J Behav Med (2019) 42:423–439
https://doi.org/10.1007/s10865-018-0004-y

Enhancing coping skills for persons with cancer utilizing mastery enhancement: a pilot randomized clinical trial

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Received: March 13, 2018 / Accepted: December 8, 2018 / Published online: December 14, 2018

Abstract The purpose of this project was to develop a short-term, theory-based intervention for patients with self-reported limited self-efficacy to perform coping behaviors. Cancer patients with low coping self-efficacy were randomly assigned to a treatment ($N = 66$) or control condition ($N = 68$). The treatment, Mastery Enhancement Therapy, was based on self-regulation and self-efficacy theories. Measures of coping self-efficacy, functional status, depression, quality of life, and adjustment were administered at baseline, after session two, after the final (fourth) session, and at 3 months post-treatment. Control participants completed the measures at about the same time intervals. Treatment participants reported highly significant immediate post-treatment improvement in self-efficacy for coping compared to controls, although controls improved by 3 months post-treatment. However, treatment participants with lower levels of functional status benefited more than controls on depression and adjustment at follow-up. Mastery Enhancement Therapy is a time-limited treatment that increases coping efficacy and subsequently adjustment during active medical treatment, and appears to warrant a large-scale RCT with patients with below average coping self-efficacy and moderate to high symptoms.

Keywords Cancer · Coping · Brief intervention · RCT · Self-regulation · Self-efficacy · Oncology

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Introduction

Cancer is the second leading cause of death in the United States behind heart disease; one in about every five deaths is the result of cancer (American Cancer Society [ACS], 2017). Despite this high mortality rate people are living longer with cancer than ever before. Currently about 68% of Caucasians and 61% of African American cancer patients live for five years after an initial diagnosis (ACS, 2017). Even with improved longevity cancer patients and survivors are at increased risk for depression, anxiety, fatigue, and pain and many treatments have been developed to mitigate those negative effects (Hart et al., 2012; Dieng et al., 2016; Richter et al., 2015; Pai et al., 2006; van de Wal et al., 2017; Mustian et al., 2017; Hilfiker et al., 2017; Lipsett et al., 2017; Devine, 2003; Sheinfeld Gorin et al., 2012).

Meta-analyses of randomized clinical trials (RCTs) have reported support regarding interventions for pain reduction and pain interference ($g = 0.34$, $g = 0.40$; Sheinfeld Gorin, et al., 2012), for psychological (WES = 0.27) and exercise-based interventions for fatigue (WES = 0.30; Mustian et al., 2017), and for psychosocial interventions to reduce depression (problem solving therapies, $g = 0.33$; cognitive behavior therapies, $g = 0.83$; Hart et al., 2012). Whereas, these studies represent interventions aimed at reducing distressing conditions, a recent systematic review of interventions to increase competencies, in this case self-efficacy, has shown similar results ($g = 0.292$; Merluzzi et al., 2018). Along those lines, this paper reports the promising results from a pilot RCT of Mastery Enhancement Therapy, which is a theory-based intervention that is marked by brevity, efficiency, and the ability to be tailored to each patient.

Mastery Enhancement Therapy provides a clear, parsimonious theoretical rationale for how change occurs. The focus is on enhancing coping efficacy, that is increasing mastery and control, which is highly valued by patients, is positively associated with quality of life, adjustment, and emotional well-being (Merluzzi, Nairn, Hegde, Martinez Sanchez & Dunn, 2001) and, thus is a catalyst for other critical outcomes. Although referring to the potential benefit of support groups, the following from the Institute of Medicine (IOM) report entitled, "The Psychosocial Needs of Cancer Patients" also applies to any intervention for cancer patients. "Self-efficacy is a critical determinant of how well knowledge and skills are obtained and is an excellent predictor of behavior. There is also evidence that self-efficacy is key to individuals' successful self-management of a range of chronic illnesses, resulting in improved health outcomes." (Institute of Medicine, 2008). This description reinforces the role of self-efficacy as a critical mechanism of change that has impact on health outcomes.

The theoretical underpinnings for Mastery Enhancement Therapy are derived from the self-regulation model (Fig. 1) proposed by Carver and Scheier (1998). Their model posits that motivation stems from an attempt to reduce discrepancies between current functioning and a desired state of functioning. Desired states or goals can range from concrete behaviors (e.g., getting up from a chair) to subjective states (e.g., feeling better). The Reference Value (Fig. 1) is the goal or desired state for an individual (e.g., having more "energy"). The Comparator represents the process of contrasting current functioning with the desired state (e.g., "I'd like to have more energy, like I used to have before treatment"). The output function is the person's behavioral attempt to reduce the discrepancy between the reference value or goal and the current state (e.g., "If I am able to go for a walk, I might feel better and have more energy"). The behavior is implemented and, according to the model, the individual then assesses whether the behavior reduced the goal-versus-current-state discrepancy. This process continues, iteratively, until the goal is reached or modified to accommodate satisfactory goal attainment or the person gives up and withdraws from the process (Carver & Scheier, 1998). In terms of the choices of behaviors to implement in goal seeking, self-efficacy theory (Bandura, 1997) posits that mastery experiences, which represent behaviors that the person has accomplished in the past, are the most powerful source of self-efficacy and, therefore, most likely to lead to other valued outcomes (Sheeran et al., 2016).

For many years researchers have recommended that structured interventions tailored to each individual (Trijsburg et al., 1992; Turner et al., 2011, 2017) would be more effective than a uniformly formatted approach. Several recent studies have incorporated that recommendation in the form of stepped approaches in which the intensity of the treatment is tailored to the degree of the patient's

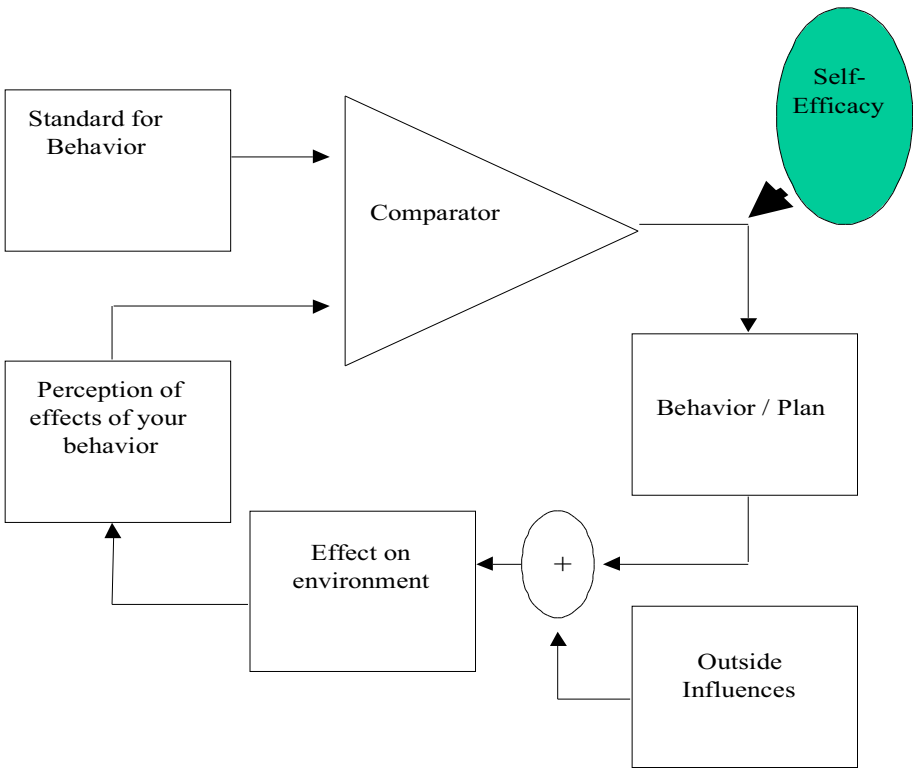

Fig. 1 Carver and Scheier (1998) Self-regulation model

impairment (Turner et al., 2011, 2017). In addition, there have been tailored approaches to information provision (Richardson et al., 2017). Mastery Enhancement Therapy implements a customized approach by proposing that the patients are already coping with the disease and that each patient is able to create a personalized way to improve coping based on accentuating prior mastery experiences as a way of optimizing critical psychosocial outcomes such as quality of life and adjustment. Because Mastery Enhancement Therapy is theory-based, the basic structure of the intervention and the mechanisms of change are the same for all participants, but the content is tailored to individuals.

The relationship of Mastery Enhancement Therapy to self-efficacy theory is based on the utilization of mastery experiences, which are the most potent sources of self-efficacy (Bandura, 1997). During each session the therapist focused on the success a person achieved between sessions and verbally reinforced them as mastery experiences. The objective was to assist patients in implementing single or multiple behaviors that have impacted their lives. Patients were not asked to try new behaviors from the therapist's fund of knowledge (i.e., verbal persuasion), but were asked to identify behaviors already in their coping repertoire. Personal agency or self-efficacy may be enhanced in Mastery Enhancement Therapy in several important ways. First, patients focus on "positive" coping behaviors instead of the negative behaviors or coping failures. Consistent with self-efficacy theory (Bandura, 1997), efficacy improves by not dwelling on past failures when analyzing a particular situation, but by focusing on past successes. Second, the goal of Mastery Enhancement Therapy was to identify exceptions to the current problem, that is, in Mastery Enhancement Therapy patients identified how they have been efficacious since starting oncology treatment. Finally, change in Mastery Enhancement Therapy occurred when patients became consciously aware of past efficacy in coping and able to integrate these behaviors into future experiences. Although Leventhal's self-regulation model (Leventhal, Phillips, & Burns, 2016) is more comprehensive than the Carver and Scheier model, which was used as the basis for the Mastery Enhancement Therapy intervention, an increase in coping self-efficacy could change higher order processes such as appraisals of controllability of desired outcomes as in reduction in depression and positive adjustment to cancer. In sum, the present study included a new treatment, Mastery Enhancement Therapy, which is based on self-regulation and self-efficacy theories and includes aspects of Solution Focused Therapy (SFT; Lindforss & Magnusson, 1997). Mastery Enhancement Therapy was designed to help patients recover coping skills that may have been compromised by the demands of the illness, its treatments, and accompanying physical problems.

This study makes unique contributions to the literature for several reasons. First, other published studies have sought to improve self-efficacy by the predominant use of verbal persuasion (through standard therapy) or vicarious experiences (through groups); whereas, this study utilized mastery experiences to enhance self-efficacy. This rationale is based on the literature that has demonstrated the superiority of mastery experiences over verbal persuasion and vicarious experiences (Bandura, 1997). Second, Mastery Enhancement Therapy allows patients to determine which coping behaviors work best for them instead of having them imposed by a therapist. Several studies that include reports of how often the participants utilized the therapist-provided coping behaviors indicate broad variance in compliance (e.g., Cunningham, Lockwood, & Cunningham, 1991; Telch & Telch, 1986). According to self-efficacy theory the participants in this study should have high compliance with their chosen behaviors because they represent behaviors that the patient has generated in the past.

In addition, a 3-month follow up was implemented for two reasons. First, Mastery Enhancement Therapy is a theoretically sequential intervention. The primary objective was to impact self-efficacy for coping behaviors, which based on its role as a mediator of change (Bandura, 1997) would then impact other critical variables in this study. Therefore, the scores of the other variables would not be impacted simultaneously with self-efficacy, but after self-efficacy for coping improved. The second objective was to determine if the effects of the treatment lasted beyond the last session of therapy. Finally, along those lines, the relative ease of implementation allows for the delivery of Mastery Enhancement Therapy by masters-level mental health professionals and also would allow for the integration of Mastery Enhancement Therapy into ongoing medical care by nurses, doctors, or other therapists.

It was hypothesized that cancer patients, selected on the basis of self-identified low self-efficacy for coping behaviors and randomly assigned to a four-session Mastery Enhancement Therapy treatment, would improve their self-efficacy for coping, which in turn would act as a catalyst for improving quality of life, adjustment to illness, and depression compared to control/usual-medical-care patients (Nairn & Merluzzi, 2003). Moreover, consistent with the findings of interventions (Manne et al., 2007; Turner et al., 2017) and the recommendations of Manne and Andrykowski (2006) and Stanton (2005) to assess moderators, it was hypothesized that functional status would moderate the effects of the treatment on outcomes. Those who were lower in functional status were expected to benefit more than those with higher functional status. A

general measure of symptoms was chosen as a covariate based on pilot data that indicated a strong relationship between general symptoms and outcome measures (e.g., depression, quality of life) and on previous studies that reported a strong relationship between symptom frequency and self-efficacy for coping (Merluzzi & Martinez-Sanchez, 1997; Merluzzi et al., 2001; Nairn & Merluzzi, 2003) and quality of life (Cella, 1997).

Method

Participants

All participants were patients at either an oncology clinic or a hospital-based radiation treatment facility in a medium sized mid-western city. A total of 671 patients completed screening questionnaires including the Cancer Behavior Inventory (Merluzzi et al., 2001), which assessed coping self-efficacy. Of the 671 cancer patients 533 were receiving chemotherapy and 138 were receiving radiation. The number of participants needed for this two-arm study was determined by power analyses (G power: http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/) that indicated that with a power of 0.80, an alpha level of 0.05, and a moderate effect size (between 0.4 and 0.5), the number of participants per condition needed to be between 63 and 78. Because of the stringent selection criteria (i.e., scoring below a multi-sample mean on a measure of self-efficacy for coping) oversampling was necessary to assure adequate numbers of participants in each arm of the study and adequate power to test hypotheses.

Inclusion and exclusion criteria

The inclusion criteria were the following: cancer diagnosis, currently in active treatment, 18 years old or older, scoring below the mean on the Cancer Behavior Inventory, and at least four sessions of medical treatment to complete. Of the 671 patients who completed the Cancer Behavior Inventory during the study, 323 of the screened patients had CBI scores above the mean/cut-off (CBI > 245) and were ineligible to participate. The mean cut-off score was established on the basis of several prior samples of cancer patients that were used in the revision of the Cancer Behavior Inventory V2.0 (Merluzzi et al., 2001). Another 69 patients failed to complete the CBI and were ineligible to participate. There were 62 patients who had CBI scores below the cut-off, but reported having less than four cancer treatment sessions left, and therefore could not be included in the study. Seventy-four patients scored below the cut-off score, but opted not to participate when contacted by phone. Nine patients who scored below the CBI mean died prior to being contacted. In sum, 208 people were eligible and 74 opted to not participate, so 134 people agreed to participate in the study, which is a recruitment rate of 64% (Fig. 2). Thus, the recruitment rate was close to the optimum rate achieved by nurses (68%) compared to the rate typically achieved by other psychosocial professionals (50%) (Brebach et al., 2016).

Randomization, allocation and ethical treatment

Participants who met the inclusion criteria and agreed to participate ($N = 134$) were randomly assigned to the treatment (n = 66) or control/usual care condition (n = 68). The people undergoing treatment who met the eligibility criteria were told during their recruitment that they would be randomly assigned to meet with a counselor for four sessions before, during, or after their scheduled oncology treatments in addition to completing the surveys, or they would be mailed the surveys and return them in a postage paid envelope. For randomization an a priori list with 150 slots was created before the study began based on a simple coin flip where heads was "treatment" and tails was "control". This list was then used in successive order to allocate eligible participants to the treatment (Mastery Enhancement Therapy) and control conditions when they confirmed their willingness to participate. The participants were referred weekly to one of the authors by research nurses and were assigned to the next slot on the a priori randomization list. The participants were called and notified as to which group they were randomly assigned and an attempt was made to schedule the first intervention session for those assigned to treatment arm. All participants were paid $80 upon the completion of their last survey at the three month follow-up.

The study was reviewed by the University of Notre Dame Human Subjects Institutional Review Board and the Institutional Review Board of Memorial Hospital of South Bend IN. All participants were treated in accordance with the Ethical Principles of Psychologists and Code of Conduct of the American Psychological Association (American Psychological Association, 2003) and the principles of the Health Information Portability and Accountability Act (US Department of Health and Human Services, 1996). This study was conducted between 2000 and 2003. The CONSORT diagram is presented in Fig. 2.

Included participants demographic and disease information

Demographic and disease information are contained in Table 1. With one exception, the 134 participants in the study did not differ from the larger screening sample

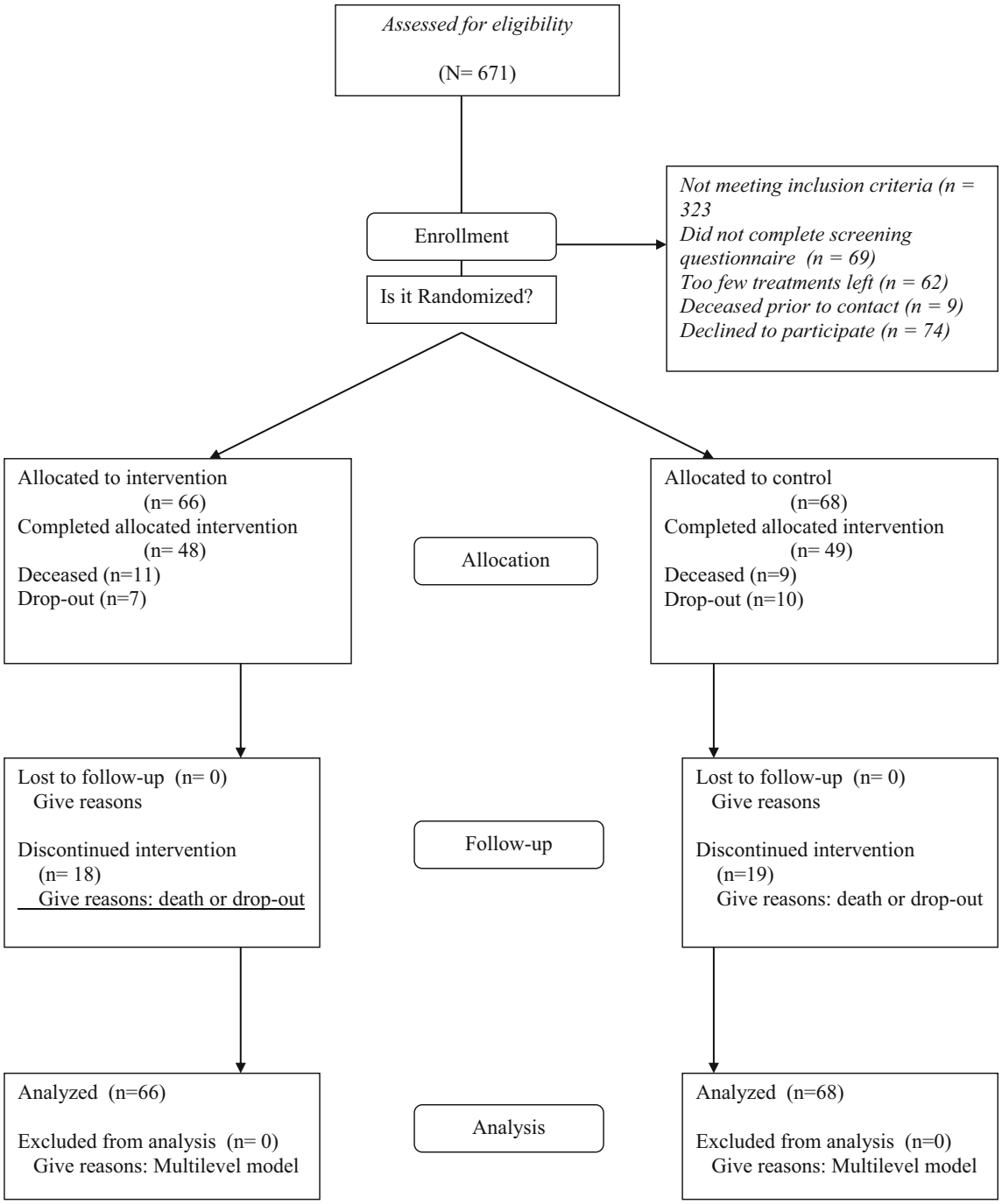

Fig. 2 CONSORT flowchart

(N = 671). For some blood and internal organ cancers, the proportions in the study exceeded that of the larger screening sample (e.g., chronic leukemia, pancreas, cervix, pharynx, multiple myeloma, and kidney).

Measures

The participants in the treatment group were asked to complete a number of measures four times: (1) prior to the first session in order to establish a baseline, (2) after the second session, to evaluate whether the intervention was already impacting the participants, (3) after the fourth and final session, to determine if any effects appeared by the

Table 1 Demographic and medical information (N = 134)

	%				%
Education		Income			
High school or less	46.3	Less than $25,999			32.1
College courses/College degree	37.3	$25,000–49,999			31.3
Graduate courses/Graduate degree	11.9	More than $50,000			32.1
Did not disclose	4.5	Did not disclose			4.5
Employment		Marital statue			
Presently employed	32.8	Never married			5.2
Unemployed	8.2	Married			67.2
Retired	30.6	Divorced			15.7
Full time homemaker	7.5	Separated			0.7
On leave from work	18.7	Widowed			8.2
Did not disclose	2.2	Did not disclose			3.0
Mean age		Sex			
Treatment group	54.9	Males			32
Control group	57.1	Females			68
Treatments		Metastases at diagnosis			21.6
Surgery	58.5	Stage: for staged tumors			
Radiation	49.6	I	18.8	II	25.0
Chemotherapy	83.0	III	30.4	IV	25.8
Site of cancer					
Breast	31.3	Esophageal/Pharynx			4.6
Lung	12.7	Multiple myeloma			3.8
Cervix/Ovary/Uterus	12.0	Chronic leukemia			2.3
Colon/Rectum	7.6	Kidney			2.3
Lymphomas	7.6	Pharynx			2.3
Prostate	6.0	Other			7.5

end of Mastery Enhancement Therapy, and (4) at 3-months post-treatment. The 3-month post-treatment interval was selected for this pilot study because of the theoretical sequential nature of the intervention in which self-efficacy for coping would impact the other variables after it had increased. It was also of interest to determine if changes evident at the end of Mastery Enhancement Therapy were long lasting, if further practice of the self-efficacious behaviors might be needed to build confidence, and if changes in self-efficacy for coping impacted the other variables in this study such as depression and quality of life.

Because the interval between treatment sessions varied between 2 and 3 weeks for the treatment participants, depending upon the scheduling of their medical appointments, control patients were provided with assessment materials to roughly equate for the time between sessions in the treatment condition. All measures were chosen based on their strong psychometric qualities and their use in cancer research.

Cancer behavior inventory (CBI)

The CBI is a measure of coping self-efficacy with cancer (Merluzzi et al., 2001). It consists of 33 items that represent behaviors that persons with cancer might perform throughout the course of the disease and treatments. The items were rated on a 9-point Likert scale ranging from "Not Confident at All" to "Totally Confident". The seven scales of the CBI are (with example items): Maintaining Activity and Independence (maintaining work activity), Seeking and Understanding Medical Information (asking nurses questions), Stress Management (reducing any anxiety associated with getting my blood drawn), Coping with Treatment Related Side Effects (coping with hair loss), Accepting Cancer/Maintaining a Positive Attitude (accepting that I have cancer), Affective Regulation (ignoring things that cannot be dealt with), and Seeking Social Support (seeking support from people and groups outside my family).

Self-efficacy was selected based on its critical role as a mechanism that is associated with positive outcomes

(Nairn & Merluzzi, 2003; Sherran et al., 2016) and as an outcome in its own right (Merluzzi et al., 2018). As a strategic variable and mechanism self-efficacy can be vital for improving well-being, adherence to treatment (Náfrádi, Nakamoto, & Schulz, 2017) and promoting resilience in the course treatment and after (Philip, Merluzzi, Zhang, & Heitzmann, 2013). Moreover, it is valued by patients, used by patients in depicting their functioning, and as such is an important aspect of patient-centered care. (Bodenheimer, Lorig, Holman, & Grumbach, 2002) The Cronbach alpha for this sample was 0.96 for the entire CBI.

Beck depression inventory-brief form (BDI-BF)

The BDI is a 13-item self-report instrument used to evaluate state-oriented depression. The BDI-BF has a correlation of 0.96 with the full form (Beck et al., 1988), which has been used in numerous empirical studies since its publication in 1961. The Cronbach's reliability coefficient for the BDI-BF for this sample was 0.73.

Functional assessment of cancer therapy scale-general (FACT-G)

The FACT-G was created to assess the quality of life for those with chronic illness (Cella, 1997). It contains 27 items, responded to on a 0 (not at all) to 4 (very much) scale, with respect to how true the items describe the last 7 days. The FACT-G measures a person's well-being in four domains: physical well-being, social/family well-being, emotional well-being, and functional well-being. The alpha for the FACT-G with this sample was 0.90.

Psychosocial adjustment to illness scale-self report (PAIS-SR)

The PAIS-SR is used to evaluate the patient's adjustment to an illness (Derogatis & Lopez, 1983; Merluzzi & Martinez-Sanchez, 1997). Forty-six items are responded to on a 4-point scale reflecting degrees of change in patients' life over the past 30 days as a function of their illness. There are 6 sub-scales: Social and Leisure Activities, Job and Household Duties, Psychological Distress, Sexual Relationship, Relationship with Partner and Family, and Health Care Orientation. The alpha for the entire scale for the sample in this study was 0.91.

Symptom impact inventory (SII)

The SII is a measure of the perceived presence of symptoms and the impact of those symptoms on a person's functioning (Merluzzi & Nairn, 2003). The SII identifies 28 symptoms and asks patients to rate the frequency (1 = never to 5 = all the time), intensity (1 = mild to 3 = severe), and disruption of the symptoms (1 = none to 5 = severe). The alphas for this sample were 0.88, 0.90, and 0.92 for the frequency, intensity, and disruption scales, respectively. The three sub-scales are highly correlated (all $rs > 0.90$)

Sources of medical, treatment, and demographic information

Information about age, employment status, income, education, religious affiliation, race, treatments, marital status, and living arrangement were obtained from the patients. Information about stage, types of treatment, and the presence of axillary metastatic disease was obtained from physician' records with the permission of the patients.

Procedures

Mastery enhancement therapy

Almost all of the sessions with the participants occurred on the same day as their office visits before or after they received chemotherapy or radiation. The sessions took place in an office adjoining the oncology and radiation center facilities.

The goals of the first session were to discuss current problems, how current problems were affecting the patient, and how the patient attempted to cope with them. Then, similar to Solution Focused Therapy, the therapist probed for exceptions to the problem; that is, instances in which the problem did not occur or when the problem was less intense based on their ability to cope. The patient was asked to choose one problem, set a goal, and create a potential solution that was clearly stated and based on coping behaviors that the patient reported having mastered at some time in the past. The patients were encouraged to choose a solution that was attainable on a daily basis. Finally, the patient was asked to be prepared to report on their coping attempts and progress toward goals at the next session. This session typically lasted about 30–40 min.

The second and third sessions followed the template of the first session, however, the therapist began by asking the patient "what's better?" Initiating the session in this fashion helped to focus the discussion on the patient's coping successes and to review progress towards goals. The patient could choose to re-organize his or her goals at any point, but the main emphasis was on encouraging the patient to self-regulate (including monitoring when things are better) and to verbally reinforce the mastery experiences that helped the patient cope. The length of these

sessions ranged from 15 to 30 min. The final session focused on the successes and reviewed the progress towards the goals, and typically was completed in 10–15 min.

For each session, there were six essential elements that the therapists were trained to deliver: (1) Asking the participant what is better since the last meeting; (2) asking the person to describe how the "exceptions" happened (when things went better); (3) asking for additional examples of when things went better; (4) having the participant rate on a 1–10 scale how things had been on average since the last meeting; (5) asking the participant what would have to occur for the person to move from his/her current level to the next higher one; (6) reiterating the participant's exceptions (when things went better). The two therapists, both with master's degrees in counseling, were trained based on the structure of the sessions outlined above and by practicing and receiving feedback to assure uniform implementation of the intervention. Fidelity data are presented in the results section.

Results

Preliminary analyses

Demographic and pretest variables

Chi square analyses of the demographic variables (e.g., education [$X^2 = 11.29$, $df = 8$, $p = 0.19$], race/ethnicity [$X^2 = 6.44$, $df = 6$, $p = 0.37$], income [$X^2 = 4.63$, $df = 6$, $p = 0.57$], initial diagnosis [$X^2 = 29.15$, $df = 27$, $p = 0.35$], marital status [$X^2 = 2.08$, $df = 5$, $p = 0.84$], metastatic status, [$X^2 = 2.25$, $df = 1$, $p = 0.13$], sex, [$X^2 = 1.45$, $df = 1$, $p = 0.23$]) revealed no differences between the treatment and control groups. One-way analyses of variance utilizing Tukey's procedure to control for familywise error rate was conducted to test for pretest differences between groups on the self-report measures to ensure that the randomization process successfully created equivalent treatment and control groups and equivalent distributions of those variables across therapists. No differences emerged between the treatment and control groups on the key variables in the study (Table 2), and only one significant difference was found between the therapists. One therapist compared to the other was assigned patients, who, on the average, had a statistically significant higher staged cancer at diagnosis. This difference was not of great consequence due to the non-significant pretreatment correlations between stage and other variables utilized in the study: BDI ($r = -0.02$), CBI ($r = 0.15$), FACT ($r = -0.07$), PAIS ($r = 0.06$), and SII-F ($r = -0.03$) and the absence of differences between the treatment and control conditions on stage.

Dropouts

Of the 134 participants in the study, 12.7% ($N = 17$) dropped out and 14.9% ($N = 20$) of the participants died after completing at least the pretest measurement, but before completing the three-month follow-up measures. There were no statistical differences on any variables between the dropouts and those who remained in the study. However, there were two differences between treatment and control dropouts; first, the treatment dropouts had self-efficacy for coping scores that were more than a standard deviation below the remaining treatment participants, the control participants, and almost two standard deviations below the mean of the instrument (i.e., the cut-off point to be eligible to participate in the study). Second, treatment dropouts were different from the treatment and control "completers" on the number of life events endorsed on a checklist (Holmes & Raye, 1967). In sum, the treatment group dropouts were less confident that they could cope with the disease, and had more personal stressors than other participants. The added effort involved in participating may have been a deterrent to continuing in the treatment. The advantage of multilevel analysis used in this study over traditional ordinary least squares analysis is that the drop-out participants' data were not excluded from analysis whereas they would have been with ordinary least squares unless a substitution protocol was used such as intent-to-treat, which is a very conservative approach to maintaining randomization.

Treatment fidelity

Two senior undergraduate research assistants rated audiotape recordings of the sessions to evaluate treatment fidelity. The raters listened to 23 randomly chosen sessions and indicated the presence or absence of components of the treatment protocol. There were six essential elements in each session that were listed in the Mastery Enhancement Therapy description in the method section of this study; thus, there were 138 potential protocol items per therapist. The percent of agreement was 91% between raters across all sessions. Cohen's Kappa was utilized to control for chance agreement between the raters, and was computed to be 0.64, which is a substantial rate of agreement. A third rater (TVM) reviewed the items on which the original raters disagreed in order to determine the disposition of the item. Because of poor audio quality 10 of the 25 disagreed-upon items could not be resolved. Of the remaining 266 potential protocol items, the therapists collectively missed

Table 2 Analysis of variance comparing treatment and control groups at pretest

	SS	*df*	*MS*	*F*	*p*
Age					
Between	156.70	1	156.70	0.80	0.37
Within	24,378.29	125	195.03		
Total	24,534.99	126			
Education					
Between	0.00	1	0.00	0.01	0.94
Within	257.49	126	2.0		
Total	257.49	127			
Beck depression inventory					
Between	12.44	1	12.44	0.65	0.42
Within	2297.13	120	19.14		
Total	2309.57	121			
Cancer behavior inventory					
Between	68.54	1	68.54	0.04	0.84
Within	212,238.65	132	1607.87		
Total	212,307.19	133			
FACT-G quality of life					
Between	798.63	1	798.63	3.2	0.08
Within	31,210.04	125	249.68		
Total	32,008.67	126			
Psychosocial adjustment to illness scale					
Between	2.70	1	2.70	0.01	0.92
Within	24,770.25	106	233.68		
Total	24,772.95	107			
Stage at diagnosis					
Between	1.19	1	1.19	0.96	0.33
Within	137.52	110	1.25		
Total	138.71	111			
Symptom impact inventory—frequency					
Between	25.14	1	25.14	0.11	0.74
Within	29,310.83	132	222.0		
Total	29,335.97	133			

only 10 instances, and in only one case were two items missed with the same participant. Thus, overall adherence rates for the two therapists were 100% and 95%, and all 10 omissions were by one therapist. In sum, fidelity with the treatment protocol was confirmed.

Multilevel analysis

A multilevel model utilizing an unstructured covariance matrix (Maxwell & Delaney, 2003) was computed with the Symptom Impact Inventory-Frequency (SII-F) score as a covariate for each patient. SII-F scores were chosen as a potential covariate prior to the study due to the likelihood that they would have a strong relationship with the outcome measures. In other words, those who reported more symptoms and more disruption caused by the symptoms would likely not do as well as those with less symptoms. Pretest correlations confirmed a strong relationship between the Symptom Impact Inventory-Frequency scores and the outcome variables of depression (0.47), self-efficacy for coping with cancer (− 0.31), quality of life (− 0.58), and adjustment to illness (− 0.51). All correlations were significant ($p < 0.01$). Thus, the multilevel analysis included: Group (Treatment vs. Control), Assessment Time (T1–T4), and SII-F (Time 1) as a covariate. In cases where the covariate was not a significant moderator of the outcomes, the two-way, Group X Assessment Time, interaction was interpreted. In other cases where the SII-Frequency score was a significant moderator, the three-way, Group X Assessment Time X SII-F was interpreted. Because in multilevel modeling time is a continuous variable, not all scores were needed at each time point to

model the data. Thus, all participants, including drop-outs, were retained in the analyses and data were modeled comparing the treatment with the control group.

Self-efficacy for coping, adjustment, and depression

The unstructured covariance matrix analysis for self-efficacy for coping (Table 3), revealed a significant two-way interaction (Group X Assessment Time) for the Cancer Behavior Inventory ($F = 2.79$, $df = 3130$; $p = 0.04$), which indicated that the treatment group's self-efficacy for coping accelerated at a greater rate than the control group; however, the groups converged at T4 (Table 3). Additional multilevel analyses were conducted on the individual subscales of the Cancer Behavior Inventory in an attempt to explore if some of the factors had been impacted by the intervention more than others (Table 4). Two of the subscales, Coping with Treatment Related Side Effects and Accepting Cancer and Maintaining a Positive Attitude, were associated with significant two-way (Group X Assessment Time) interactions that mirrored the two-way interaction obtained with the full scale. In addition, the two-way interaction with Seeking and Understanding Medical Information as the dependent variable was nearly significant ($p = 0.06$). Because of the risk of Type I error, these sub-scale results should be interpreted cautiously, but do give some indication as to what subscales might be contributing to the omnibus variance in the total CBI score.

Two three-way interactions (Group X Assessment Time X Symptom Frequency) were significant (Tables 3) for depression (BDI) ($F = 2.66$, $df = 3126$; $p = 0.05$) and adjustment (PAIS) ($F = 3.14$, $df = 3121$; $p = 0.03$). These results indicate that at Time 4 (the 3-month follow-up) those with high symptom frequency scores in the treatment group reported lower depression scores than the control group participants with high symptom frequency scores (i.e., for participants with high symptom scores, the intervention group improved more, that is, had a greater reduction in depression than the control group, whereas there was no difference in depression symptoms for participants with low symptom frequency scores regardless of group). As depicted in Fig. 3a for participants whose SII-F z-score was -0.5 (i.e., 0.5 *SD*s below the mean) an advantage emerged for the treatment group. That advan-

Table 3 Unstructured covariance matrix full factorial model for outcome variables (T1–T4)

	df	*F*	*p*
Cancer behavior inventory			
Time	3130	6.82	0.00
Group	1130	0.32	0.57
Symptom frequency mean (SFM)	1130	25.25	0.00
Group*time	3130	2.79	0.04
SFM*group*time	3130	0.33	0.80
Beck depression inventory			
Time	3126	1.47	0.22
Group	1126	0.25	0.62
Symptom frequency mean (SFM)	1126	61.49	0.00
Group*time	3126	0.31	0.82
SYMFM*group*time	3126	2.66	0.05
FACT-G: quality of life			
Time	3128	6.76	0.00
Group	1128	1.42	0.24
Symptom frequency mean (SFM)	1128	102.36	0.00
Group*time	3128	2.05	0.11
SFM*group*time	3128	0.33	0.80
Psychosocial adjustment to illness scale			
Time	3121	2.50	0.06
Group	1121	0.22	0.64
Symptom frequency mean (SFM)	1121	70.30	0.00
Group*time	3121	1.40	0.25
SFM*group*time	3121	3.14	0.03

TIME data collection point, *GROUP* treatment and control group, *SFM* mean score of symptom impact inventory—frequency score for each participant

Table 4 Unstructured covariance matrix cancer behavior inventory sub-scales (T1–T4)

	df	*F*	*p*
Maintaining activity and independence			
Time	3131	4.06	0.01
Group	1131	1.41	0.24
Symptom frequency mean (SFM)	1131	56.17	0.00
Group*time	3131	1.58	0.20
Seeking and understanding medical information			
Time	3131	4.48	0.00
Group	1131	0.15	0.70
Symptom frequency mean (SFM)	1131	6.50	0.01
Group*Time	3131	2.53	0.06
Stress management/medical appointments			
Time	3131	4.11	0.01
Group	1131	0.42	0.52
Symptom frequency mean (SFM)	1131	11.35	0.00
Group*Time	3131	2.06	0.11
Coping with treatment-related side effects			
Time	3131	8.32	0.00
Group	1131	0.05	0.82
Symptom frequency mean (SFM)	1131	16.51	0.00
Group*time	3131	4.37	0.01
Accepting cancer maintaining a positive attitude			
Time	3131	2.31	0.08
Group	1.131	0.99	0.32
Symptom frequency mean (SFM)	1131	5.71	0.01
Group*time	3131	3.08	0.03
Affective regulation			
Time	3131	4.48	0.00
Group	1131	0.08	0.77
Symptom frequency mean (SFM)	1131	0.17	0.00
Group*time	3131	0.85	0.47
Seeking social support			
Time	3131	6.73	0.00
Group	1131	1.09	0.30
Symptom frequency mean (SFM)	1131	13.84	0.00
Group*Time	3131	1.66	0.18

TIME data collection point, *GROUP* treatment and control group, *SFM* mean score of symptom impact inventory—frequency score for each participant

tage of the treatment participants relative to controls in terms of lower depression scores increased for those participants with higher SII-Frequency scores.

A similar finding is reported (Table 3) for adjustment scores (i.e., PAIS) at T4. At higher levels of SII-F participants in the treatment group did experience an advantage similar to that found for the BDI. In Fig. 3b at a SII-F *z*-score of − 0.75 (i.e., 0.75 *SD*s below the mean) the advantage for the treatment relative to the control condition emerged. This advantage increased for those treatment patients who had higher SII-F scores. These data suggested a moderating role for symptoms in the response to treatment; those with higher levels of symptoms benefited more from the treatment relative to control participants at the same level of symptom frequency at the 3-month follow up assessment in spite of no differences in self-efficacy for coping scores at the follow-up. While there was an overall three-way interaction for the overall PAIS no subscale scores for the PAIS were associated with significant three-way interactions (Table 5).

Table 6 contains the effect sizes for the measured variables. The self-efficacy for coping changes were sup-

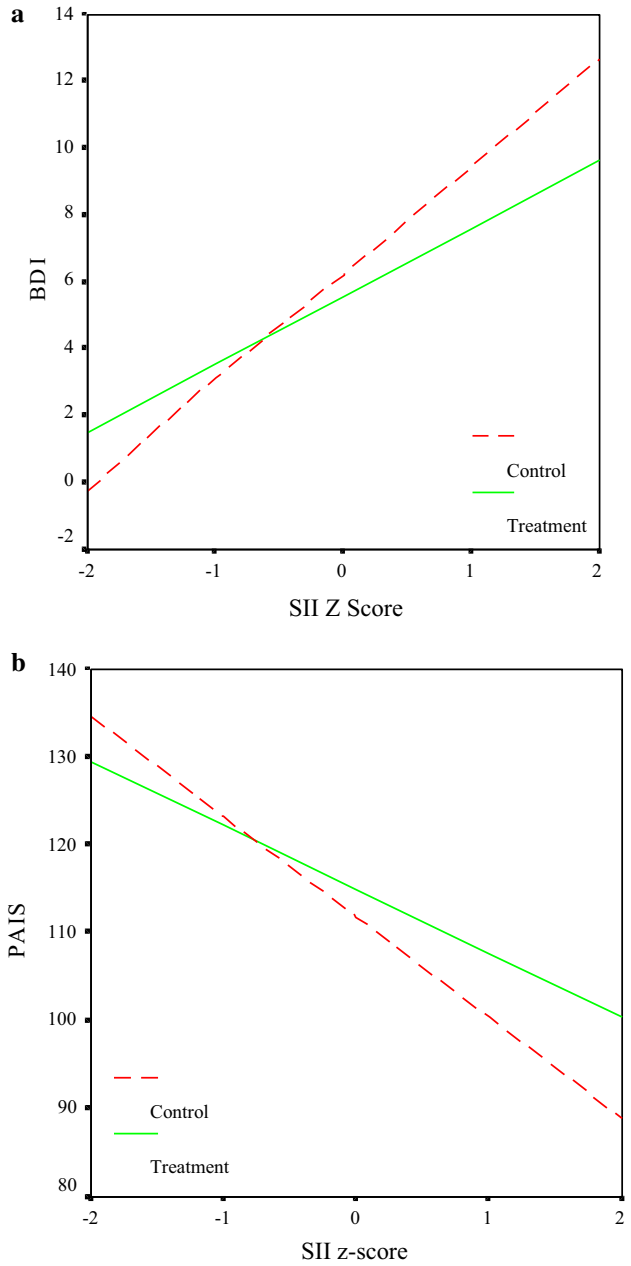

Fig. 3 **a**, **b** Interaction of Group (treatment vs. control), and Symptom Impact Inventory-Frequency (SII-F; z-transformed) on Depression (BDI; **a**) and Adjustment (PAIS; **b**) at 3-Month Follow up (T4). *Note:* − 2 Symptom Impact Inventory *z*-score indicates a low number of symptoms and + 2 indicates a high number of symptoms

ported by this analysis as evidenced by the 0.39 (95% CI: 0.044, 0.728) effect size at the end of the intervention (T3). The FACT-G quality of life measure had a small effect size of 0.24 at the end of the intervention as well, but that impact was not determined to be statistically significant by the other analyses conducted on this sample and the CI for the effect size contained "0" (95% CI: − 0.102, 0.578). In summary, the advantage for the Mastery Enhancement Therapy group in self-efficacy for coping behaviors diminished by the three-month follow-up when the control participants improved to the level of the treatment group, which indicated that Mastery Enhancement Therapy accelerated the process of self-efficacy for coping behaviors. However, at Time 4 there was an advantage for those in the treatment group relative to the control group with regard to improvements on depression and psychosocial adjustment if they had higher levels of symptoms.

Discussion

The results of this study provide initial support for the brief presentation of Mastery Enhancement Therapy in accelerating the improvement of self-efficacy for coping behaviors, which then resulted in improving levels of depression and psychosocial adjustment for those with moderate to severe levels of symptoms. The study also demonstrated that the treatment group retained the level of coping self-efficacy functioning they achieved at post-test as the control group converged with the treatment group at the 3-month post-treatment assessment. Given the strong theoretical base, the relative ease of administration, the significant boost to coping over a 3-month period, and the brevity of the treatment, Mastery Enhancement Therapy has potential for being integrated into oncology care with minimal training and cost.

Significant three-way interactions provided insight into how the treatment worked in conjunction with the moderating effect of symptom frequency. Treatment participants were less depressed and more adjusted than the control group at the three-month follow-up if they had a moderate to high levels of symptom frequency. Thus, future applications of Mastery Enhancement Therapy may focus on choosing patients not only on the basis of low self-efficacy but also on the basis of high levels symptoms, which may help tailor psychosocial treatment to patient care beyond the oncology setting.

The analysis of the individual Cancer Behavior Inventory scales provided preliminary details about the mechanisms used by a number of the participants in the treatment group to improve their overall self-efficacy to cope with cancer. The treatment group became more confident in coping with the side effects of the disease and showed a more positive and accepting attitude towards the disease compared to the control group. Perhaps initiating Mastery Enhancement Therapy treatment sessions by asking patients, "What's better?" provided the impetus to adopt a more positive attitude. The increase in a positive, accepting attitude may have also been the result of helping patients discern what they could and could not control in the context of their disease and medical treatments. These inter-

Table 5 Unstructured covariance matrix for psychosocial adjustment to illness scale sub-scales—full factorial model (T1–T4)

	df	*F*	*p*
Social and leisure activities			
Time	3126	1.15	0.33
Group	1126	0.02	0.90
Symptom frequency mean (SFM)	1126	47.74	0.00
Group*time	3126	1.71	0.17
SFM*group*time	3126	1.76	0.16
Job and household duties			
Time	3126	0.90	0.44
Group	1126	0.21	0.65
Symptom frequency mean (SFM)	1126	81.42	0.00
Group*time	3126	0.88	0.45
SFM*Group*time	3126	1.72	0.17
Psychological distress			
Time	3126	2.94	0.04
Group	1126	1.14	0.29
Symptom frequency mean (SFM)	1126	49.92	0.00
Group*time	3126	0.02	0.99
SFM*group*time	3126	0.45	0.72
Sexual relationship			
Time	3121	2.52	0.06
Group	1121	0.16	0.69
Symptom frequency mean (SFM)	1121	0.33	0.80
SFM*group*time	3121	1.03	0.38
Relationship with partner and family			
Time	3126	1.55	0.20
Group	1126	0.09	0.76
Symptom frequency mean (SFM)	1126	31.64	0.00
Group*time	3126	4.84	0.00
SFM*group*time	3126	2.14	0.10
Health care orientation			
Time	3126	1.99	0.12
Group	1126	2.35	0.13
Symptom frequency mean (SFM)	1126	7.56	0.01
Group*time	3126	0.96	0.41
SFM*group*time	3126	0.62	0.60

TIME data collection point, *GROUP* treatment and control group, *SFM* mean score of symptom impact inventory—frequency score for each participant

pretations are offered cautiously based on the fact that alpha level was not adjusted for multiple tests of significance.

The delayed onset of the treatment efficacy in the case of depression and adjustment was expected due to self-efficacy being the construct Mastery Enhancement Therapy was designed to impact, and that initial impact would be expected to be a catalyst for improvements in other variables in this study. That is, in this study the intervention accelerated the participants' self-efficacy in the treatment group by the end of the intervention (Time 3), and while the control group matched the overall self-efficacy level at the three-month follow up, the treatment group had a more than three-month advantage in terms of experiencing higher coping self-efficacy. That advantage in self-efficacy may have facilitated improvement in the other significant outcome variables such as depression and adjustment. This explanation is consistent theoretically with self-efficacy as a mediator of change (Bandura, 1997; Nairn & Merluzzi 2003).

The recruitment rate of 64% was slightly higher than a recent meta-analysis found across all psychological inter-

Table 6 Means and standard deviations for outcome variables for times 2–4 controlling for Symptom Impact inventory-Frequency (time 1) and baseline scores for each outcome

Variable	Treatment group		Control group		Effect size	95% CI
	Mean	SD	Mean	SD	g	
CBI						
T2	231.12	35.54	225.97	40.14	0.136	− 0.20, 0.48
T3	240.26	37.89	224.94	41.27	0.387	0.04, 0.73
T4	239.57	37.45	238.29	47.65	0.030	− 0.31, 0.37
FACT						
T2	75.63	13.78	73.93	15.12	0.118	− 0.22, 0.46
T3	79.10	15.32	75.34	16.22	0.238	− 0.10, 0.58
T4	79.32	15.52	82.73	16.20	− 0.214	− 0.55, 13
PAIS						
T2	110.96	15.60	109.74	14.65	0.081	− 0.26, 0.42
T3	112.04	17.01	112.40	14.56	− 0.023	− 0.36, 0.32
T4	114.72	13.82	114.24	15.73	0.032	− 0.31, 0.37
BDI						
T2	6.40	3.93	6.38	4.09	0.005	− 0.33, 0.34
T3	5.65	4.66	5.71	4.03	− 0.015	− 0.35, 0.33
T4	5.34	3.71	5.51	4.57	− 0.041	− 0.38, 30

CBI cancer behavior inventory, *FACT* fact quality of life, *PAIS* psychosocial adjustment to illness scale, *BDI* beck depression inventory. *T1* pre-treatment, *T2* after session 2, *T3* post-treatment, *T4* 3-month post-treatment follow up

vention studies, but in line with the 68% rate found in studies where participants had equal probability of being assigned to a therapeutic intervention or a non-therapeutic condition (Brebach, et al., 2016). Moreover, the recruitment rate (64%) was consistent with the finding that people are much more likely to accept recruitment for psychological intervention from nurses (68%) compared to other psychosocial professionals (50%). The rate for this study was closer to the former than the latter. Another feature of this study was the low drop-out rate (12.7%), which is consistent with other psychological intervention studies with cancer patients (Brebach, et al., 2016). In fact, more people did not complete all four questionnaires because they died before the end of the study (n = 20) than dropped out (n = 17). One possible factor in this attrition is that the intervention was conducted in conjunction with the participant's oncology treatment, so no extra travel was necessary. Also, the therapists reported that the intervention was not perceived as onerous by patients, who were engaging in behaviors that they were not current utilizing effectively but were, nonetheless, accessible. Thus, there seemed to be no aversion to meeting with the therapists providing the Mastery Enhancement Therapy treatment. It is also plausible that the participants were experiencing benefits of the intervention and wanted to continue. As noted previously, the treatment participants who chose to drop out reported significantly more stressful life events and lower self-efficacy than the participants who completed the study or the control group members who dropped out of the study. These risk factors for dropping out might be taken into account in future intervention studies. Perhaps there is a need for a more supportive environment for those who are at risk for dropping out. There also may be a need to be more flexible in the scheduling of appointments or the use of phone sessions to ease the burden of actually coming to sessions or prolonging their stay at the oncologist's office in order to participate in the treatment. This need for flexibility is consistent with the findings in Brebach et al.'s (2016) meta-analysis.

With regards to the outcomes, Mastery Enhancement Therapy at the post-treatment assessment provided results similar to those in literature reviews and meta-analyses of psychotherapeutic interventions with oncology patients, with one exception, CBT reported in Hart et al. (2012). However, Mastery Enhancement Therapy achieved those results in about 100 min of therapy compared to, for example to 540 min for CBT (Hart et al., 2012), which was over 5 times longer than Mastery Enhancement Therapy. Moreover, the effect size for CBT in Hart et al. (2012) was based on only two studies.

The acceleration of coping efficacy may have been the result of the integration of mastery experiences with the empirically supported intervention techniques of solution-focused therapy. This combination creates an easily understood and easily implemented model for rapid improvement of self-efficacy of coping behaviors, which in

this pilot study impacted some widely utilized outcome variables in psycho-oncology interventions, depression and adjustment. Certainly, other interventions in the literature provide clear theoretical rationales for explaining change, but this study provide promising initial data for a very short-term intervention, in most cases less than a quarter of the time of other interventions.

Mastery Enhancement Therapy intervention skills are accessible to a variety of professionals and may be offered in a systematic intervention like that used in this study or as an adjunct to nursing or therapy services to enhance the functioning of patients. Thus, nurses as well as physical and occupational therapists may be able to use Mastery Enhancement Therapy as part of their regular interactions with patients because of its emphasis on monitoring current functioning, setting goals, and assessing the impact of behaviors on reducing the discrepancy between current and desired functioning. It will be important in future studies to implement training on Mastery Enhancement Therapy with a broader scope of professionals who provide services to oncology patients to determine if the intervention is truly portable to other professions (e.g., physicians, oncology nurses, physician's assistants, occupational and physical therapists). Also, it may be important to investigate the optimal length of treatment as additional time may provide more substantial effects .

There are several important limitations to this study. The participants were predominantly European-American and from a geographically limited sample. Also, this study used a heterogeneous sample of cancer patients, so it unknown if different types of cancer might respond differently to the intervention. The 3-month delay between the end of the intervention and the 3-month follow up appears to have been too large an interval to detect when the intervention began to have an impact on participants' depression and adjustment. Therefore, more frequent follow-up prior to the 3-month mark would have been helpful in clarifying the nature of the change. With regard to assessment, all instruments in the study were self-report; it would have been beneficial to have corroborating data from oncologists, oncology nursing staff, and a family member. Along those lines, measures such as endocrine levels (e.g., cortisol, prolactin, and ACTH), which have a positive relationship with cancer progression, and immune system levels (e.g., CD3, CD4, CD8, and natural killer cell activity), which indicate a threat to the body that has stimulated its defenses, would be valuable to collect. Future research might incorporate a more formal analysis of in-session goal setting data as a potential mediator of change. Whereas, it was expected that the acceleration of self-efficacy for the Mastery Enhancement Therapy group would occur, it was also expected that any differences between the Mastery Enhancement Therapy and control group would persist to the 3-month follow-up. It is difficult to determine why the control group improved to the level of the treatment group, although this is not unusual in treatment studies for mood disorders. One of the more parsimonious reasons for the control group's improvement is test-taking reactivity or "demand". However, to untangle that puzzle a Solomon 4-groups design would be necessary. In addition, an attention control group would be important to add in future research. Finally, this trial was not registered as funding was granted prior to the registration requirement.

In conclusion, this initial use of Mastery Enhancement Therapy provided a theoretically-based intervention to cancer patients, which produced evidence of accelerating gains for treatment participants in coping self-efficacy as well as subsequent benefits with regard to depression and adjustment to illness for those with higher levels of symptoms when compared to a control group. The intervention, which is based on enhancing mastery experiences was time effective (i.e., the results occurred in four brief sessions), and also provided a customized intervention that appeared to optimize each participant's coping behavior, improved compliance, and likely was related to the small drop-out rates found in this study. Finally, the treatment was more effective for those with a greater number of symptoms, indicating is value for advanced cancer patients. These findings will hopefully act as a catalyst for further research and refinement of this therapeutic intervention to help oncology patients cope with the rigors of treatment and may be useful in enhancing the functioning of persons who suffer from other chronic conditions such as dialysis patients, chronic headache patients, or chronic pain patients.

Acknowledgements The authors would like to thank the patients who participated in this study as well as the physicians and staff of Michiana Hematology-Oncology, the Northern Indiana Cancer Research Consortium, and Memorial Hospital's Regional Cancer Center, South Bend, Indiana.

Funding This research was supported by a Grant from the National Cancer Institute (CA88603).

Compliance with ethical standards

Conflict of interest Raymond C. Nairn and Thomas V. Merluzzi declared that they do not have any conflicts of interest.

Human and animal rights and Informed consent All procedures were in accordance with the ethical standards of the institutional research committees and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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