

# Are there preferred coping and communication strategies while undergoing IVF, and do cognitive behavioral interventions help?

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(Information about the authors can be found at the end of this article.)

## Abstract

**Purpose** – Coping and communication strategies affect how one perceives potentially stressful life events, such as infertility. Cognitive behavioral interventions (CBI) can reduce the distress related to undergoing in vitro fertilization (IVF). The purpose of this paper is to examine the effect of CBI on the coping and communication skills as well as perceived stress and depressive symptoms of women undergoing IVF treatment. The authors also explored the relationship between coping strategies and pregnancy rates.

**Design/methodology/approach** – The authors conducted a randomized controlled trial of CBI in 50 women undergoing IVF (NCT00685282).

**Findings** – The authors found that CBI was associated with reductions in active-confrontive coping among over 50 percent of participants, which was also found to be positively related to depressive symptoms. Furthermore, high meaning-based coping at baseline and high-avoidant coping at the end of IVF treatment were associated with increased pregnancy rates.

**Research limitations/implications** – CBI can be helpful in reducing the perceived stress of women undergoing IVF; however, the adaptiveness of individual coping skills and communication skills vary. Since different coping strategies seem to be of benefit at different time points, further studies might benefit from the examination of engaging in context-dependent coping strategies.

**Practical implications** – Integrating mental health care on infertility units may assist in reducing the stress and thus quality of care in women undergoing IVF. Mental health care can be tailored to meet the individual needs of infertility patients based on their preferred coping strategies and communication style. Further research is needed to examine the cost benefit of reducing perceived stress in fertility patients.

**Social implications** – Infertility is a social and medical problem that has vast implications on the mental health of individuals. Providing support along with practical tools for stress reduction and improved coping and communication can result in reduced stress and improved coping.

**Originality/value** – This paper examined the effect of a cognitive behavioral intervention on the coping strategies and communication skills of women undergoing IVF and can contribute to our understanding of the value of integrating mental health and medical care.

**Keywords** Coping, Infertility, Cognitive behavioural interventions

**Paper type** Research paper

Received 16 April 2018  
Revised 13 July 2018  
Accepted 7 November 2018

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## Introduction

Infertility affects the physical and mental health of several million women and men worldwide (Boivin *et al.*, 2007) and is considered a stressful life event (Cesta *et al.*, 2018). *In vitro* fertilization (IVF) is an invasive, last resource treatment for infertility which can also be cause for stress. In Israel, the government funds IVF treatment for women until two live births have been achieved. In 2017, 42,000 IVF cycles were performed (Ministry of Health, 2017). Personal beliefs, cognitions and coping skills mediate the response to potentially stressful events (Derogatis and Coons, 1993; Elliot *et al.*, 2011). Thus, stress reduction for fertility patients by

integrating mental health care in the fertility setting provides opportunities for increased quality of care. In this paper, we focus on examining the way in which coping and communication strategies change following a specific psychological intervention tailored to reduce stress of women undergoing IVF.

The appraisal of a situation effects the way individuals experience an event and the appraisal of one's resources mediates the mobilization of coping strategies, which influences mood, wellbeing and quality of life (Lazarus and Folkman, 1987). Coping is the cognitive and behavioral effort to reduce external and internal conflicts (Lazarus and Folkman, 1987).

There are three broad coping strategies: problem focused: attempts to manage the situation practically; emotion focused: attempts to regulate emotional distress; and meaning based: positive interpretations given to the situation (Lazarus and Folkman, 1987; Park and Folkman, 1997). Historically, the problem-focused coping was considered more adaptive and meaning-based coping was associated with negative mood and adverse health outcomes (Carver *et al.*, 1989). However, emotion-based coping includes positive and negative emotions, which should be differentiated (Austenfeld and Stanton, 2004). Problem-focused coping is adaptive in high control situations, whereas emotion-focused coping is beneficial in low control situations (e.g. death of a loved one; Terry and Hynes, 1998).

Infertility and subsequent IVF have been identified as a low control, high stress situations (Schmidt, Christensen and Holstein, 2005). Avoidant coping strategies were associated with higher perceived stress levels in women undergoing IVF (Gourounti *et al.*, 2012; Schmidt, Christensen and Holstein, 2005; Schmidt, Holstein, Christensen and Boivin, 2005; Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen, 2005; Stanton *et al.*, 1992; Terry and Hynes, 1998). Women using emotion-focused coping had increased pregnancy rates after IVF (Rapoport-Hubschman *et al.*, 2009) and low expression of negative affect was found to be associated with low birth rates (de Klerk *et al.*, 2005).

In addition to non-adaptive coping, difficulties in marital communication were a strong predictor of fertility-related stress in women (Schmidt, Christensen and Holstein, 2005; Schmidt, Holstein, Christensen and Boivin, 2005; Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen, 2005). Perceived stress adversely affects communication between couples and this in turn can have a negative effect on the relationship. In contrast, conveying messages of empathy was beneficial in reducing stress (O'Brien *et al.*, 2009). Thus, finding ways to improve coping and communication and reduce stress during IVF are important.

Cognitive behavioral interventions (CBI) are a collection of therapeutic techniques that aim to detect and alter maladaptive ways of thinking and patterns of behavior. CBI attempts to change perceptions and responses to external and internal stimuli. Several studies have found that CBI and related focused interventions, such as mindfulness are beneficial in reducing distress of IVF patients and may increase pregnancy rates (Bloch-Damti *et al.*, 2007; Boivin and Schmidt, 2005; Cwikel *et al.*, 2004; Domar *et al.*, 2011, 2015; Friedler *et al.*, 2011; Li *et al.*, 2015).

The aims of this study were to examine changes in coping and communication strategies following CBI. We hypothesized that:

*H1.* Women participating in CBI will increase the use of meaning-making and approach coping.

In addition, we expected that:

*H2.* Changes in coping would be coupled with increases in open communication strategies.

Furthermore, we hypothesized that:

*H3.* Changes in coping strategies among CBI participants will depend on their perceived level of stress at baseline, so that women with increased stress levels will experience more changes in coping.

Lastly, we hypothesized that:

*H4.* Changes in coping among CBI participants will be related to depressive symptoms, specifically, women who had adaptive meaning and active coping strategies at baseline or those who able to change to more adaptive coping strategies would display less depression.

Since there has been support that “letting go” coping is related to higher pregnancy rates (Rapoport-Hubschman *et al.*, 2009), we also tested an exploratory hypothesis that there is a relationship between adaptive coping and pregnancy rates.

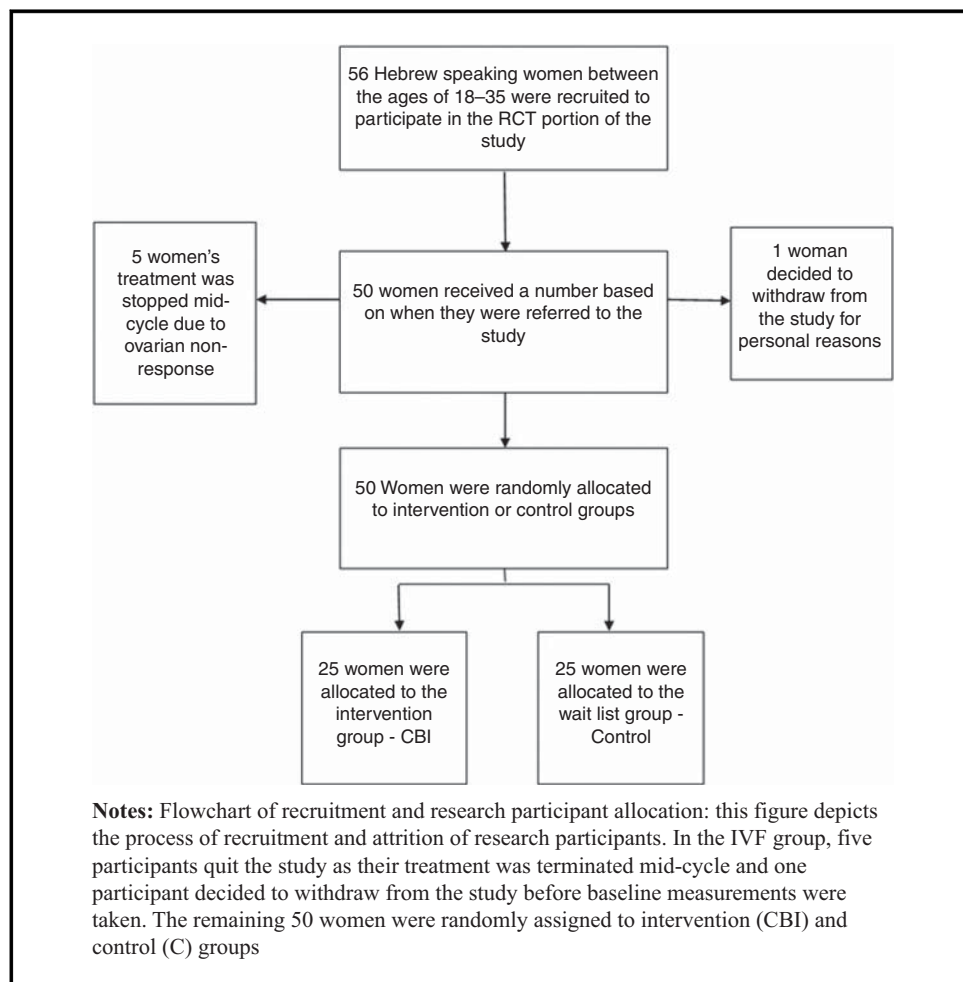
## Method

The current study was a randomized controlled pilot trial conducted among 50 women undergoing IVF treatment. Inclusion criteria were Hebrew speaking, nulliparous women between the ages of 18 and 35. The cutoff age of 35 reflected the decline in fertility that occurs after 35 (ASRM, 2006). Exclusion criteria: *Having an axis I Diagnostic and Statistical Manual of Mental Disorders IV-TR* (APA, 2000) diagnoses to eliminate women possibly affected differently by the stress of infertility.

The Institution Review Board approved the procedure. Women who agreed to participate in the study and signed informed consent were randomized to intervention (CBI) and control (C) groups (treatment as usual). Randomization was conducted using “Research Randomizer” software. Six women left the study before completion (Figure 1).

The sample size was calculated using “OpenEpi” software (Dean *et al.*, 2009). We utilized an assumption of a 20 vs 40 percent outcome (pregnancy rate) in our control vs intervention groups, respectively, based on previous research with this outcome in the IVF unit at (removed for blind review). This means that we expected 20 percent of the women in the control group to

**Figure 1** Flowchart of recruitment and research participation



become pregnant and 40 percent of women in the intervention group to become pregnant. In our analyses we controlled for diagnosis, or reason for treatment to ensure that women with lower chances to become pregnant due to diagnosis would not affect our results. Furthermore, the limitation of women over 35 in the study was because women in this age group are very likely to have very similar success rates regardless of their cause of infertility. Demographics of the population are presented in Table I.

### Procedure

IVF. Patients were treated using standard controlled ovarian stimulation protocols including downregulation of the pituitary gland with a GnRH agonist and controlled ovarian stimulation and monitored by serum 17 $\beta$ -estradiol levels and vaginal ultrasound to measure follicular diameters. After 36–38 h, after two or three follicles of 17–20 mm diameter were observed by the US examination and blood 17 $\beta$ -estradiol levels reached around 150–200 pg/ml per follicle over 17 mm diameter, ovum pick up (OPU) was conducted. Embryos were transferred on the second or third day after OPU. Blood  $\beta$ hCG level was determined 14 days after embryo transfer by  $\beta$ -hCG assay levels (IU > 7 mIU/mL). Women with a positive pregnancy result returned to the unit at six weeks of pregnancy for a vaginal ultrasound for detection of a gestational sac and fetal heartbeat (Figure 2).

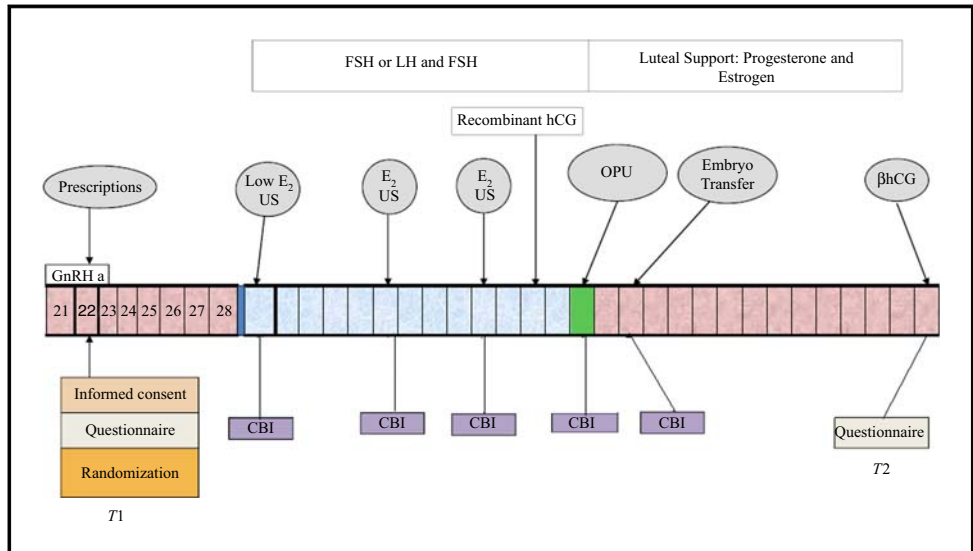
### Ethical considerations

The Helsinki committee (internal review board) of Soroka University Medical Center approved the research protocol. Women signed informed consent forms when agreeing to participate in the

<b>Table I</b> Demographics in CBI vs control groups		
Characteristics	CBI	Control
<i>Age (years)</i>		
Mean (SD)	29 (4.1)	29 (3.8)
<i>Education (years)</i>		
Mean (SD)	13.7 (2.6)	13 (2.4)
<i>Marital status (%)</i>		
Married	100	99
<i>Religiosity (%)</i>		
Religious	12	28
Traditional	48	44
Secular	40	28
<i>Economic difficulty (%)</i>		
Very difficult	0	4
Somewhat difficult	20	36
Not difficult at all	80	60
<i>Study/work outside the home (%)</i>		
Yes	76	80
No	24	20
<i>Born in Israel (%)</i>		
Yes	88	92
No	12	8
<i>Location of dwelling (%)</i>		
City	84	68
Village	0	16
Farm (Moshav)	4	4
Development town	12	8
Other	0	4
<i>Smoking status (%)</i>		
Smoking past or present (Yes)	40	44
Currently smoke (Yes)	24	20
<i>Intensive exercise (<math>\geq 3 \times</math> week) (%)</i>		
Yes	28	24

**Note:** None of the relationships are statistically significant

**Figure 2** Study and IVF time points



study and researchers notified them that participation was voluntary, and they can resign from the study at any stage without effect on IVF treatment.

*Intervention.* An experienced psychotherapist implemented a flexible treatment protocol that included five to six individual sessions of cognitive behavioral based stress reduction techniques, including progressive relaxation, diaphragmatic breathing, guided imagery and cognitive reframing. The researcher invited members of the control group to receive the intervention after the study ended. A detailed description of the protocol is in our previously published manuscript (Czamanski-Cohen *et al.*, 2014). While we were aware that the two week wait period for the pregnancy test following embryo transfer is a stressful period, we instructed women to continue practicing techniques learned in previous sessions, and did not request that they come in to the clinic in order to avoid addition burden. Thus, the end point of the study was determined to be at the pregnancy test, two weeks following embryo transfer (see Figure 2).

### Measures

The Copenhagen Multi-Center Psychosocial Infertility Scales (COMPI) measures psychosocial aspects of infertility and its treatment (Schmidt, 2006). The subscales measure fertility problem stress, marital benefit, partner communication, infertility-related communication strategies and coping strategies (described in detail below). The original COMPI scales were reliable and valid (Cronbach's  $\alpha > 0.70$ ) except for the passive-avoidance coping scale.

The COMPI "infertility problem stress scale" measures stress in three different domains: the "personal domain" (Cronbach's  $\alpha$  at Time 1 ( $T1$ ) = 0.62 and at Time 2 ( $T2$ ) = 0.72); the "marital domain" (Cronbach's  $\alpha$  at  $T1$  = 0.76 and  $T2$  = 0.69); and the "social domain" (Cronbach's  $\alpha$  at  $T1$  = 0.75 and  $T2$  = 0.8). For Items 1 and 2 in the personal and marital domains, the Likert scale had five categories from 1 = strongly disagree to 5 = totally agree. The rest of the fertility problem stress scales had ratings from 1 = none at all to 4 = a great deal. The COMPI marital benefit measure used one item on a scale of 1 = strongly disagree to 5 = totally agree.

The "partner communication" sub-scale is comprised of eight items. One question used the scale of "1 = yes, always," to "3 = no, never," and the remaining items were on a scale from "1 = often" to "3 = no, never." This scale had a Cronbach's  $\alpha$  at  $T1$  = 0.71 and at  $T2$  = 0.63.

Communication strategies – first, "secret": at least three out of four factual issues and at least one of two emotional issues are not discussed with others. Second, "formal": at least three of four factual issues are discussed with others and a maximum of one or two emotional issues are

discussed with close people. Third, “open-minded”: at least three of four factual issues are discussed with others and both emotional issues are discussed with close or distant social relationships. Fourth, “others”: no participants fell into this category in the original COMPI studies (Schmidt, 2006; Schmidt, Christensen and Holstein, 2005; Schmidt, Holstein, Christensen and Boivin, 2005; Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen, 2005). However, in our study, ten participants did not fall in to any category, thus we examined the answers to assess patterns in the communication strategies of these participants. We found that these individuals participated in at least two formal and one emotional type of communication, with close people. We coined this category “reticent,” meaning they communicated very little in both formal and emotional categories (Schmidt, Christensen and Holstein, 2005; Schmidt, Holstein, Christensen and Boivin, 2005; Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen, 2005).

Coping strategies include 24 questions that represent four types of coping – first, active avoidance: four items with a Cronbach’s  $\alpha$  at  $T1 = 0.72$  and at  $T2 = 0.70$ . Second, active confronting: seven items with a Cronbach’s  $\alpha$  at  $T1 = 0.67$  and at  $T2 = 0.68$ . Third, passive avoidance: three items with a Cronbach’s  $\alpha$  at  $T1 = 0.54$  and at  $T2 = 0.45$ . Fourth, meaning-based coping: five items with a Cronbach’s  $\alpha$  at  $T1 = 0.64$  and at  $T2 = 0.68$ .

Each participant recorded the frequency in which she utilized this type of coping.

The Center for Epidemiological Studies six-item depression scale (CES-D) is a self-report scale designed to measure depressive symptoms in the general population (Radloff, 1977). Responses were recorded on a four-point Likert scale (1 = did not happen in the past week to 4 = happened most of the time). The scores ranged between 6 and 24 (Cronbach’s  $\alpha = 0.74$ ).

The Perceived Stress Scale (PSS) is a 14-items scale designed to measure the level of perceived stress of an individual (Cohen *et al.*, 1983). The questions probe about the occurrences of a perception of a variety of situations in the past month on a scale from 0 to 56 (Cronbach’s  $\alpha = 0.70$ ).

### Data analysis

Data analysis was performed using the Statistics Package for Social Sciences (SPSS 17.0, Chicago, IL, USA). All statistical tests were performed at a 0.05 confidence level. *t*-Tests were conducted to examine differences in the intervention and control groups on all measures. Pearson correlations were conducted to examine the relationship between coping strategies, communication strategies and fertility-related problem stress, depressive symptoms and perceived stress. Linear regression was used to examine the relationship between the differences in coping and communication strategies, the PSS and the CES-D. In all models, an interaction for the independent variables at  $T1$  and  $T2$  were evaluated and included in the final models if statistically significant ( $p < 0.05$ ).

## Results

To begin with, we provide descriptive statistics of coping and communication strategies regardless of CBI exposure (Tables II and III) and main effects of the intervention on perceived stress and depressive symptoms (Table IV).

We found no differences between the control and intervention groups in fertility problem stress in all domains as well as general fertility problem stress, marital benefit and depressive symptoms. We did find a difference in perceived stress between the intervention and control groups but only at  $T2$ , which was reported in a previous paper (Czamanski-Cohen *et al.*, 2016). The control group had higher levels of perceived stress at  $T2$  compared to the CBI group:  $\chi^2(1, n = 50) = 5.13$ ,  $p = 0.024$ . Perceived stress at  $T1$  was correlated with COMPI personal stress at  $T1$  ( $0.533$ ,  $p = 0.002$ ) and  $T2$  ( $0.441$ ,  $p = 0.021$ ), but not with marital or social stress. Perceived stress at  $T2$  was correlated with COMPI personal stress at  $T2$  ( $0.467$ ,  $p = 0.002$ ), but not with COMPI personal, marital or social stress at  $T1$ . This suggests that there is a relationship between general perceived stress and fertility-related perceived stress in the personal domain.

**Table II** Descriptive statistics for coping strategies by time point

<i>Coping strategy</i>	<i>Mean (SD)</i>	<i>Min.</i>	<i>Max.</i>
<i>Active avoidance</i>			
T1	7.74 (2.70)	4	16
T2	7.55 (2.59)	4	14
Δ	-0.18 (2.60)	-6	6
<i>Active confronting</i>			
T1	15.84 (4.32)	9	25
T2	15.05 (3.79)	7	24
Δ	-0.78 (3.88)	-11	7
<i>Passive avoidance</i>			
T1	9.95 (2.08)	3	12
T2	9.58 (1.70)	3	12
Δ	-0.37 (1.38)	-4	4
<i>Meaning based</i>			
T1	13.21 (3.51)	6	20
T2	13.50 (3.31)	6	20
Δ	0.29 (2.77)	-5	7

**Table III** Distribution of coping strategies among participants at T1 and T2

<i>Coping strategy</i>	<i>T1 (%)</i>				<i>T2 (%)</i>			
	<i>Not at all</i>	<i>Rarely</i>	<i>At times</i>	<i>Often</i>	<i>Not at all</i>	<i>Rarely</i>	<i>At times</i>	<i>Often</i>
I avoid being with pregnant women or women with children	85	7	4	4	83	10	7	0
I leave the room when people start talking about pregnancies and children	83	7	4	6	81	10	10	0
I try to keep my feelings to myself	13	24	30	33	24	17	38	21
I turn to work or alternative activities for distraction	28	24	26	22	29	29	26	17
I can express my negative thoughts somehow	28	30	35	7	32	15	46	7
I receive empathy or understanding from someone	11	7	44	38	12	14	33	41
I seek advice of others who are childless	48	22	24	6	52	19	26	3
I seek advice from family or friends	41	22	24	13	38	24	33	5
I read or watch television shows about childless people	26	26	33	15	38	24	33	5
I talk to someone about my feelings as a woman who still does not have children	50	24	15	11	48	19	33	0
I talk to someone about how the treatment and examinations affect me emotionally	30	17	39	13	24	26	43	7
I am hoping for a miracle	4	7	24	65	7	7	41	45
I feel that the only thing I can do is wait	9	4	50	37	15	10	51	24
I fantasize and hope for children	11	4	15	70	12	2	31	55
I grow and develop individually as a person	14	4	38	44	3	7	45	45
I think about infertility in a positive light	33	22	31	15	29	31	21	19
I find partnership with my husband as much more meaningful	16	9	30	45	10	5	30	53
I find other goals in life	34	16	36	14	28	19	44	9
I believe there is meaning in the difficulties of having children	27	18	24	31	23	21	35	21

**Table IV** Distribution of communication strategies used by respondents

<i>Communication strategy</i>	<i>T1 (%)</i>	<i>T2 (%)</i>
Secret	7 (14)	5 (10)
Reticent	11 (22)	10 (20)
Formal	12 (24)	4 (8)
Open	20 (40)	24 (48)
Missing data		7 (14)

A significant inverse relationship was observed in changes in active-confronting coping and the CBI intervention, with a decrease in 66 percent of CBI participants as opposed to 32 percent of participants in the control group ( $p = 0.023$ ). This means that, differing from our hypothesis ( $H1$ ), participating in CBI was associated with a statistically significant reduction in active-confronting coping strategies (Table V).

Women who used mainly secretive communication at T1 and participated in the CBI had an increase in active-confronting coping. This is more like our first hypothesis regarding an increase in active-confrontive strategies in the CBI group. Women who used open communication at T1 and participated in CBI had a decrease in active-confronting and meaning-based coping (Table VI).

The correlations between types of coping and depressive symptoms showed a significant but weak linear relationship between depressive symptoms at T1 and active-confrontive coping at T2 adjusted  $R^2 = 0.1117$  ( $p = 0.033$ ); active-confrontive coping at T2 and depressive symptoms at T2 adjusted  $R^2 = 0.1447$  ( $p = 0.014$ ); and passive-avoidance coping at T2 and depressive symptoms at T2 adjusted  $R^2 = 0.0989$  ( $p = 0.045$ ) ( $H4$ ). There were no associations between depressive symptoms and coping strategies while controlling for CBI.

We identified a decrease in perceived stress at T2 when active avoidance increased  $F(3, 29) = 1.97$ , adjusted  $R^2 = 0.0835$  ( $p = 0.027$ ) and an increase in active-confrontive coping when perceived stress was lower at T1:  $F(3, 29) = 6.73$  adjusted  $R^2 = 0.3495$  ( $p = 0.003$ ).

Higher mean levels of reported use of “meaning-based coping” at T1 and “passive-avoidance coping” at T2 were positively correlated to pregnancy (Table VII). In addition, perceived stress at T1 was positively correlated with “passive-avoidance coping” at T2 ( $r = 0.345$ ,  $p = 0.027$ ).

## Discussion

We found a relationship between the use of secretive communication at T1 and participating in the CBI and increases in active-confronting coping, as well as, a relationship between open communication at T1 and participation in CBI with decreases in active-confronting and

**Table V** Summary of regression of  $\Delta$  in coping strategies and CBI

Coping strategies	p-values	If significant, $\beta$
$\Delta$ in active avoidance	0.611	
$\Delta$ in active confronting	0.023	$\beta = -2.9$
$\Delta$ in passive avoidance	0.499	
$\Delta$ in meaning based	0.363	

**Table VI** Changes in coping strategies and their relationship with communication strategy in CBI group

Coping strategy	Communication strategies									
	Secret		Formal		Open		Formal		Reticent	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
$\Delta$ in active avoidance	0.28	0.07	0.86	0.60	0.99	0.69	0.72	0.91	0.66	0.06
$\Delta$ in active confronting	0.004 <sup>a</sup> †	0.17 <sup>a</sup>	0.43	0.66	0.03 <sup>b</sup> ↓	0.29	0.16 <sup>c</sup>	0.09	0.98	0.45 <sup>d</sup>
$\Delta$ in passive avoidance	0.54	0.46	0.35	0.64	0.14	0.70	0.60	0.93	0.70	0.54
$\Delta$ in meaning based	0.31	0.62	0.11	0.27	0.01 <sup>e</sup> ↓	0.06	0.42	0.25	0.98	0.52

**Notes:** <sup>a</sup>The interaction between secret communication at Time 1 and secret communication at Time 2 is statistically significant  $\beta_3(T1 \times T2) = -10.6$  ( $p = 0.025$ ); <sup>b</sup> $\beta_1$  (Open T1) =  $-2.8$  ( $p = 0.03$ ); CBI is statistically significant:  $\beta_4$  (CBI) =  $-2.8$  ( $p = 0.019$ ); <sup>c</sup>CBI is statistically significant:  $\beta_4$  (CBI) =  $-2.7$  ( $p = 0.028$ ); <sup>d</sup>CBI is statistically significant  $\beta_4$  (CBI) =  $-3.0$  ( $p = 0.026$ ); <sup>e</sup> $\beta_1$  (Open T1) =  $-2.6$  ( $p = 0.014$ )



**Table VII** The relationship between coping strategies at T1 and T2 and pregnancy

<i>Coping strategy</i>	<i>Pregnant</i>	<i>Mean (SD)</i>	<i>t</i>	<i>df</i>
Active-confrontive coping T1	Yes	2.27 (0.49)	0.183	43
	No	2.24 (0.62)		
Active-confrontive coping T2	Yes	2.18 (0.59)	-0.214	39
	No	2.22 (0.54)		
Passive-avoidance coping T1	Yes	3.45 (0.41)	1.137	44
	No	3.27 (0.77)		
Passive-avoidance coping T2	Yes	3.38 (0.44)	2.125*	39
	No	2.95 (0.72)		
Meaning-based coping T1	Yes	2.96 (0.60)	2.230*	41
	No	2.5 (0.71)		
Meaning-based coping T2	Yes	2.88 (0.54)	1.219	38
	No	2.62 (0.72)		
Active-avoidance coping T1	Yes	1.91 (0.71)	-0.761	44
	No	3.23 (0.75)		
Active-avoidance coping T2	Yes	1.76 (0.68)	0.286	40
	No	1.71 (0.55)		

**Note:** \* $p < 0.05$

meaning-based coping. Thus, we can see an emerging pattern related to changes in coping and communication strategies in which CBI may assist women in taking a more active role in their coping as well as increasing the meaning-making in their experience. Meaning making has been shown to assist women in coping with stressful life events (Park, 2010). These findings diverge from the Danish findings in which increases in active-confrontive coping were associated with decreased distress (Schmidt, Christensen and Holstein, 2005; Schmidt, Holstein, Christensen and Boivin, 2005; Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen, 2005). Our study had similar percentages of secretive and open communication strategies among respondents compared to Schmidt, Christensen and Holstein (2005), Schmidt, Holstein, Christensen and Boivin (2005) and Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen (2005). Surprisingly, we found lower levels of open communication strategies used (20–34 percent) in comparison to 74.4 percent in the Dutch study. This may be related to the very strong social pressure to have children present in Israeli society (Benyamini *et al.*, 2017). Perhaps the shame of being childless led to reduced open communication regarding infertility. Benyamini *et al.* (2017) found those women who were able to maintain normal life routines and a sense that they were not different than others, had higher quality of life and better adjustment to fertility treatment.

We found a decrease in formal communication from 12 to 4 percent which may be because the second time point is concurrent with the pregnancy test, and there is very little formal communication (regarding treatment procedures and appointment times) left to discuss, as treatment at this point, has ended. In general, 18 percent of Danish women in the Schmidt (2006) study reported using formal communication strategies. Finally, 10–11 percent of our sample utilized a different communication strategy than reported in the Danish study, which we coined “reticent.” These women communicated very little in both formal and emotional areas related to infertility. Again, while the society in general promotes open communication, the strong pro-natal pressure may cause women to discuss very little in both arenas.

Our study found that women who utilized “meaning-based coping” at baseline were more likely to become pregnant. Meaning-based coping may represent a coping mechanism that contains high levels of hope which are beneficial in reducing perceived stress and increasing pregnancy rates. “Meaning-based coping” is often used when the outcome is unfavorable (Folkman, 2008). Thus, at the beginning of an IVF cycle when the outcome is still unknown, it is adaptive. Asserting meaning to IVF treatment may be one way of perceiving a sense of control, which is deemed beneficial (Benyamini *et al.*, 2016). Over 75 percent of our participants reported engaging in meaning-based coping at both time points. On the other hand, at T2 (the pregnancy test) when the IVF cycle is over, women that have flexibility in coping strategies may change their mode of

coping to include a “letting go” to prepare themselves for any potential outcome as described previously (Rapoport-Hubschman *et al.*, 2009). In this study, passive-avoidance coping at T2 was positively associated with pregnancy. Several studies have found relationships between coping strategies and IVF outcome (Demyttenaere *et al.*, 1998; Panagopoulou *et al.*, 2006; Rapoport-Hubschman *et al.*, 2009). A large longitudinal study looking at coping strategy as a predictor of psychological stress found that passive-avoidant coping was positively related to pregnancy rates (Schmidt, Christensen and Holstein, 2005; Schmidt, Holstein, Christensen and Boivin, 2005; Schmidt, Tjørnhøj-Thomsen, Boivin and Andersen, 2005). Alternately, women who scored higher on the need for parenthood scale and viewed childfree life strategy more negatively had higher pregnancy rates (Cooper *et al.*, 2007). This discrepancy may be explained by the fact that need for parenthood and childfree life represent attitudes, while coping taps into emotional and behavioral sources.

We found that active-confrontive coping, had statistically significant correlations with depressive symptoms at both time points and passive avoidance had statistically significant correlations with depressive symptoms at T2. Coping strategies or strategies can vary across situations, although individuals tend to be consistent engaging in certain coping strategies (Lazarus, 1993). In our study, the relationships between coping and depressive symptoms were statistically significant in the case of active-confrontive and passive-avoidant coping, however, these relationships were not strong. Perhaps a larger sample size would have produced more meaningful results.

While it seems that passive-avoidant and active-confrontive coping were related to depressive symptoms, individuals in the CBI group had increases in active-confrontive coping when their stress levels were lower at baseline. Furthermore, increases in active avoidance were related to decreases in perceived stress. It is possible that actively avoiding high stress situations, when successful, leads to reduced stress. However, being passive and avoidant, while participating in an intervention that calls for active participation in coping may lead to or be related to depressive symptoms. It is possible that only participants, who had lower levels of stress when treatment and intervention began, had the energy to engage in active-confrontive strategies of coping. The relationship between being active-confrontive style and depressive symptoms may be expressed in agitated symptoms of depression that are in turn interpreted to be confrontive.

Recent research claims that adaptive coping includes a high level of flexibility in choosing the coping strategy most suitably appraised for a given situation (Folkman, 2008). Flexible coping was related to decreased depressive symptoms and improved psychological health in Japan (Kato, 2012). While flexible coping has a stronger affiliation with psychological adjustment in countries with lower individualism, a small to moderate effect size was found for this relationship regardless of culture (Cheng *et al.*, 2014). Integrating mental health care on fertility units may provide opportunities for fertility patients to develop higher levels of coping flexibility, thus increasing their psychological health and possibly health outcomes.

The findings from the present study must be considered with its limitations. The sample size was relatively small with a short time frame (one IVF cycle) which limits our ability to make causal inferences regarding the effect of the intervention on changes in coping. Furthermore, we did not examine personality measures, which could provide us with individual differences regarding coping and communication. Third, used a measure that was developed in Denmark, which may not be suitable for Israel. The reticent communication style we found may indicate this. Lastly, we did not include spouses in our study. Research demonstrates that communication style and coping are reciprocal, and the sense of spousal support is very important for wellbeing during IVF. Thus, future research should include spouses (De Liz and Strauss, 2005; Quant *et al.*, 2013; Ying *et al.*, 2015). Further studies are needed to develop interventions tailored to increase communication and improve adaptive coping and to take in to consideration the changing stress levels and coping needs throughout the IVF cycle. Specifically, studies are needed to examine the potential individualization of CBI with regards to initial coping strategies of patients.

## Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee 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 and during this process they were notified that they could remove themselves from the study at any time during the study without any consequence to their treatment.

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### Further reading

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