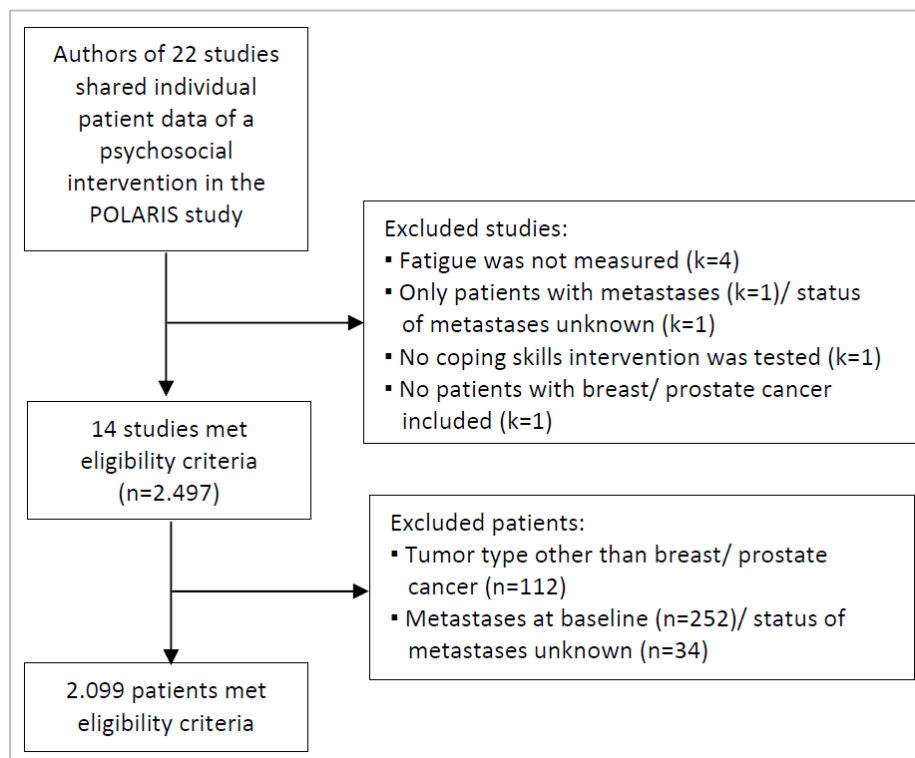**Figure 1.** Flow-chart of included studies

Notes. k=number of studies; n=number of patients.

Table 1. Patient characteristics at baseline

	Patients with breast cancer		Patients with prostate cancer	
	Intervention (n=565)	Control (n=526)	Intervention (n=500)	Control (n=508)
Sociodemographic characteristics				
Age, mean (SD) years	52.7 (9.7)	53.3 (9.7)	62.2 (8.1)	61.9 (8.0)
Age in categories, n (%)				
<50 years	204 (36)	208 (40)	29 (6)	24 (5)
50-70 years	322 (57)	284 (54)	373 (75)	395 (78)
≥70 years	38 (7)	32 (6)	98 (20)	89 (18)
Unknown	1 (<1)	2 (<1)	-	-
Married/living with a partner, n (%)				
Yes	381 (67)	333 (63)	414 (83)	422 (83)
No	112 (20)	119 (23)	63 (13)	64 (13)
Unknown	72 (13)	74 (14)	23 (5)	22 (4)
Education level, n (%)				
Low/middle	210 (37)	227 (43)	229 (46)	227 (45)
High	138 (24)	135 (26)	247 (49)	259 (51)
Unknown	217 (38)	164 (31)	24 (5)	22 (4)
Cancer treatment type				
Surgery, n (%)				
Yes	561 (99)	526 (100)	229 (46)	266 (52)
No	4 (1)	-	259 (52)	237 (47)
Unknown	-	-	12 (2)	5 (1)
Radiotherapy, n (%)				
Yes	462 (82)	432 (82)	211 (42)	220 (43)
No	100 (18)	94 (18)	272 (54)	280 (55)
Unknown	3 (<1)	-	17 (3)	8 (2)
Chemotherapy, n (%)				
Yes	360 (64)	355 (68)	-	-
No	204 (36)	171 (33)	500 (100)	508 (100)
Unknown	1 (<1)	-	-	-
Hormone therapy, n (%)				
Yes	296 (52)	299 (57)	146 (29)	155 (31)
No	219 (40)	177 (34)	339 (68)	345 (68)
Unknown	50 (9)	50 (10)	15 (3)	8 (2)

Notes. Baseline characteristics did not differ significantly between the intervention and control group in (i) patients with breast and (ii) prostate cancer. Abbreviation: SD=Standard deviation.

Table 2. Potential moderators of the effect of psychosocial interventions on cancer-related fatigue on patient-level

	χ2 [df], *p*-value
Patients with breast cancer	
Socio-demographic characteristics	
Age (continuous)	3.23 [1], 0.07
Age (<50 versus 50-70 versus ≥70 years)	4.42 [2], 0.11
Having a partner (yes versus no)	0.35 [1], 0.55
Education level (low versus middle or high)	0.40 [1], 0.53
Cancer treatment type	
Surgery (yes versus no)	2.61 [1], 0.11
Radiotherapy (yes versus no)	0.64 [1], 0.42
Chemotherapy (yes versus no)	0.04 [1], 0.84
Hormone therapy (yes versus no)	0.02 [1], 0.89
Baseline level of fatigue and other symptoms	
Fatigue (continuous)	1.53 [1], 0.22
Clinically relevant fatigue (yes/no)	1.10 [1], 0.29
Depression (continuous)	0.01 [1], 0.94
Anxiety (continuous)	0.02 [1], 0.89
Pain (continuous)	2.48 [1], 0.12
Insomnia (continuous)	1.31 [1], 0.25
Patients with prostate cancer	
Socio-demographic characteristics	
Age (continuous)	0.01 [1], 0.91
Age (<50 versus 50-70 versus ≥70 years)	0.78 [2], 0.68
Partner status (yes versus no)	3.44 [1], 0.06
Education level (low versus middle/high)	0.26 [1], 0.61
Type of cancer treatment	
Surgery (yes versus no)	0.21 [1], 0.65
Radiotherapy (yes versus no)	0.14 [1], 0.71
Hormone therapy (yes versus no)	0.19 [1], 0.66
Baseline level of fatigue and other symptoms[1]	
Fatigue (continuous)	0.19 [1], 0.66
Clinically relevant fatigue (yes/no)	0.04 [1], 0.84
Pain (continuous)	0.19 [1], 0.66

Notes. Chi-square test with corresponding degrees of freedom (df) and *p*-values of the likelihood ratio test of the difference between models with and without interactions (χ2) are presented. All analyses are controlled for the level of fatigue at baseline.

[1]As data on the symptoms depression, anxiety, and insomnia were administered in only 7% of patients with prostate cancer, these variables were not tested as moderators in this patient sample. *p<0.05.

Table 3. Intervention-related moderators of psychosocial interventions on fatigue in patients with breast cancer

	β (95% CI)	χ2 [df], *p*-value
Type of intervention strategy		5.67 [1], 0.02*
Cognitive behavioral therapy	-0.27 (-0.40; -0.15)*	
Other	0.03 (-0.20; 0.25)	
Selection of patients with clinically relevant levels of fatigue		5.23 [1], 0.02*
Yes	-0.85 (-1.40; -0.30)*	
No	-0.17 (-0.28; -0.05)*	
Fatigue-specific intervention		4.62 [1], 0.03*
Yes	-0.48 (-0.79; -0.18)*	
No	-0.15 (-0.27; -0.03)*	
Timing (during versus post cancer treatment)		0.04 [1], 0.84
Intervention duration (<12 versus ≥12 weeks)		1.32 [1], 0.25
Number of sessions (<6 versus ≥6)		0.41 [1], 0.52
Professional guidance (yes versus no)		2.91 [1], 0.09
Leading profession (psychologist versus other)		2.45 [1], 0.12
Delivery mode (individual versus couple or group)		3.34 [1], 0.07
Type of delivery (face-to-face versus telephone)		0.76 [1], 0.38

Notes. The table presents regression coefficients (β) with 95% confidence intervals (CI) of the effect of psychosocial interventions stratified per intervention-related moderator subgroup, and chi-square tests (χ2) with corresponding degrees of freedom (df) and *p*-values of the likelihood ratio test of the difference between models with and without interaction term. All analyses are based on study-level data and controlled for the level of fatigue at baseline. *p<0.05.

APPENDIX

Table A1. Studies evaluating the effects of psychosocial interventions on fatigue (N=14)

| Study | Coun-try | Eligible patients[1] | Baseline fatigue screening[2] | Fatigue instru-ment | Type control group | INTERVENTION CHARACTERISTICS | | | | | | | |
						Fatigue-specific	Timing	Stra-tegy	Duration, mean (SD)	Sessions, mean	Professional guidance	Delivery mode	Type of delivery
Patients with breast cancer													
Arving, 2007	SWE	143	No	QLQ-C30 fatigue	UC	No	During treatment	PST[a]	17 weeks	4	Nurse or psychologist	Indivi-dual	Face-to-face
Duijts, 2012	NL	212	No	SF-36 vitality	WL	No	Post treatment	CBT[b]	6 weeks	6	Psychologist and social workers	Group	Face-to-face
Gellaitry, 2010	UK	93	No	POMS fatigue	UC	No	Post treatment	EW[c]	<1 week	-	-	-	Self-guided
Gielissen, 2006	NL	30	Yes	CIS fatigue	WL	Yes	Post treatment	CBT[b]	26 weeks	13	Psychologist	Indivi-dual	Face-to-face
Graves, 2003	USA	32	No	POMS fatigue	WL	No	During + post treatment	SCT[d]	8 weeks	8	PhD candidate/ trained intern	Group	Face-to-face
Heiney, 2003	USA	66	No	POMS fatigue	UC	No	Post treatment	CSI[e]	6 weeks	6	Group therapist	Group	Telephone
Mann, 2012	UK	96	No	SF-36 vitality	UC	No	Post treatment	CBT[b]	6 weeks	6	Psychologist	Group	Face-to-face
Northouse, 2005	USA	30	No	SF-36 vitality	UC	No	During + post treatment	DT[f]	12 weeks	5	Nurse	Couple	Face-to-face + telephone
Savard, 2005	CAN	57	No	MFI global fatigue	WL	No	Post treatment	CBT[b]	8 weeks	8	Psychologist	Group	Face-to-face
Vd Berg, 2015	NL	150	No	QLQ-C30 fatigue	UC	No	Post treatment	CBT[b]	16 weeks	-	-	-	Self-guided
Patients with prostate cancer													
Chambers, 2013	AUS	734	No	SF-36 vitality	UC	No	Pre + post treatment	CBT[b]	7 weeks	5	Nurse	Indivi-dual	Telephone

Table A1. Studies evaluating the effects of psychosocial interventions on fatigue (N=14)

| Study | Coun-try | Eligible patients[1] | Baseline fatigue screening[2] | Fatigue instru-ment | Type control group | INTERVENTION CHARACTERISTICS | | | | | | | |
						Fatigue-specific	Timing	Stra-tegy	Duration, mean (SD)	Sessions, mean	Professional guidance	Delivery mode	Type of delivery
Northouse, 2007	USA	195	No	SF-36 vitality	UC	No	During + post treatment	DT[f]	17 weeks	5	Nurse	Couple	Face-to-face
Patients with breast (B) and prostate (P) cancer													
Goeden-dorp, 2010	NL	B: 70 P: 34	No	CIS fatigue	UC	Yes	During treatment	CBT[b]	30 (11.3) weeks	6	Psychologist	Indivi-dual	Face-to-face
Johansson, 2008	SWE	B: 112 P: 45	No	QLQ-C30 fatigue	UC	No	During treatment	CBT[b]	12 weeks	Median 3	Psychologist	Indivi-dual	Face-to-face

Notes. [1]Number of patients from each study that were eligible and included in the meta-analyses. [2]Screening at baseline to select patients with fatigue.

Abbreviations: CIS fatigue=Checklist Individual Strength, subscale Fatigue Severity; Ftf=face-to-face therapy; MFI global fatigue=Multidimensional fatigue inventory, global fatigue score; POMS fatigue =Profile of Mood State fatigue subscale; QLQ-C30 fatigue=European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Core 30 fatigue subscale; SF-36 vitality= Short Form-36 Item Health Survey vitality subscale; Tel=telephone; UC=usual care; WL=waiting list.

Intervention strategies: [a]Problem Solving Therapy: focuses on generating, applying, and evaluating solutions to identified problems. [b]Cognitive Behavioral Therapy: focuses on recognizing and changing maladaptive thoughts and behaviors to reduce negative emotions and facilitate psychological adjustment. [c]Dyadic Therapy: focuses on modifying problematic interactions within a relationship through conjoint sessions with partners. [d]Expressive Writing: individuals write about their thoughts and feelings related to a personally stressful or traumatic life experience. [e]Coping Skills Intervention: focuses on the acquisition of new cognitive skills aimed at cognitive or behavioral change. [f]Social Cognitive Theory: experimental skill-building intervention based on the view that people learn by watching others.

Table A2. Baseline and post-intervention levels of fatigue

	Patients with breast cancer				Patients with prostate cancer			
	Intervention (n=584)		Control (n=547)		Intervention (n=500)		Control (n=508)	
	N	Mean (SD)/ %	N	Mean (SD)/ %	N	Mean (SD)/ %	N	Mean (SD)/ %
Fatigue								
SF-36 vitality subscale, range 0-100								
Baseline	164	48.7 (20.4)	160	46.7 (18.9)	460	45.3 (18.9)	465	44.3 (18.0)
Post-intervention	138	41.5 (20.1)	143	44.6 (19.4)	411	48.4 (19.7)	439	49.2 (19.9)
Clinically relevant level of fatigue (cut-off score ≤50)	85	52%	77	48%	201	44%	194	42%
QLQ-C30 fatigue subscale, range 0-100								
Baseline	161	30.9 (22.8)	126	33.5 (23.9)	22	30.3 (27.0)	17	21.6 (18.6)
Post-intervention	149	27.4 (22.6)	114	31.4 (22.6)	20	22.2 (21.6)	19	25.1 (20.2)
Clinically relevant fatigue (cut-off score ≥40)	49	30%	46	9%	5	22%	3	14%
POMS fatigue subscale, range 0-28								
Baseline	93	10.6 (7.0)	97	10.0 (7.5)	-	-	-	-
Post-intervention	79	9.5 (7.0)	85	9.2 (7.2)	-	-	-	-
CIS fatigue severity subscale, range 8-56								
Baseline	51	30.4 (15.6)	49	29.5 (15.3)	16	25.0 (15.1)	18	20.3 (11.0)
Post-intervention	50	23.5 (12.3)	45	30.4 (14.2)	16	17.7 (10.5)	18	22.7 (11.8)
Clinically relevant fatigue (cut-off score ≥35)	23	45%	19	39%	4	25%	3	17%
MFI general fatigue score, range 1-5								
Baseline	27	2.9 (0.7)	30	2.7 (0.6)	-	-	-	-
Post-intervention	23	2.5 (0.7)	27	2.5 (0.5)	-	-	-	-

Note. Higher scores indicate higher symptom levels.

Abbreviations: CIS fatigue=Checklist Individual Strength, subscale Fatigue Severity; MFI global fatigue=Multidimensional fatigue inventory, global fatigue score; POMS=Profile of Mood State; QLQ-C30 fatigue=European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Core 30 fatigue subscale; SCL=Symptom Checklist; SF-36= Short Form-36 Item Health Survey.

Table A3. Baseline levels of depressive symptoms, anxiety, pain, and insomnia

	Patients with breast cancer				Patients with prostate cancer			
	Intervention (n=584)		Control (n=547)		Intervention (n=500)		Control (n=508)	
	N	Mean (SD)/ %	N	Mean (SD)/ %	N	Mean (SD)/ %	N	Mean (SD)/ %
Depressive symptoms								
HADS depression subscale, range 0-21	348	4.2 (3.7)	304	4.0 (3.4)	22	2.7 (2.4)	18	3.2 (3.2)
POMS depression subscale, range 0-60	93	7.3 (8.6)	98	6.4 (10.5)	-	-	-	-
BDI, range 0-63	15	14.8 (8.3)	13	10.2 (4.5)	-	-	-	-
WHQ depression subscale, range 0-1	47	0.4 (0.3)	46	0.5 (0.3)	-	-	-	-
SCL depression subscale, range 0-72	36	21.4 (5.2)	34	20.6 (4.1)	16	22.5 (6.8)	18	21.2 (6.1)
Anxiety								
HADS anxiety subscale, range 0-21	350	6.4 (4.3)	302	6.5 (4.5)	21	4.0 (3.2)	18	4.2 (4.1)
STAI state subscale, range 20-80	15	44.5 (13.1)	13	11.2 (3.1)	-	-	-	-
POMS anxiety subscale, range 0-36	92	8.3 (6.5)	98	6.3 (6.3)	-	-	-	-
WHQ anxiety subscale, range 0-1	47	0.3 (0.3)	46	0.5 (0.3)	-	-	-	-
SCL anxiety subscale, range 0-40	36	13.6 (3.2)	34	13.6 (4.0)	16	14.1 (3.7)	18	12.0 (2.5)
Pain								
QLQ-C30 pain subscale, range 0-100	254	24.5 (25.1)	208	22.9 (23.4)	38	21.1 (27.9)	36	17.1 (26.3)
SF-36 pain subscale, range 0-100	167	33.7 (27.0)	162	29.6 (24.9)	491	13.4 (19.9)	495	13.6 (20.2)
Insomnia								
QLQ-C30 insomnia subscale, range 0-100	255	36.5 (30.7)	208	36.3 (32.7)	38	22.8 (29.1)	36	14.8 (20.2)

Note. Higher scores indicate higher symptom levels.

Abbreviations: BDI=Beck Depression Inventory; HADS=Hospital Anxiety and Depression Scale; POMS=Profile of Mood State; QLQ-C30 =European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Core 30; SCL=Symptom Checklist; SF-36= Short Form-36 Item Health Survey; STAI=State-Trait Anxiety Inventory; WHQ=Women's Health Questionnaire.