, making meaning out of the illness, feelings of isolation and reordering life priorities (Classen et al., 2008). Special attention was paid to the expression of emotion with the therapists using emotion as a marker for what may be important to focus on in that session. No drop outs occurred during sessions.

### **Exercise group**

The duration of the training program for the individuals of the exercise group was 10 weeks at a frequency of two training sessions per week, of 60 minutes each session. Since there is no sufficient evidence supporting precise guidelines for exercise prescription for each different type of cancer (Azevedo et al., 2013) let alone for this sample of patients with heterogeneous types, this study followed the general recommendations of exercise. These include duration of 20 to 60 minutes per session, at a moderate intensity of exercise that does not interfere with conversation and a training frequency of 2 times per week that is better tolerated for deconditioned populations (Schmitz et al., 2010; Courneya et al., 2000) as compared to 3-5 days per week training recommended for healthy individuals. (Mishra et al., 2012)

Each training session included a 5-minute warm-up period of respiratory and flexibility exercises followed by 10 minutes of walking, 35 minutes of aerobic exercises, balance and co-ordination activities and a cool-down period of 10 minutes of breathing and relaxation exercises. Overall, the purpose was to provide a training program that takes moderate physical effort to perform. In general, moderate intensity exercise sessions of between 20 and 60 minutes duration are recommended for cancer patients and survivors, with modifications as necessary. (Mishra et al., 2012)

A medical clearance for exercise was provided by their physician prior commencing of the program, to ensure the absence of general contraindications to exercise participation such as cardiovascular insufficiency, acute infectious diseases, metabolic diseases, anemia (Hemoglobin <10g/dl), absolute neutrophil count less than  $0.5 \times 10^9/\mu\text{l}$  and platelet count less than  $50 \times 10^9/\mu\text{l}$ , mental or physical impairment leading to inability to exercise, significant peripheral

neuropathies and use of indwelling catheter. (Schmitz et al., 2010)

### **Control Group**

Control group individuals did not participate in any supportive therapy or exercise program and they just filled in the POMS questionnaire twice, prior and after intervention.

### **Instruments**

The General Health Questionnaire (GHQ-28), a 28-item measure of emotional distress in medical settings. developed by Goldberg in 1978 was used as a screening tool to detect those likely to have or to be at risk of developing psychiatric disorders. The questionnaire consists of four subscales, that is, somatic symptoms (items 1–7); anxiety/insomnia (items 8–14); social dysfunction (items 15–21), and severe depression (items 22–28) (Goldberg, 1986). It takes less than 5 minutes to complete. In the present study, the GHQ-28 scoring followed the binary method, where "Not at all", and "No more than usual" score 0, and "Rather more than usual" and "Much more than usual" score 1. Using this method any score above 4 indicates the presence of "caseness", i.e. strong possibility of psychiatric morbidity. The latter scoring method was applied in this study.

### **Statistical analysis**

Statistical analysis included the use of Statistical Package of Social Sciences (SPSS 22.0). GHQ "caseness" variables were treated as nominal ones. A binary "yes" or "no" variable was created and the percentage distribution across the three groups was studied. To further study the statistical differences, one more binary variable was created, with those patients scoring over "0" points in each GHQ subscale classified as "symptomatic" and the remaining patients scoring "0" classified as "no symptomatic at all". McNemar's test appropriate for repeated nominal data was applied. Statistical significance was set at  $p=0.05$ ,

### **Results**

In the psychotherapy group, 6 out of 13 persons (46.2%) were considered as "no cases" at pre-intervention level, while in the physical activity group 7 (53.8%) persons were classified as "no cases". Ten persons were classified as "no cases" in the control group. While in the control group there had been no change in the rates of "cases" and no "cases", in the psychotherapy



group “cases” were diminished by one (5 persons at post intervention vs 6 at pre - intervention) ( $p=0.625$ ). A statistically significant difference was observed in the PA group. In this group the “no cases” category was raised to 11 cases at post – intervention level in comparison with the 6 cases before intervention (38% increase, from

46% to 84%),  $p=0.031$ . (Table 1) When the PA group was further analyzed by GHQ subscales, the greater difference, although not statistically significant was observed in the anxiety/insomnia subscale: 6 persons were classified as “asymptomatic” before intervention, vs 8 persons after intervention, a 15% increase. (Table 2)

**Table 1. GHQ caseness differences among treatment groups**

Group	No cases			Cases		p
	Pre	Post		Pre	Post	
Psychotherapy	7	8		6	5	1,000
Physical activity	6	11		7	2	0,031
Control	10	3		10	3	1,000
Mc Nemar test						

**Table 2. GHQ subscales differences among treatment groups**

Group	“S”		“AI”		“SD”		“Dep”	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
No symptoms	5	5	6	8	8	5	10	11
Symptoms	8	7	7	5	7	8	3	2
p	0,625		0,508		0,625		1,000	
*S: Somatization *AI: Anxiety & Insomnia *SD: Social Dysfunction *Dep: Depression								

## Discussion

According to findings, physical activity exerts a favorable effect on psychiatric morbidity of cancer patients especially in the field of anxiety and insomnia, while psychological intervention had a negligible effect. This study was part of a project in fulfillment of Ph.D. requirements concerning also the effect of this program on mood profile and quality of life (QOL) on this sample of patients. Overall, psychotherapy seems to improve mood and quality of life (Papastergiou et al., 2018; Papastergiou et al., 2019), however its effect on general health, as

measured with the GHQ-285 questionnaire is questionable.

There seem to be some psychological evidence underlying this effect. During treatment period patients experience high level of anxiety and depression, and poor QOL. SEG T provides support and help patients and their caregivers cope with their disease related stress (Kissane et al., 2007; Rainburger et al., 2011; Mukherjee et al., 2017), offering a positive perspective that provides a state of comfort and respect to all cancer patients. This is particularly effective when experience of cancer treatment is recent, hopelessness and fatigue are intense and

survivors have not yet sufficiently developed coping strategies of the disease. Indeed, QOL tumor-related fatigue and coping strategies improve following SEGT application (Reuter et al., 2010; Yavuzsen et al., 2012).

Nevertheless, in case cancer diagnosis and treatment with no metastasis present exceeds the five years rate of survival, the psychotherapy benefits are questionable and patients appear to derive only modest benefits in terms of their psychological well-being from either intervention. (Ho et al., 2016) Quality of life and mood are related to stress level but they also comprise a wide range of variables, being discreet from anxiety itself. Exercise exerts its effect on anxiety and insomnia via multiple physiological ways. The relevant to anxiety and insomnia items included in GHQ-28, refer to general symptoms of anxiety that are often alleviated with exercise. GHQ-28 questionnaire is a general health questionnaire and the exercise effect on anxiety and insomnia subscales reflects exercise contribution to improve general health.

Indeed, physical activity is capable to lower anxiety sensitivity and increase the resistance to stressful stimuli by multiple ways, since it promotes the release of IL-6 sleep-mediating cytokines in direct proportion to exercise intensity, muscle mass involved during exercise, duration and training status, along with modulation of the central serotonergic systems and endorphin production (Shephard, 2000).

Exercise directly influences the circadian system, resulting in an increased total sleep time as well as time in deep sleep (slow-wave sleep), that overall improves sleep quality. Increasing the quality of sleep through aerobic exercise and relaxation techniques that are useful for dealing with insomnia symptoms, exercise exerts beneficial effects to anxiety in cancer patients. Both. (Ferioli et al., 2018) According to Tang et al., (2010), simple and home based exercise programs do have an effect, since walking briskly 3 days a week, for 30 min a day over 8 weeks, significantly improves sleep quality.

On the other hand, efficacy of psychological interventions regarding their effect on psychiatric morbidity in cancer survivors is questioned. Although a noteworthy effect on reducing somatic anxiety and sleep problems has been observed (Torre-Luque et al., 2016) these benefits tend to reduce in patients under active treatment. As patients recover from cancer they

tend to adapt more efficiently to different daily conditions than before. Psychological intervention might have a limited effect on certain QoL fields, such as vitality and mental health component of patients with cancer (Papastergiou et al., 2018). Moreover, psychological interventions effect size is rather small regarding improvement of QOL and reduction in depressive symptomatology (Knobf et al., 2014).

Tailored psychological interventions using different formats, durations and facilitators are necessary and future studies should focus on this point. A low psychological distress at baseline may also account for low effectiveness. It has been postulated that screening and assessment to determine clinical levels of anxiety in patients with cancer should be considered in future studies as an inclusion criterion before providing psychological interventions. In a similar manner, the type, frequency and intensity of physical exercise should be related to each specific cancer, prescribed and supervised as a therapeutic program, as it happens with it occurs for the type, dose and duration of a drug treatment (Mosher et al., 2017; Anderson & Ozakinci, 2018; Sanjida et al., 2018).

The small sample size, the mixed population of cancer patients and the relatively short duration of intervention were the major limitations of the present study. In any case, the findings of this study suggest that the effect of physical exercise on cancer patients' general health status could be carried out easily using a widely used, short and patient-friendly questionnaire, such as GHQ-28.

On the other hand, the GHQ-28 widely used for general health assessment and possible psychiatric morbidity screening is more sensitive to short-term distress or psychiatric disorders than to longstanding attributes of the client, assessing and recording client's current state and differences from the usual state. Some confusion may also exist over the different scoring methods and this has implications for interpretation of scores derived from the questionnaire and interdisciplinary comparisons (Wright et al., 1987; Failde et al., 2000) as well as additional concerns over the severe depression subscale which includes some confronting questions for the patient to answer.

All these limitations along with the small sample size might not fully allowed statistically significant differences to come forth. Future

studies with larger samples and prospective design will help to further clarify all issues emerged from this study.

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