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Final Dissertation

THE EFFECTS OF PROTECTION FACTORS FROM WORK-RELATED STRESS ON SOME BIOMARKERS OF STRESS IN THE HAIR: A LONGITUDINAL STUDY

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Index

Introduction

The goal of this research is to study and analyse the relationship over time (three months period) between protection factors from work-related stress, such as a transformational leadership style, and the levels of some biomarkers of stress in the hair. Following the JD-R model, this research will also deepen the role of some individual characteristics of the worker, specifically self-efficacy, and work-engagement. This work will study these resources individually, in relationship with one another, and in relationship with the biomarkers.

Consequently, starting from the first chapter, the research will present the concept of health and all its nuances in the workplace, and how it is delineated during a pandemic. Secondly, because this research follows the JD-R model, the model will be explained, while investigating further the chosen characteristics, such as transformational leadership style, self-efficacy, and work engagement. Finally, because the goal is to analyse the relationship between the described protection factors and the biomarkers, this research will focus on the roles of the two biomarkers: cortisol and DHEA(S).

The goal of the second chapter is to deeply analyse the relationships between the protection factors and the chosen biomarkers. The protection factors will be analysed with one another, so transformational leadership style with self-efficacy, transformational leadership style with work engagement, and self-efficacy with work engagement, and in relation with the cortisol and DHEA and DHEA(S) biomarkers.

In the third and final chapter the hypotheses and the research design will be presented. Thereafter, the analysis of the participants and of the data will be introduced, and finally, the analysis of the results of the study with regards to the hypotheses. Because the literature of DHEA(S) biomarkers is very scarce, the hypotheses will be more exploratory than confirmatory, however, this should be considered as a relevant positive point of our research.

In the conclusion, the limitations and the possibilities for future research will be analysed.

Chapter one

Introduction of the JD-R model and its constructs

This first chapter will outline the general concepts that one needs to describe health and all its nuances inside the workplace. Indeed, starting with the broad definitions of health, subsequently it will be related with the work context in a truly particular historical period, this being the global pandemic of COVID-19, and how this health crisis affected workers' stress in relation to different psychological and psychobiological resources. Once the general concepts have been described, this work will introduce the same psychological and psychobiological resources chosen to analyse the effects on stress on the workers during this difficult time. These resources will divide into three major categories: one work-related, one personal and one motivational. Respectively, the categories are a positive and transformational leadership style, the concept of self-efficacy and the notion of work engagement.

1.1 Health and well-being during a pandemic

Health has always had various connotations, indeed, during the centuries and across cultures, its denotation changed; however, if one cannot find a meaning to it, one cannot measure it and describe it scientifically. Therefore, the first definition that would be better to analyse is the one from the World Health Organization (1948), which describes it as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization (WHO), 1948). As one can notice, this explains not only that it is not necessary to just present the absence of a disease, but it underlines the importance of both mental and social aspects of a person.

Once explained how health can be defined, the focus shifts from a general perspective to a more specific one, indeed, as mentioned earlier, health will now be related to the spread of coronavirus disease 2019 (COVID-19), which started at the end of 2019 and evolved into a global pandemic. It has been a major crisis for the health systems all around the world. During the last two years, in response to the expanding threat, the different governments around the states have

introduced many safety measures, such as the necessity to wear a surgical mask, continuously disinfect the hands and practise social distancing, as well as banning specific kind of gatherings, closing selected industries and companies, and deciding to implement remote education and learning and remote working. As Sekścińska, Trzcińska, Pankowski, Pisula, and Wytrychiewicz-Pankowska (2022) explained, many factors have contemporaneously affected people's physical health and psychological distress; they analyse how this distress can be defined as a state of emotional suffering characterized by symptoms of depressions and anxiety and that this global pandemic has been characterized as one stressful event (quoted by Lamichhane, 2022).

1.2 Health of workers and work-stress during the pandemic

It needs to be specified that stress in the working environment has been identified long before the Coronavirus disease happened in our lives; in fact, because stress can be associated with different physiological and psychological symptoms, it is a vastly studied phenomenon. Nevertheless, to better study its implications on health, it is better to firstly describe it; studies generally examine stress in one of three ways: "as a stimulus or event external to the individual, as a psychological transaction between the stimulus event and the cognitive and emotional characteristics of the individual, or as a physical or biological reaction" (Morrison & Bennet, 2016, p. 304). Psychological stress can be described as a perception that an individual holds regarding environmental demands that apparently exceed their adaptive capacity (Cohen, Janicki-Deverts, & Miller, 2007), thus the studies show both the external and internal elements that increase the chances of developing stress.

Particularly for this research, the focus will be on the concept of work-stress relationship, all the elements that contribute to increase stress in the workplace and some resources that will contribute to decrease stress in an organizational setting. Moreover, this dissertation revolves around this particular period; as already mentioned, COVID-19 disrupted many aspects of daily lives, one of these being work. Indeed, the companies and the organizations started to require people to work from home, a condition that is commonly named smart-working or

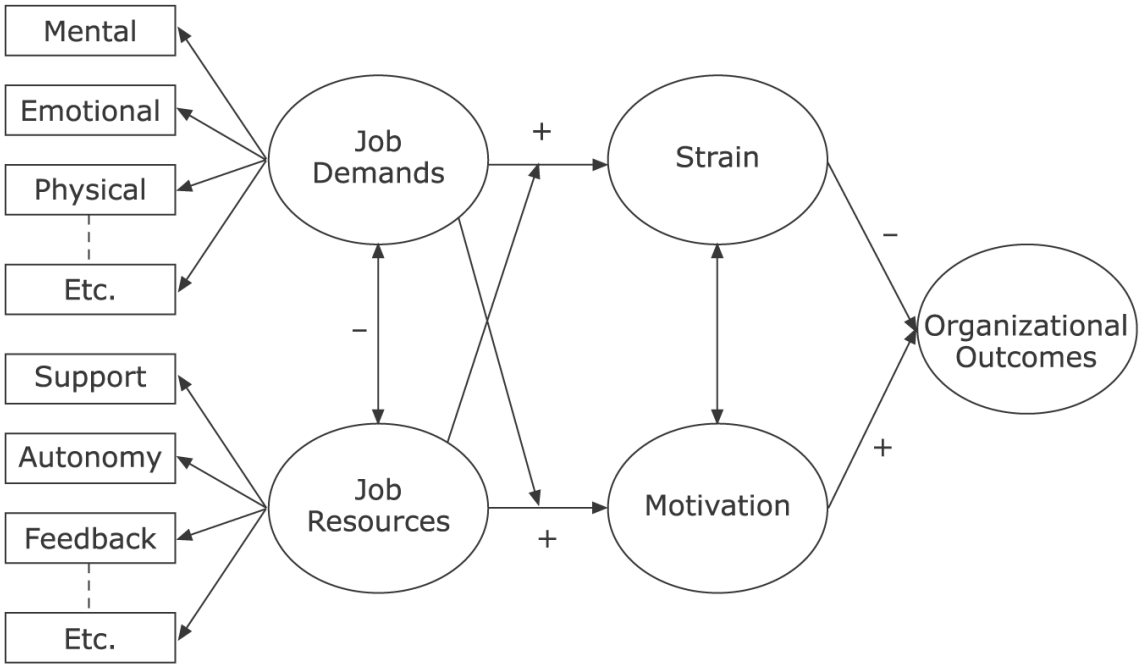
remote working. Numerous studies have shown the psychological consequences of this stressful event. For instance, Albano, Parisi and Tirabeni (2019) explained how the reduction to face-to-face interactions with one's own colleagues can have negative effects on either their professional identity and sense of community, or their extra-work life. Again, a study by Prasad, Rao, and Vaidya (2020) analysed the relationship between smart working and occupational stress while taking into considerations some variables that mediated the relationship in a negative way; they found that among these variables were included "isolation from co-workers, distraction from family, lack of suggestions about work practices, failure to balance work time, and poor ability to design work independently" (quoted by Marino & Capone, 2021, p. 1529). As these studies suggest, the coronavirus disease and its consequences on a broad aspect of daily life such as work have enhanced the conditions to develop stress and thus to worsen the well-being of the workers.

1.3 Introduction of the JD-R model

This dissertation will use the JD-R model to discuss the job resources and how they affect our organizational outcomes. The Job Demands-Resource model was created by two academics: Arnold Bakker and Evangelia Demerouti. In general, this model was used to improve employee wellbeing and performance, indeed the authors analysed how every profession may have its specific health and psychological risk elements associated with job stress, these elements can be classified in two general categories, which are job demands and job resources (Bakker & Demerouti, 2006). As Bakker and Demerouti (2006) described, the first one refers to those job aspects, which can be either physical, psychological, social, or organizational and, because they require effort, they are therefore related to physiological and/or psychological costs. The second one refers to those job aspects that are either stimulating personal or organizational growth, employable to achieve work goals and those aspects that reduce the costs associated with job demands. Moreover, for the sake of this work, it needs to be underlined that, in the development of job stress and motivation, this model works through a dual process: one is the health impairment process (e.g., work overload, exhaustion, general health problems), and the other is motivational in

nature, and it assumes that the job resources can lead to high work engagement and better performance.

Figure 1. The Job Demands-Resource Model (Bakker & Demerouti, 2007)



Indeed, as one can see from the Figure 1 job resources play an important role in those motivational processes useful for positive organizational outcomes. Moreover, as Schaufeli, Bakker, and Van Rhenen (2009) analysed, job resources tend to fulfil basic human needs, for instance, as showed in the Figure 1, the needs for autonomy or the needs for feeling supported. Furthermore, Simbula, Guglielmi, and Schaufeli (2011) underline the motivational potential of this model, indeed, they believe that the job resources induce employees to fulfil their work goals and, in turn, to lead to work engagement. Additionally, as one can see from the Figure 1, and as Bakker, Demerouti, and Sanz-Vergel (2014) analysed, job resources have been identified as the principal drivers of work engagement, which can lead to increased positive organizational outcomes, while, on the other hand, job demands have been characterised as the main causes of burnout and general negative organizational outcomes. As already introduced, this dissertation will focus on three specific job resources: the transformational leadership style, work-engagement, and self-efficacy.

1.4 Delineation of job resources

Before deepening our knowledge on the relationship among the resources, it is useful to delineate what these three constructs are.

Starting with the work-related construct, the transformational leadership style has been one of the most studied types of leadership in the past 30 years and Dìaz-Sàenz described it as: “the process by which a leader fosters group or organizational performance beyond expectation by virtue of the strong emotional attachment with his or her commitment to a higher moral cause” (quoted by Bryman, Collinson, Grint, Jackson, & Uhl-Bien, 2011, p. 299). This definition highlights how this type of leadership has a significant impact on the employees’ performances, and how high organizational commitment to employees is likely to boost productivity (Fithriani, 2016, quoted by Almaududi Ausat, Suherlan, Peirisal, & Hirawan, 2022). Furthermore, studies by Hetland, Sandal, and Johnsen (2007) suggest that there is evidence that associate this kind of leadership with higher productivity in the work environment, lower staff turnover rates, and a general higher level of trust from employees as well as lower levels of stress and burnout among workers (quoted by McKenna, 2020).

Following with the personal resource, the concept of self-efficacy has been introduced by the psychologist Bandura; the psychologist described it as “belief in one’s capabilities to organize and execute the course of action required to produce given attainments” (quoted by Simbula et al., 2011, p. 288). Self-efficacy is a contributing factor to motivation, in fact, perceived self-efficacy affects people’s choice of activities, how much effort they will expend in these activities and how long they will persist given possible obstacles and aversive experiences (Bandura & E. Adams, 1977). Furthermore, because it refers to people’s judgment of their capabilities to execute and to put into action designed types of performance and behaviours, self-efficacy is also an important affecting element of behaviours, especially goal-oriented behaviour (Yakin & Erdil, 2012). Therefore, one can conclude saying that this personal resource contributes to people’s motivation by influencing the different challenges that people want to overcome, the effort they spend overcoming these challenging, and how they act

in the face of obstacles (Simbula et al., 2011). Self-efficacy can also be linked with job satisfaction, in fact, as Yakin and Erdil (2012) mentioned, individuals with high self-efficacy tend to deal more efficiently with difficulties and obstacles and are more likely to be persistent in achieving their goals and valued outcomes, and therefore derive satisfaction from their jobs. It then can be concluded that individuals with higher self-efficacy are more likely to feel satisfied with their jobs.

The motivational job resource chosen for this research is work engagement, which Schaufeli (2002) defines as “a positive, fulfilling, work-related state of mind that is characterised by vigour, dedication, and absorption” (quoted by Bakker & Demeoruti, 2008, p. 209). These characteristics can be related to work, and, in fact, vigour is characterised by high levels of energy and mental resilience while working; dedication refers to experiencing feelings of enthusiasm challenge at work, and finally absorption is related to feeling completely concentrated in one’s work (Bakker & Demerouti, 2008). According to Maslach and Leiter (1997), engagement can also be analysed with burnout dimensions, the authors believe that the first one is characterised by energy and involvement, which can be seen as the direct opposite of the second one, because it is characterised by the opposite: a low level of energy and low connection and association with one’s work (quoted by Bakker et al., 2014).

1.5 Role of biomarkers: cortisol and DHEA

To further investigate the relationship between protection factors (such as these resources) from work-related stress and the levels of biomarkers of stress in the hair, it is necessary to introduce the biomarkers that will be used in this work. To begin with, cortisol is the first biomarker used to measure long term stress levels: it has been investigated through the hair of the participants. Because salivary cortisol is frequently used as a biomarker of psychological stress, cortisol levels are normally studied through saliva sample. However, Manenschijn, Koper, Lamberts, and Rossum (2011) investigated whether hair cortisol is a feasible parameter to measure cortisol exposure, in fact, they collected samples of 195 healthy individuals, patients with hypercortisolism and patient with hypocortisolism. They found that cortisol in hair reflects cortisol exposure at the

tissue level, and it was also supported by elevated hair cortisol levels in hypercortisolaemic patients.

Biologically speaking, cortisol is a steroid hormone that the adrenal glands produce and release, it helps regulate the body's response to stress. The process of responding to stress involves direct actions of different stress-responsive systems, which work in a coordinated manner. One of these systems is the hypothalamic-pituitary-adrenocortical (HPA) axis, which will adapt to environmental demands for maintaining an optimal homeostatic individual state. Nonetheless, functions of this axis can be non-manageable under conditions of prolonged stress, leading to alterations in levels of hormones production (Kamin & Kertes, 2016).

Under normal circumstances, the primary investigated biomarker used in this research, DHEA (and its sulphated metabolite dehydroepiandrosterone sulphate DHEA(S)), is secreted simultaneously with cortisol, however dissociation of DHEA and cortisol secretion has been observed in response to adrenal corticotropin-releasing hormone (ACTH) (Kroboth, Salek, Pittenger, Fabian & Frye, 1999). Nevertheless, DHEA and cortisol are the most abundant hormones released as end products of a strictly coordinated endocrine response to stress. However, going deeper into the understanding of this biomarker, it is necessary to underline that levels of DHEA and DHEA(S) are age-dependent, peak levels are reached in early adulthood and decline after that period; moreover, DHEA and DHEA(S) have been shown to be associated with a wide range of health outcomes, indeed high levels of DHEA and DHEA(S) have been associated with good health and well-being. For the sake of this research, it is important to understand that long-term psychosocial stress may be one factor that lowers the DHEA and DHEA(S) levels. One study from Lennartsson, Theorell, Rockwood, Kushnir, and Jonsdottir (2013) investigated whether levels of DHEA and DHEA(S) differ in individuals who report perceived stress at work compared to individuals who report no perceived stress at work. In agreement with the hypothesis, the study concluded that stresses individual have markedly lower levels of DHEA(S). The authors underlined that in studies where the prolonged effects of stress are analysed, it is preferably to measure DHEA(S) levels, since

they are more stable. Therefore, given the important and beneficial functions of DHEA and DHEA(S), lower levels of DHEA(S) may constitute one link between psychosocial stress and health (Lennartsson et al., 2013).

Chapter two

Analysis of the constructs' literature

In the first chapter, the general background of this work has been outlined, specifically, the topic of health and its outcomes during a pandemic, and its different features in a work environment have been briefly analysed. Moreover, the JD-R model that has been utilised in this work has been introduced, with it, also the resources that will be analysed have been described, and, finally, the role of the biomarkers chosen for this research has been introduced.

The goal of this second chapter is to investigate the literature regarding the constructs: therefore, each paragraph will try to build a relationship between these resources; the reader will be able to read about the relationship between the transformational leadership style and self-efficacy, the transformational leadership style and work engagement, and again the relationship between work engagement and self-efficacy. Finally, the analysis will shift on whether in the contemporary literature there are references to these constructs analysed together with the chosen biomarkers.

2.1 Transformational leadership style and self-efficacy

The first relationship that will be analysed in this second chapter is between the work-related resource, such as the transformational leadership style, and the personal resource, the concept of self-efficacy. The objective is to investigate through the past literature which can be the possible relationship between these two resources, how they have been analysed together, what methods have been utilised, and what are the outcomes that have been found.

The contemporary literature has shown that a few studies demonstrated how transformational leadership can be found to be related to follower levels of self-efficacy, but how Walumba, and Hartnell (2011) underlined, it is also important to gain a better understanding of why this kind of leadership can enhance the employees' self-efficacy. In the study by Walumba and Hartnell (2011), the authors analysed the effect of transformational leadership on 426 employees' performance through two main mechanisms: their relational identification with

their supervisor (N=75) and self-efficacy; in this work, the authors also consider the concept of self-efficacy as a "cognitive process in the identification-performance relationship" (p. 155). Because self-efficacy has already been described, to continue with this analysis it is necessary to discuss what relational identification is: as Sluss and Ashfort (2007) described, relational identification is the extent to which one individual defines oneself in terms of a specific role-relationship, what the relationship means to that individual; moreover, the scientists specify that relational identification has motivational and behavioural consequences, it thus can raise one's level of self-efficacy beliefs in multiple ways. According to the transformational leadership theory, one of the goals of this kind of leader is to increase employees' self-worth and confidence, by encouraging them and setting high performance expectations, therefore, it is expected that workers who relationally identify with these leaders to be highly efficacious (Avolio, 1999; quoted by Walumba & Hartnell, 2011) and to have a change in their self-efficacy to accomplish a task. Data were collected in four waves: transformational leadership at Time 1, relational identification with the supervisor at Time 2, self-efficacy at Time 3, and supervisory ratings of follower performance were collected at Time 4. In conclusion, the authors hypothesis was that self-efficacy mediates the positive relationship between relational identification with the supervisor and employees' performance. The results of the study show how this hypothesis was supported, and that self-efficacy fully mediate the relationship between relational identification with the supervisor and the performance.

Again, a study by Liu, Siu, and Shi (2010) examined the mediating effect of trust in the leader and self-efficacy on the influence of transformational leadership on employee well-being. As Bandura (1997) explained, self-efficacy cannot alter people's capabilities, but it can alter that sense of control and understanding over the work environment, and it can influence the choices people make and their degree of confidence (quoted by Liu et al., 2010). Because people with high self-efficacy deal more effectively with failure and difficulties, they are more likely to achieve expected outcomes and derive satisfaction from their jobs. As was said, the purpose of this study was to examine the relationship between

transformational leadership and 745 Chinese employees' well-being and to analyse the mediating role of trust and self-efficacy. For this purpose, they hypothesized that trust in the leaders was a mediator between transformational leadership and perceived work stress, and that self-efficacy was a mediator between transformational leadership and perceived work stress. Here, the transformational leadership style was measured through Li and Shi's (2005) 26-item scale, which was developed for Chinese societies and measured four dimensions: charisma, morale building, individual consideration, and inspirational motivation (quoted by Liu et al., 2010). A self-administered survey method using structured questions was adopted to collect the data from the Chinese employees. The results showed how trust in the leaders and self-efficacy fully mediated the influence of transformational leadership on perceived work stress, thus confirming the relationship between this type of leadership and employee well-being (Liu et al., 2010).

A cross-sectional questionnaire survey design by Nielsen, Yarker, Randall and Munir (2009) examined how self-efficacy had a mediating effect on the relationship between transformational leadership and work outcomes, such as commitment to the organization and job satisfaction. The study took place in two elderly care centres in Denmark, and the participants were 274 elderly care assistants. Here, transformational leadership style was measured through the Global Transformational Leadership Scale, which consisted of seven items, that evaluate the frequency of transformational leadership behaviours exhibited by the leader, based on a 5-point Likert scale In this study, another mediator was evaluated, their own levels of self-efficacy, as well as the level of efficacy in their team, "team efficacy"; it was found that, as hypothesized, both self and team efficacy were acting as mediators, but with different effects. The first one fully mediated the relationship between transformational leadership and employees' well-being, while the second one had a partial mediating effect between this type of leadership and job satisfaction, and a fully mediating effect on the relationship between transformational leadership and well-being (Nielsen et al., 2009).

In these studies, self-efficacy was analysed using the 10-item General Self-efficacy scale, the items assessed participants' personal work skills and their

abilities on performing tasks (Walumba & Hartnell, 2011). It was also used a reduced 7-item version of this scale (Nielsen et al., 2009).

Past literature analysed in great details the relationship between the two resources, it underlines the mediating role of self-efficacy on this style of leadership and other concepts, usually work-related, such as performance and well-being.

2.2 Transformational leadership and work engagement

The second relationship that will be analysed in this second chapter is between the work-related resource, such as the transformational leadership style, and the motivational resource, the work engagement. Again, the objective is to investigate through the past literature which can be the possible relationships between these two resources, how they have been analysed together, what methods have been utilised, and what are the outcomes that have been found.

The literature found for the relationship of these resources is not as frequent as the previous relationship's literature. The studies analysed for this work examined the relationship between transformational leadership and work engagement through the mediating role of some variables, such as the meaning of work and the structural empowerment. It is necessary to notice how, in this occasion, the relationship has a necessity of a mediator, while in the relationship between transformational leadership and self-efficacy, it was self-efficacy that had a mediating role.

Before deepening the explanations on the effects of mediators in this relationship, it is necessary to firstly examine the direct relationship of these two resources. Indeed, a study by Monje Amor, Abeal Vàzquez, and Andrés Faìna (2019) predicted a positive direct association between transformational leadership and work engagement. They studied this relationship among Spanish employees from organizations in the tourism sector, through a questionnaire comprised 36 items measuring transformational leadership, structural empowerment, and work engagement. Furthermore, another study by Ghadi, Fernando, and Caputi (2012) believed that if a leader can provide relevant personal resources to their

employees (such as consideration and respect), the workers are more likely to perceive the workplace as supportive, and in turn they may feel obligated to reciprocate to this sense of support. Through an empirical study based on a sample of 530 full-time workers in Australia, they hypothesised that transformational leadership behaviours may predict work engagement. The results demonstrated that employees who have managers with this kind of leadership are more likely to be dedicated and absorbed in work.

Now that their direct relationship has been analysed, this work can focus on the mediating role of some chosen mediators, found in the above-mentioned works, such as structural empowerment and meaning of work. The first one refers to having access to information, support, and opportunities to learn and grow at work (Kanter, 1977; quoted by Monje Amor et al., 2019); it is necessary to clarify that leaders play a fundamental role in creating these kind of workplace conditions. In this study, the purpose was to investigate the mediating role of structural empowerment in the positive relationship between transformational leadership and work engagement. Transformational leadership style was studied using Rafferty and Griffin's scale, comprised of 15 items assessing the intellectual stimulation, inspirational communication, and personal recognition; structural empowerment was measured with the 12-item Spanish structural empowerment scale, which capture four dimensions: opportunity, resources, information, and support; finally, work engagement was examined with the shortened nine-item version of the Utrecht Work Engagement Scale, which assess vigour, dedication, and absorption, the dimensions chosen by Schaufeli (2002) for describing this resource. Results of this study showed that transformational leadership was positively related to structural empowerment, and that empowerment positively influences work engagement (Monje Amor et al., 2019). Regarding the second chosen mediator, Arnold et al. (2007), describe the meaning of work as "finding a purpose in work that is greater than the extrinsic outcome of the work" (quoted by Ghadi et al., 2012, p. 533). To support of this concept, Maslow's Hierarchy of Needs indicated that individuals tend to address their higher order needs (which involves "self-actualisation"), once their basic survival and psychological needs are met (quoted by McLeod, 2018). Thus, individuals seek to experience

meaningful work, and meaning of work can act as a possible mediator between the relationship of transformational leadership and work engagement. Through a questionnaire, it was used the Global Transformational Leadership Scale to assess the transformational leadership's behaviours, the Utrecht Work Engagement Scale to measure the dimensions of work engagement, and the May et al' s (2004) scale to assess meaning of work by asking the 350 Australian participants to rate the perceptions of some items (such as "my job activities are personally meaningful to me") (quoted by Ghadi et al., 2012). The results showed how employees' perceptions of meaning in work partially mediated the relationship between transformational leadership style and work engagement in an Australian context (Ghadi et al., 2012).

It is interesting to notice how the literature support the direct relationship between the transformational leadership style and work engagement, and, to analyse how to improve workers' performances and their workplace condition, it studies the effects of some mediators on this relationship.

2.3 Work engagement and self-efficacy

The third and last relationship that will be analysed in this second chapter is between the motivational resource, such as the work engagement, and the personal resource, the self-efficacy. Again, the objective is to investigate through the past literature which can be the possible relationships between these two resources, how they have been analysed together, what methods have been utilised, and what are the outcomes that have been found.

In the literature, this relationship has been analysed deeply, indeed, personal traits, such as self-efficacy, due to their motivational potential are considered to be important antecedents of work engagement (Yakin & Erdil, 2012). Moreover, many previous studies showed that self-efficacy is positively related to work engagement, and work engagement is positively associated with this personal resource and job performance (Federici & Skaalvik, 2011).

In a study by Simbula, Guglielmi, and Schaufeli (2011), it was used the JD-R model, and the authors believed that job resources are likely to enhance work

engagement through a motivational process which satisfies basic needs for autonomy and competence, which in turn can induce to fulfil the work goals. The aim of this study was to test how job resources, specifically self-efficacy, and work engagement, are related over time. According to Bandura (2001) self-efficacy acts as a "self-motivating mechanism", when people perceive their levels of competences to be high, it will be more likely that they will be setting goals and be motivated to be persistent in overcoming obstacles (quoted by Simbula et al., 2011). Thus, the hypothesis that was formulated stated that self-efficacy would have a lagged positive effect on work engagement. Moreover, because Xanthopoulou et al. (2009) hypothesized that work engagement, by stimulating goal achievement, builds personal resources over time, the other hypothesis that was formulated stated that work engagement led to self-efficacy (quoted by Simbula et al., 2011). For testing these hypotheses, a three-wave panel study, with a time lag of 4 months between each wave was used, among 104 Italian schoolteachers. The teachers needed to fill a questionnaire with engagement dimensions, job, and personal resources. Regarding the work engagement, the short version of the Utrecht Work Engagement Scale was used; while regarding self-efficacy, it was assessed by an eight-item scale. The results showed that, in general, the participants' perceptions of job resources, self-efficacy, and work engagement are quite stable over time. Furthermore, according to the analysis, self-efficacy has a short-term and longer-term effect on work engagement, however, also work engagement has a short-term and longer-term effect on self-efficacy, therefore, none of these constructs can be considered as only a cause or only a consequence (Simbula et al., 2011).

Another study by Yakin and Erdil (2012) linked these two resources with job satisfaction, indeed, the basic aim of the research was to examine the relationship between self-efficacy, work engagement and job satisfaction. According to Spector (1997), "job satisfaction is defined as the extent to which people like their job either on the whole or with respect to particular conditions or rewards" (quoted by Yakin & Erdil, 2012, p. 371). Again, according to Luthans et al. (2006) individuals who present a higher self-efficacy tend to be more persistent in reaching their goals and have more positive outcomes, thus, to be more satisfied

with their jobs (quoted by Yakin & Erdil, 2012). The research was conducted on 200 public accounts with use of questionnaires (a total of 16 completed the survey) that measured self-efficacy through a 12-item scale developed by Scherer (1982), work engagement measured with an 18-item scale consisting of emotional, physical, and cognitive engagement (quoted by Yakin & Erdil, 2012). It appears from the findings that organizational commitment had the strongest association with job satisfaction, thus, it appears that work engagement is significantly and positively related to job satisfaction. Furthermore, findings also suggest that beliefs regarding one's capabilities influence work related attitudes and motivation, which in turn effect job performance and satisfaction.

With this relationship is interesting to notice how these resources can be effectively studied together through longitudinal studies, or they can be studied related to other characteristics, such as job satisfaction. In both ways, they are fundamental resources that contribute to the general well-being in a work environment.

2.4 Transformational leadership style, self-efficacy, and work engagement

The literature available for this relationship is scarce, indeed, further studies are needed to examine the relationship between these three resources. However, in many studies, self-efficacy and/or work engagement had the role of mediators.

In one study conducted by Prochazka, Gilova, and Vaculik (2017), they investigated whether followers' self-efficacy mediates the relationship between a transformational leadership style and workers' engagement. It was a study conducted with 307 Czech employees and it was a sufficiently large sample to supplement previous studies and help determine, more visibly, whether self-efficacy has a mediating role in the relationship between transformational leadership and work engagement. The method used was a questionnaire that had different measures, for instance, work engagement was measured through the 9-item Utrecht Work Engagement Scale, which consisted of the three subscales (vigour, dedication, and absorption) delineated to describe the concept of work engagement; self-efficacy was measured through a 10-item self-efficacy scale, which measured this resource across various work-related situations and

task; finally, transformational leadership was measured through a 16-item scale from the Czech Leadership Questionnaire. The mediation model was the one that gave major results, indeed, the relationship between transformational leadership and work engagement was mediated by the employees' work-related self-efficacy. Moreover, because the relationship between transformational leadership style and work engagement may also be conveyed by other mediators other than self-efficacy, the results supported the model in which self-efficacy partially mediated this relationship (Prochazka et al., 2017).

Another study by Salanova, Lorente, Chambel and Martinez (2011) analysed the link between transformational leadership to nurses' extra-role performance. As Ilgen and Pulakos (1999) clarify, the changing nature of the work environment is challenging the traditional view of the in-role performance, and employees need to account for a full range of behaviours (such as competitiveness, rapid innovations, and specific requirements) outside the formal job requirement (quoted by Eldor & Harpaz, 2016). The aim of this study was to analyse whether the relationship between transformational leadership style of 17 supervisors and the staffs' extra-role performance (364 nurses) is fully mediated by staffs' self-efficacy and work engagement. Transformational leadership was measured with the Multifactor Leadership Questionnaire, self-efficacy was measured using a self-constructed scale composed of four items, and work engagement was again measured through the Utrecht Work Engagement Scale. The results showed how, as the authors hypothesised, the influence of transformational leadership and self-efficacy on extra-role performance was fully mediated by work engagement, it is also important to notice that only engaged workers will show extra-role performance (Salanova et al., 2011).

These studies are interesting for different reasons, it is necessary to notice how work engagement can be used as a very powerful psychological mediator; moreover, the relationship among these three variables can be studied alone, meaning that the research can examine in many ways the links of these three resources, or it can be studied in relation to another variable, such as extra-role performance.

2.5 Biomarkers and the chosen resources

Now, this study has analysed what are the possible relationship between the resources; however, following the goal of this research, there is the necessity to introduce what are the possible relationships between the resources and the chosen biomarkers. However, in the contemporary literature, the research done with the DHEA biomarker is very scarce, for this reason, the literature presented will be with the cortisol biomarker, and our hypothesis will be more exploratory than confirmatory.

Because work-related stress has considerable consequences for organizations, the prevention of this stress is relevant for employees' health and even performance. Starting with the job resource, transformational leadership has been analysed in relation to the levels of stress of the workers. A study by Rowold, Diebig, and Heinitz (2017) has tested the differences and the similarities between this kind of leadership and instrumental leadership by utilizing an objective indicator of stress, such as levels of cortisol found in the workers' saliva and hair. As Hobfoll (1989) demonstrated, leaders and colleagues are potentially in the right position to offer support to stressed employees (quoted by Rowold et al., 2017). More specifically, this study shows that by formulating and communicating an inspiring vision, by eliciting trust and helping employees to understand the long-term goals, the transformational leadership is negatively related to stress. Regarding the assessment of hair cortisol, hair samples, equally to this research, were obtained by cutting 3 cm hair strands from the posterior region of the head. The results found that transformational leadership was not related to any of the cortisol indicators (Rowold et al., 2017). Despite this, another study by Diebig, Bormann, and Rowold (2016) examined how the transformational leadership can have a negative side; indeed, they analysed that, even if this kind of leadership has generally positive outcomes, leaders may exaggerate the goals, leading followers to burn out and higher cortisol levels.

Following with the personal resource, the relationship between self-efficacy and the levels of stress has been vastly examined. In a study by Crockett, Morrow, and Muyshondt (2017) the resource of self-efficacy was studied in relation to the

visibility of support, and how they interact to affect cortisol levels. To analyse this, a 2 x 2 analysis of variance was used to ensure that there were no pre-existing differences in 74 participants' cortisol levels. By manipulating the visibility of support, the results showed how participants whit high self-efficacy would show increased cortisol reactivity to a stressful task when they received visible support; on the contrary, participants with low self-efficacy would show increased cortisol reactivity to a stressful task when they received invisible support. In another study, by Cieslak, Benight, Luszcynska, and Laudenslager (2011), self-efficacy was studied in relation to post-traumatic stress disorder, and it was examined how this relationship was associated with diurnal salivary cortisol levels in the early post-traumatic period. A total of 30 participants provided their cortisol samples across three measurement points (1, 4, and 12 hours after waking). According to Benight and Bandura (2004), in this context, the post-traumatic context, self-efficacy perceptions refer to "optimistic beliefs about the ability to deal with problems arising after trauma" (quoted by Cieslak et al., 2011, p. 261). Because self-efficacy is relevant for physiological stress responses, cortisol may be affected by efficacy beliefs. The results show that that stronger self-efficacy would be associated with reporting less PTSD symptoms. With this resource, it is interesting to notice that self-efficacy, contrary to the transformational leadership style, is studied in relation with other variables to observe effects on cortisol levels.

As stated in the previous chapter, work engagement is associated with job resources and it is defined as a positive, fulfilling state of mind; on the contrary, burnout is associated with the developing of illnesses and diseases. A study by Langelaan, Bakker, Schaufeli, Rhenen, and Doornen (2006) examined the differences in the functioning of the HPA axis between 29 burned-out and 33 work-engaged managers. They measured salivary cortisol during three consecutive workdays and one nonwork day. As the authors suggest, the cortisol awakening response reflects the capacity of the adrenal cortex to produce cortisol, thus the measure is a relevant indicator of the HPA axis activity. Specifically, a strong cortisol awakening response is associated with chronic work

stress. Interestingly, the awakening cortisol levels were higher in the workdays than on the nonwork days, so there was no difference between the groups.

Chapter three

The effects of protection factors from work-related stress on some biomarkers of stress in the hair: A longitudinal study

In the second chapter, the constructs under investigation were analysed, with a focus on their relationships. The literature on the association between the psychological constructs and the biomarker cortisol was also summarised, although the dearth of studies in this respect. Following the JD-R model, this research focuses on the positive outcomes of the chosen job/personal resources, namely transformational leadership style and self-efficacy, as well as work engagement. With respect to biomarkers, the focus is on cortisol and DHEA and DHEA(S). However, it should be noted that, given the scarcity of research carried out on the DHEA and DHEA(S) biomarkers, our hypothesis will be more exploratory than confirmatory. Nevertheless, this should be considered as a relevant point of our research, which aims to contribute to the topic, with possible theoretical and practical implications.

3.1 Aims and hypotheses

As already explained, the JD-R model is a flexible theoretical model that specifies the relationship between classes of constructs. The model can include job and personal demands and resources and can be applied to different organizational contexts (De Carlo, Girardi, Dal Corso, Arcucci, & Falco, 2022).

Not surprisingly, past research on transformational leadership style and work engagement investigated the direct relationship between this leadership style and work engagement, as well as the mediating role of other constructs, such as structural empowerment and meaning of work, in this association. Consistently, in this study we hypothesized a direct effect of transformational leadership on work engagement, that is, transformational leadership style will positively influence work engagement.

Hypothesis 1 (H1): *Transformational leadership style will positively influence work engagement*.

Regarding the second relationship among the constructs under investigation, the literature showed that, in line with the JD-R model, personal resources – including self-efficacy – may positively influence work engagement. Accordingly, our third hypothesis is that self-efficacy will positively influence work engagement.

Hypothesis 2 (H2): *Self-efficacy will positively influence work engagement*.

Finally, according to the JD-R model, job resources will trigger a motivational process and will positively influence work engagement. Moreover, previous studies on the relationship between job and personal resources have shown that transformational leadership, as a job resource, can be related to follower levels of self-efficacy, a personal resource. In fact, through the analysis of the mediating effect of self-efficacy between this leadership style and other outcomes, Walumba and Hartnell (2011) found an enhancement of self-efficacy related to transformational leadership. Hence, building on the JD-R model, according to which personal resources may mediate the association between job resources and work engagement, we hypothesized that transformational leadership style is positively associated with self-efficacy, which in turn can lead to work engagement. In other words, we expected that self-efficacy may mediate the association between transformational leadership style and work engagement.

Hypothesis 3 (H3): *Self-efficacy mediates the relationship between transformational leadership style and work engagement*.

Taking a step forward, in this work we focus on possible physiological indicators of health, motivation, and resilience, such as cortisol and DHEA and DHEA(S) biomarkers. However, considering that the literature on these biomarkers of health is still scarce, as mentioned before, the next three hypotheses will be exploratory in nature. Nevertheless, we believe that our study will contribute to the literature by addressing this important gap in the field.

Starting with job resources, as explained in the previous chapter, transformational leadership was found to be negatively associated with stress, although not related to cortisol (Rowold et al., 2017). Similarly, given that job resources are positively associated with motivation and health (i.e., the motivational process of the JD-R;

Bakker & Demerouti, 2017) in this study we proposed that the transformational leadership style is positively associated with the DHEA(S) biomarker.

Hypothesis 4 (H4): *The transformational leadership style is positively associated with the DHEA(S) biomarker*.

Next, with respect to personal resources, self-efficacy has been studied – together with other constructs – to observe its effects on cortisol levels. As was noted in chapter two, self-efficacy is relevant for physiological stress responses, and stronger self-efficacy was associated with reporting less stress-related disorders. Therefore, it can be hypothesized that self-efficacy is positively associated with the DHEA(S) biomarker.

Hypothesis 5 (H5): *Self-efficacy is positively associated with the DHEA(S) biomarker*.

Regarding the last construct, previous research did not show an association between work engagement and cortisol. Contrarily, work engagement is related to positive effects on health in the workplace. Therefore, it can be hypothesized that work engagement is positively associated with the DHEA(S) biomarker.

Hypothesis 6 (H6): *Work engagement is positively associated with the DHEA biomarker*.

3.2 Research design

In this section the different phases in which the empirical study was articulated will be described. This research took place in Italy, and workers from different organizations were asked to participate. Specifically, the research adopted a multi-method, longitudinal design, which included the collection of both psychological and physiological data at two time points.

Consequently, a first step included the preparation and implementation of the different methodologies. On one hand, psychological data were collected using a self-report questionnaire. Accordingly, the preparation phase involved the retrieval of the specific self-report scales aimed at measuring the focal psychological constructs, the preparation of the self-report questionnaire, and its

online implementation. On the other hand, the procedure for collecting the biological data, which included the collection of a hair strand of approximately 3 cm. from the participant's scalp, has been defined.

Then, the identification of possible participants occurred. Specifically, to take part in the study, participants had to meet the following inclusion criteria: (a) actually being workers, (b) have being working for at least one year in one's current working context, and (c) having hair that is at least three centimeters long.

Next the sampling step was implemented. Possible participants were identified and invited to take part in the study. They were also informed about the general purpose of the research as well as the methodology adopted, in the light of the hypotheses under investigation. Specifically, given the multi-method, longitudinal design, participants were asked to complete an online questionnaire and to collect a biological sample in two different occasions over three months. Upon acceptance, they were given a link that included the informed consent form and the self-report measures. Participants had to fill out the informed consent prior to the completion of the questionnaire. Furthermore, before entering the questionnaire itself, participants were given an alphanumeric identification code, which was created by the researcher using the first letter of her/his name and surname, a random number, and the year of birth of the participant (e.g., GM011961). This code had to be entered on the first page of the online questionnaire.

The questionnaire included the following self-report measures:

a) Transformational leadership style was measured using a scale taken from the Q_u-Bo test (De Carlo et al., 2008). The scale consisted of two items (e.g., "My direct supervisor stimulates the employees to grow professionally") with a response scale from 1 (*strongly disagree*) to 6 (*strongly agree*).
b) Work engagement was measured through the Utrecht Work Engagement Scale (UWES-9; Schaufeli, Bakker, et al., 2006) in its Italian adaptation (Balducci et al., 2010). The scale included nine items aimed at detecting the three dimensions of the construct, namely vigor (three items, such as

"At my work, I feel bursting with energy"), dedication (three items, such as "I am enthusiastic about my job"), and engagement (three items, such as "I am immersed in my work"). The response scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). In line with the authors' indications, both the scores of the individual dimensions and an overall work engagement score were used in this study.

c) Self-efficacy perception was measured using a scale taken from the Q_u-Bo Test (De Carlo et al., 2008). The scale consisted of two items (e.g., "I feel able to tackle most of the problems that arise at work") with a response scale that ranged from 1 (*strongly disagree*) to 6 (*strongly agree*).

The last step involved the collection of the biological samples. The procedure could be done at the participant's home, or at any place the researcher deemed appropriate. After agreeing on the location, the researcher provided each participant with an envelope bearing the alphanumerical code, in which the participant needed to place her/his hair sample. To collect the biological samples, participants could decide whether to proceed on their own or to get help from a trusted person or from the researcher. Participants provided a 3-cm hair segment cut closely to the scalp from the back of the head at both time points. The data collection procedure was in accordance with the anti-COVID-19 regulations. Hormones were quantified in the first 3 most proximal centimeter of the gathered scalp hair from a posterior-to-vertex position. They were measured using an in-house Enzyme-linked immunosorbent assay (ELISA).

3.3 Study participants

Overall, 126 workers from different organizations completed the self-report questionnaires and collected the hair strands at both time points. Fourteen participants had extensive missing data in scale items (i.e., more than 50% of missing values in a scale) and were excluded from subsequent analyses. Because levels of DHEA(S) showed a nonnormal distribution, a logarithmic transformation was applied. Furthermore, a univariate outlier was detected and was excluded from subsequent analyses. Accordingly, the final sample included

111 participants. Sociodemographic characteristics of participants at baseline (T1) are reported in Table 1.

Table 1

Sociodemographic Characteristics of Participants at Time 1 (N = 111)

	n	*%*
Gender		
Female	83	74.8
Male	28	25.2
Type of Job		
Entrepreneur/ professional/ artisan	13	11.7
Manager	3	2.7
Office Worker	37	33.3
Tertiary clerk	8	7.2
Professor/ teacher	6	5.4
Doctor/ nurse	7	6.3
Other	25	22.5
	M	*SD*
Age	39.9	13.2

3.4 Data analysis

First, to test the hypothesized associations between psychological variables over time, four path analysis were estimated. In the first model (M1), transformational leadership at T1 was the independent variable, self-efficacy at T1 was the mediator, and work engagement at T2 was the dependent variable. Model 2 (M2), Model 3 (M3), and Model 4 (M4) were similar, except that vigor (M2), dedication (M3), and absorption (M4) were the dependent variables, respectively. Next, the association between psychological and physiological variables, namely the biomarker DHEA(S), were investigated by estimating Pearson's correlation coefficients. Statistical analyses were carried out using the software R version 4.2.1 (R Core Team, 2022), and, more specifically, path analysis models were

estimated by using the lavaan package version 0.6–12 (Rosseel, 2012) for R software.

3.5 Results

Descriptive statistics and correlations between study variables are reported in Table 2. Interestingly, there was a positive association between self-efficacy at T1 on the one hand and work engagement (r = .39, p < .001), vigor (r = .34, p < .001), dedication (r = .32, p < .001), and absorption (r = .39, p < .001) at T2, on the other. Contrarily, only a positive association between transformational leadership at T1 and absorption at T2 emerged (r = .19, p < .05).

Table 2

Descriptive Statistics and Correlation for Study Variables (N = 111)

Variable	*M*	*SD*	1	2	3	4	5	6
1. Transformational leadership (T1)	3.22	1.61	–					
2. Self efficacy (T1)	4.41	1.00	.10	–				
3. Work engagement (T2)	3.97	1.02	.13	.39***	–			
4. Vigor (T2)	3.67	1.11	.06	.34***	.90***	–		
5. Dedication (T2)	4.19	1.23	.10	.32***	.90***	.71***	–	
6. Absorption (T2)	4.07	1.11	.19*	.39***	.88[h]	.71***	.67***	–

Note. T1= Time 1; T2= Time 2.

*p < .05. ***p < .001.

The results of path analysis are showed below. In M1 (Figure 1), transformational leadership at T1 was not associated with work engagement at T2, controlling for self-efficacy at T1 (β = .09, *ns*). A similar pattern of results occurred in M2 (Figure

2) and M3 (Figure 3), in which transformational leadership at T1 was not associated with vigor (β = .02, *ns*) or dedication (β = .07, *ns*) at T2, controlling for self-efficacy at T1. Contrarily, in Model 4 (Figure 4) there was a positive, albeit marginally significant, association between transformational leadership at T1 and absorption at T2, controlling for self-efficacy at T1 (β = .15, $p < .10$).

Self-efficacy at T1 was positively associated with work engagement (M1; β = .38, $p < .001$), vigor (M2; β = .33, $p < .001$), dedication (M3; β = .31, $p < .01$), and absorption at T2 (M4; β = .37, $p < .001$), controlling for transformational leadership at T1. On the contrary, transformational leadership at T1 was not associated with self-efficacy at T1 (M1-M4; β = .10, *ns*). Not surprisingly, the indirect effect of transformational leadership on work engagement and its dimensions through self-efficacy was not significant.

Overall, self-efficacy at T1 was positively associated with work engagement and its dimensions at T2, and H2 was supported. On the contrary, transformational leadership at T1 was not associated, neither directly nor indirectly, with work engagement at T2 (with the partial exception of absorption), so H1 and H3 were not supported.

Figure 1

Path Analysis Model of Associations Between Transformational Leadership, Self-Efficacy and Work Engagement

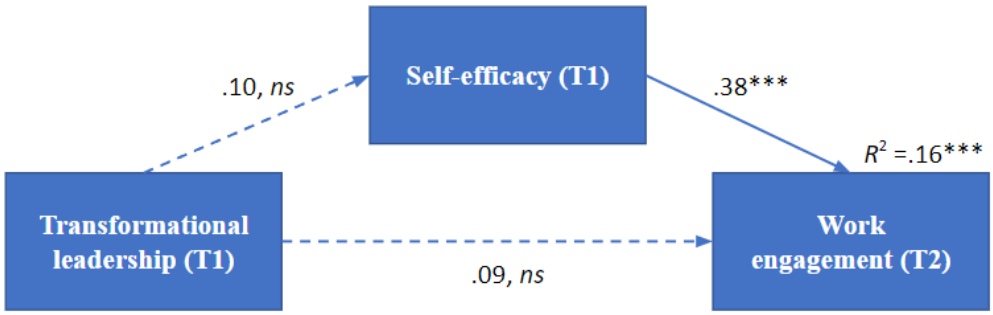


Figure 2

Path Analysis Model of Associations Between Transformational Leadership, Self-Efficacy, and Vigor

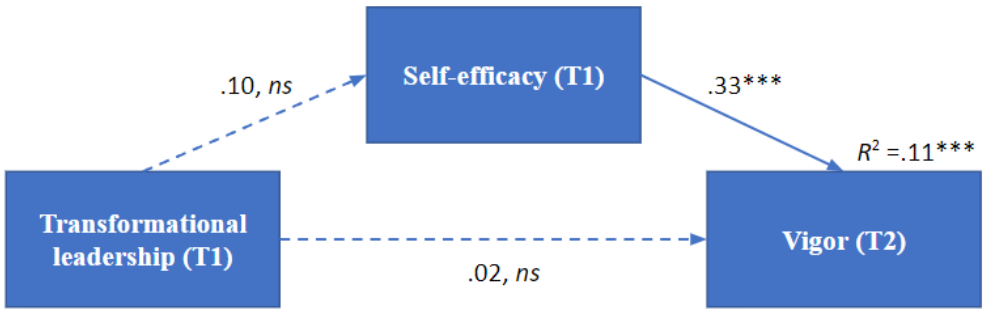


Figure 3

Path Analysis Model of Associations Between Transformational Leadership, Self-Efficacy, and Dedication

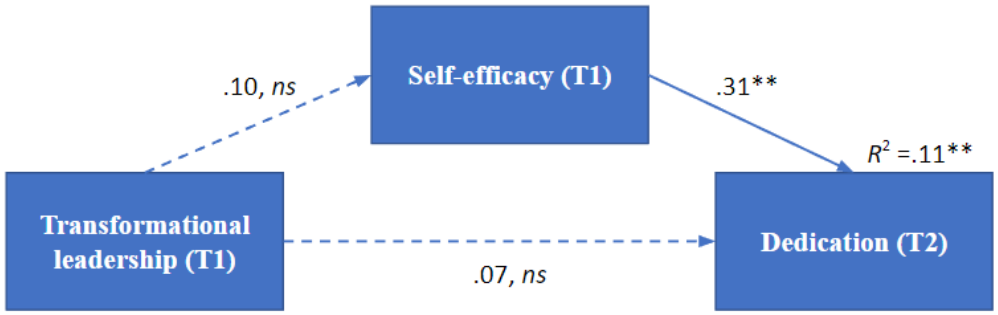
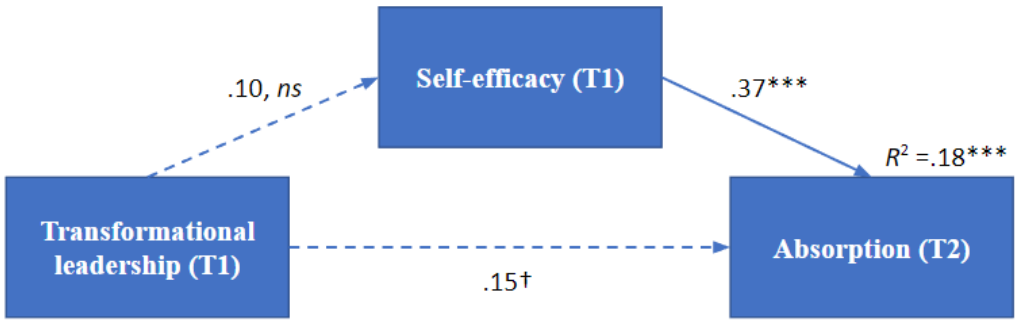


Figure 4

Path Analysis Model of Associations Between Transformational Leadership, Self-Efficacy, and Absorption



Finally, results showed that neither transformational leadership at T1 (r = .04, *ns*) nor self-efficacy at T1 (r = -.03, *ns*) were associated with DHEA(S) at T2. Conversely, there was a positive, albeit marginally significant, association between DHEA(S) at T2 and work engagement, r = .19, p = .05 (see Figure 5), as well as vigor, r = .16, p < .10 (see Figure 6), at T2. A positive and statistically significant association between dedication at T2 and DHEA(S) at T2 also emerged, r = .20, p < .05 (see Figure 7), whereas the association between absorption at T2 and DHEA(S) at T2 was not significant (r = .13, *ns*). Hence, H4 and H5 were not supported, whereas H6 was partially supported.

Figure 5

The Association Between Work Engagement and DHEA(S) at Time 2

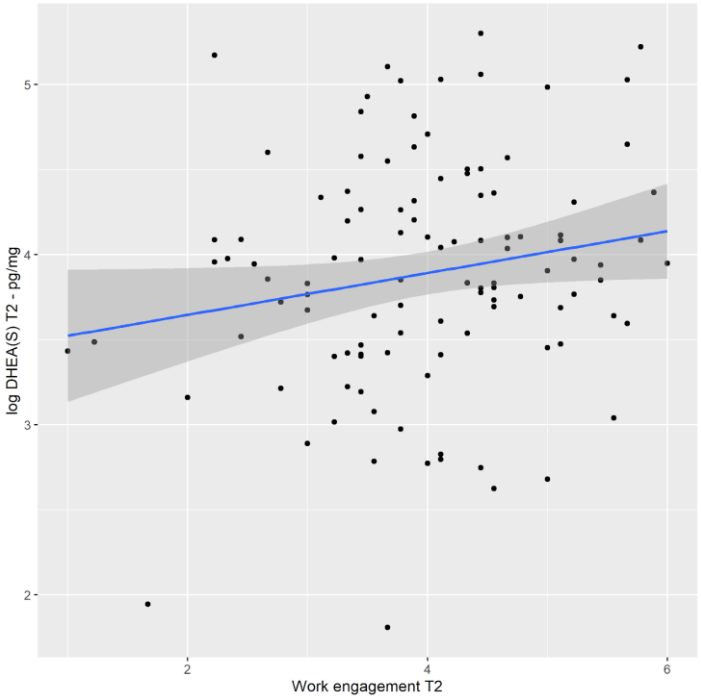


Figure 6

The Association Between Vigor and DHEA(S) at Time 2

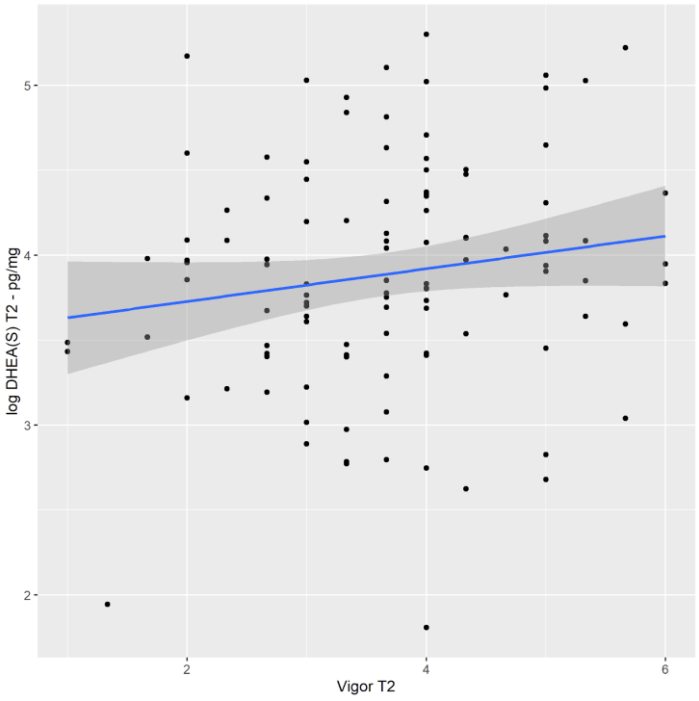
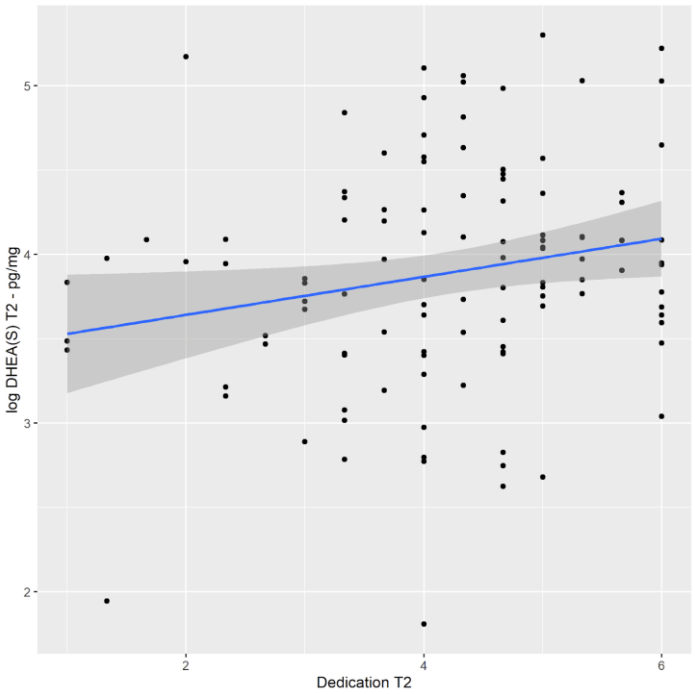


Figure 7

The Association Between Dedication and DHEA(S) at Time 2



Conclusion

Before moving on to final conclusions, it would be beneficial to write about the limitations of this study. In fact, as every work, this study presents some limitations. The first one refers the relatively short timeframe (i.e., three months interval), with the biological samples being collected at two time points. Hence, future studies could adopt a longer timeframe, such as – for instance – a one-year period, with additional, repeated collections of the biological samples. This design could give us more insight into some of the observed relationships. Another limitation could be the difference among occupational sectors: it would be interesting to investigate possible peculiarities and similarities across different type of job, such as, for instance, healthcare workers or office workers. One final limitation that can be found is the relatively small number of participants. Although this number is consistent with previous research and understandable, given the complexity of the longitudinal, multi-method approach, it would be useful to include additional participants, to increase the statistical power and the representativeness of the results.

The goal of this study was to analyse the effects of some protective factors from work-related stress on biomarkers of stress in the hair, including the DHEA(S). Therefore, the ultimate goal was to study how to protect and improve the health of the workers. As already described, transformational leadership style is one of the most studied types of leadership, and studies demonstrated how it can be associated with higher productivity and lower levels of stress at work. Even though this research did not find an association between transformational leadership style and the DHEA(S) biomarker, it was found that this leadership style is positively associated with absorption, a characteristic of work engagement, which has a positive association, albeit marginal significant, with DHEA(S). Perhaps future research can focus on a longer timeframe to discover the possible beneficial long-term effects of transformational leadership style on employees' health. Furthermore, because since transformational leadership has beneficial consequences for the employees, it is necessary to analyse how interventions aimed at fostering this leadership style can be applied in organizations. As McKenna (2020) listed, the major characteristics of

transformational leadership are the charisma, the idealised influence, the intellectual stimulation, and the consideration of the emotional needs of each employee. Given these qualities, it is understandable that the focus and attention turned to their training and development. In organizations, the first obvious step would be to recruit people with leadership potential. However, this is not sufficient, and human resources need to develop a career pattern to provide the new leaders with opportunities to take risks and to learn from failures and successes. According to Kotter (1990), general management courses, workshops, and the creation of external and internal networks are fundamental in developing this leadership style (quoted by McKenna, 2020). Because learning by doing is efficient, Kirkbride (2006) proposed specific workshops to help leaders to develop transformational leadership. These workshops would start with the analysis of the environment of a client organization. The psychologist believed that this step was essential to "link the leadership styles to the strategic realities of the business rather than be seen as just another HR initiative" (Kotter, 1990, p.29). Furthermore, according to this workshop, specific goals need to be developed and monitored (Kelloway & Barling, 2000), and one of the most important step was the coaching sessions. These sessions were designed as a part of the whole leadership intervention, and – as Kakabadse (2002) emphasized the need to provide both internal and external training while developing transformational leadership is essential (quoted by McKenna, 2020). While these trainings increase leadership behaviour, Kelloway and Barling (2000) were interested in whether increasing these leadership behaviours resulted in increases in outcomes of interest to the organization. The results showed that employees of trained leaders became more committed to the organization, and, perhaps more importantly, the financial outcomes increased only in those branches where the leader was trained. Moreover, they suggested small changes to adopt in everyday life. For instance, leaders could take some time to make their decision-making more transparent with the employees, and they could display enthusiasm and optimism to inspire individuals to try harder.

By providing their employees with autonomy and a positive attitude to perform their tasks, these leaders create trust and thereby promote employees' innovative

behaviours and self-efficacy (Scott & Bruce, 1994, quoted by Birasnav, Rangnekar, & Dalpati, 2009). Although self-efficacy was not associated with the DHEA(S) biomarker, it was demonstrated how it can positively influence work engagement, which in turn, as already mentioned, had a positive association with DHEA(S). Practically, high self-efficacy can be beneficial to the workers: research has found that this construct is relevant to sustain the considerable effort required to master some skills that are necessary in the working environment such as, for instance, public speaking. Furthermore, in a dynamic work environment, high self-efficacy helps employees to react more positively and less defensively when receiving negative feedback (Heslin & Klehe, 2006). According to the literature, there can be three ways to achieve high self-efficacy in the working context; the first one would be the action of progressive mastery: in this case the worker breaks down difficult tasks into easier smaller steps to ensure a high level of initial success, and to show him/her that he/she has what it is required to accomplish more difficult tasks. A second action would be role-modelling: in this case the employees observe others perform a task that they are attempting to learn. This task can provide workers with ideas, and it can inspire confidence, since workers can act in a similar, successful manner. The third action that could increase self-efficacy is verbal persuasion. In fact, regardless of its source, verbal persuasion can increase self-efficacy when it is perceived as credible. Moreover, effective verbal persuasion is reinforced with corresponding actions (Heslin & Klehe, 2006). It should be noted that all these three ways can be acted by the employees themselves or by the leaders and managers. Regarding progressive mastery, the employee can think about breaking down a task that looks too difficult, or the leader can choose a coach to guide them through the action. For role modelling, the employee can observe others and learn from their mistakes and successes, or the manager can mentor them or demonstrate the task in front of them. Finally, concerning verbal persuasion, the leader can always inspire their followers and give them rewards. However, the employees themselves must remember to use positive self-talk while learning a new task or doing their jobs.

In relation to the last construct, according to the JD-R model, job and personal resources will trigger a motivational process and will positively influence work

engagement, which, as shown, is the one construct associated with DHEA(S). Consequently, in agreement with the results, one answer for reducing the stress of the employees would be focusing on engaging the employees in their work. As already described, work engagement is commonly defined in terms of vigor, dedication, and absorption. Given its relevance for individual and organizational outcomes, several interventions aimed at increasing work engagement have emerged. According to a systematic review and meta-analysis of Knight, Patterson, and Dawson (2016), 20 interventions exist that can be used for increasing work engagement. This taxonomy includes four types: personal resource building, job resource building, leadership training, and health promoting (quoted by Knight, Patterson, Dawson, & Brown, 2017). In accordance with the JD-R model, personal resources interventions aim to promote positive self-evaluations and resilience. In a study by Van Wingerden, Derks, and Bakker (2017), to increase personal resources, the authors used exercises to increase participants' self-efficacy and resilience. This intervention consisted of three sessions over a period of six weeks and one of the tasks was the practice of giving and receiving feedback, including compliments, which contributed to increasing their self-efficacy. The goal of job resource-building interventions was to increase physical, social, or organizational aspects of the job, such as social support. Regarding leadership training, the third type, these interventions included workshops for leaders. Finally, with respect to the last type, the health-promoting interventions incorporated encouragement to adopt a healthier lifestyle and strategies such as mindfulness (Knight et al., 2017). According with the results of this study, there was an overall positive effect, suggesting the utility of applying these work engagement interventions to an organizational setting.

To conclude, given the positive effects that constructs under investigation can have on health and, in general, on organizational outcomes, it is highly suggested to increase and adopt the aforementioned interventions in an organizational setting. Furthermore, this study, with all its limitations, can pave the way for possible future research that focus on highlighting all the beneficial effects of these constructs on health, possibly in a longer timeframe.

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