



The mediating role of optimism and resilience on emotional distress in infertility: an integrative literature review

Diana Santa-Cruz, Soledad Chamorro

Psychologist IVI RMA MADRID.

ABSTRACT

Objective: To find any role of optimism and/or resilience mediating emotional distress in infertility. **Method:** We performed a literature search for 2000–2017 in PubMed, PsycINFO and Elsevier, for original articles and reviews, using keywords “resilience,” “infertility,” “optimism,” “LOT-R,” “in vitro fertilization,” and “assisted reproductive technology.” Additional references were collected from articles located thereby. **Results:** The evidence reveals a growing trend of promoting people’s positive health assets and indicates significant negative associations of optimism and resilience with anxiety and depression and positive associations with self-esteem and perception of control. It seems optimism and resilience heavily influence physical and mental health and diminishes emotional distress due to infertility. **Discussion:** This review highlights the importance of the development of therapeutic and preventive interventions increasing optimism and resilience against affective dysregulation and emotional distress caused by infertility.

Keywords: Assisted reproductive technology (ART); Infertility; optimism; Resilience, Emotional distress

*Correspondence to Author:

Diana Santa-Cruz
Psychologist IVI RMA MADRID.

How to cite this article:

Diana Santa-Cruz, Soledad Chamorro. The mediating role of optimism and resilience on emotional distress in infertility: an integrative literature review. International Journal of Psychological Research and Reviews, 2019, 2:22

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Introduction

The inability to conceive children leads individuals and couples to have very high levels of multifaceted stress [1–3] and depression [4–5]. This topic has been reviewed by various authors [3,6–10]. A systematic review [7] including 23 studies concluded that protective psychosocial factors for emotional adjustment during in vitro treatments included trait optimism, problem-focused coping, positive family/marital function, social support, situation appraisal involving acceptance of the situation, and secure attachment style. Originally proposed by Carver and Scheier, dispositional optimism can be defined as global expectations that things will turn out well in the future and bad things will be scarce [11–12]. This is particularly relevant to clinical psychology once it is associated with the risk of developing a psychopathology, not only at the individual but also at the social level [11–12]. Moreover, optimism is inversely related to hopelessness, a well-known risk factor for depressive disorders [13–17]. Similarly, it seems to confer resilience to stressful life events, and this resilience is associated with both onset and recurrence of various psychopathologies [18–19]. As an individual resource for coping, psychological resilience can help balance the negative effects of emotional distress, defined as negative emotional reaction to the output of resources (stressors) [77]. In short, there are enough reasons to believe that dispositional optimism and psychological resilience are positive predictors of subjective well-being and low emotional distress; most likely, those two dimensions are interrelated [20].

Despite diverse research publications on the benefits of optimism and resilience with respect to emotional distress levels, little is known about how these factors affect patients' experience and outcomes during assisted reproductive tre-

atments. We aim to gather the most recent and best evidence regarding optimism and resilience as protective psychosocial factors and to identify variables that need further investigation, in order to build personalized psychotherapeutic strategies for infertile patients. This review responds to the need to identify new biopsychological markers of emotional resilience after studies have demonstrated the protective role of optimism and OFC volume against anxiety [45], highlighting the importance of developing therapeutic and preventive interventions to reduce susceptibility to/increase resilience against affective dysregulation and emotional distress in infertility.

Methods

A systematic literature search using PubMed, Science Direct, and Elsevier databases was performed using the limits "human" and the age range "adult" and "middle-aged." Original articles and literature reviews, published from 1 January 2000 to 31 December 2017, in English, were included using the following strategy: (optimism or optimistic), (resilience), (emotional distress), (infertility or infertile couple/s), (LOT-R), (in vitro fertilization), (assisted reproductive technology). The authors read the abstracts of the 120 articles found and excluded works dealing with systemic diseases. As the review was aimed at analyzing the relationship between infertility and stress mediators, we also did not take into account studies concerning exclusively cross-cultural aspects or ethical implications of involuntary childlessness. Of the initially located articles, 20 were analyzed in their full-length versions, and 4 additional relevant references were found in their reference lists; thus, the final number of articles taken into account was 24. Of these, 5 were reviews and 19 original articles. The relevant data gathered from the literature

review were categorized as either “Optimism as a buffer of emotional distress,” “Optimism and resilience,” or “Role of optimism and resilience in infertility.” The issues are discussed under each of the three aforementioned headings.

Results

Optimism as a buffer to emotional distress

Interest in the relationship between personality characteristics and physical health has increased hugely in the last decades. Dispositional optimism—an individual’s expectations of positive outcomes across situations and over time—is considered an individual difference or trait that is stable and applies more or less across a person’s lifespan [21].

The differences in how people face adversity have implications for success in completing goal-directed behavior, and also have implications for how they cope with emotional distress. A distress reaction is unique to each person based on individual characteristics and well as environmental factors that may impact the individual.

There are two ways to think about generalized expectations for the future and how to measure them. One is to do so directly, by asking people whether they expect outcomes in their lives to be good or bad, as reflected by the Life Orientation Test-Revised [22]. The other approach supports the idea that people’s expectations for the future arise from their interpretations of the past and how they give meaning to the things that happened to them [76]

Over the past 30 years, the body of research related to dispositional optimism has become increasingly rich, in particular that showing correlations between dispositional optimism and subjective well-being [19], for instance self-esteem, positive emotions, and life satisfaction [15,24–25]. On the other hand, negative correlations have

been found between dispositional optimism and negative emotions, anxiety, and depression [10,16,26–27]. Optimism is a very stable trait. It is thought that it is about 25% genetically heritable [28] and arises from childhood environment, particularly the presence of conditions such as parental warmth and financial security [29–30]. Nevertheless, there are also variations in optimism, both transient and over extended periods. There is some evidence that optimism is more inconstant during life transitions, when there is a break from prior experience and outcomes become more uncertain [13]. A forthright influence of this trait is on how people feel when they face problems. Optimists are people who generally have a positive outlook and expect things to go their way in the future; conversely, pessimists are individuals who generally have a more negative outlook on life and expect things to go badly [12]. This small difference—between anticipating good versus anticipating bad—seem to have important impact on people’s lives, perhaps leading to or influencing differences in how they perceive and confront problems, how well they approach and cope with adversity, and in their resources, both social and socioeconomic. The conclusion might be that optimism is not only a disposition but it is also affected by ongoing life conditions and events through the way we explain the events that happen to us [76].

Research has suggested that various facets of positive well-being are associated with better health outcomes. This trait has been linked to reduced risks of chronic health conditions, especially to vascular factors, and to cancer survival rate [24,27,31]. One meta-analysis [32] found that optimism predicts health outcomes even when hard disease endpoints and direct markers of underlying physiologic state are used. The review showed statistically significant effects

ts on survival of all-cause mortality in general population, cardiovascular outcomes, immune function, and cancer and pregnancy outcomes. Optimism has also been associated with lower depression symptoms at initial assessment during pregnancy and postpartum, to which optimism therefore appears to yield resistance [16,33–34].

Short-term randomized trials have suggested that optimism can be modified using fairly accessible tools like cognitive-behavioral psychological interventions [35] which makes optimism a promising target for intervention strategies aimed to improve well-being. However, the mechanism of the potential protective effect of optimism on health remains unclear. Optimistic people tend to prefer more positive health practices, engaging in higher levels of physical activity and reduced levels of smoking and alcohol consumption, as well as healthier diet [17,27,33,36]. Moreover, they more proactively adopt an active coping style when dealing with adversity, and are less likely to use avoidant coping strategies related to poorer long-term health [13,25,37–39]. Optimism is also inversely correlated with personality characteristics such as neuroticism, anxiety, and depression; these in turn are associated with poorer mental and physical health [40]. Nevertheless, even when these factors are controlled optimism appears to have a significant positive effect on health, which makes us believe that there are other pathways involved. One of those pathways might be the immune system [25,41–42].

A new study [43] identified orbitofrontal cortex (OFC) grey-matter volume as a structural neural marker of trait optimism in healthy functioning. This suggests that this region might help maintain the positive self-evaluation when threatened and the flexibility in coping strategies ob-

served in optimistic individuals when facing adversity. It also showed a negative association between trait optimism and anxiety symptoms in healthy young adults, confirming previous evidence that trait optimism is a resilience factor in both healthy and clinical adults.

Resilience and optimism

Resilience, conceptualized as the capacity and dynamic process of adaptively overcoming uncertainty, conflict, and adversity while maintaining normal psychological and physical functioning, is a necessary factor in patients' adaptation [31]. More precisely, it can be defined as the belief that one can control the way one copes with adversity; it is one of the strongest buffers against mental health problems [18,44–45]. Most existing studies explore how resilience can prevent mental health problems and psychopathology, foster capacity to learn and develop positive skills, and be nurtured in the face of hardships such as socioeconomic deprivation, family discord, and maternal depression [41,46–47]. It is believed nowadays that resilience is trainable and can be increased over time by promoting early insight and understanding of life's struggles, and by encouraging the externalization of problems rather than their internalization and self-blame. Psychological traits common among resilient individuals include optimism, hopefulness, curiosity, and adaptability [21] (and therefore should adjust well to the uncertain outcome of infertility treatments).

Resilience may be critical in determining how individuals cope with and adapt to stress [48]. In one study [50] resilience was a possible protective factor for the couple's quality of life and against infertility-specific distress experienced by women. One situation causing distress is unsuccessful IVF attempts: the ensuing sense of loss, failure, and shame can progress into

enduring infertility-related depression, the alleviation of which might be facilitated by cognitive reappraisal as a coping strategy [45]. According to self-regulation theory [52], within a supportive environment, mild depression may itself be adaptive and could facilitate growth and recovery; indeed, individuals who strive to contemplate their problems experience a transient increase in negative emotions, followed by a great improvement in their psychological state [31].

In sum, considerable evidence indicates that pessimism can lead to self-defeating patterns: less persistence, more avoidance coping (defined as a maladaptive coping mechanism, characterized by avoiding to deal with a stressor, for instance, avoiding social activities), health-damaging behavior and potentially, given lack of hope for and confidence in the future [11, 12], even having the impulse to evade life, withdrawing from social relationships. Optimists, on the other hand, appear to take an active role minimizing health risks and reducing threats to well-being. It seems that people who expect a good thing to happen take active steps to ensure good things do happen, and experience teaches such people that their own efforts play an important part in life success, reinforcing their proactive attitude [12].

Optimism and resilience in infertility

Once an individual or couple is diagnosed with infertility, they have likely been through months or years of trying unsuccessfully to conceive. The journey of infertility can be likened to a rollercoaster ride. Each new cycle is met with excitement and anticipation, hopefulness and optimism; then, ovulation is followed by a two-week wait with anxiety and trepidation. With the Internet and social media, one can seek information immediately, but this information is not always accurate or helpful. Patients are bom-

barded with information from many sources, many of which try to convince them not to give up hope. A negative result can elicit a grief cycle, including sexual dysfunction, depression, anxiety, and relationship problems; without sufficient psychological intervention, stress levels can increase and affect coping skills and quality of life [53–57].

According to some recent results [55,58] and consistent with past research, over an 18-month period, a majority of women experience clinically significant levels of depression and anxiety: for depression, 56.5% of women and 32.1% of men, of whom 16.5% of women and 5.8% of men reported prolonged depressive symptoms, and for anxiety, 75.9% of women and 60.6% of men, of whom 40.1% and 28.1% reported prolonged symptoms.

A recent meta-analysis [6] of 14 studies indicated that although distress appears not to compromise the possibility of becoming pregnant in women undergoing fertility treatment, contrary to what many couples believe, definitive research is lacking and the relation is complex. The study showed several methodological limitations of the reviewed research: use of convenience (non-consecutive or selected) samples, failure to fully demonstrate equivalence of pregnant and non-pregnant groups on prognostic indicators before treatment, use of a “state” anxiety scale utilized weeks or even months prior to cycle start, and assessment of outcome after only a single cycle of ART treatment. Indeed, contrary to that study’s conclusion that stress does not impact ART outcome, the majority of research indicates the opposite: the largest meta-analysis on the topic [59] connected interventions with a cognitive-behavioral and/or mind/body approach to increased pregnancy rates and lower levels of psychological distress [3,4,5,

54,60,61].

An early study on optimism and in vitro fertilization (IVF) failure [62] assessed coping and cognitive factors: demographic and reproductive history, general appraisal (dispositional optimism), situational appraisal (chances for success), and coping skills, using questionnaires. Eight weeks beforehand, participants reported their optimism, distress, expectancy of fertilization success, and the impact of infertility on their lives; two weeks after notification of negative pregnancy test, distress was measured again. Only optimism was found to predict follow-up distress: the most optimistic participants were the least distressed after a disappointing event, further contradicting the idea that optimists are more vulnerable to disappointment than pessimists. Feelings of loss of control, perceived self-contribution to IVF failure and use of avoidance as coping strategy were related to increased post-distress.

In this study, optimism protected women from infertility's treatments distress, consistent with evidence that optimism buffers against emotional distress [11] and does not put one at risk when optimistic expectations are challenged by failure. Of two hypotheses as to why—first, as optimists view their goals as attainable, they better withstand obstacles to their goals; second, optimists employ more instrumental coping, which helps them attain their goals—this study supported the second. Why optimism enhances adaptation has not been fully assessed. Dispositional optimism may be a function of ability to cognitively reframe more positively or to see the “silver lining.” For instance, optimists may be more able to find or create benefits from their childless state. Although dispositional optimism appears quite protective, situational optimism (as perceived by estimated chances of success)

seems not predictive of adjustment.

One study [63] used regression and structural equation modelling (SEM) analyses to check whether optimism effects on reproductive health were due to unique aspects of optimism, aspects related to coping strategies, or shared variance with another underlying personality dimension, like neuroticism. The last was shown to be the case; they hypothesized that personality variables impacted reproductive health through lifestyle (e.g., smoking), reproductive behavior (e.g., intercourse frequency), or activation of the hypothalamic-pituitary-adrenal (HPA) axis, which regulates stress response.

Two alternative routes may mediate stress effects on reproduction. First, a highly estrogenic environment like that of IVF may cause HPA activation and premature release of luteinizing hormone (LH) [64]. Second, release of corticotrophin-releasing hormone would increase cortisol and inhibit estradiol production [65–67].

A longitudinal study [9] on emotional adjustment vis-à-vis fertility treatment cycles had women and their spouses complete pre-, post-, and delayed post-questionnaires to assess state anxiety, depression, neuroticism, optimism, infertility-related cognitions of helplessness and acceptance, coping, and self-evaluated social support. Results showed lack of emotional recovery 6 months after treatment, which might be explained by continued uncertainty about the character of infertility and the possibility of different treatments. Personality characteristics, the idiosyncratic meaning of infertility, cognitive factors, and social support were important for emotional adjustment. In particular, neuroticism (especially) and optimism were interrelated with anxiety and depression.

A recent investigation [68] analyzed the prospective relation between bipolar dispositional traits

of optimism/pessimism and the outcome of a woman's first IVF treatment cycle; they also analyzed trait neuroticism to evaluate if the relations between optimism/pessimism and IVF failure were independent of effects of neuroticism. More pessimistic women at baseline were more likely to experience treatment failure in the following 18-month period, regardless of risk factors for poor treatment response. The authors' hypotheses were that pessimism may buffer psychological stress, enhance neuroendocrine dysregulation, and reduce immune function, as previous studies suggested.

Other survey research ^[69] examined individual recollections of emotional experiences trying to conceive and coping strategies, as well as personal and situational characteristics underlying variability from 429 American adults. The study revealed a smoother emotional road for people high in dispositional optimism, tolerant of uncertainty, who place relatively little importance on parenthood, are at low risk of infertility, and who have relatively high social, emotional, and cognitive resources, but a more difficult road for those low in dispositional optimism, intolerant of uncertainty, searching for meaning in their lives, who place greater importance on parenthood, or who have few coping resources.

One study ^[70] assessed the efficacy of brief couples' support-group sessions concurrent with IVF treatment. Results showed that women who attended sessions were significantly less anxious after IVF treatment than before the cycle, while men who attended were more optimistic than nongroup men and women but endorsed a great number of irrational beliefs related with IVF, fertility and parenthood.

Thus, classically, the main variables studied were anxiety and depression, without conclusive results ^[8]. New approaches have investi-

gated variables such as distress and emotional imbalance—not clinical measures but functional psychopathology risk indicators for people undergoing stressful processes.

Discussion

Optimists cope, that is, attempt to manage stressful situations, in more adaptive ways than pessimists, prominently through problem-solving, positive interpretation, acceptance, and seeking social support, as distinct from disengagement, avoidance, denial, and distance that pessimists report. These differences are thought to reflect self-regulatory processes: optimists see positive outcomes as attainable and thus persist in efforts to realize their goals; pessimists disengage because their outcome expectancies are unfavorable ^[11,13,71]. Emotional distress may lower optimism, although there is some evidence that optimism is robust even in the face of stressful experiences ^[25,41,42]. Other studies ^[15,32] outline the importance for quality of life of one's capacity to modify his or her objectives situationally, allowing one to avoid or reduce negative psychological and physical consequences of non-achievement of a goal (e.g., failing to get pregnant after ART) and adaptively self-regulate to concentrate efforts on more attainable targets. This protects patients from repeated failures, while re-directing objectives gives back meaning and purpose to life. Managing difficulties itself also makes patients more optimistic towards their future as they are flexible towards their goals ^[11, 12]. This psychological flexibility protects them from the emotional consequences of failure. In short, the more optimistic patients are, the more easily they adjust to IVF failure and to their new reality ^[39].

The evidence reviewed in the preceding sections suggest that optimists have somehow found the keys to a rich and fulfilling life. Com-

pared to people who are more pessimistic, they experience less distress when they encounter adversity. They cope with stressful situations by remaining engaged in the goals and activities that the stressor is threatening. They engage in problem-focused coping when there is something to be done, and they display accommodative coping when adversity simply has to be endured. Maybe as a result of these differences in terms of coping strategies, they also have better health-related outcomes and better social connections, both broadly and in intimate relationships. In terms of disengagement and goal re-engagement. When goals are perceived to be attainable optimists do not find it easier to disengage from those goals than pessimists. They do report, nevertheless, that it is easier for them to find new goals to value and pursue [32,71,72].

Evidence shows a growing trend to focus on the positive health assets and significant associations of increasing levels of optimism with lower levels of anxiety, depression and greater self-esteem and perception of control. It seems apparent that optimism is a mental attitude that heavily influences physical and mental health, as well as coping with everyday social and working life. Through an adaptive management of personal objectives and individual resources and by using active coping tactics, optimists are significantly more successful than pessimists in aversive events and when important life-goals are impaired. Dispositional optimism may be a function of the ability to reframe cognitively in a positive way or to see the silver lining in bad events. This review shows the up to date a short number of research dedicated to finding correlations between optimism and resilience and correlate it to the infertility experience during IVF treatments. The findings of the research done so far show stronger correlations between

pessimism as a separate unipolar dimension and lower positive reproductive outcomes, presumably due to higher psychological stress, changed immune function, negative behavioral factors and neuroendocrine dysregulation. The good news is that empiric evidence also shows that personality traits are amenable to change and that pessimism is malleable [35]. Additional longitudinal and experimental research is required to determine whether optimism and resilience causally contribute to healthy behaviors and whether optimism and resilience could be an effective target for reducing emotional distress and maladaptive dysfunction. Most individuals and couples show resilience throughout their infertility experience and treatment pathway; nonetheless, around one-fifth of individuals are at risk of clinically significant emotional problems. Risk factors for emotional distress include previous psychological vulnerability, lack of social support, communication problems, and cognitions of parenthood as central to one's life [34,73] Only quite distressed patients will need specialized psychosocial support, but all patients will benefit from general psychosocial support integrated into routine fertility care. Such care should not only try to adapt the patient to the treatment process, but also the treatment and clinical processes to the patient's needs and preferences, before, during, and after treatment, to ensure long-term adjustment in case of unsuccessful treatment [74].

Although some projects have aimed specifically at increasing optimism, through the frame of positive psychology, other interventions may also have a beneficial effect on optimism. When people change negative schemas about themselves and the world or learn to deal more effectively with stress, they may gravitate to a more optimistic view of life in general. Encouraging

patients to be more proactive and less avoidant, and screening and treating them for depression, could contribute to long-term optimism and resilience and yield their benefits.

Psychological interventions in infertility must grapple with patients' sadness, guilt, anxiety, self-esteem and body-image, coping mechanisms, and their social implications. Couples counselling helps to explore gender differences and couple dynamics when faced with infertility, how couples learn to support and understand each other, how to enhance communication between them. Group work brings patients the opportunity to share with others in the same circumstances and normalize their reactions, deal with specific feelings and concerns, and manage relationships with family and friends [75]. Psychological interventions may also promote pregnancy [4], perhaps by reducing anxiety and depression and/or promoting compliance.

Only when we understand which individual psychological traits foster positive infertility experience can we develop patient-centered interventions and treat mood disorders (like anxiety or depression) early and efficiently, to improve patient care and reduce dropout due to emotional burden by equipping patients with resources to cope with treatment difficulties, loss of control, and uncertainty, and to encourage a healthy lifestyle. The aim of psychological intervention in infertility must be to help patients "accept the outcome as acceptable," giving a personal meaning and purpose to the journey, within patients' own beliefs, and seeing the situation as an opportunity to understand their own resources, resilience, and limits—as individuals and couples. Moreover, reducing pessimism may help achieve better treatment outcomes in less time. Indeed, simply knowing they are at risk for distress during ART may motivate vulnerable

individuals to muster and extend their social and emotional resources before beginning their efforts. What is learned and discovered from the infertility experience will probably be more important than the results of such interventions for reproductive success rates, if it can foster the understanding of parenthood as only one facet of the human experience.

Acknowledgments

None

Disclosure of Interest

None

References

1. Cousineau TM, Domar AD. The psychological impact of infertility. *Best Pract Res.* 2007;21(2):293–308.
2. Donarelli Z, Lo Coco G, Gullo S, et al. Infertility-related stress, anxiety and ovarian stimulation: can couples be reassured about the effects of psychological factors on biological responses to assisted reproductive technology? *Reprod Biomed Soc Online.* 2016;3:16–23.
3. Hämmerli K, Znoj H, Barth J. The efficacy of psychological interventions for infertile patients: a meta-analysis examining mental health and pregnancy rate. *Hum Reprod Updat.* 2009;15(3):279–295.
4. Domar AD, Rooney KL, Wiegand B, et al. Impact of a group mind/body intervention on pregnancy rates in IVF patients. *Fertil Steril.* 2011; 95(7):2269–2273.
5. Domar AD, Meshay I, Kelliher J, et al. The impact of acupuncture on in vitro fertilization outcome. *Fertil Steril* 2009;91(3):723–726.
6. Boivin J, Griffiths E, Venetis CA. Emotional distress in infertile women and failure of assisted reproductive technologies: a meta-analysis of prospective psychosocial studies. *BMJ.* 2011; 342:d223.
7. Rockliff HE, Lightman SL, Rhidian E, et al. A

- systematic review of psychosocial factors associated with emotional adjustment in in vitro fertilization patients. *Hum Reprod Updat.* 2014;20(4):594–613.
8. Verhaak CM, Smeenk JM, Nahuis MJ, et al. Long-term psychological adjustment to IVF/ICSI treatment in women. *Hum Reprod.* 2007;22(1):305–308.
 9. Verhaak CM, Smeenk JM, van Minnen A, et al. A longitudinal, prospective study on emotional adjustment before, during and after consecutive fertility treatment cycles. *Hum Reprod.* 2005;20(8):2253–2260.
 10. Williams KE, Marsh WK, Rasgon NI. Mood disorders and fertility in women: a critical review of the literature and implications for future research. *Hum Reprod Updat.* 2007;13(6):607–616.
 11. Carver CS, Scheier MF. Dispositional optimism. *Trends Cogn Sci.* 2014;18(6):293–299.
 12. Carver CS, Scheier MF, Segerstrom SC. Optimism. *Clin Psychol Rev.* 2010;30(7):879–889.
 13. Brissette I, Scheier MF, Carver CS. The role of optimism in social network development, coping, and psychological adjustment during a life transition. *J Personal Soc Psychol.* 2002;82(1):102–111.
 14. Brydon L, Walker C, Wawrzyniak AJ, et al. Dispositional optimism and stress-induced changes in immunity and negative mood. *Brain Behav Immun* 2009;23(6):810–816.
 15. Conversano C, Rotondo A, Lensi E, et al. Optimism and its impact on mental and physical well-being. *Clin Pract Epidemiol Ment Health* 2010;6:25–29.
 16. Robakis TK, Williams KE, Crowe S, et al. Optimistic outlook regarding maternity protects against depressive symptoms postpartum. *Arch Women's Ment Health.* 2015;18(2):197–208.
 17. Solberg Nes L. Stress: concepts, cognition, emotion, and behavior. Amsterdam (the Netherlands): Elsevier Inc.; 2016. Chapter 51, Optimism, pessimism, and stress; p. 405–411.
 18. Cousins LA, Cohen LL, Venable, C. Risk and resilience in pediatric chronic pain: Exploring the protective role of optimism. *J Pediatr Psychol.* 2014;40(9):934–942.
 19. Kleiman EM, Chiara AM, Liu RT. Optimism and well-being: a prospective multi-method and multi-dimensional examination of optimism as a resilience factor following the occurrence of stressful life events. *Cogn Emot.* 2017;31(2):269–283.
 20. Mosing MA, Zietsch BP, Shekar SN, et al. Genetic and environmental influences on optimism and its relationship to mental and self-rated health: a study of ageing twins. *Behav Genet.* 2009;39(6):597–604.
 21. He F, Cao R, Feng Z, et al. The impacts of dispositional optimism and psychological resilience on the subjective well-being of burn patients: a structural equation modelling analysis. *Plos One.* 2013;8(12):8–12.
 22. Hinz A, Sander C, Glaesmer H, et al. Optimism and pessimism in the general population: psychometric properties of the Life Orientation Test (LOT-R). *Int J Clin Health Psychol.* 2017;17(2):161–170.
 23. Peterson CP, Seligman ME, Vaillant GE, et al. Pessimistic explanatory style is a risk factor for physical illness: a thirty-five-year longitudinal study. *J Personal Soc Psychol.* 1988;55(1):23–27.
 24. Karademas EC, Karvelis S, Argyropoulou K. Short communication: stress-related predictors of optimism in breast cancer survivors. *Stress Health.* 2007;23(3):161–168.
 25. Segerstrom SC, Taylor SE, Kemeny ME, et al. Optimism is associated with mood, coping, and immune change in response to stress. *J Per-*

- sonal Soc Psychol. 1998;74(6):1646–1655.
26. Gong E, Yan LL, Yan LL. Editorial on “Optimism and cause-specific mortality: a prospective cohort study.” *J Public Health Emerg.* 2017;11851.
 27. Kim ES, Hagan KA, Grodstein F, et al. Optimism and cause-specific mortality: A prospective cohort study. *Am J Epidemiol.* 2017;185(1):21–29.
 28. Plomin R, Scheier M, Bergeman C, et al. Optimism, pessimism and mental health: a twin/adoption analysis. *Personal Individ Differ.* 1992; 13(8):921–930.
 29. Heinonen K, Räikkönen K, Matthews KA, et al. Socioeconomic status in childhood and adulthood: associations with dispositional optimism and pessimism over a 21-year follow-up. *J Personal.* 2006;74(4):1111–1126.
 30. Heinonen K, Räikkönen K, Keltikangas-Järvinen L. Self-esteem in early and late adolescence predicts dispositional optimism-pessimism in adulthood: a 21-year longitudinal study. *Personal Individ Differ.* 2005;39(3):511–521.
 31. Wang ZY, Liu L, Shi M. Exploring correlations between positive psychological resources and symptoms of psychological distress among haematological cancer patients: a cross-sectional study. *Psychol Health Med.* 2016;21(5):571–582.
 32. Rasmussen HN, Scheier MF, Greenhouse JB. Optimism and physical health: a meta-analytic review. *Ann Behav Med.* 2009;37:239–256.
 33. Andersson, G. The benefits of optimism: a meta-analytic review of the Life Orientation Test. *Personality Individ Differ.* 1996;21(5):719–725.
 34. Loh J, Harms C, Harman B. Effects of parental stress, optimism, and health-promoting behaviours on the quality of life of primiparous and multiparous mothers. *Nurs Res.* 2017;66(3):231–239.
 35. Malouff JM, Schutte NS. Can psychological interventions increase optimism? A meta-analysis. *J Pos Psychol.* 2017;12(6):594–604.
 36. Soliah LL. The role of optimism regarding nutrition and health behavior. *Am J Lifestyle Med.* 2011;5(1):63–68.
 37. Dag H, Yigitoglu S, Aksakal BI, et al. The association between coping method and distress in infertile woman: a cross-sectional study from Turkey. *Pak J Med Sci.* 2015;31(6):1457–1462.
 38. Kirchner T, Muñoz D, Fornis M, et al. Identifying by means of coping typologies and primary appraisal the likelihood of positive β -hCG test results in women undergoing IVF treatment: a preliminary study. *Hum Reprod.* 2011;26(5):1138–1143.
 39. Rapoport-Hubschman N, Gidron Y, Reicher-Atir R. et al. “Letting go” coping is associated with successful IVF treatment outcome. *Fertil Steril.* 2009;92(4):1384–1388.
 40. Mahajan NN, Turnbull DA, Davies MJ, et al. Adjustment to infertility: the role of intrapersonal and interpersonal resources/vulnerabilities. *Hum Reprod.* 2009;24(4):906–912.
 41. Segerstrom SC, Miller GE. Psychological stress and the human immune system: a meta-analytic study of 30 years of inquiry. *Psychol Bull.* 2004;130(4):601–630.
 42. Segerstrom SC, Sephton SE. Optimistic expectancies and cell-mediated immunity: the role of positive affect. *Psychol. Sci.* 2010;21(3):448–455.
 43. Dolcos S, Hu Y, Iordan AD. Optimism and the brain: trait optimism mediates the protective role of the orbitofrontal cortex grey matter volume against anxiety. *Soc Cogn Affect Neurosci.* 2015;11(2):263–271.
 44. Antúnez JM, Navarro JF, Adan A. Circadian typology is related to resilience and optimism in healthy adults. *Chronobiol. Int.* 2015;32(4):524–530.
 45. Chochovski J, Moss SA, Charman DP. Recovery after unsuccessful in vitro fertilization: the

- complex role of resilience and marital relationships. *J Psychosom Obstet Gynecol.* 2013;34(3):122–128.
46. Bieda, A., Hirschfeld, G., Schönfeld, P., et al. Universal happiness? Cross-cultural measurement invariance of scales assessing positive mental health. *Psychol Assess.* 2016;29(4):408–421.
 47. Johnson, J., Panagioti, M., Bass, J., Ramsey, L., & Harrison, R. (2017). Resilience to emotional distress in response to failure, error or mistakes: A systematic review. *Clinical Psychology Review*, 52, 19–42. <http://doi.org/10.1016/j.cpr.2016.11.007>
 48. Mancini AD, Bonanno GA. Predictors and parameters of resilience to loss: toward an individual differences model. *J Personal.* 2009;77(6):1805–1832.
 49. Driscoll MA, Davis MC, Aiken LS, et al. Psychosocial vulnerability, resilience resources, and coping with infertility: a longitudinal model of adjustment to primary ovarian insufficiency. *An Behav Med.* 2016;50(2):272–284.
 50. Herrmann D, Scherg H, Verres R, et al. Resilience in infertile couples acts as a protective factor against infertility-specific distress and impaired quality of life. *J Assist Reprod Genet.* 2011;28(11):1111–1117.
 51. Sexton MB, Byrd MR. Measuring resilience in women experiencing infertility using the CD-RISC: examining infertility-related stress, general distress, and coping styles. *J Psychiatr Res.* 2010;44(4):236–241.
 52. Kuhl J, Kazén M, Koole SL. Putting self-regulation theory into practice: a user's manual. *Appl Psychol.* 2006;55(3):408–418.
 53. Abbey A, Halman LJ, Andrews FM. Psychosocial, treatment, and demographic predictors of the stress associated with infertility. *Fertil Steril.* 1992;57(1):122–128.
 54. Lemmens GMD, Vervaeke M, Enzlin P, et al. Coping with infertility: a body-mind group intervention programme for infertile couples. *Hum Reprod.* 2004;19(8):1917–1923.
 55. Pasch LA, Dunkel-Schetter C, Christensen A. Differences between husbands' and wives' approach to infertility affect marital communication and adjustment. *Fertil Steril.* 2002;77(6):1241–1247.
 56. Peterson BD, Newton CR, Rosen KH, et al. Coping processes of couples experiencing infertility. *Fam Rel.* 2006;55(2):227–239.
 57. Romano GA, Ravid H, Zaig I, et al. The psychological profile and affective response of women diagnosed with unexplained infertility undergoing in vitro fertilization. *Arch Women's Ment Health.* 2012;15(6):403–411.
 58. Pasch LA, Holley SR, Bleil ME, et al. Addressing the needs of fertility treatment patients and their partners: are they informed of and do they receive mental health services? *Fertil Steril.* 2016;106(1):209–215.
 59. Frederiksen Y, Farver-Vestergaard I, Skovgaard NG, et al. Efficacy of psychosocial interventions for psychological and pregnancy outcomes in infertile women and men: a systematic review and meta-analysis. *BMJ Open.* 2015;5(1):e006592–e006592.
 60. Coughlan C, Walters S, Ledger W, et al. A comparison of psychological stress among women with and without reproductive failure. *Int J Gynecol Obstet.* 2014;124(2):143–147.
 61. Lancaster D, Boivin J. A feasibility study of a brief coping intervention (PRCI) for the waiting period before a pregnancy test during fertility treatment. *Hum Reprod.* 2008;23(10):2299–2307.
 62. Litt MD, Tennen H, Affleck G, et al. Coping and cognitive factors in adaptation to in vitro fertilization failure. *J Behav Med.* 1992;15(2):171–

187.

63. Lancastle D, Boivin J. Dispositional optimism, trait anxiety, and coping: unique or shared effects on biological response to fertility treatment? *Health Psychol.* 2005;24(2):171–178.
64. Xiao E, Xia-Zhang L, Ferin M. Stress and the menstrual cycle: short- and long-term response to a five-day endotoxin challenge during the luteal phase in the Rhesus Monkey. *J Clin Endocrinol Metabol.* 1999;84(2):623–626.
65. Facchinetti F, Tarabusi M, Volpe A. Cognitive-behavioural treatment decreases cardiovascular and neuroendocrine reaction to stress in women waiting for assisted reproduction. *Psychoneuroendocrinol.* 2004;29(2):162–173.
66. Massey AJ, Campbell BK, Raine-Fenning N, et al. Relationship between hair and salivary cortisol and pregnancy in women undergoing IVF. *Psychoneuroendocrinol.* 2016;74:397–405.
67. Puig-Perez, S., Hackett, R. A., Salvador, A., & Steptoe, A. (2017). Optimism moderates psychophysiological responses to stress in older people with Type 2 diabetes. *Psychophysiology*, 54(4), 536–543.
68. Bleil ME, Pasch LA, Gregorich SE, et al. Fertility treatment response: is it better to be more optimistic or less pessimistic? *Psychosom Med.* 2012;74(2):193–199.
69. Sweeny K, Andrews SE, Nelson SK, et al. Waiting for a baby: navigating uncertainty in recollections of trying to conceive. *Soc Sci Med.* 2015;141:123–132.
70. McNaughton-Cassill ME, Bostwick JM, Arthur NJ, et al. Efficacy of brief couples support groups developed to manage the stress of in vitro fertilization treatment. *Mayo Clin Proc.* 2002;77(10):1060–1066.
71. Chang EC. Optimism–pessimism and stress appraisal: testing a cognitive interactive model of psychological adjustment in adults. *Cogn Ther Res.* 2002;26(5):675–690.
72. Geers AL, Wellman JA, Seligman LD, et al. Dispositional optimism, goals, and engagement in health treatment programs. *J Behav Med.* 2010; 33(2):123–134.
73. Flykt, M., Lindblom, J., Punamäki, R.-L., et al. Prenatal expectations in transition to parenthood: former infertility and family dynamic considerations. *J Fam Psychol.* 2009;23(6):779–89.
74. Gameiro, S., Boivin, J., Dancet, E., et al. ESHRE guideline: routine psychosocial care in infertility and medically assisted reproduction—a guide for fertility staff. *Hum Reprod.* 2015; 30(11):2476–2485.
75. Van den Broeck U, Emery M, Wischmann T, et al. Counselling in infertility: individual, couple and group interventions. *Patient Educ Couns.* 2010;81(3):422–428.
76. Seligman, M. (1990). *Learned Optimism*. New York: Simon & Schuster, Inc
77. Lazarus R et Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer

