



Article in press

## DISPOSITIONAL OPTIMISM AND STRESS: KEYS TO PROMOTING PSYCHOLOGICAL WELL-BEING

**Sara Puig Pérez, Marta Aliño Costa, Aránzazu Duque Moreno, Irene Cano López,  
Paula Martínez López, Mercedes Almela Zamorano y María José García Rubio**

*Grupo de Investigación en Psicología y Calidad de Vida (PsiCal), Universidad Internacional de Valencia*

Numerous studies signal that psychological factors affect in an important way the physiological functioning of the organism. Dispositional optimism, considered a one-dimensional personality trait, is related to expectations of future success according to the Self-Regulatory Behavior Theory. In various studies, optimism is proposed as a modulating factor of both the chronic and acute stress response, since high levels of optimism have been associated with low levels of perceived stress and cortisol. Furthermore, optimism appears to be a key variable in the regulation of the circadian rhythm of the hypothalamic-pituitary-adrenal (HPA) axis. This influence has been studied with data on hair cortisol, the awakening cortisol response, and the cortisol level throughout the day, with inconsistent results being found so far. In the present work, the relationship between optimism and the stress response according to the HPA axis is analyzed, which has been shown to be relevant in promoting physical and psychological well-being. Likewise, the incorporation of dispositional optimism in psychological intervention programs is considered as a strategy to promote psychological well-being and prevent disease in the population, given its relationship with the development of physical and psychological alterations as a result of dysfunctional states of stress.

**Palabras clave:** Optimismo, Eje HHA, Estrés, Bienestar, Salud.

Numerous studies indicate that psychological factors significantly affect the physiological functioning of the body. Dispositional optimism, considered a one-dimensional personality trait, is related to expectations of future success according to self-regulatory behavior theory. In various studies, optimism is proposed as a modulating factor of both the chronic and acute stress response, since high levels of optimism have been associated with low levels of perceived stress and cortisol. Furthermore, optimism appears to be a key variable in the regulation of the circadian rhythm of the hypothalamic-pituitary-adrenal (HPA) axis. This influence has been studied with data on hair cortisol, the awakening cortisol response, and the cortisol level throughout the day, with inconsistent results being found so far. In the present work, the relationship between optimism and the stress response according to the HPA axis is analyzed, which has been shown to be relevant in promoting physical and psychological well-being. Likewise, the incorporation of dispositional optimism in psychological intervention programs is considered as a strategy to promote psychological well-being and prevent disease in the population, given its relationship with the development of physical and psychological alterations as a result of dysfunctional states of stress.

**Key words:** Optimism, HPA axis, Stress, Well-being, Health.

**D**ifferent studies have shown the impact of psychological factors on the functioning of basic physiological systems (see Chida & Steptoe, 2009). In this sense, the presence of positive psychological resources, such as optimism, has been linked to a more adaptive physiological response to stressful events, as well as to the activity of brain structures involved in the emotional response, such as the ventrolateral prefrontal cortex and the amygdala (Taylor et al., 2008).

Received: 24 October 2020 - Aceptado: 28 December 2020

Correspondence: Sara Puig Pérez. Grupo de Investigación en Psicología y Calidad de Vida (PsiCal), Universidad Internacional de Valencia. C/ Pintor Sorolla, 21. 46002 Valencia. España.

E-mail: sara.puig@campusviu.es

### DISPOSITIONAL OPTIMISM: THE ORIGIN OF THE CONSTRUCT AND ITS RELEVANCE TO HEALTH

#### **The origin of the construct**

The concept of dispositional optimism is based on theoretical models that attempt to explain human behavior based on the value of expectations; these models consider the aim of behavior to be to respond to desired objectives (Carver & Scheier, 2000). When one approaches the attainment of a desired goal or avoids an undesired goal, an assessment is made with regard to the level of confidence or doubt relating to the goal. In this assessment, the extent to which the resources are available to deal with the situation and the probability of success in achieving the desired goal are estimated. This process is what is meant by expectation, and it implies that a lack of confidence in the achievement of a goal induces non-action, i.e., ceasing to try to achieve it.



## Article in press

However, the mere act of believing that there is sufficient confidence to achieve the objective increases the possibility that the individual will become involved and persevere in achieving what he or she desires. This process is the basis of the concept of dispositional optimism (Scheier et al., 2001), defined and theoretically supported in the theory of the self-regulation of behavior (Carver & Scheier, 2000). Dispositional optimism (hereafter optimism) is considered a unidimensional personality trait with two opposite poles (optimism vs. pessimism), in which it is considered that optimistic people will be more confident and persistent with expectations of success focused on achieving their goals, while pessimists tend to be more hesitant about success and expect negative outcomes (Carver et al., 2010; Scheier & Carver, 1992; Scheier et al., 1994).

The assessment of this construct can be carried out through different self-reports, the Life Orientation Test (LOT, Scheier & Carver, 1985) and its revised version (LOT-R, Scheier et al., 1994) being the most used assessment instruments internationally. Previous studies showed good test-retest reliability from weeks to years, ranging from 0.58 to 0.79 (Atienza et al., 2004; Lucas et al., 1996; Scheier & Carver, 1985; Scheier et al., 1994). Of note is the study by Matthews et al. (2004) which showed a test-retest reliability of 0.71 after a period of 10.4 years. Furthermore, the cross-cultural stability of the construct has been observed in a meta-analysis conducted in 22 countries, using 213 items that measured the optimism trait through the LOT and LOT-R with a total sample size of 89,138 participants (Fischer & Chalmers, 2008). Also, we must consider the repeated reviews of validations of the LOT-R. For example, Herzberg et al. (2006) conducted a robust psychometric analysis of the LOT-R with a large sample of 46,133 participants ranging from 18 to 103 years of age.

Recent research has assessed the possibility that optimism is not a unidimensional construct, but rather two separate dimensions (optimism vs. pessimism) (Mroczek et al., 1993; Plomin et al., 1992; Puig-Perez, et al., 2015; Robinson-Whelen et al., 1997). In fact, there are hypotheses that show a unique pattern of behavior as a dimension of the construct in young people, although the shared variance between optimism and pessimism subscales decreases with age (Herzberg et al., 2006). According to different theoretical formulations, it would be consistent to consider the two subscales as independent constructs based on the independence of positive and negative mental states (Diener et al., 1999; Ryff & Singer, 1998), as has been observed in some empirical studies (e.g., Lai, 1994, 1997; Lai et al., 2005). Likewise, it is considered that the independence of these factors with age may be due to meta-cognitive changes that appear with maturity, thus allowing the adaptive use of an optimistic or pessimistic perspective depending on the situation experienced. Specifically for the Spanish population, the LOT-R has shown adequate reliability supporting the hypothesis of a two-factor model (Ferrando et al. 2002). These same conclusions have been subsequently confirmed (Grau et al., 2005; Vera-Villaruel et al., 2009), and are in line with

the recommendations to analyze optimism together with the two subscales, since this provides more information on the relationship between this construct and health (Rasmussen et al., 2009; Scheier et al., 2020).

### **Relevance of dispositional optimism in health**

One of the most remarkable aspects of optimism is its proven role as a protective factor for health and physical and psychological well-being. There is ample and solid scientific evidence pointing to a negative relationship of optimism with negative emotions such as anxiety, anger, distress, and depression; and a positive relationship with happiness, well-being, life satisfaction, and self-esteem (for a review, see Pavez et al., 2012). Likewise, optimism is inversely related to the presence or development of mood disorders (Rajandram et al., 2011), that is, it is associated with a decrease in depressive symptomatology. Thus, optimism provides mental strength in the face of depressive states (Flores-Lozano, 2005). With respect to physical health, it has been shown that optimism is related to greater protection against disease and longer life expectancy, through its positive influence on the immune, respiratory, and circulatory systems (see review by Vázquez et al., 2009). Different studies have highlighted the role of optimism in adaptation to cancer (Carver et al., 1993, 2005; Fasano et al., 2020), pain perception (Goodin et al., 2012), and prognosis in cardiovascular (Tindle et al., 2010) and metabolic diseases (Puig-Perez et al., 2017), as well as its effect on immune activity (Cohen et al., 2006; Puig-Perez et al., *under review*). In relation to breast cancer, optimistic patients show better psychological adjustment after diagnosis, use more adaptive coping strategies, report lower levels of emotional distress, and perceive greater social support (Vázquez & Castilla, 2007); optimism has even been shown to predict the level of well-being several years later (Carver et al., 2005). Therefore, this psychological construct, in addition to being strongly connected to satisfaction and psychological well-being, seems to play a key role in physical health (Avia & Vázquez, 1998).

However, the ways in which optimism influences physical and psychological health have not yet been clarified. One avenue of action could be the role of optimism in promoting proactive behaviors that protect the individual's health. In fact, different studies suggest that the improvement of health due to optimism lies in the influence of optimism on one's own behavior. Specifically, it has been shown that people with greater optimism show greater adherence to prescribed medical treatments, higher vitamin intake, and increased physical activity, as well as lower consumption of saturated fats (Giltay et al., 2006; Leedham et al., 1995; Nabi et al., 2010; Shepperd et al., 1996). On the other hand, it has been postulated that optimism acts as a health protector through its influence on cognition, generating greater self-confidence, persistence in the face of challenges, and a greater use of adaptive coping strategies; and in addition, it reduces levels of perceived stress and promotes a positive re-evaluation of the experiences a person goes through (Carver et al., 2010;

## Article in press

Carver & Connor-Smith, 2010; Taylor & Stanton, 2007; Solberg Nes & Segerstrom, 2006; Puig-Perez et al., 2018; Puig-Perez et al., *under review*). Another pathway that links optimism with health lies in its direct effect on certain physiological mechanisms fundamental to the maintenance of health such as the immune system (IS), the autonomic nervous system (ANS), and the hypothalamic-pituitary-adrenal (HPA) axis. Specifically, optimism has been observed to improve the functioning of these three (Brydon et al., 2009; Roy et al., 2010; Puig-Perez et al., 2015, Puig-Perez et al., 2017; Puig-Perez et al., *under review*).

### THE HPA AXIS: KEY TO STRESS RESPONSE AND HEALTH PRESERVATION

The HPA axis is a complex neuroendocrine system linked to the maintenance of homeostasis and the response to stressful stimuli. Certain internal or external stimuli of a physiological or psychological nature promote the activation of neurons in the paraventricular nucleus of the hypothalamus (PVN), which secrete corticotropin-releasing hormone (CRH), facilitating the release of adrenocorticotrophic hormone (ACTH) by the adenohypophysis (Charmandari et al., 2005). Circulating ACTH in turn stimulates the cortex of the adrenal gland, inducing the synthesis and release of glucocorticoids, cortisol being the most important glucocorticoid in humans and the main product of the HPA axis (Charmandari et al., 2005; Jacobson, 2005). The cortisol production of the HPA axis follows a circadian pattern, with the lowest point of secretion being in the middle of the night. Cortisol begins to increase 2-3 hours after sleep onset until reaching its maximum peak at the time of awakening and, as the day progresses, there is a decrease that continues until the minimum point of secretion is reached. Stabilization of these cortisol levels is described as a resting period (Buckley & Schatzberg, 2005).

In addition to being essential for generating the stress response and coping with a stressful situation, glucocorticoids are necessary for suppressing the stress response, mediating recovery from the stress response, and preparing the organism for the next challenge. Stress is defined as the process in which the individual perceives that the demands of a situation exceed the organism's regulatory capacity to adapt to a psychological and/or physiological challenge (Fink, 2010). In general, when there is an excessive demand from the external environment that is perceived as potentially threatening by the individual, a chain reaction of both behavioral and neurophysiological changes occurs. Although these changes depend on the nature, intensity, duration, and frequency of the stressful stimulus, their function is to facilitate the individual's ability to cope with the new situation successfully, having a clear adaptive significance because: i) they help the organism to make a great effort physically; ii) they eliminate behaviors that are not adaptive to a threatening situation; and iii) they facilitate the evaluation of the situation, increasing alertness and vigilance, as well as decision making that sets in motion possible solutions to the stressful situation (Sandi et al., 2001).

When the stressful situation is maintained over time, this is understood as chronic stress. In these circumstances, an increased activation of the HPA axis is observed, leading to a hypersecretion of glucocorticoids and a reduction in the efficacy of the negative feedback mechanism of glucocorticoids in the limbic system (Jankord & Herman, 2008). Likewise, alterations are observed in indicators of the circadian cortisol profile, such as the morning cortisol response or the daily cortisol curve (Chida & Steptoe, 2009; Clow et al., 2004; Fries et al., 2009; Herriot et al., 2020; Kudielka & Wüst, 2010; Miller et al., 2007). The maintenance of elevated cortisol levels has serious health consequences, with remodeling and damage to neural networks being observed (McEwen, 2007; McEwen et al., 2016), which in turn leads to alterations in cognitive processes (Adam & Kumari, 2009) and emotional regulation (Hinkelmann et al., 2009; Rubinow et al., 1984). In fact, prolonged alteration of cortisol affects its function as a regulatory hormone of numerous basal processes such as glucose metabolism, blood pressure, and inflammatory and immune responses (Marieb & Hoehn, 2007). Thus, it is not surprising that cortisol has been proposed as an important indicator of health status (Hellhammer et al., 2007; Adan et al., 2017), both physically, as well as cognitively and emotionally.

### DISPOSITIONAL OPTIMISM AND THE HPA AXIS IN THE ACUTE STRESS RESPONSE

In stressful psychosocial situations, optimism has been related to the cortisol response, as well as to other variables involved in this relationship; however, existing studies are limited and show inconsistent results. In a recent study with an adult population, it was observed that people with higher optimism, who were trained in their expectations at a stage prior to exposure to stress, showed lower cortisol levels in the face of a standardized laboratory psychosocial stressor (Salzmann et al., 2018). In contrast, in the study by Binsch et al. (2017), it was the group of military personnel with the highest levels of optimism that showed the highest cortisol levels when exposed to a stressful simulator (Binsch et al., 2017). These results were consistent in the study conducted by Solberg Nes et al. (2005) with young population, where they observed a significant relationship between optimism and cortisol (higher levels) employing a laboratory psychosocial stressor (Solberg Nes et al., 2005).

However, the relationship between optimism and cortisol in acute stress situations has not always been observed. The study by Rist and Pearce (2019) attempted to categorize participants according to their stress response and analyze their relationship with multiple psychological factors; however, they found no relationship between cortisol response profiles and the optimism variable. Along the same lines, the study developed by Puig-Perez et al., (2015) with older people showed the absence of a direct relationship between the cortisol response and optimism, although it was observed that optimism promoted a faster recovery from stress. Similarly, in

## Article in press

a study where the immune response, autonomic response, and cortisol levels were analyzed, comparing adult people infected by *Salmonella typhi* with healthy people, an inverse relationship was found between optimism and cortisol levels in infected people (both those exposed to psychosocial stress and those not exposed) during the recovery period after the stressor/control task; however, the relationship was not significant during exposure to the stressor (Brydon et al., 2009).

### RELATIONSHIP OF DISPOSITIONAL OPTIMISM TO THE CIRCADIAN RHYTHM OF THE HPA AXIS

The influence of optimism on well-being and the functioning of the HPA axis has also been studied in the face of stressful life events. Different indicators have been used to analyze the function of the HPA axis; these include the relationships between optimism and hair cortisol, the cortisol awakening response (CAR), and cortisol throughout the day.

With respect to hair cortisol, to our knowledge, there is only one study that has observed a relationship between optimism and stress. Specifically, a relationship was found between trait optimism, a lower perception of stress and, importantly, lower levels of accumulated cortisol in hair, all in an adolescent population (Milam et al., 2014). On the other hand, studies focused on analyzing the relationship between optimism and CAR have observed that, both in youth (Lai et al., 2005) and older (Endrighi et al., 2011) healthy populations, optimism has been found to be related to lower CAR. However, this relationship between optimism and morning cortisol response has not been found in other studies with youth population (Ebrecht et al., 2004), healthy older adult population (Puig-Perez et al., 2018), or with those diagnosed with type II diabetes (Puig-Perez et al., 2017).

Regarding the relationship between optimism and diurnal cortisol, it has been found that people over 60 years old who live in residences and have higher optimism, present lower levels of cortisol upon awakening, in the afternoon, and in the total daily calculation, compared to groups with lower optimism, during days that are perceived by both groups themselves as stressful (Jobin et al., 2014). In addition, trait optimism has been found to be associated with a greater sense of physical and psychological well-being, less intrusion and avoidance of grief memories, and lower diurnal cortisol levels. These results were found in a longitudinal study with data taken from widowed individuals whose spouse had died 12 months prior to data collection (Minton et al., 2009). In the case of older people with type II diabetes, which has been found to be related to an alteration in diurnal cortisol levels, it was obtained that the optimism factor promotes diurnal cortisol levels closer to those of healthy people than to those of patients diagnosed with type II diabetes (Puig-Perez et al., 2017). In relation to other chronic diseases, no relationship has been found between diurnal cortisol and optimism in women with breast cancer (Garcia et al., 2016), for example.

### THE PROMOTION OF OPTIMISM IN SOCIETY AS A RESOURCE IN THE FACE OF STRESS

Several studies consider that optimism acts as a buffer against the stress process that people may experience, and also against psychopathologies derived from a state of sustained stress (see review by Gallagher et al., 2020). Currently, society as a whole—both healthy individuals and those with a previous medical diagnosis—is facing an adverse event considered by experts to be of high magnitude or high psychosocial stress: the coronavirus pandemic (read the meta-analysis by Cooke et al., 2020). This universal, exceptional, and unexpected stressful event, which has spread rapidly throughout the world, has demanded the implementation of extraordinary measures by the different agents involved in our society. The factors surrounding this pandemic, such as the ambiguity and uncontrollability of the threatening situation, the invisibility and lethality of the virus, the possibility of a new wave or the lack of knowledge of its duration, among others, can generate in the population a continuous perception of threat to personal health and a feeling of helplessness faced with the possible interruption of life plans, giving rise in some cases to emotional disturbances. Likewise, it has been proven that concern for the health of loved ones, the collapse of health systems, the excess of information available, the loss of family members or acquaintances due to this virus, the associated work and economic consequences, among others, are factors that can contribute to the development of anxiety problems, pathological worry, post-traumatic stress, and/or sleep problems (see the review by Sandín et al., 2020). The solution so far involves the implementation of behaviors and changes in people's lifestyles (Vera-Villaroel, 2020) and in this, our profession has much to contribute.

Considering the implications of optimism on physical and psychological health, it is to be expected that this construct plays a relevant role as a protective factor against the stress response caused by the COVID-19 situation. However, to date few studies have focused on studying this variable in the present context (Puig-Perez et al., in preparation). From a care point of view, one could consider the development of intervention programs for the promotion of psychological well-being and the prevention of mental illness that include among their components the promotion of optimism as a personal strength. As the literature points out, high levels of optimism imply good management of stressful situations and the use of problem-focused coping strategies, as the optimistic person presents greater flexibility in the face of novel or unexpected situations (Anggayani & Hartawan, 2019; Reed, 2016). This strategy is embedded in the context of positive psychology and the interventions that have been proposed and that have proven therapeutic efficacy within this approach.

### CONCLUSION

Optimism is a psychological resilience factor in the face of stress that enables effective coping with adverse situations by mediating positively between external events and the person's

## Article in press

interpretation of them. Thus, since the construct of «dispositional optimism» was defined as the general expectation for positive outcomes and/or successes and a marked tendency to think that future events will be positive, it has become a recurrent research topic in the field of positive psychology because of its impact on the physical and psychological state of the individual.

**CONFLICT OF INTEREST**

No conflict of interest

**REFERENCES**

- Adam, E. K. & Kumari, M. (2009). Assessing salivary cortisol in large-scale, epidemiological research. *Psychoneuroendocrinology*, *34*, 1423-1436. <https://doi.org/10.1016/j.psyneuen.2009.06.011>
- Adam, E. K., Quinn, M. E., Tavernier, R., McQuillan, M. T., Dahlke, K. A., & Gilbert, K. E. (2017). Diurnal cortisol slopes and mental and physical health outcomes: A systematic review and meta-analysis. *Psychoneuroendocrinology*, *83*, 25-41. <https://doi.org/10.1016/j.psyneuen.2017.05.018>
- Anggayani, L., & Hartawan, I. G. M. D. (2019). The relationship between self reliance, proactive attitude, and optimism with coping stress. *Bisma The Journal of Counseling*, *3*(2), 74-81. <http://dx.doi.org/10.23887/bisma.v3i2.22532>
- Atienza, A. A., Stephens, M. A. P., & Townsend, A. L. (2004). Role stressors as predictors of changes in womens' optimistic expectations. *Personality and Individual Differences*, *37*(3), 471-484. <https://doi.org/10.1016/j.paid.2003.09.016>
- Avia, D., & Vázquez, C. (2011). *Optimismo inteligente: Psicología de las emociones positivas [Intelligent Optimism: Psychology of Positive Emotions]*. Madrid. Alianza Editorial.
- Binsch, O., Van Wietmarschen, H. & Buick, F. (2017). Relationships between cortisol, optimism, and perseverance measured in two military settings. *Military Psychology*, *29*(2), 99-116. <https://doi.org/10.1037/mil0000146>
- Brydon, L., Walker, C., Wawrzyniak, A. J., Chart, H. & Steptoe, A. (2009). Dispositional optimism and stress-induced changes in immunity and negative mood. *Brain, Behavior, and Immunity*, *23*(6), 810-816. <https://doi.org/10.1016/j.bbi.2009.02.018>
- Buckley, T. M., & Schatzberg, A. F. (2005). On the interactions of the hypothalamic-pituitary-adrenal (HPA) axis and sleep: Normal HPA axis activity and circadian rhythm, exemplary sleep disorders. *The Journal of Clinical Endocrinology & Metabolism*, *90*(5), 3106-3114. <https://doi.org/10.1210/jc.2004-1056>
- Carver, C.S., & Connor-Smith, J., 2010. Personality and coping. *Annual Review of Psychology*, *61*, 679-704. <https://doi.org/10.1146/annurev.psych.093008.100352>
- Carver, C. S. & Scheier, M. F. (2000). On the structure of behavioral self-regulation. In M. Boekaerts, P. Pintrich & M. Zeidner. (Eds.), *Handbook of self-regulation*. (pp. 42-85). San Diego, CA: Academic Press.
- Carver, C. S., Pozo, C., Harris, S. D., Noriega, V., Scheier, M. F., Robinson, D. S., ... & Clark, K. C. (1993). How coping mediates the effect of optimism on distress: A study of women with early stage breast cancer. *Journal of Personality and Social Psychology*, *65*(2), 375-390. <https://doi.org/10.1037/0022-3514.65.2.375>
- Carver, C. S., Scheier, M. F. & Segerstrom, S. C. (2010). Optimism. *Clinical Psychology Review*, *30*, 879-889. <https://doi.org/10.1016/j.cpr.2010.01.006>
- Carver, C. S., Smith, R. G., Derhagopian, R. P., Antoni, M. H., Petronis, V. M. & Weiss, S. (2005). Optimistic personality and psychosocial well-being during treatment predict psychosocial well-being among long-term survivors of breast cancer. *Health Psychology*, *24*(5), 508-516. <https://doi.org/10.1037/0278-6133.24.5.508>
- Charmandari, E., Tsigos, C. & Chrousos, G. (2005). Endocrinology of the stress response. *Annual Review of Physiology*, *67*, 259-284. <https://doi.org/10.1146/annurev.physiol.67.040403.120816>
- Chida, Y. & Steptoe, A. (2009). Cortisol awakening response and psychosocial factors: A systematic review and meta-analysis. *Biological Psychology*, *80*, 265-278. <https://doi.org/10.1016/j.biopsycho.2008.10.004>
- Clow, A., Thorn, L., Evans, P. & Hucklebridge, F. (2004). The awakening cortisol response: Methodological issues and significance. *Stress*, *7*, 29-37. <https://doi.org/10.1080/10253890410001667205>
- Cohen, S., Alper, C. M., Doyle, W. J., Treanor, J. J., & Turner, R. B. (2006). Positive emotional style predicts resistance to illness after experimental exposure to rhinovirus or influenza A virus. *Psychosomatic Medicine*, *68*(6), 809-815. <https://doi.org/10.1097/01.psy.0000245867.92364.3c>
- Cooke, J. E., Eirich, R., Racine, N., & Madigan, S. (2020). Prevalence of posttraumatic and general psychological stress during COVID-19: A rapid review and meta-analysis. *Psychiatry Research*, *292*, 113347. <https://doi.org/10.1016/j.psychres.2020.113347>
- Diener, E., Suh, E., Lucas, R. E. & Smith, H. L. (1999). Subjective well being: Three decades of progress. *Psychological Bulletin*, *125*, 276-302.
- Fasano, J., Shao, T., Huang, H. H., Kessler, A. J., Kolodka, O. P., & Shapiro, C. L. (2020). Optimism and coping: Do they influence health outcomes in women with breast cancer? A systemic review and meta-analysis. *Breast Cancer Research and Treatment*, 1-7. <https://doi.org/10.1007/s10549-020-05800-5>
- Ferrando, P. J., Chico, E., & Tous, J. M. (2002). Propiedades psicométricas del test de optimismo Life Orientation Test [Psychometric properties of the Life Orientation Test optimism test]. *Psicothema*, *14*(3), 673-680.
- Fink, G. (2010). Stress: definition and history. In G. Fink (Ed.), *Stress science: Neuroendocrinology* (pp. 3-9). Academic Press
- Fischer, R. & Chalmers, A. (2008). Is optimism universal? A meta-analytical investigation of optimism levels across 22 nations. *Personality and Individual Differences*, *45*, 378-382. <https://doi.org/10.1016/j.paid.2008.05.008>
- Flores-Lozano, J. (2006). Optimismo y salud [Optimism and health]. *JANO*, *1616*, 59-61

## Article in press

- Fries, E., Dettenborn, L. & Kirschbaum, C. (2009). The cortisol awakening response (CAR): facts and future directions. *International Journal of Psychophysiology*, *72*, 67–73. <https://doi.org/10.1016/j.ijpsycho.2008.03.014>
- Gallagher, M. W., Long, L. J., & Phillips, C. A. (2020). Hope, optimism, self efficacy, and posttraumatic stress disorder: A meta analytic review of the protective effects of positive expectancies. *Journal of Clinical Psychology*, *76*(3), 329–355. <https://doi.org/10.1002/jclp.22882>
- García, D. M. J., Hernández, R. L., Ramírez, M. T. G., & Bernal, L. J. (2016). Variación diurna del cortisol y su relación con estrés, optimismo y estrategias de afrontamiento en mujeres con cáncer de mama [Diurnal variation of cortisol and its relationship with stress, optimism, and coping strategies in women with breast cancer]. *Acta Colombiana de Psicología*, *19*(1), 103–112.
- Giltay, E. J., Kamphuis, M. H., Kalmijn, S., Zitman, F. G., & Kromhout, D. (2006). Dispositional optimism and the risk of cardiovascular death: The Zutphen Elderly Study. *Archives of Internal Medicine*, *166*(4), 431–436. doi: <https://doi.org/10.1001/archinte.166.4.431>
- Goodin, B. R., Kronfli, T., King, C. D., Glover, T. L., Sibille, K., & Fillingim, R. B. (2013). Testing the relation between dispositional optimism and conditioned pain modulation: Does ethnicity matter? *Journal of Behavioral Medicine*, *36*(2), 165–174. <https://doi.org/10.1007/s10865-012-9411-7>
- Grau, J., Hernández, E. & Vera-Villarreal, P. (2005). Estrés, salutogénesis y vulnerabilidad [Stress, salutogenesis, and vulnerability]. In E. Hernández & J. Grau (Eds.), *Psicología de la Salud: Fundamentos, metodología, aplicaciones* (pp. 113–177). México: Universidad de Guadalajara.
- Herriot, H., Wrosch, C., Hamm, J. M., & Pruessner, J. C. (2020). Stress-related trajectories of diurnal cortisol in older adulthood over 12 years. *Psychoneuroendocrinology*, *121*, 104826. <https://doi.org/10.1016/j.psyneuen.2020.104826>
- Hellhammer, J., Fries, E., Schweisthal, O. W., Schlotz, W., Stone, A. A. & Hagemann, D. (2007). Several daily measurements are necessary to reliably assess the cortisol rise after awakening: State and trait components. *Psychoneuroendocrinology*, *32*, 80–86. <https://doi.org/10.1016/j.psyneuen.2006.10.005>
- Herzberg, P. Y., Glaesmer, H. & Hoyer, J. (2006). Separating optimism and pessimism: A robust psychometric analysis of the revised Life Orientation Test (LOT-R). *Psychological Assessment*, *18*(4), 433–438. <https://doi.org/10.1037/1040-3590.18.4.433>
- Hinkelmann, K., Moritz, S., Botzenhardt, J., Riedesel, K., Wiedemann, K., Kellner, M. & Otte, C. (2009). Cognitive impairment in major depression: Association with salivary cortisol. *Biological Psychiatry*, *66*, 879–885. <https://doi.org/10.1016/j.biopsych.2009.06.023>
- Jacobson, L. (2005). Hypothalamic-pituitary-adrenocortical axis regulation. *Endocrinology & Metabolism Clinics of North America*, *34*(2), 271–292. <https://doi.org/10.1016/j.ecl.2005.01.003>
- Jankord, R. & Herman, J. P. (2008). Limbic regulation of hypothalamo pituitary adrenocortical function during acute and chronic stress. *Annals of the New York Academy of Sciences*, *1148*, 64–73. <https://doi.org/10.1196/annals.1410.012>
- Jobin, J., Wrosch, C. & Scheier, M. F. (2014). Associations between dispositional optimism and diurnal cortisol in a community sample: When stress is perceived as higher than normal. *Health Psychology*, *33*(4), 382. <https://doi.org/10.1037/a0032736>
- Kudielka, B. M. & Wüst, S. (2010). Human models in acute and chronic stress: Assessing determinants of individual hypothalamus-pituitary-adrenal axis activity and reactivity. *Stress*, *13*, 1–14. <https://doi.org/10.3109/10253890902874913>
- Lai, J. C. L. (1994). Differential predictive power of the positively versus of the negatively worded items of the Life Orientation Test. *Psychological Bulletin*, *75*, 1507–1515. <https://doi.org/10.2466/2Fpr0.1994.75.3f.1507>
- Lai, J. C. L. (1997). Relative predictive power of the optimism versus the pessimism index of a Chinese version of the Life Orientation Test. *The Psychological Record*, *47*, 399–410. <https://doi.org/10.1007/BF03395234>
- Lai, J. C. L., Evans, P. D., Ng, S. H. & Chong, A. M. L. (2005). Optimism, positive affectivity, and salivary cortisol. *British Journal of Health Psychology*, *10*, 467–484. <https://doi.org/10.1348/135910705X26083>
- Leedham, B., Meyerowitz, B. E., Muirhead, J., & Frist, W. H. (1995). Positive expectations predict health after heart transplantation. *Health Psychology*, *14*(1), 74. <https://doi.org/10.1037/0278-6133.14.1.74>
- Lucas, R. E., Diener, E., & Suh, E. (1996). Discriminant validity of well-being measures. *Journal of Personality and Social Psychology*, *71*(3), 616–628.
- Marieb, E. N., & Hoehn, K. (2007). The Endocrine System. In E.N. Marieb, & K. Hoehn (Eds.): *Human anatomy and physiology* (pp. 265–285). San Francisco, EEUU: Pearson.
- Matthews, K. A., Räikkönen, K., Sutton-Tyrrell, K., & Kuller, L. H. (2004). Optimistic attitudes protect against progression of carotid atherosclerosis in healthy middle-aged women. *Psychosomatic Medicine*, *66*(5), 640–644. doi: [10.1097/01.psy.0000139999.99756.a5](https://doi.org/10.1097/01.psy.0000139999.99756.a5)
- McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiological Reviews*, *87*, 873–904. <https://doi.org/10.1152/physrev.00041.2006>
- McEwen, B. S., Nasca, C. & Gray, J. D. (2016). Stress effects on neuronal structure: Hippocampus, amygdala, and prefrontal cortex. *Neuropsychopharmacology*, *41*, 3–23. <https://doi.org/10.1038/npp.2015.171>
- Milam, J., Slaughter, R., Verma, G., & McConnell, R. (2014). Hair cortisol, perceived stress and dispositional optimism: A pilot study among adolescents. *Journal of Traumatic Stress Disorders & Treatment*, *3*(3), 1000126. doi: [10.4172/2324-8947.1000126](https://doi.org/10.4172/2324-8947.1000126)
- Miller, G. E., Chen, E., & Zhou, E. S. (2007). If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychological Bulletin*, *133*(1), 25. <https://doi.org/10.1037/0033-2909.133.1.25>
- Minton, M. E., Hertzog, M., Barron, C. R., French, J. A. &

## Article in press

- Reiter-Palmon, R. (2009). The first anniversary: Stress, well-being, and optimism in older widows. *Western Journal of Nursing Research*, 31(8), 1035-1056. <https://doi.org/10.1177%2F0193945909339497>
- Mroczek, D. K., Spiro, A., Aldwin, C. M., Ozer, D. J. & Bossé, R. (1993). Construct validation of optimism and pessimism in older men: Findings from the normative aging study. *Health Psychology*, 12(5), 406-409.
- Nabi, H., Koskenvuo, M., Singh-Manoux, A., Korkeila, J., Suominen, S., Korkeila, K., ... & Kivimaki, M. (2010). Low pessimism protects against stroke: The Health and Social Support (HeSSup) prospective cohort study. *Stroke*, 41(1), 187-190. <https://doi.org/10.1161/STROKEAHA.109.565440>
- Pavez, P., Mena, L. & Vera-Villarreal, P. (2012). El rol de la felicidad y el optimismo como factor protector de la ansiedad [The role of happiness and optimism as a protective factor against anxiety]. *Universitas Psychologica*, 11(2), 369-380.
- Plomin, R., Scheier, M. F., Bergeman, C. S., Pedersen, N. L., Nesselrode, J. R. & McClean, G. E. (1992). Optimism, pessimism and mental health: A twin/adoption analysis. *Personality and Individual Differences*, 13(8), 921-930. [https://doi.org/10.1016/0191-8869\(92\)90009-E](https://doi.org/10.1016/0191-8869(92)90009-E)
- Puig-Perez, S., Villada, C., Pulpulos, M. M., Almela, M., Hidalgo, V., & Salvador, A. (2015). Optimism and pessimism are related to different components of the stress response in healthy older people. *International Journal of Psychophysiology*, 98, 213-221. <https://doi.org/10.1016/j.ijpsycho.2015.09.002>
- Puig-Perez, S., Pulpulos, M. M., Hidalgo, V., & Salvador, A. (2018). Being an optimist or a pessimist and its relationship with morning cortisol release and past life review in healthy older people. *Psychology & Health*, 33(6), 783-799. <https://doi.org/10.1080/08870446.2017.1408807>
- Puig-Perez, S., Hackett, R. A., Salvador, A., & Steptoe, A. (2017). Optimism moderates psychophysiological responses to stress in older people with Type 2 diabetes: Optimism and stress in older diabetics. *Psychophysiology*, 54, 536-543. <https://doi.org/10.1111/psyp.12806>
- Puig-Perez, S., Kozusznik, M.W. & Pulpulos, M.M. Optimism as a key factor in coping with the common cold. Under review
- Puig-Perez, S., Cano-López, I., Martínez, P., Kozusznik, M.W., Alacreu-Crespo, A., Pulpulos, M.M., Duque, A., Almela, M., Aliño, M., García-Rubio, M.J., Pollak, A. & Kozusznik, B. Optimism as a protective factor of psychological impact of COVID-19 pandemic through its effects on perceived stress and infection stress anticipation. In preparation
- Rajandram, R. K., Ho, S. M., Samman, N., Chan, N., McGrath, C., & Zwahlen, R. A. (2011). Interaction of hope and optimism with anxiety and depression in a specific group of cancer survivors: A preliminary study. *BMC Research Notes*, 4(1), 519. <https://doi.org/10.1186/1756-0500-4-519>
- Rasmussen, H. N., Scheier, M. F., & Greenhouse, J. B. (2009). Optimism and physical health: A meta-analytic review. *Annals of Behavioral Medicine*, 37(3), 239-256. <https://doi.org/10.1007/s12160-009-9111-x>
- Reed, D. J. (2016). Coping with occupational stress: The role of optimism and coping flexibility. *Psychology Research and Behavior Management*, 9, 71. <https://doi.org/10.2147/PRBM.S97595>
- Rist, B., & Pearce, A. J. (2019). Tiered levels of resting cortisol in an athletic population. A potential role for interpretation in biopsychosocial assessment? *Journal of Functional Morphology and Kinesiology*, 4(1), 8. <https://doi.org/10.3390/jfmk4010008>
- Robinson-Whelen, S., Kim, C., MacCallum, R. C. & Kiecolt-Glaser, J. K. (1997). Distinguishing optimism from pessimism in older adults: Is it more important to be optimistic or not to be pessimistic? *Journal of Personality and Social Psychology*, 73(6), 1345-1353. <https://psycnet.apa.org/doi/10.1037/0022-3514.73.6.1345>
- Rubinow, D. R., Post, R. M., Savard, R. & Gold, P. W. (1984). Cortisol hypersecretion and cognitive impairment in depression. *Archives of General Psychiatry*, 41, 279-283. <https://doi.org/10.1001/archpsyc.1984.01790140069008>
- Ryff, C. D. & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry*, 9, 1-28. [https://doi.org/10.1207/s15327965pli0901\\_1](https://doi.org/10.1207/s15327965pli0901_1)
- Saavedra, J., Zúñiga, L., Amézquita, A., & Vásquez J. (2013). Ritmo circadiano: El reloj maestro. Alteraciones que comprometen el estado de sueño y vigilia en el área de la salud [Circadian rhythm: The master clock. Alterations that compromise the state of sleep and wakefulness in the area of health]. *Morfología*, 5(3), 16-35.
- Salzmann, S., Euteneuer, F., Strahler, J., Laferton, J. A., Nater, U. M. & Rief, W. (2018). Optimizing expectations and distraction leads to lower cortisol levels after acute stress. *Psychoneuroendocrinology*, 88, 144-152. <https://doi.org/10.1016/j.psyneuen.2017.12.011>
- Sandi C, Venero C, Cordero I (2001). Fisiología y patología del estrés [The physiology and pathology of stress]. In C. Sandi, C. Venero, & I. Cordero. (Eds.): *Estrés. Memoria y trastornos asociados. Implicaciones en el daño cerebral y el envejecimiento* [Stress. Memory and associated disorders. Implications for brain damage and aging] (pp. 39-73). Barcelona: Editorial Ariel SA.
- Sandín, B., Valiente, R. M., García-Escalera, J., & Chorot, P. (2020). Impacto psicológico de la pandemia de COVID-19: Efectos negativos y positivos en población española asociados al periodo de confinamiento nacional [Psychological impact of the COVID-19 pandemic: Negative and positive effects on the Spanish population associated with the period of national confinement]. *Revista de Psicopatología y Psicología Clínica*, 25(1).
- Scheier, M. & Carver, C. (1985). Optimism, coping and health: Assessment and implications of generalized outcome expectancies. *Health Psychology*, 4, 219-247. <https://doi.org/10.1037/0278-6133.4.3.219>

## Article in press

- Scheier, M. F. & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research*, 16(2), 201–228. <https://doi.org/10.1007/BF01173489>
- Scheier, M. F., Carver, S. C. & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, 67(6), 1063–1078.
- Scheier, M. F., Carver, C. S. & Bridges, M. W. (2001). Optimism, pessimism, and psychological well-being. In E. C. Chang (Ed.), *Optimism and pessimism: Implications for theory, research, and practice* (pp. 189-216). Washington, DC: American Psychological Association.
- Scheier, M. F., Swanson, J. D., Barlow, M. A., Greenhouse, J. B., Wrosch, C., & Tindle, H. A. (2020). Optimism versus pessimism as predictors of physical health: A comprehensive reanalysis of dispositional optimism research. *American Psychologist*. <https://doi.org/10.1037/amp0000666>
- Schou, I., Ekeberg, Ø., & Ruland, C. M. (2005). The mediating role of appraisal and coping in the relationship between optimism pessimism and quality of life. *Psycho Oncology: Journal of the Psychological, Social and Behavioral Dimensions of Cancer*, 14(9), 718-727. <https://doi.org/10.1002/pon.896>
- Shepperd, J. A., Maroto, J. J., & Pbert, L. A. (1996). Dispositional optimism as a predictor of health changes among cardiac patients. *Journal of Research in Personality*, 30(4), 517-534. <https://doi.org/10.1006/jrpe.1996.0038>
- Solberg Nes, L. S., & Segerstrom, S. C. (2006). Dispositional optimism and coping: A meta-analytic review. *Personality and Social Psychology Review*, 10(3), 235-251. [https://doi.org/10.1207%2Fs15327957pspr1003\\_3](https://doi.org/10.1207%2Fs15327957pspr1003_3)
- Taylor, S. E., & Stanton, A. L. (2007). Coping resources, coping processes, and mental health. *Annual Review of Clinical Psychology*, 3, 377-401. <https://doi.org/10.1146/annurev.clinpsy.3.022806.091520>
- Taylor, S. E., Burklund, L. J., Eisenberger, N. I., Lehman, B. J., Hilmert, C. J., & Lieberman, M. D. (2008). Neural bases of moderation of cortisol stress responses by psychosocial resources. *Journal of Personality and Social Psychology*, 95(1), 197. DOI: 10.1037/0022-3514.95.1.197
- Tindle, H., Davis, E., & Kuller, L. (2010). Attitudes and cardiovascular disease. *Maturitas*, 67(2), 108-113. <https://doi.org/10.1016/j.maturitas.2010.04.020>
- Vázquez, C., & Castilla, C. (2007). Emociones positivas y crecimiento postraumático en el cáncer de mama [Positive emotions and post-traumatic growth in breast cancer]. *Psicooncología*, 4(2/3), 385.
- Vázquez, C., Hervás, G., Rahona, J. J., & Gómez, D. (2009). Psychological well-being and health. Contributions of positive psychology. *Annuary of Clinical and Health Psychology*, 5(2009), 15-27.
- Vera Poseck, B. (2006). Psicología positiva: una nueva forma de entender la psicología [Positive psychology: a new way of understanding psychology]. *Papeles del Psicólogo*, 27(1), 3-8. <http://www.papelesdelpsicologo.es/resumen?pii=1279>
- Vera-Villarroel, P. (2020). Psicología y COVID-19: un análisis desde los procesos psicológicos básicos [Psychology and COVID-19: an analysis centred on the basic psychological processes]. *Cuadernos de Neuropsicología/Panamerican Journal of Neuropsychology*, 14(1): 10-18. <http://doi.org/10.7714/CNPS/14.1.201>
- Vera-Villarroel, P., Cordova-Rubio, N., & Celis-Atenas, K. (2009). Optimism evaluation: Preliminary analysis of the Life Orientation Test Revised Version (Lot-R) in Chilean population. *Universitas Psychologica*, 8(1), 61-68.