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RESEARCH ARTICLE

Social support as a predictor of outcomes of cognitive behavioral therapy with a trauma focus delivered face-to-face and via guided internet-based self-help

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Abstract

There is mounting evidence that cognitive behavioral therapy with a trauma focus (CBT-TF) delivered via guided internet-based self-help is noninferior to CBT-TF delivered face-to-face for individuals with posttraumatic stress disorder (PTSD) of mild-to-moderate severity. The availability of multiple evidence-based treatment options creates a need to determine predictors of outcome to enable clinicians to make informed treatment recommendations. We examined perceived social support as a predictor of treatment adherence and response among 196 adults with PTSD enrolled in a multicenter pragmatic randomized controlled noninferiority trial. Perceived social support was measured using the Multidimensional Scale of Perceived Social Support and PTSD was assessed using the Clinician-Administered PTSD Scale for *DSM-5*. Linear regression was used to explore the associations between different dimensions of perceived social support (i.e., from friends, family, and significant others) and posttraumatic stress symptoms (PTSS) at baseline. Linear and logistic regression were used to determine whether these dimensions of support predicted treatment adherence or response for either treatment modality. Lower baseline perceived social support from family was associated with higher levels of PTSS, $B = -0.24$, 95% CI $[-0.39, -0.08]$, $p = .003$, but the same did not apply to social support from friends or significant others. We did not find evidence that any dimension of social support predicted treatment adherence or response for either treatment. This work does not indicate that social support is a factor that can help predict the suitability of psychological therapy for PTSD delivered via guided internet-based self-help versus face-to-face.

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A substantial evidence base supports the efficacy of psychological therapies for posttraumatic stress disorder (PTSD), with the strongest evidence for cognitive behavioral therapy with a trauma focus (CBT-TF) and eye movement desensitization and reprocessing (EMDR; Lewis, Roberts, Andrew, et al., 2020). Psychological therapies for PTSD are traditionally delivered face-to-face by a therapist, but some barriers limit access to treatment, resulting in a need for alternative delivery methods (Lewis & Olf, 2020). This has led to the development of more accessible and flexible treatment approaches that are less reliant on therapists, such as guided internet-based self-help interventions, which deliver psychological therapy via an app or website with regular input from a therapist (Simon et al., 2021). There is mounting evidence that CBT-TF delivered via guided internet-based self-help is effective and noninferior to therapist-delivered CBT-TF for the treatment of PTSD (Bisson et al., 2022; Simon et al., 2021). However, not everyone responds to treatment to the same degree, and little is known about factors that influence treatment response, especially in the context of guided internet-based self-help (Barawi et al., 2020).

Many factors have been hypothesized to impact the outcome of psychological therapy for PTSD (Barawi et al., 2020). Given the evidence of a strong association between social support and the development and maintenance of posttraumatic stress symptoms (Y. Wang et al., 2021), an interest has emerged in determining whether social support also impacts the outcome of psychological therapy for PTSD (Fredette et al., 2016). Social support is a multidimensional construct with a range of definitions (Y. Wang et al., 2021). The essence of social support is having friends or family an individual can turn to in times of crisis (Thoits, 2010). Social support can be viewed from an evolutionary perspective. Humans develop slowly, and this delayed maturation necessitates a reliance on others and leads to the development of supportive relationships. These relationships often continue into adulthood and impact the way an individual assesses and responds to stress. Social support systems buffer against the impact of loss, challenge, and change and enhance quality of life (Cohen & Wills, 1985).

Social support has been described as a “metaconstruct” consisting of multiple subconstructs (Haber et al., 2007). A distinction can be drawn between received and perceived social support. Received social support refers to the receipt of actual support, whereas perceived social support refers to the level of social support an individual thinks their network can provide (Rui & Guo, 2022). Three key dimensions of perceived social support have been identified based on their source, categorized as support from friends, support from family, and support from significant others (Dahlem et al., 1991). In the context of psychological

therapy, researchers have also distinguished the influence of naturally occurring support (i.e., the focus of this work) from the influence of therapist involvement in treatment (Cloitre et al., 2022), investigated the impact of engaging social contacts as allies in treatment (Sayers et al., 2021), and examined the provision of interventions that include a social component (Sak-Dankosky et al., 2022).

A recent systematic review that looked at naturally occurring social support and PTSD synthesized longitudinal data from 75 studies including 32,402 total participants (Y. Wang et al., 2021). The authors found evidence of a bidirectional association between the two constructs whereby PTSD and social support predicted each other with similar effect sizes. Social support has the potential to promote treatment engagement and influence outcomes in several ways. First, there is evidence that social relationships can impact treatment-seeking and the uptake of psychological therapy through direct encouragement and the perception of having sufficient emotional and practical support to draw on through therapy (Sayer et al., 2009; Sayers et al., 2021). Second, there is evidence that social support can provide encouragement and more general support to engage in anxiety-provoking or distressing components of treatment, which promotes engagement (Meis et al., 2019). Third, perceived social support may provide a general indicator of sufficient stability to engage in and benefit from psychological therapy.

Despite the established association between social support and PTSD, far less is known about the influence of social support on PTSD treatment response (Fredette et al., 2016). Components of CBT-TF such as exposure can cause distress, and for many individuals, there is a natural inclination to avoid engagement in the most challenging aspects of therapy (Lewis, Roberts, Gibson, & Bisson, 2020). There is often a requirement for homework and exposure to trauma memories and reminders outside of sessions with a therapist (Forbes et al., 2020), which may be facilitated by direct encouragement or the perception of practical or emotional support if needed. Conversely, negative social support, such as criticism or a lack of validation, may hinder engagement. It is, thereby, plausible that social support facilitates adherence and maximal engagement with therapy, acting as a predictor of treatment outcome. There is also some evidence that social support is a predictor of therapeutic alliance, which may, in turn positively, influence treatment outcomes (Keller et al., 2010). It is possible that guided internet-based self-help is influenced by social support to a greater degree than in-person therapy because it is more reliant on self-motivation and the completion of activities in the absence of a therapist. Individuals engaging in guided internet-based self-help need to overcome avoidance to utilize program components,

manage their time to progress through the steps, and problem-solve when they encounter barriers; emotional and practical support from other may facilitate this.

Several studies have evaluated a possible association between social support and psychological therapy outcomes. A systematic review of 34 studies that included participants with depression, schizophrenia, bipolar disorder, and anxiety disorders found that poorer baseline perceived social support was a significant predictor of higher depressive symptom severity at follow-up (J. Wang et al., 2018). In the context of PTSD, several studies have found an association between social support and psychological therapy outcomes, but these findings have not been consistent. For example, in a sample of 123 veterans who received prolonged exposure therapy, elevated social support during treatment was associated with larger reductions in PTSD symptoms (Price et al., 2018). Similarly, a study of telemedicine-based cognitive processing therapy (CPT) for rural veterans ($N = 225$) found that pretreatment social support moderated the association between CPT duration and PTSD symptom change such that increased duration was associated with more PTSD symptom change only at average or higher levels of social support (Campbell et al., 2020). However, a study of modified prolonged exposure with 231 veterans found no baseline differences in social support between treatment responders and non-responders (Allan et al., 2017). Similarly, a nonrandomized study of 91 participants receiving cognitive therapy found that the presence or absence of a supportive relationship failed to predict treatment response (Gillespie et al., 2002). Partially in keeping with these findings, a study of conjoint CBT failed to show an association between treatment outcomes and baseline perceived support from family or friends but did demonstrate a significant association with support from a significant other (Shnaider et al., 2017). Looking at the limited literature related to social support in the context of digital interventions, an analysis of data from 3,684 young people with anxiety who received a digital intervention delivered in a self-help format demonstrated that participants with higher levels of social support from all sources tended to show more program adherence, although the proportion of explained variance was small (Spence et al., 2019). For the prediction of treatment response, the results were varied and, again, explained only a small proportion of the variance.

A recently completed multicenter pragmatic randomized controlled noninferiority trial aimed to determine if trauma-focused guided self-help using a program called *Spring* was noninferior to individual, face-to-face CBT-TF for mild-to-moderate PTSD that stemmed from a single traumatic event (Bisson et al., 2022). Adults with a primary diagnosis of mild-to-moderate PTSD ($N = 196$) were randomized, and the primary outcome was PTSD symptom

severity, as assessed using the Clinician-Administered PTSD Scale (CAPS) for the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed. [DSM-5]; i.e., CAPS-5; Weathers et al., 2013) at 16 weeks postrandomization. Participants in the CBT-TF group attended an average of 8.6 ($SD = 3.4$) face-to-face therapy sessions, and participants in the guided internet-based self-help group attended a mean of 3.9 sessions ($SD = 1.7$). The noninferiority of guided self-help using *Spring* was demonstrated at the primary endpoint of 16 weeks postrandomization on the CAPS-5 ($\Delta M = 1.01$, one-sided 95% CI $[-\infty, 3.90$, noninferiority $p = .012$), and guided self-help using *Spring* appeared to be acceptable and well-tolerated by participants. Perceived social support was measured using the 12-item Multi-dimensional Scale of Perceived Social Support (MSPSS; Dahlem et al., 1991), and posttreatment data indicated noninferiority of guided self-help for this outcome.

Given the disparate findings and an absence of studies examining social support in the context of internet-based self-help, we aimed to examine perceived social support (i.e., from friends, family, and significant others) as a predictor of treatment adherence and response to CBT-TF delivered face to face and via guided internet-based self-help. We used data from a recently completed multicenter pragmatic randomized controlled noninferiority trial (Bisson et al., 2022) that tested these two methods of treatment delivery. We aimed to determine whether perceived social support was a prognostic factor with the potential to predict the outcome of face-to-face and guided internet-based CBT-TF. First, we hypothesized that all dimensions of social support would be associated with baseline PTSS severity. Secondly, we hypothesized that all dimensions of social support would be significant predictors of treatment adherence and response for both treatment groups and that this association would be stronger for participants who received guided internet-based self-help.

METHOD

Participants and procedure

Study design

Data for the current study were collected as part of the RAPID trial (Bisson et al., 2022), which followed a published protocol (Nollett et al., 2018). The RAPID trial was supported by a public advisory group and overseen by a trial-steering group and an independent data monitoring committee. The trial adhered to CONSORT guidelines (Schulz et al., 2010) and was granted a favorable ethical opinion by the Wales Research Ethics Committee. The trial was conducted between August 2017 and January 2021.

Inclusion and exclusion criteria, consent, and recruitment

Participants were 196 adults (guided internet-based self-help: $n = 97$, CBT-TF: $n = 99$) aged 18 or over who had a primary diagnosis of DSM-5 PTSD stemming from a single-incident traumatic event and a score less than 50 on the CAPS-5 (Weathers et al., 2013) at baseline. Participants were required to have regular access to the internet to complete the internet-based program and be willing and able to give informed consent to participate. Exclusion criteria were the inability to read and write fluently in English, the previous completion of a course of trauma-focused psychological therapy for PTSD, current PTSD symptoms related to more than one traumatic event, current engagement in psychological therapy, a diagnosis of psychosis or substance dependence, active suicide risk, and change in psychotropic medication in the past 4 weeks. Participants were recruited from National Health Service (NHS) primary care settings in Wales, England, and Scotland.

Interventions

Face-to-face CBT-TF

Face-to-face CBT-TF was administered according to the protocol for cognitive therapy for PTSD (CT-PTSD; Ehlers & Clark, 2000) and delivered at up to 12 individual face-to-face sessions of 60–90 min duration delivered weekly, augmented by daily homework. CT-PTSD involves the identification of appraisals, memory characteristics, triggers, and cognitive and behavioral strategies that maintain PTSD symptoms. These are addressed by modifying excessively negative appraisals of the traumatic event and its sequelae; reducing reexperiencing symptoms by elaboration of the trauma memories through imaginal exposure or narrative-based reliving and discrimination of triggers; and dropping dysfunctional behaviors and cognitive strategies, particularly those related to avoidance of triggers for intrusive symptoms, a trauma site visit, and relapse prevention plan. Treatment was delivered in person except for a small number of final sessions delivered via video call at the beginning of the COVID-19 pandemic.

Guided internet-based self-help using Spring

Spring is an eight-step guided internet-based self-help program developed through careful feasibility and efficacy work (Lewis et al., 2013, 2017). Guided internet-based self-help using *Spring* follows the same principles as CBT-TF but reduces contact time with the therapist by providing components of the therapy digitally through a website and app. Treatment is initiated by a 1-hr orientation session with a therapist aimed at developing rapport, learning about the traumatic event, demonstrating the program, and providing log-in details. Participants completed the internet-based program on their own time alongside 30-min sessions with the therapist, delivered fortnightly, with up to four sessions total. These sessions can be delivered in person, via video calls, or by telephone, according to participant preference. At each session, the therapist reviews progress by logging into a clinician dashboard and guides the participant through the program by offering continued support, monitoring, motivation, and problem-solving. The participant also receives four brief telephone calls or email contacts between sessions to discuss progress, identify problems, and identify new goals. The eight steps of the program are delivered over 8 weeks and cover psychoeducation, grounding, anxiety management and relaxation, behavioral activation, imaginal exposure, cognitive techniques to address negative appraisal, graded in vivo exposure, and relapse prevention. The eight steps are usually completed sequentially, with some later steps relying on mastery of techniques presented earlier. Although the therapist helps set goals and targets, the user is free to move through the program at their own pace. Each step activates a tool in the “toolkit” area of the website. With the participant’s knowledge, specific activities become visible to the therapist via a dashboard to facilitate therapist input.

Both interventions were delivered by the same therapists, all of whom had experience delivering CBT-TF for PTSD. All therapists had 1.5 days of additional training in CT-PTSD as well as a half-day training in guided internet-based self-help using *Spring*, with training sessions delivered by clinicians involved in the development of the interventions. To establish competence, clinicians were required to satisfactorily complete at least one training case for each intervention. Therapists followed treatment manuals for both interventions and received regular trial-specific group clinical supervision. To ensure that interventions were delivered as intended, each therapist aimed to audio-record at least one session with every participant, and these were rated using general and intervention-specific fidelity checklists by one of two experienced clinicians who were independent of the study.

Therapists, adherence, and fidelity

Both interventions were delivered by the same therapists, all of whom had experience delivering CBT-TF for PTSD. All therapists had 1.5 days of additional training in CT-PTSD as well as a half-day training in guided internet-based self-help using *Spring*, with training sessions delivered by clinicians involved in the development of the interventions. To establish competence, clinicians were required to satisfactorily complete at least one training case for each intervention. Therapists followed treatment manuals for both interventions and received regular trial-specific group clinical supervision. To ensure that interventions were delivered as intended, each therapist aimed to audio-record at least one session with every participant, and these were rated using general and intervention-specific fidelity checklists by one of two experienced clinicians who were independent of the study.

Measures

All outcome measures analyzed to address the aims of the current study were completed at baseline and 16 weeks after randomization (i.e., posttreatment). The 16-week endpoint was chosen to accommodate delays in starting treat-

ment after baseline assessment and to allow for circumstances that may impact the delivery timescale, such as the participant or therapist being unwell or going on vacation.

PTSS

PTSD diagnostic status and PTSS symptom severity were assessed using the CAPS-5 (Weathers et al., 2013). The CAPS-5 is a 30-item structured interview with items that correspond to the *DSM-5* criteria for PTSD (American Psychiatric Association, 2013). The measure has demonstrated excellent reliability and convergent and discriminant validity, diagnostic utility, and sensitivity to clinical change (Weathers et al., 2018). In the current sample, Cronbach's alpha was .69 at baseline and .92 at the 16-week endpoint.

Perceived social support

Perceived social support was measured using the 12-item MSPSS (Dahlem et al., 1991). The MSPSS assesses the perceived adequacy of social support in three key dimensions: family, friends, and significant others. Each domain-specific subscale includes four items addressing practical help, emotional support, availability to discuss problems, and help in decision-making. Participants were asked to rate items on a Likert scale ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*). Scores for each of the 12 items are summed and then divided by 12 to produce an overall score (range: 1–7). A high score indicates a higher level of social support. In the current sample, Cronbach's alpha was .86 at baseline and .91 at the 16-week endpoint.

Symptoms of current depression

Symptoms of current depression were measured using the nine-item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001). Participants were asked to indicate the frequency of symptoms over the previous 2 weeks, rating responses on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Total scores can range from 0 to 27, with higher scores indicating more severe depressive symptoms. In the current sample, Cronbach's alpha was .86 at baseline and .90 at the 16-week endpoint.

Data analysis

All analyses were conducted using Stata (Version 17; StatCorp, 2021). Demographic characteristics of the sample

were examined using descriptive statistics. Total MSPSS scores were calculated, as were subscale scores for each dimension of social support (i.e., friends, family, and significant others). To test our first hypothesis, we conducted linear regression to determine associations between baseline social support and PTSS for the whole sample. The association between each dimension of social support was investigated separately by a series of linear regressions minimally corrected for age and gender, with baseline CAPS total score as the dependent variable. To further examine these associations, social support variables were entered into a model with age and gender as well as two additional variables, time since trauma and baseline depressive symptoms, that the literature indicates are potentially important in the association between social support and PTSS (Zalta et al., 2021; Y. Wang et al., 2021).

There were no missing data at baseline, and data from all participants were included in these analyses. To test our second hypothesis (i.e., that baseline dimensions of social support would predict posttreatment PTSS), we repeated the analyses performed for the first hypothesis, with posttreatment CAPS score as the dependent variable and the addition of baseline CAPS score in the multiple regression that included social support variables and other potentially relevant variables (i.e., time since trauma and baseline depressive symptoms). These analyses were limited to the subsample of participants who completed the posttreatment assessment ($n = 160$), and there were no missing data for these participants. Using variables collected at baseline, we did not find evidence of an association between noncompletion of the posttreatment assessment and PTSS severity, age, or gender (see Table 5).

Testing our third hypothesis followed a similar analytic strategy but with adherence operationalized in terms of the a priori definitions for the trial, with full adherence indicated by the completion of three or more therapy sessions for internet-based CBT-TF participants and eight or more sessions for face-to-face CBT-TF participants. Using the same predictor variables as those used for our second hypothesis, logistic regression was conducted with adherence as the dependent variable. Adherence data were missing for three participants, and these individuals were omitted from this set of analyses.

RESULTS

Sample characteristics

The mean participant age was 36.5 years ($SD = 13.4$), and 63.8% of the sample ($n = 125$) was female. Most participants were White ($n = 180$, 91.8%). The face-to-face CBT-TF group reported higher levels of educational attainment,

but baseline demographics were generally well-matched (Bisson et al., 2022). Demographic characteristics of the sample are presented in Table 1. Participants reported exposure to an average of 5.5 traumatic events. A range of index traumatic events was reported, the most common being transportation accidents ($n = 33$, 16.8%); serious accidents not involving transportation ($n = 23$, 11.7%); the sudden unexpected death of someone close ($n = 22$, 11.2%); physical assault ($n = 21$, 10.7%); sexual assault ($n = 18$, 9.2%); and sudden, violent death ($n = 16$, 8.2%). The mean baseline CAPS-5 score was 35.1 ($SD = 6.7$).

Adherence

In the CBT-TF group, 30 of 97 participants (30.3%) attended 12 sessions. In the guided internet-based self-help group, the most frequent number of sessions attended was five ($n = 47$, 48.5%). In total, 78 (82.1%) of participants in the guided internet-based self-help group completed three or more therapy sessions, and 61 (62.2%) face-to-face CBT-TF participants fully completed eight or more sessions (i.e., the a priori definitions of full adherence).

Regression analyses

In the linear regression analyses, there was evidence of a statistically significant association between PTSS severity and perceived social support from both family, $p = .001$, and friends, $p = .003$, at baseline after minimal adjustment for age and gender. These variables were entered into a second model, which also included time since trauma and baseline depressive symptoms as additional variables, again with baseline PTSS as the dependent variable. We found evidence that social support from family was associated with baseline PTSS, $B = -0.25$, 95% confidence interval (CI) $[-0.41, -0.09]$, $p = .002$, but we did not find evidence of associations between other dimensions of social support and baseline PTSS. The model accounted for 42% of the variance in the model. These results are presented in Table 2.

Regarding the association between baseline social support and posttreatment PTSS, there was no evidence of an association for any dimension of social support among participants in the face-to-face CBT-TF group after minimally adjusting for age and gender. For the guided internet-based self-help group, there was some evidence that baseline social support from friends predicted posttreatment PTSS after controlling for age and gender, $B = -0.55$, 95% CI $[-0.99, -0.11]$, $p = .003$, but this association was not statistically significant after controlling for baseline PTSS, baseline depressive symptoms, and time since trauma. The

model explained 19% of the variance, $F(6, 70) = 2.74$, $p = .026$. These results are presented in Table 3 and should be interpreted in consideration of the fact that this was an analysis of the subsample of participants who took part in a posttreatment assessment ($n = 160$, 81.63% of the total sample). There was no evidence of an association between baseline social support and treatment adherence. These results are presented in Table 4.

DISCUSSION

We found evidence of an association between perceived social support from family and baseline PTSS whereby participants who reported lower social support of this type reported higher PTSS. This is consistent with an abundance of previous literature indicating an inverse association between dimensions of social support and PTSS severity (Y. Wang et al., 2021). We did not find evidence of associations between perceived social support from friends or significant others and baseline PTSS. This contradicts previous research, but the findings have not been consistent. The lack of an association between baseline perceived social support from friends in our study is consistent with pretreatment findings from a trial of conjoint CBT for PTSD (Shnaider et al., 2017), but the pattern of findings differed otherwise. Shnaider et al. (2017) failed to find an association with perceived support from family but observed a significant association with support from a significant other. The authors attributed their findings to the whole sample having PTSD and selection bias that may have increased the likelihood of individuals in a supportive relationship entering into a trial of conjoint therapy. Our findings are also likely to be attributable to the characteristics of our sample, which was limited to participants with mild-to-moderate PTSD stemming from a single traumatic event. Baseline ratings of social support in the current sample were higher than those reported in many epidemiological studies of PTSD (Simon et al., 2019), perhaps due to trauma histories that were less complex than some populations, a relatively short mean time since trauma, and diagnostic status of mild-to-moderate PTSD. The restricted range of social support ratings and CAPS-5 scores may have limited our ability to detect associations.

Among participants who provided posttreatment data ($n = 160$), we did not find evidence that any dimension of perceived social support at baseline predicted posttreatment PTSS or treatment adherence after controlling for potential confounders, including baseline PTSS severity, baseline depressive symptom severity, and time since trauma. Although our findings contradict studies demonstrating an association between baseline social support and posttreatment PTSS (Campbell et al., 2020; Price et al.,

TABLE 1 Demographic information

Variable	Face-to-face CBT-TF (<i>n</i> = 99)		Guided internet-based self-help (<i>n</i> = 97)		Total (<i>N</i> = 196)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age (years) ^{a,b}	37.6	13.4	35.4	13.4	36.5	13.4
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender ^b						
Male	36	36.4	35	36.1	71	36.2
Female	63	63.6	62	63.9	125	63.8
Ethnicity ^b						
White: Welsh/English/Scottish/Northern Irish/British	86	86.9	86	88.7	172	87.8
White: Irish	1	1.0	1	1.0	2	1.0
White: Any other White background	3	3.0	3	3.1	6	3.1
Mixed/multiple ethnic groups: White and Black Caribbean	1	1.0	0	0.0	1	0.5
Mixed/multiple ethnic groups: White and Black African	0	0.0	1	1.0	1	0.5
Mixed/multiple ethnic groups: Any other mixed/multiple ethnic background	0	0.0	1	1.0	1	0.5
Asian/Asian British: Indian	1	1.0	2	2.1	3	1.5
Asian/Asian British: Pakistani	0	0.0	1	1.0	1	0.5
Asian/Asian British: Bangladeshi	1	1.0	0	0.0	1	0.5
Asian/Asian British: Chinese	1	1.0	1	1.0	2	1.0
Black/African/Caribbean/Black British: African	2	2.0	1	1.0	3	1.5
Black/African/Caribbean/Black British: Caribbean	1	1.0	0	0.0	1	0.5
Black/African/Caribbean/Black British: Any other Black/African/Caribbean background	1	1.0	0	0.0	1	0.5
Any other ethnic group	1	1.0	0	0.0	1	0.5
Educational attainment ^b						
None	1	1.0	7	7.2	8	4.1
1–4 GCSE/O levels	12	12.1	12	12.4	24	12.2
≥ 5 GCSE/O levels	19	19.2	17	17.5	36	18.4
Apprenticeship	3	3.0	1	1.0	4	2.0
≥ 2 A levels	22	22.2	24	24.7	46	23.5
Higher education	37	37.4	27	27.8	64	32.7
Other	5	5.1	9	9.3	14	7.1
Main income source						
Salary/wage	64	94.1	59	98.3	123	96.1
State benefits	3	4.4	0	0.0	3	2.3
Other	1	1.5	1	1.7	2	1.6
Missing	31	31.3	37	38.1	68	34.7
Gross income (GBP) ^c						
≤ £10,000	36	37.1	36	39.6	72	38.3
£10,000–£20,000	19	19.6	19	20.9	38	20.2

(Continues)

TABLE 1 (Continued)

	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
£20,000–£30,000	23	23.7	16	17.6	39	20.7
£30,000–£40,000	14	14.4	14	15.4	28	14.9
£40,000–£50,000	3	3.1	3	3.3	6	3.2
£50,000–£60,000	0	0.0	2	2.2	2	1.1
≥ £60,000	2	2.1	1	1.1	3	1.6
Missing	2	2.0	6	6.2	8	4.1
Current employment status						
Employed (including being on temporary leave)	63	63.6	56	57.7	119	60.7
Self-employed or freelance	5	5.1	4	4.1	9	4.6
Homemaker	6	6.1	3	3.1	9	4.6
Student	12	12.1	15	15.5	27	13.8
Retired	4	4.0	3	3.1	7	3.6
Volunteering	3	3.0	0	0.0	3	1.5
Unable to work	6	6.1	12	12.4	18	9.2
Out of work and looking for work	4	4.0	2	2.1	6	3.1
Out of work but not currently looking for work	3	3.0	6	6.2	9	4.6

Note: CBT-TF = cognitive behavioral therapy with a trauma focus; GCSE = General Certificate of Secondary Education.

^aFace-to-face: *Mdn* = 37.0, interquartile range (*IQR*): 25.7, 48.3; internet-based self-help: *Mdn* = 31.4, *IQR*: 24.7, 43.8; total sample: *Mdn* = 32.3, *IQR*: 25.2, 47.

^bNo data were missing for this variable.

^cIndividual, without benefits.

TABLE 2 Multivariable linear regression models to determine associations between baseline social support and posttraumatic stress symptoms

Variable	<i>R</i> ²	<i>B</i>	95% CI	<i>F</i>	<i>df</i>	<i>p</i>
Minimally adjusted analyses ^a						
Social support: Significant other	.01	−0.11	[−0.30, −0.07]	0.50	3, 192	.232
Social support: Family	.06	−0.33	[−0.51, −0.14]	4.14	3, 192	.001
Social support: Friends	.12	−0.40	[−0.55, −0.25]	8.98	3, 192	.003
Full model ^b						
Age		0.03	[−0.03, 0.09]	22.71	6, 189	.262
Gender		1.03	[−0.56, 2.62]			.203
Social support: Family		−0.25	[−0.41, −0.09]			.002
Social support: Friends		−0.09	[−0.23, 0.05]			.209
Social support: Significant other		0.05	[−0.11, 0.20]			.198
Baseline depression		0.56	[0.44, 0.68]			.000
Time since trauma (weeks)		−0.01	[−0.02, 0.00]			.053

Note: CI = confidence interval; *df* = degrees of freedom.

^aAnalyses were adjusted for age and gender.

^bModel included all dimensions of social support and additional variables of hypothesized importance to the association between treatment outcome and social support.

2018), they were consistent with other studies that failed to determine a significant influence of perceived social support on treatment outcome. For example, the findings from a study of modified prolonged exposure therapy found no baseline differences in social support between treatment responders and nonresponders (Allan et al., 2017).

The findings are also broadly consistent with a study of digital self-help for anxiety, which demonstrated that participants who reported higher levels of social support from all sources explained only a small proportion of the variance in treatment adherence and response (Spence et al., 2019). In line with previous studies, these findings may

suggest that minimal contact with a therapist provides sufficient social contact to promote engagement (Cloitre et al., 2022).

Our findings add to a mounting body of literature indicating that it is difficult to predict the outcome of treatment based on sociodemographic or clinical variables. This was demonstrated by a comprehensive systematic review of 126 randomized controlled trials (RCTs) of psychological therapy for PTSD that failed to identify find any strong or consistent associations between treatment outcomes and factors considered to be possible predictors of treatment adherence and response (Barawi et al., 2020). The authors concluded that despite the importance of understanding predictors of treatment outcomes, the current literature does not provide sufficient evidence to indicate factors that may influence the degree to which individuals benefit. This cautions against assumptions that people may be unsuitable or unable to engage in specific types of psychological therapies based on their characteristics.

To our knowledge, this was the first study to examine the association between social support and outcomes of guided internet-based self-help for PTSD. Data for the study were obtained from a large RCT that adhered to rigorous methodological standards (Bisson et al., 2022). However, the findings should be considered in the context of the study's limitations. First, the study was powered to determine noninferiority of guided internet-based self-help relative to CBT-TF as assessed using the CAPS-5 at posttreatment (i.e., 16-week follow-up). It may not have been adequately powered to detect predictors of adher-

ence or treatment response. Second, similar to other RCTs, the strict eligibility criteria resulted in a sample with a restricted range of clinical characteristics. Adherence was defined a priori for the RAPID trial and was based on the number of therapist sessions attended because this could be measured consistently across the two treatment groups. Therefore, we were unable to conclude whether social support impacted adherence to program use. In addition, it is worth noting that adherence is complex, and lower adherence does not necessarily signal a negative outcome. Because the trial did not include a waitlist control group, we cannot differentiate between the influence of social support on treatment effect and a more direct longitudinal effect of social support on PTSS. The analyses related to treatment response, presented in Table 3, include only the subsample of participants who provided posttreatment data ($n = 160$), and these findings should be interpreted with that in mind. Finally, we measured perceived social support via self-report as opposed to actual received social support. Although this may appear to be a limitation, previous findings have indicated that perceived support has the greatest influence on psychological outcomes (Sarason et al., 1994).

The availability of multiple evidence-based treatment options creates a compelling rationale to determine predictors of outcome that may enable clinicians to make informed treatment recommendations at the individual level. However, we found no evidence to suggest that perceived social support is a factor that would help clinicians or patients choose between the delivery of CBT-TF in

TABLE 3 Multivariable linear regression models to determine associations between baseline social support and posttreatment posttraumatic stress symptoms, by treatment modality

Variable	Guided internet-based self-help				Face-to-face CBT-TF			
	R^2	B	95% CI	p	R^2	B	95% CI	p
Minimally adjusted analyses ^a								
Social support: Significant other	.02	−0.42	[−1.20, 0.36]	.290	.00	−0.11	[−0.53, 0.30]	.583
Social support: Family	.02	−0.39	[−1.03, 0.25]	.230	.00	−0.15	[−0.62, 0.33]	.538
Social support: Friends	.08	−0.55	[−0.99, −0.11]	.015	.02	−0.27	[−0.74, 0.19]	.246
Full model ^b	.19				1.76			
Age ^c		0.02	[−0.18, 0.22]			0.35	[−0.15, 0.22]	.712
Gender		0.55	[−5.04 – 6.13]	.846		0.38	[−4.87, 5.63]	.885
Social support: Significant other		−0.14	[−0.96, 0.68]	.738		−0.04	[−0.46, 0.37]	.845
Social support: Family		−0.26	[−0.79, 0.54]	.708		−0.00	[−0.53, 0.53]	.993
Social support: Friends		−0.20	[−0.70, 0.29]	.251		0.00	[−0.50, 0.50]	.988
Baseline depression		0.42	[−0.33, 0.86]	.068		0.60	[0.43, 1.16]	.035
Time since trauma (weeks)		−0.00	[−0.03, 0.03]	.838		−0.00	[−0.03, 0.03]	.872

Note: CBT-TF = cognitive behavioral therapy with a trauma focus; CI = confidence interval.

^aAnalyses were minimally adjusted for age and gender.

^bModel included all dimensions of social support and additional variables of hypothesized importance to the association between treatment outcome and social support.

^cGuided internet-based self-help: $F(8, 68) = 2.05$; face-to-face CBT-TF: $F(8, 74) = 1.75$.

TABLE 4 Multivariable logistic regression models to determine associations between baseline social support and full adherence, by treatment modality

Variable	$\chi^2(3, N = 95)$	<i>p</i>	Guided internet-based self-help				Face-to-face CBT-TF					
			OR	SE	95% CI	<i>p</i>	$\chi^2(3, N = 99)$	<i>p</i>	OR	SE	95% CI	<i>p</i>
Minimally adjusted analyses ^a												
Social support: Significant other	3.33	.343	1.08	0.07	[0.96, 1.23]	.206	0.41 ^c	.938	0.97	0.35	[0.93, 1.07]	.874
Social support: Family	3.32	.345	0.91	0.07	[0.79, 1.06]	.228	1.14	.760	0.99	0.39	[0.93, 1.05]	.742
Social support: Friends	2.71	.438	1.04	0.04	[0.96, 1.13]	.309	0.42	.935	1.01	0.37	[0.94, 1.08]	.858
Full model ^b	10.21 ^{d,e}	.253					14.79 ^{c,e}	.063				
Age			1.04	0.29	[0.99, 1.10]	.131			1.00	0.02	[0.97, 1.04]	.838
Gender			1.00	0.61	[0.30, 3.30]	.998			0.88	0.44	[0.33, 2.33]	.793
Social support: Significant other			1.13	0.09	[0.97, 1.32]	.115			1.04	0.42	[0.96, 1.12]	.310
Social support: Family			0.84	0.79	[0.69, 1.01]	.060			0.97	0.47	[0.88, 1.06]	.494
Social support: Friends			1.00	0.52	[0.90, 1.10]	.976			1.00	0.43	[0.92, 1.09]	.943
Baseline depression			0.94	0.05	[0.85, 1.04]	.232			1.03	0.13	[1.01, 1.06]	.013
Time since trauma (weeks)			1.00	0.00	[0.99, 1.00]	.273			0.93	0.05	[0.84, 1.03] ^d	.198
Severity of baseline PTSS			1.00	0.05	[0.90, 1.10]	.949			1.01	0.05	[0.92, 1.11]	.799

Note: CBT-TF = cognitive behavioral therapy with a trauma focus; OR = odds ratio; CI = confidence interval; PTSS = posttraumatic stress symptoms.

^aAnalyses were minimally adjusted for age and gender.

^bModel included all dimensions of social support and additional variables of hypothesized importance to the association between treatment outcome and social support.

^c*N* = 98.

^d*N* = 95.

^e*df* = 8.

TABLE 5 Results of univariate regression analyses to determine predictors of missing posttreatment data

Variable	OR	SE	95% CI	p	$\chi^2(1, N = 196)$	p
Baseline CAPS-5 score ^a	1.05	0.03	[0.99, 1.10]	.100	2.77	.099
Gender ^b	0.65	0.25	[0.31, 1.36]	0.258	1.26	.258
Age ^a	0.97	0.15	[0.95, 1.00]	0.079	3.32	.079

Note: CAPS-5 = Clinician-Administered PTSD Scale for DSM-5; OR = odds ratio; CI = confidence interval.

^aContinuous variable.

^bCoded as: 0 = male, 1 = female.

person or via guided internet-based self-help. However, the absence of significant findings related to the influence of social support on treatment outcome does not detract from the fact that a proportion of participants reported low levels of perceived social support at baseline and posttreatment, and these individuals may benefit from [supplementary interventions](#) designed to optimize or mimic such support. Abundant evidence indicates that the perception of social support is beneficial to psychological well-being (Y. Wang et al., 2021), and it is intuitive that such support would protect against future PTSS relapses and the emergence or continuation of other disorders, indicating that it is nonetheless an important consideration. It is also worth noting that the absence of an association with treatment outcome does not indicate the absence of associations with other adverse outcomes that were not considered by this work.

Further research with larger, more diverse samples is needed to determine whether our failure to find a significant association between any dimension of social support and treatment outcome represents reality. It would advance the field to determine the conditions necessary for social support to influence treatment outcome, such as whether support can simply be instrumental or whether an emotional component is required. It would be clinically beneficial to determine the potential merit of social contacts actively supporting treatment and establishing the extent to which they would need to understand how the treatment works. There may also be a benefit in exploring paradoxical associations, such as whether people with low levels of social support stay in treatment longer because they have more need for the support that treatment provides. The use of routinely collected health care data may overcome some of the limitations of the current study but might also introduce a new set of limitations related to difficulties controlling for confounders in a real-world setting. Pooling the results of relevant studies may offer another way of increasing confidence in conclusions, but this is also problematic due to inconsistent measurement and reporting of social support, resulting in difficulties in conducting meta-analyses. In addition, many of the relevant studies to date have had relatively small samples and methodological limitations. Meta-analyses of individual participant data

may be more fruitful, but their use is limited by the significant resources needed for their execution (Riley et al., 2010). Social support may be more important in the context of self-help delivered without guidance, and this may warrant investigation. Additionally, social support may play a role in the maintenance of treatment gains, and this deserves attention. Apart from treatment type, there is little certainty about any other factors that influence outcomes from psychological therapy, and further research is needed to determine whether any sociodemographic or clinical characteristics can helpfully indicate the modality of treatment most likely to benefit an individual.

OPEN PRACTICES STATEMENT

The study reported in this article was formally pre-registered at <https://bmcp psychiatry.biomedcentral.com/articles/10.1186/s12888-018-1665-3>. Neither the data nor the materials have been made available on a permanent third-party archive; requests for the data or materials should be sent via email to the lead author at LewisCE7@Cardiff.ac.uk.

AUTHOR NOTE

The Spring program was developed by and is owned by Cardiff University (CU) and, if commercialized, CU would stand to benefit as would authors Jonathan I. Bisson, Neil J. Kitchiner, Catrin Lewis, and Neil P. Roberts.

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