DOCTORATE IN PSYCHOLOGY OF HUMAN RESOURCES

Individual mindfulness and objective performance. An experimental approach

DOCTORAL THESIS

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GENERAL INTRODUCTION

"*Like it or not this moment is all we really have to work with*" (Kabat-Zinn, 1994, p.7). The focus on the present moment is the centrepiece of one of the hot topics of scholarship today: mindfulness research. In the last 20-30 years, the concept of mindfulness, an Eastern tradition with roots based in Buddhism, extended its influence within the Western culture, gradually evolving into a secular concept. Although in the next chapter, we further develop on mindfulness' definitions, we must indicate that the most famous definition of mindfulness is the one provided by Kabat-Zinn (1994, p. 4): "*paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally*". However, the definition that best resonates with the content of the present thesis is the one provided by Dane (2011, p. 1000), mindfulness is "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*". In his definition, Dane (2011, p. 1000) highlights three important features of mindfulness (1) state of consciousness, 2) present-moment, and 3) external and internal phenomenon, which defines its essence.

As an indication of the increasing popularity, Glomb et al. (2011) noted that a 2011 Google search on "*mindfulness and work*" generated 1.4 million links, while a Google search on "*mindfulness*" produced more than 6 million links. In January 2023, we observed that the same two searches produced 162 million and more than 229 million hits, respectively. This has even led some people to speak of a "*mindfulness revolution*" in the business world (Stahl & Goldstein, 2010).

One of the most obvious reasons behind this popularity is the physical and psychological benefits of mindfulness (Hyland et al., 2015). Thus, mindfulness practice reduces chronic pain (Kabat-Zinn et al., 1985), multiple sclerosis, fibromyalgia, psoriasis, and human immunodeficiency virus (HIV) (Chiesa & Seretti, 2010), as well as decreases blood pressure, improves breathing rate, and heart rhythm (Wolever et al., 2012). Moreover, Davidson et al. (2003) even found that mindfulness practices could boost the energy levels and the immune system of employees in high-stress demanding jobs. However, as previously said, besides the

physical benefits, mindfulness has benefits across numerous psychological variables, because the majority of its benefits are psychological in nature (Hyland et al., 2015). In this direction, the most common ones are related to reduced stress (Chu, 2010; Davidson et al., 2003; Donald et al., 2016; Jayewardene et al., 2017). Furthermore, mindfulness is associated with reduced anxiety and increased happiness (Davidson et al., 2003), reduced depression (Roeser et al., 2013), and increased subjective well-being (Orzech et al., 2009). Thus, we can affirm that in general, mindfulness seems to improve overall mental health (Chu, 2010).

Besides the aforementioned benefits, mindfulness may also just be the answer to enhancing several features of the workplace. These days, work is experienced more and more demanding and challenging with the promotion of constant availability (Reb & Choi, 2014), so even our breaks from work are connected to technology. Interestingly enough there are authors (Southerton & Tomlinson, 2005) talking about "*time squeeze*" as the perception of a constant lack of time and multitasking. Excessive multitasking can negatively affect organizational performance by increasing stress levels and error frequency, and decreasing the ability to concentrate, think creatively, and make good decisions (McCartney, 1995). To be even more precise, in the United States, stress-related problems were estimated to cost companies approximately 300$ billion every year in employee turnover and absenteeism (Healthline, 2018).

If in the beginning, introducing mindfulness into an organizational setting was seen as a challenge, in the present, things have changed for several reasons. First, the success of the program Mindfulness-Based Stress Reduction (MBSR), developed by Kabat-Zinn led to the development of many mindfulness-based programs (Hyland et al., 2015). The research indicates that mindfulness-based interventions have been associated with many positive effects such as reduced stress (Donald et al., 2016; Sweeny & Howell, 2017), increased work engagement (Leroy et al., 2013), job satisfaction (Hülsheger et al., 2013), resilience (Jha et al., 2010), emotional intelligence (Chu, 2010), and the quality of relationships with others (Baer, 2003). Second, mindfulness offers a different perspective on the concept of attention (Vogus & Sutcliffe, 2012).

Mindfulness exercises focus on concentrative attention (where attention focuses on a specific target, like breath) and receptive attention (where attention includes the present moment, without selecting a particular aspect; Brown, 1977). Third, organizational practitioners apply mindfulness in addressing workplace challenges. Even though it is obvious that mindfulness is included in the workplace, not every organization around the world is adopting a mindfulness program. Anyway, important companies, such as Google, Apple, and General Mills, have implemented aspects of mindfulness into their culture to enhance well-being and effectiveness. Mindfulness practices extend further different other areas including health and healing, caregiving, law enforcement, prisons, education, and personnel development (Hyland et al., 2015).

However, less attention has been paid to the association between mindfulness and individual performance (Dane, 2011), there being a relevant research gap caused by several reasons. First, the majority of research is focused on the health-related outcomes of well-being (Watier & Dubois, 2016; Verhaeghen, 2021). As previously mentioned, a high number of studies suggest the benefits of mindfulness on psychological well-being and psychopathology (Baer, 2003; Chiesa & Malinowski, 2011; Davis & Hayes, 2011). Second, although research supports that mindfulness improves resilience (Jha et al., 2017; Kaplan et al., 2017), job satisfaction (Hofmans et al., 2013; Zivnuska et al., 2016), motivation (Hafenbrack & Vohs, 2018) and reduces employees' emotional exhaustion (Hülsheger et al., 2013), all these results are measured subjectively. The same happens when we look at the studies that measure the relationship between mindfulness and performance. Thus, different studies suggest that mindfulness contributes to job performance (Dane, 2011), academic performance (Jha et al., 2010), task performance (Reb et al., 2017), group performance (Cleirigh & Greaney, 2015), creative performance (Zheng & Liu, 2017), sports performance (Röthlin et al., 2016), safety performance (Zhang et al., 2013). Nevertheless, there is a lack of studies regarding the influence of mindfulness on objective performance. Third, there is considerable variance in descriptions of

mindfulness in the organizational theory literature (Weick et al., 1999). Scholars are having difficulty translating mindfulness into a clear operationalized construct. Fourth, definitions of mindfulness refer to a state of consciousness, but mindfulness can also be understood as a personality trait (Dane, 2011), thus, because of dispositional tendencies, some people may be in a mindful state of consciousness more often than others may be (Giluk, 2009). Fifth, in terms of criterion-related validity for mindfulness scales, there is a genuine problem of introspective limits (Quickel et al., 2004). Some studies argue that Western mindfulness scales do not capture the Buddhist nature of the phenomenon and may be capturing intervention effects in acceptance of distressing feelings, present moment awareness, and attentional training rather than mindfulness as understood in a Buddhist context (Grossman, 2011; Wong et al., 2018). Sixth, the results concerning the relationship between trait mindfulness and performance, as well as the relationship between state mindfulness and performance are contradictory. More specifically, while some studies support these relationships (Geisler et al., 2017; Larson et al., 2013; Lin et al., 2018; Moore & Malinowsky, 2009; Polak, 2009), other investigations do not support these same relationships (Calma-Birling & Gurung, 2017; Johnson et al., 2015; Keith et al., 2017; Quickel et al., 2014).

These results clearly indicate that more research is needed to determine when and for whom mindfulness can improve performance (Dane & Brummel, 2014).

Thus, when we take a closer look at the relationship between mindfulness and performance, we see that the research is underdeveloped (Dane, 2011). Dane and Brummel (2014) suggest that mindfulness seems to be associated with more philosophical experiences than scientific ones. In the same line, in a recent meta-analysis, Verhaeghen (2021) still indicates the fact that the majority of the studies are focused on the effects of mindfulness on well-being. As an attention-related concept, research must continue exploring mindfulness in relation to performance to assure a more realistic perspective of its potential in the organizational environment. More specifically, to reach a state of consciousness implies the effort one has to

make to direct their attention toward the task their performing. The majority of the existing investigation (Bishop et al., 2004; Dane, 2011; Quickel et al., 2014) suggests that present-focused attention is a central feature of mindfulness. Therefore, how one directs attention affects the outcome of the task or, according to Nadkarni and Barr (2008) affects how one takes strategic decisions. However, performing well requires not only paying attention to the present moment but also actively applying one's intentions (Ajzen, 1991). Hence, according to Chatzisarantis and Hagger (2007), mindfulness may be the resource that facilitates the implementation of intentions into action.

Nevertheless, to provide this realistic perspective it is mandatory to distinguish between trait and state mindfulness not only to ensure an accurate measurement of this concept but also an integrated view of the beneficial outcomes. We know that even though trait and state mindfulness are related, in that individuals with high trait mindfulness are more receptive to experiencing momentary mindfulness, their effects are independent (Brown & Ryan, 2003). We also know, from a theoretical standpoint, that mindfulness is related to attention (Watiers & Dubois, 2016) but we still have a limited understanding of when this relationship appears; if mindful individuals perform better (considering objective indicators); or in which way they perform better (more accurate, faster). Therefore, maybe the characteristics of the task can moderate the effects of mindfulness on performance, or maybe when we take both trait and state mindfulness into consideration, the interaction between both of them can influence the outcomes.

Thus, the general objective of this doctoral thesis is to contribute to further understanding of the relationship between individual mindfulness and objective performance. Our investigation is focused on two main approaches. First, the distinction between trait and state mindfulness. Second, to investigate more broadly the effects of individual mindfulness on performance through objective indicators. With these approaches in mind, we want to (1) address the emergence of mindfulness in the workplace and see the gaps in the literature (2) to

test whether trait mindfulness is associated with objective performance while taking into consideration the moderating role of task complexity; and (3) to test whether state mindfulness is associated with objective performance while taking into consideration the moderating role of trait mindfulness and the moderating role of task complexity. Thus, through our above-mentioned objectives, we want to contribute to the literature on mindfulness by addressing this concept in relation to performance and by offering new insights into its usage in different performance situations.

We address our objectives through three studies, with two of them being carried out in a laboratory-controlled setting to assure not only a higher level of control of our variables but also specific results regarding the influence of individual mindfulness on objective performance. In the first research study, we address the emergence of mindfulness in the workplace, and we provide an overview of what mindfulness is, where the concept originated, its antecedents, and its beneficial and practical consequences in organizational and occupational settings. This study was a review that helped us see the major gaps that needed to be addressed in the area of individual mindfulness and performance (Study 1). The second study is based on an experimental design and investigated the relationship between trait mindfulness and individual objective performance and the moderating role of task complexity. Specifically, four objective indicators of performance are studied: accuracy, reaction time, variability in reaction times, and detection of unexpected stimuli. We expected that the higher trait mindfulness, the better the objective performance (Study 2). The third study, also an experimental one, investigated the relationship between state mindfulness and objective performance, and besides the aforementioned objective indicators of performance, we added rigidity scores. Moreover, we wanted to test the moderator role of trait mindfulness in the relationship between state mindfulness and objective performance and we also wanted to test the moderator role of task complexity (Study 3).

In the subsequent sections, more specifically in Chapter I, we include the fundamental aspects of individual mindfulness, such as, its relevance for organizations, as well as, what we know so far regarding mindfulness as a concept in organizations. We continue with its origins, definitions, characteristics, implications, and measures. We then move on to a theoretical review of the concept of individual performance (Chapter II). Chapter III describes the objectives of this thesis and the methodology applied in each study presented within this thesis. The three studies carried out for this thesis are found in Chapters IV, V, and VI. Our first study (Chapter IV) is a revision that helped us acknowledge the gaps concerning the concept of individual mindfulness. In Chapter V, we expand our understanding of the relationship between individual mindfulness and objective performance by focusing on the relationship between trait mindfulness and the outcome component of performance evaluated with objective indicators. We also explore the moderating role of task complexity. In the next chapter, Chapter VI we investigate the relationship between state mindfulness and the outcome component of performance evaluated with objective indicators and the moderating role of trait mindfulness and task complexity in the relationship between state mindfulness and objective performance. Finally, in Chapter VII, we discuss the theoretical and practical implications of the findings of this doctoral thesis and in Chapter VIII we outline the main conclusions that can be drawn from our work.

CHAPTER I: INDIVIDUAL MINDFULNESS

1.1. Introduction

This chapter will present and try to explain the growing interest in individual mindfulness in organizations. Structurally, in this chapter, we begin addressing the emergence of mindfulness in the workplace and comment on what we know so far regarding this subject. Then, we go back to the roots and see the evolution of mindfulness from its religious context in the East to the modern West. We continue with definitions of this construct, and then we try to understand the impact of mindfulness on human functioning so that we can understand its impact on organizations. Finally, we conclude with the methodological challenges of the mindfulness scales.

1.2. Why should organizations care about mindfulness?

Current workplace mindfulness research and interventions suggest that learning mindfulness will have beneficial effects on people and organizations (Rupprecht et al., 2019). So, why should mindfulness practice produce significant changes in workplace experience, or lead to overall better outcomes?

The same authors, Rupprecht et al. (2019), say that just because people are encouraged to practice mindfulness this does not guarantee positive outcomes in the workplace. Therefore, to understand mindfulness in the context of organizations we must see mindfulness as an organization-level variable. Regarding this aspect, Dane and Brummel (2014) outline that is important to clarify the difference between individual mindfulness in organizations and its characteristics in different non-organizational settings.

Furthermore, it is important to clarify that the increasing popularity of mindfulness in academia leads to the appearance of a new concept, such as organizational mindfulness (Weick et al., 1999). Organizational mindfulness or collective mindfulness is a concept designed in relation to high-reliability organizations (HROs) that explains how this kind of organization can avoid catastrophic consequences and perform in a nearly error-free manner (Weick et al., 1999; Weick & Sutcliffe, 2001). This distinction between these two concepts (individual mindfulness

and organizational mindfulness) is important because as suggested by Chandwani et al. (2016), individual mindfulness is a tool for fostering organizational mindfulness. This explanation can be deducted from the fact that individual mindfulness is an intrapsychic process, whereas organizational mindfulness is a set of organizational and social processes and structures set up by the organization to obtain specific goals (Kelemen et al., 2020). Therefore, reaching organizational mindfulness implies the presence of individual mindfulness, while reaching individual mindfulness does not need the presence of organizational mindfulness (Kelemen et al., 2020). In this doctoral thesis, we are interested in the study of individual mindfulness (not organizational mindfulness).

Nevertheless, research on mindfulness shows that there is ongoing increased interest from organizational practitioners in applying mindfulness to address workplace issues. Reb and Choi (2014) explain that mindfulness in the modern work environment contains features that make it an appealing proposition to organizations. Furthermore, as we have already mentioned, the degree of accessibility has nurtured a culture where the expectation for immediate answers affects the work and home life balance (Reb & Choi, 2014). Thus, concepts such as "*time squeeze*" and frequent and excessive multitasking may result in lower performance and lead to health issues (Hallowell, 2005). However, other studies indicate that individuals performing multitasking can increase productivity in the military (Shanker & Richtel, 2011) and in healthcare (Chisholm et al., 2000).

With all of these working challenges, mindfulness-inspired programs are seen as tools to overcome the aforementioned problems. As mindfulness-training programs are increasingly applied, researchers should evaluate qualitatively and quantitatively the content and the structure of these programs. The success of mindfulness programs depends not only on their theoretical background but also on the instructors' experience and several individual variables. For instance, individual variables, such as personality traits, mental models, and dispositions can affect the efficacy of mindfulness interventions (Hyland et al., 2015). Therefore, organizations

should seek to understand how mindfulness training interacts with these variables. In the same manner, cultural differences may also affect the success of mindfulness programs when implemented internationally or with employees who hail from international backgrounds (Christopher et al., 2009). Hence, it is important to consider all these aspects to know when and with whom to utilize mindfulness training to achieve positive outcomes.

But, what do we know so far about mindfulness in the workplace? Clarifying this question will be our aim during the next section.

1.3. Individual mindfulness in organizations. What do we know so far?

We know that mindfulness in organizations has been associated with many positive effects on health and psychological well-being (Good et al., 2016). Thus, a series of quantitative studies have found that individual mindfulness is a way to decrease stress work levels and improve general well-being (Donald et al., 2016; Jayewardene et al., 2017; Zołnierczyk-Zreda et al., 2016). Nevertheless, mindfulness is important not only for the reduction of stress but also for strengthening the personal resources of work engagement. To be more specific, mindfulness is context-free, while work engagement is context related to the work situation, reflecting how workers experience their work (Tuckey et al., 2018). In this direction, research has demonstrated that mindfulness can be linked to feelings of engagement (vigour, dedication, absorption) in one´s daily work (Leroy et al., 2013) and engagement among restaurant servers (Dane & Brummel, 2014). Langer and Moldoveanu (2000) even sustain that mindfulness can foster engagement by helping individuals see existing activities in novel and more interesting ways. Mindfulness has also been linked with resilience (Jha et al., 2017; Kaplan et al., 2017; Roche et al., 2014), with job satisfaction (Hofmans et al., 2013; Zivnuska et al., 2015), and motivation (Hafenbrack & Vohs, 2018; Levesque & Brown, 2007). Other studies point out as the benefits of mindfulness reduced employees' emotional exhaustion (Hülsheger et al., 2013), higher levels of emotional intelligence (Chu, 2010), and even improved quality of the relationships with others (Brown et al., 2007). In the same line, Davidson et al. (2003) also suggest that employees' moods

and happiness increased after applying for a mindfulness program. Accordingly, Orzech et al. (2009) found enhanced subjective well-being among participants in a mindfulness intervention, while, other studies, (Allen & Kiburz, 2012; Michel et al., 2014) also sustain that mindfulness can boost the work-life balance among employees.

Further research also suggests that mindfulness is likely to be associated with job performance (Dane & Brummel, 2014; King & Haar, 2017), academic performance (Calma-Birling & Gurung, 2017; Shao & Skarlicki, 2009), organizational citizenship behaviour (Reb et al., 2013) and with low counterproductive performance or deviant behaviour in the workplace (Reb et al., 2013). Bond and Bunce (2003) also found that employees' capacity to accept their emotions and thoughts predicted higher levels of work performance a year later. Although this is positive in some situations, Ericson et al. (2014) suggest that influencing employees to act accordingly to their values, may trigger behaviours that do not promote workplace performance. For instance, mindfulness may help individuals realize to have a more relaxed attitude toward work and spend more time doing personal activities than work responsibilities (Hyland et al., 2015). Hence, is mandatory to understand when and for whom mindfulness works.

Moreover, mindfulness is also associated with safety performance (Zhang & Wu, 2014; Zhang et al., 2013). In this direction, mindfulness is expected to improve performance by making individuals not only more aware of their surroundings but also helping them see everything as if for the first time (Zhang & Wu, 2014). Research has also found that mindfulness practice leads to increased attention-related behavioural responses (e.g., spatial orienting) as well as the ability to be selectively attentive (Jha et al., 2007), and even improved working memory capacity (Jha et al., 2010).

As we can see, mindfulness has numerous well-being-related benefits, with more than 26 systematic reviews examining these benefits (Chiesa & Malinowski, 2011). However, if we compare the studies that investigate mindfulness in relation to well-being benefits with the research studying the impact of mindfulness on cognitive functioning, we observe that the latter

is still underdeveloped (Verhaeghen, 2021; Watier & Dubois, 2016). Therefore, research falls short in this direction. This is an important gap because introducing mindfulness in organizations can benefit people not only at an organizational level but also at a personal level (Hyland et al., 2015).

Nevertheless, taking a closer look at the few studies that focus on mindfulness in organizations, we observe another gap. All the obtained results are subjective, indicating the effect of mindfulness on the perceptions of individuals' behaviours. This means that they do not allow us to draw objective conclusions regarding the influence of mindfulness on performance. Thus, with such limited insight, the organizational literature does not provide objective support for the effects of mindfulness on the selected variables.

These gaps must be addressed to clarify and get support for the potential of mindfulness in the organizational context. However, before trying to solve the aforementioned gaps, it is mandatory to look back to mindfulness roots to understand how this construct arrived in the organizational context.

1.4. Origins of individual mindfulness

Research on mindfulness is an ongoing topic of trying to clarify what we are referring to when applying the notion of mindfulness. To have a clear answer it is mandatory to go back to the roots and see the evolution of this concept from its religious context in the East to the modern West.

As mentioned above, mindfulness has its origin in Buddhist teachings in the ancient East. The oldest written reference for the notion of mindfulness, *sati* in the Pali language can be found in the *Pali Canon* of the oldest Buddhist school, Theravada (Schmidt, 2011). However, according to Cousins (1996), its roots stretch back even further as part of the Brahmanic traditions in the Indian subcontinent. *Sati* is often translated as "*bare attention*" but in the Buddhist tradition, it has a wide meaning and utilization. For instance, Salzberg (2008) outlines that the term "*bare*" refers to perceiving the object of observation, rather than interacting with

it. In addition, according to Analayo (2004), a Theravadin monk and scholar, the word *sati* comes from the verb *sarati*, which means "*remember*". Therefore, *sati* is meant as awareness of the present moment, which, in turn, aids memory. Present moment awareness and memory complement each other because for achieving *sati* the mind must be in the present moment.

Even though all these meanings suggest the idea of a theoretical notion, it is mandatory to outline that mindfulness or *sati* is based on experience (Schmidt, 2011). This concept changes according to the practice and experience of each person. Therefore, the ancient Eastern context of mindfulness insists on the idea that the practice of mindfulness is not just a solitary meditation technique performed to have a period of silence, but it is part of a larger spiritual path with the goal of compassion for all living beings and liberation. In other words, in the Eastern context, mindfulness is the capacity to perceive things as they truly are with an attitude of curiosity and an intention of compassion.

After 2500 years, as an important concept without much change in the Eastern Buddhist tradition, the concept was introduced into modern Western culture. The idea of mindfulness was introduced in the West by several sources, but according to Schmidt (2011), the most important ones were:

1) Insight Meditation Society (IMS) in Barre, Massachusetts, USA by Jack Kornfield, Joseph Goldstein, and Sharon Salberg in 1974. IMS offered Theravada Buddhism and the *Vipassanā* practice with some of its original religious context in the United States.

2) Mindfulness-Based Stress Reduction (MBSR) is an 8-week programme for chronic pain developed by Jon Kabat-Zinn (1990). This course contains techniques of mindfulness, but not the Buddhist context as presented above.

3) Vipassana is an ancient tradition that extends back to Buddha. However, in 1969, the 10-day *vipassanā* meditation retreats were taught by S. N. Goenka and his followers. This organization had meditation centres all over the world and participants were asked to comply with several ethical guidelines taken from the *pali canon*. This meditation

programme included techniques, such as the mindfulness of breathing and mindfulness of the body sensations or body-scan.

Above, we addressed the main sources of propagation of mindfulness in the Western culture, but it is important to also consider the interest of the people in mindfulness. For instance, Huber (2007) outlines, as a source of interest, the accessibility in our days to select from an impressive number of religious spiritual teachings and services. Schmidt (2011) includes that modern society is constantly changing, bombarding us with demands and information, therefore, many people wish to find an inner guide on how to stand in the face of these demands. In accordance with this idea, Pepping et al. (2016) found that most of the participants in their study began practicing mindfulness meditation to reduce negative emotional experiences, manage their emotions more effectively, and feel calmer, and these same reasons were the explanation for the continued practice of mindfulness meditation. Very few participants in their sample reported practicing mindfulness for its original purpose, namely spiritual or religious reasons.

It is clear the interest in this topic, but in the Western context, the ongoing diffusion of the notion of mindfulness without a proper definition of the context in which the term is used turned eventually into a mix of ideas and meanings. According to Schmidt (2011), mindfulness may refer to:

1) a meditation;
2) a concept from Buddhist teachings;
3) an attitude towards one's daily actions (informal mindfulness);
4) a psychological concept originating from Buddhist teachings but defined according to the terms of Western psychological science;
5) a process of drawing novel distinctions where the whole individual is involved (Langer, 1989);
6) the noun related to the adjective 'mindful' and its everyday life meaning.

From the above analysis, it can be concluded that the concept of mindfulness, from the ancient East to the modern West, has changed. Differences between these two approaches, like the translation process (many *Pali* words do not have an exact translation into modern languages) or the secularized form of practice (MBSR, Kabat-Zinn, 1990; one of many examples) sustain the emergence of a new culture of mindfulness. In addition, Schmidt (2011) insists that the growing interest in mindfulness and meditation will continue experiencing transformations, driven by the needs of our modern culture.

So, this leads us back to one fundamental question: what is mindfulness?

1.5. What is individual mindfulness?

With its increasing popularity, scholars have difficulty translating mindfulness into a clear operationalized construct. As aforementioned, there is an ongoing debate between the scientific approach and the Buddhist approach, with the latter being concerned that scientists are eliminating the true meaning of mindfulness (Schmidt, 2011). The certain fact is that individual-level mindfulness does not have a single accepted definition. Therefore, it is important to expose several conceptualizations of mindfulness (see Table I. 1) to have a clear view of the similarities and differences between them. For precision, we include each definition, the author/s, and the domain.

Table I. 1.

Definitions of mindfulness

Authors	Domain	Definition
Bishop et al. (2004, p. 234)	Academia	"A process of regulating attention in order to bring a quality of non-elaborative awareness to current experience and a quality of relating to one's experience within an orientation of curiosity, experiential openness, and acceptance"
Brown et al. (2007, p. 212)	Academia	"A receptive attention to and awareness of present moment events and experiences"

Dane (2011, p. 1000)	Academia	"A state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally"
Epstein (1995, p. 96)	Academia	"Bare attention in which moment-to-moment awareness of changing objects of perception is cultivated"
Gunaratana (2011, p. 85)	Buddhism	"Mindfulness sees things as they really are. It adds nothing to perception and it subtracts nothing. It distorts nothing. It is bare attention and just looks at whatever comes up"
Hanh (1976, p. 11)	Buddhism	"Keeping one's consciousness alive to the present reality"
Harvey (2000, p. 38)	Academia	"A state of keen awareness of mental and physical phenomena as they arise within and around [oneself]"
Herndon (2008, p. 32)	Academia	"Being attentively present to what is happening in the here and now"
Hülsheger et al. (2014, p. 1114)	Academia	"A state of consciousness in which individuals pay attention to the present moment with an accepting and non-judgmental attitude"
Kabat-Zinn (1994, p. 4)	Academia	"Paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally"
Langer (2014, p. 11)	Academia	"An active state of mind characterized by novel distinction-drawing that results in being (*a*) situated in the present, (*b*) sensitive to context and perspective, and (*c*) guided (but not governed) by rules and routines"
Lau et al. (2006, p. 1447)	Academia	"A mode, or state-like quality, that is maintained only when attention to experience is intentionally cultivated with an open, non-judgmental orientation to experience"
Mikulas (2011, p.5)	Academia	"Mindfulness, as a behaviour of the mind, is the active maximizing of the breadth and clarity of awareness. It includes moving and sharpening the focus of awareness within the field of consciousness"
Nyanaponika (1972, p. 5)	Buddhism	"The clear and single-minded awareness of what actually happens to us and in us at the successive moments of perception"

Table I. 1.

Definitions of mindfulness (cont.)

Authors	Domain	Definition
Rosch (2007, p. 259)	Academia	"A simple mental factor that can be present or absent in a moment of consciousness. It means to adhere, in that moment, to the object of consciousness with a clear mental focus"
Ruedy and Schweitzer (2010, p. 73)	Academia	"An individual's awareness, both internally (awareness of their own thoughts) and externally (awareness of what is happening in their environment)"
Thondup (1996, p. 48)	Academia and Buddhism	"Giving full attention to the present, without worries about the past or future"
Weick and Sutcliffe (2006, p. 518)	Academia	"Eastern mindfulness means having the ability to hang on to current objects, to remember them, and not to lose sight of them through distraction, wandering attention, associative thinking, explaining away, or rejection"

Perhaps, the most known definition of mindfulness from the ones presented above is the one formulated by Kabat-Zinn (1994, p. 4): "*paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally*". In other words, mindfulness implies paying attention to whatever is coming your way, engaging with those impressions, and noticing them. Mindfulness is choosing where you put your attention and keeping it there, on purpose. So, you decide consciously.

As we can see, common across these definitions is the observation that mindfulness is a particular state of consciousness, in which an individual focuses attention on present-moment events. We must highlight that Dane (2011) did one of the first attempts to clarify the concept of mindfulness. Dane (2011, p. 1000) formulated the definition "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*" starting from eleven definitions of mindfulness. These definitions were from

Buddhism (Hanh, 1976; Nyanaponika, 1972; Thondup, 1996) and some others from academia (Brown et al., 2007; Epstein, 1995; Harvey, 2000; Herndon, 2008; Kabat-Zinn, 2005; Lau et al., 2006; Rosch, 2007; Weick & Sutcliffe, 2006), and lead to the conclusion that three features were common to most of them. First, mindfulness is a state of consciousness. It is not a quality, that some individuals possess and others lack, being an inherent human capability. Second, the state of consciousness characterizing mindfulness consists of focusing attention on present-moment phenomena. Focusing attention on the present moment is a mandatory condition for mindfulness (Gärtner, 2013). Thirdly, this state of present-moment awareness involves attending not only to the external phenomena (the environment) but also to the internal ones (intrapsychic processes).

Despite the similarities across these definitions of mindfulness, there also are differences. First, most definitions differ on whether mindfulness consists only of focusing attention on the present-moment events or if additional features characterize mindfulness (Sutcliffe et al., 2016). For instance, attending the present-moment events must be non-judgmental (Bishop et al., 2004; Hülsheger et al., 2014; Lau et al., 2006; Mikulas, 2011). What we try to accomplish with mindfulness is to look at the present moment objectively. To do this, we need to momentarily suspend our preconceived notions about how we think things are or how we think things should be. The view of mindfulness as non-judgmental aligns with the Buddhist tradition that emphasizes the importance of adopting an open and accepting attitude towards the events one encounters (Bishop et al., 2004), refraining from making judgements or evaluations and thus maintaining a non-judging stance. Second, a different line of research pioneered by Langer defines mindfulness as "*an active state of mind characterized by novel distinction-drawing that results in being (1) situated in the present; (2) sensitive to context and perspective; and (3) guided (but not governed) by rules and routines*" (Langer, 2014, p. 11). For Sutcliffe et al. (2016) this approach to mindfulness is different in its focus on drawing distinctions and is more directly tied to creative thinking than to Eastern perspectives on the concept. As

Hyland et al. (2015) also recognise this is an alternative definition that understands mindfulness as an "*active information processing*" mode (Langer, 1989, p. 138), which requires categorizing, judging, and problem-solving, activities that are inconsistent with concepts like acceptance and non-judging.

Mindfulness has been defined as a state in terms of practiced meditation (Lau et al., 2006), but it also has been defined as a trait in terms of one's predisposition to be mindful in daily life (Baer et al., 2006). However, we must outline that mindfulness is a psychological state and its appearance is not necessarily determined by meditation or by brief mindfulness exercises (Brown & Ryan, 2003). In this direction, although trait and state mindfulness are later explained and clarified in all three of our studies, we consider it relevant to define these constructs in the following lines because as indicated above, mindfulness is a complex construct. Thus, state mindfulness is the extent to which an individual is currently aware of and paying attention to stimuli occurring in the present (Brown & Ryan, 2003) and trait mindfulness is the duration, frequency, and intensity with which an individual tends to engage in states of mindfulness (Hülsheger et al., 2013). According to mindfulness-based interventions and Buddhist-based theories, individuals can increase trait mindfulness through state mindfulness (Davidson, 2010; Kiken et al., 2015).

To summarize, there is not a single definition of mindfulness; most of them share the three common features mentioned above, but there are also differences. The increasing number of definitions of mindfulness shows the importance of determining when and for whom mindfulness can enhance specific results, so that we can better understand this phenomenon.

1.6. The impact of individual mindfulness on human functioning

It is mandatory to consider the effects of mindfulness on human functioning so we can understand how this construct might affect the organizations and eventually the performance. In this vein, several studies (Good et al., 2016; Mrazek et al., 2013; Quaglia et al., 2015) show

that mindfulness has important effects on a) attention; b) cognition; c) emotion; d) behaviour and e) physiology.

Attention. The research shows that mindfulness improves three characteristics of attention (stability, control, and efficiency). For instance, mindfulness can stabilize attention in the present (Smallwood & Schooler, 2006) with both trait (Mrazek et al., 2012) and state mindfulness (Rahl et al., 2017) reducing mind wandering. In other words, increased attentional stability can be seen by noticing the mind wandering and making the decision to return to present moment awareness (Hasenkamp et al., 2012). Furthermore, mindfulness also supports attentional control by reducing attention to distracting information (Tang et al., 2007). Attentional control suggests appropriately directing attention amid interruptions (Ocasio, 2011). Moreover, Cahn et al. (2013), showed through neurological findings more effective attentional control from experienced meditators. Last, but not least, mindfulness also supports attentional efficiency, assuring an economical use of cognitive resources (Tang et al., 2015) with long-term meditators reporting less effort in engaging in attention.

Cognition. Smallwood and Schooler (2006) link mindfulness with cognitive capacity (working memory and fluid intelligence) and cognitive flexibility. Different investigations (Mrazek et al., 2013; Roeser et al., 2013) indicate that mindfulness increases working memory capacity, even after controlling for general intelligence (Ruocco & Direkoglu, 2013). Moreover, both trait and state mindfulness support cognitive flexibility (Ding et al., 2015; Ostafin & Kassman, 2012) with research suggesting that mindfulness improves the ability to search for new perspectives.

Emotion. Mindfulness seems to influence emotions through attention (Wadlinger & Isaacowitz, 2011), more specifically, mindfulness appears to influence the selection of the stimuli for observation and alters how one evaluates those stimuli. According to Keng et al. (2013), mindfulness appears to speed recovery from negative emotions after a mood induction exercise. Moreover, mindfulness appears to influence reactivity to emotional stimuli,

specifically, individuals with high trait mindfulness present reduced negative affect after stressors (Arch & Craske, 2010). Reduced reactivity to emotional stimuli can be explained by changes in emotional appraisal fostered by mindfulness. As mindful individuals see their experiences in a non-judgmental manner and more objectively, more evaluations that are neutral appear to occur (Hülsheger et al., 2014). Interestingly enough, mindfulness training also influences the emotional tone (overall positivity or negativity of emotions) with less negative and more positive emotional tone (Eberth & Sedlmeier, 2012), which can be important to daily workplace climate.

Behaviour. Glomb et al. (2011) suggest that mindfulness is linked with self-regulation of behaviour and a key mechanism to explain this link is reduced automaticity. Therefore, by providing awareness of automatic operations and usual behaviours, mindfulness assures a degree of selectiveness over whether to allow the automatic responses to regulate or not the behaviour. For instance, mindfulness practice has been used to help individuals quit smoking (Westbrook et al., 2013) and reduce eating compulsions (Papies et al., 2014). Good et al. (2016) indicates that the processes involved are unclear, but it is assumed that mindful attention creates a gap between stimulus (e.g., a cigarette) and the usual response (to smoke), which enables awareness and with that, a behavioural regulation (e.g., "I will take a walk instead of smoking").

Physiology. Given that the focus of this present doctoral dissertation is on the workplace, we will only briefly mention the physiological impact of mindfulness. For instance, mindfulness is connected to neurobiological mechanisms involved in stress regulation (Creswell & Lindsay, 2014). These effects are linked with both trait and state mindfulness, with outcomes such as improved sleep quality (Hülsheger et al., 2014). Mindfulness is also connected with changes in the brain (neuroplasticity), with mindfulness training altering brain regions associated with attention, memory, self, and emotion regulation (Fox et al., 2014). Moreover, mindfulness is associated with the aging process, with investigations (Luders et al., 2015)

indicating that experienced meditators show fewer age-related degradations in the neural tissue.

In conclusion, the impact of individual mindfulness in all these major domains of human functioning presents us with possible explications for the influence of this construct in the workplace. Therefore, taking into consideration all these aspects of mindfulness, we must look at the instruments to choose the adequate ones for the measurement of trait and state mindfulness.

1.7. Measuring individual mindfulness

A reliable and valid measurement of mindfulness is fundamental for empirical investigation. However, current mindfulness scales differ by focusing on certain aspects of the mindfulness construct (Bergomi et al., 2013a). In this diversity, an important role is played by the complexity of the concept of mindfulness, as we have stated previously. In the literature, several self-report questionnaires have been applied and validated, representing a practical way to address certain mindfulness features. These self-report questionnaires include trait measures and state measures. Thus, in the moment of selecting an instrument, it is important to consider how one approaches mindfulness conceptually (Sutcliffe et al., 2016).

Over the last decade, researchers have developed at least ten mindfulness self-report questionnaires.

Most of the scales applied in psychological research are for measuring *trait* mindfulness:

1. The Mindful Attention Awareness Scale (MAAS; Brown & Ryan 2003);
2. The Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman et al., 2007; Hayes & Feldman 2004), measures 4 different sub-dimensions (Attention, Present-focus, Awareness, and Acceptance);

3. The Kentucky Inventory of Mindfulness Scale (KIMS; Baer et al., 2004) measures 4 different sub-dimensions (Observing, Describing, Act with awareness, and Accept without judgment.);
4. The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) measures Observing, Describing, Acting with awareness, Non-judging, and Non-reactivity.
5. The Freiburg Mindfulness Inventory (FMI; Buchheld et al., 2001; Walach et al., 2006);
6. The Philadelphia Mindfulness Scale (PHLMS; Cardaciotto et al., 2008) with two subscales (Present moment awareness and Acceptance);
7. The Southampton Mindfulness Questionnaire (SMQ; Chadwick et al., 2008);
8. The Langer Mindfulness Scale (LMS, Pirson et al., 2012), includes 4 subscales (Novelty producing, Novelty seeking, Engagement, and Flexibility).

Two additional scales are applied in psychological research for measuring *state* mindfulness:

9. The Toronto Mindfulness Scale (TMS; Lau et al., 2006), is made up of two subscales (Curiosity and Decentering);
10. The State Mindfulness Scale (SMS, Tanay & Bernstein, 2013) with two subscales (State Mindfulness of Mind and State Mindfulness of Body).

As we have already mentioned, these scales differ with respect to fundamental aspects of the mindfulness construct, therefore, it is advisable to take into consideration this aspect. For instance, some scales measure mindfulness focusing on one component (FMI; MAAS; SMQ), other scales measure mindfulness focusing on two-components (SMS; TMS; PHLMS) and some scales measure mindfulness as a multifaceted construct (CAMS-R; FFMQ; KIMS; LMS).

All these self-report measures are applied in the research; however, concerns regarding differential item understanding and taxonomy are an ongoing debate (Bergomi et al., 2013a; Quickel et al., 2014). While most scales focus on attention or awareness, comparisons reveal differences. Thus, even if mindfulness is measured as a multifaceted construct, for

instance, facets are distinct in the KIMS but overlap in the FMI and cannot be clearly distinguished through factor analysis (Leigh et al., 2005). Moreover, Quickel et al. (2014) outline the difficulty of comprehending the construct of mindfulness in terms of criterion-related validity for mindfulness scales. Their study concludes that these scales measure how mindful participants think they are, and maybe this perceived mindfulness is not related to the attention that actual mindfulness is supposed to have.

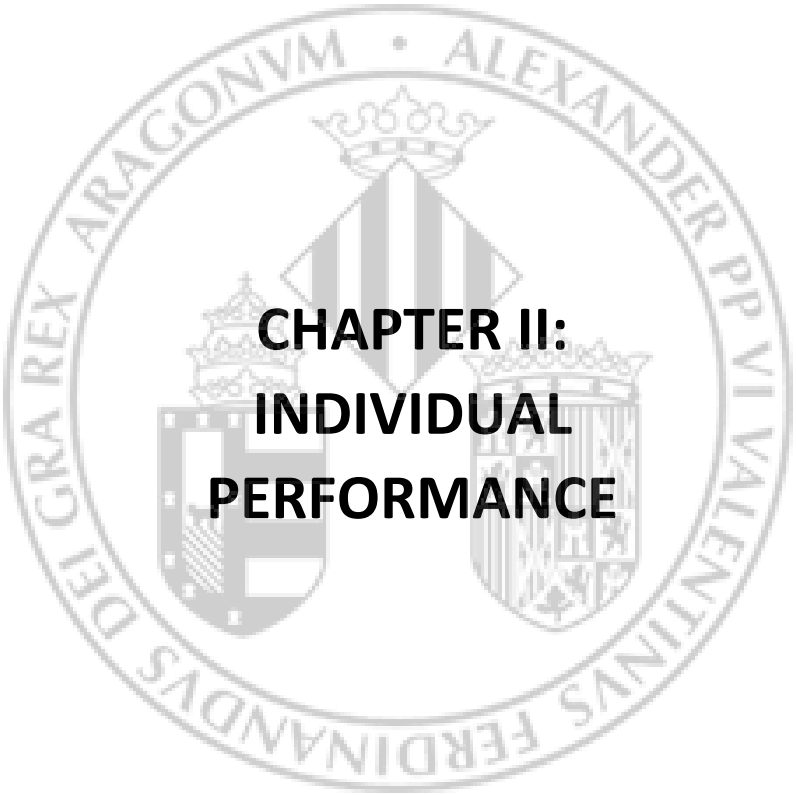
The fact is that these current scales offer advantages and disadvantages, caused by the lack of consensus regarding which aspects of mindfulness must be included in a scale (Bergomi et al., 2013a). In addition, Malinowski (2008) suggests that maybe the problem with the measurement of mindfulness is that the scales rely on declarative knowledge, while it may not be justified to assume that the quality of mindfulness practice can be fully expressed in this manner.

However, given the increasing popularity and relevance of mindfulness, the measurement of this construct must be formulated on more solid theoretical and methodological foundations. Malinowski (2008) outlines that until there is not an unequivocal operational definition of mindfulness, there is not going to be a solid measurement of this construct. Furthermore, Bergomi et al. (2013a) suggest that researchers working on the development of future measures of mindfulness must take into account three important facts: the aspects of mindfulness to be measured, the relationship between these aspects, and the validity of this instrument using self-report.

1.8. Synthesis

A growing body of research shows the evolution of the concept of individual mindfulness from its religious context in the East to the modern West. Moreover, acknowledging the impact of mindfulness on human functioning helps us see a glimpse of its potential in the workplace. Thus, the emergence of a new culture of mindfulness requires adequate measurement of both trait and state mindfulness, to assure clear explanations for mindfulness'

effects. Furthermore, only a few studies have explored the effects of mindfulness on performance, and fewer studies have explored the effects of mindfulness on objective performance. Thus, we want to contribute in this direction, by attempting to evaluate the impact of individual mindfulness on performance through objective indicators, but first, we must clarify what kind of performance and also what kind of factors are involved, in order to ensure the desired outcome.



CHAPTER II: INDIVIDUAL PERFORMANCE

2.1. Introduction

The following chapter presents an overview of individual performance in organizations. We begin this chapter by first addressing the importance of individual performance in a constantly changing workplace. Then we define the concept of performance. Thereafter, we will discuss performance as a multi-dimensional concept, in this case distinguishing between task and contextual performance. We continue addressing the relationship between individual mindfulness and performance. We, then comment on the relationship between task complexity and task difficulty, and, the relationship between task complexity and task performance. Finally, we conclude this chapter by outlining the necessity of addressing this subject in future studies.

2.2. Why does individual performance matter?

Individual performance is relevant for several reasons. Probably the most important of them is that through individual performance employees contribute to the achievement of the organizational goals. Performance is an important condition for future career development and success in the area one is activating (Van Scotter et al., 2000). Sonnentag and Frese (2002), highlight that organizations need high-performing individuals to accomplish and deliver the expected services. In this direction, Motowidlo and Schmit (1999), also state that performance refers only to those behaviours that contribute to the organizational goal accomplishment.

Secondly, as goal achievement is relevant for organizations, individual performance is often linked to the formal and informal rewards within the organization. According to Kerr (1975), organizations cannot function successfully without recognizing and rewarding the behaviours that support the achievement of organizational goals. Compensation or career opportunities are often linked to individual performance. Employees are rewarded when their abilities, skills, and knowledge contribute to the organization`s goals (Van Scotter et al., 2000). Individual performance (e.g., goal achievement) is often rewarded financially. Successful individuals have more opportunities in the organization than individuals with low performance.

Frese (1997) also sustains that individual performance implies also proactivity. Proactive behaviours (e.g., personal initiative) are needed because just complying with the job requirements is no longer sufficient in nowadays organizations.

Thirdly, performance is also relevant at the psychological level. Employees represent the central resource for organizations, and they must be managed to maximize their abilities and skills to assure increased performance (Atkinson et al., 2012). If the employee's well-being is ignored, then organizational performance can be affected. Thus, although organizations recognize the importance of well-being, it is also necessary to acknowledge the distinction between different dimensions of well-being. The most important distinction is between *hedonic views* of well-being (as pleasant experiences and evaluation) and *eudaimonic views* of well-being (behaviours that are meaningful, flourishing, and self-actualizing) (Ryan & Deci, 2001; Ryff & Singer, 2008). Nevertheless, Grant et al. (2007) recommend another distinction between three important dimensions of employee well-being. The first dimension of employee well-being highlights subjective experiences and work performance (Grant et al., 2007), focusing on satisfaction and commitment as key factors of happiness at work (Appelbaum et al., 2000). According to Fisher (2010), both these characteristics have cognitive and affective elements. The second dimension of employee well-being, presents employee well-being from the perspective of health, both physical and mental (Appelbaum et al., 2020), with aspects such as stress, and anxiety (Grant et al., 2007). The third dimension of employee well-being is related to relationships, meaning that employee well-being is characterized by the quality of the interaction with co-workers, supervisors, and the organization (Appelbaum et al., 2020; Grant et al., 2007). Thus, as Grant et al. (2007) suggest is important to distinguish between these three dimensions of employee well-being in order to understand the complete picture.

Nevertheless, it is also important to mention, that also different variables come to influence the conditions under which the association between well-being and performance is higher or lower. According to Kahneman, (1973), there is a short-term variability in performance,

which is due to changes in an individual psycho-physiological state, including processing capacity across time. For instance, these changes can be caused by exposure to stress or long working hours that can damage performance or can determine the individuals to apply strategies to increase their effort (Hockey, 1997). Moreover, a higher number of external constraints (e.g., instructions from a supervisor or strong control affect performance), determines a low association between well-being and performance. Furthermore, other variables, such as the role of personality characteristics (Bowling, 2007), social behaviour (Lyubomirsky et al., 2005), and environmental variables (Warr & Nielsen, 2018) influence the association between well-being and performance. It is important to mention Motowidlo and Keil's (2013) revision, which outlines that employees' basic individual differences (e.g., cognitive ability, personality traits) impact performance through their influence on their knowledge, skills, and motivation. In addition, regarding personality traits, these same authors (Motowidlo & Keil, 2013) suggest that certain personality traits are better predictors of contextual performance, while skills and abilities would be better predictors of task performance. In this direction, the meta-analysis conducted by Organ and Ryan (1995), identified job attitudes (e.g. job satisfaction, organizational commitment, perceived fairness) as predictors of OCB. Moreover, the relationship between job satisfaction and OCB was stronger than the relationship between job satisfaction and task performance. Understandably, task performance requires certain activities that need specific skills and knowledge, while OCB can involve other situations in the work context beyond a specific task. Thus, specific skills and knowledge are more related to task performance, while attitudes and personality traits are more related to contextual or OCB performance (Organ & Ryan, 1995). Furthermore, Jacobs and Solomon (1977) also observed that job satisfaction and supervisor-rated task performance were moderated by the presence or absence of reward contingencies. In the same line, when the perceived distributive justice is present (Janssen et al., 2010), emotional exhaustion was negatively associated with performance. Hence, it seems that intrinsic rather than extrinsic rewards prove to be relevant.

Furthermore, other variables, such as the role of personality characteristics (Bowling, 2007), social behaviour (Lyubomirsky et al., 2005), and environmental variables (Warr & Nielsen, 2018) influence the association between well-being and performance. However, among all the aforementioned variables, job satisfaction is one of the variables that have been the most investigated in relation to performance. More specifically, the association between well-being (job satisfaction) and performance leads to different debates caused either by the intensity of this relationship, or either by the directionality (Judge et al., 2001). Thus, while some studies (Vroom, 1964) report a median correlation of .14 between job satisfaction and performance, other studies (Iaffaldano & Muchinsky, 1985; Judge et al., 2001) indicate that this relationship is rather moderate and bi-directional or circular.

Therefore, it is important to consider the consequences of all these variables in order to attend and understand constant changes in an increasingly competitive environment, where organizations must adapt to obtain the expected outcomes.

Hence, as we have just seen, individual performance has been always important, but it is even more important because today's organizations face an unstable and competitive organizational environment (Chang & Huang, 2005). Nevertheless, in the last decades, changes such as the globalization of the economy (Elrehail et al., 2019) as well as the rapid advances in technology (Cascio & Montealegre, 2016), have led to increased competitiveness (Elrehail et al., 2019). Moreover, although all these changes sustain economic growth, they were also affected by the 2008 economic crisis (Butterick & Charlwood, 2021) or the uncertainty and confusion generated by the COVID-19 pandemic (Boiral et al., 2021). In this direction, Amabile (1988) sustains that domestic and international competition, as well as changing government regulations and market conditions force organizations to innovate in order to survive. Thus, in this kind of environment, organizations need to rely on the input of their workers, which in turn need psychological resources to function and perform in these uncertain and changing conditions. According to Kohn (1992), competition is a learned attitude that reduces

performance, motivation, and relationship quality, while increasing anxiety and unethical behaviour. However, despite these possible negative outcomes, management research considers competition as strategic positioning between organizations, states, and countries, even including this construct as a social comparison in social psychology (Porter, 1980). The social comparison theory identifies upward (comparing with superior individuals) and downward (comparing with inferior individuals) social comparisons (Festinger, 1954). Upward usually can lead to negative consequences, while downward is more likely to diverge into positive consequences. Therefore, the main idea is that competition in the workplace can be motivational and increase organizational outcomes and individual performance (Sauers & Bass, 1990), but it can also make individuals overly aggressive (Bing, 1999) to the point of being hypercompetitive.

Nevertheless, besides a competitive workplace, another important aspect, that displays the relevance of individual performance is the ongoing process of transformation of the organizations (Howard, 1995). Consequently, individuals need to engage in a continuous learning process in order to deliver the expected performance. Campbell (1999) suggests including learning as an important dimension in the performance concept. Thus, this reasoning suggests that learning is a predictor of performance but not the performance itself. Different studies (Avolio et al., 1990; Quiñones et al., 1995) support that performance increases with increasing the time spent in a specific job, and later it reaches a plateau. Therefore, this evolution begins with performance relying mainly on declarative knowledge (facts, principles), whereas later with the skill acquisition process, performance relies on automatic processing, procedural knowledge (cognitive skills, physical skills, management skills, and interpersonal skills), and psychomotor abilities (Ackerman, 1988). Furthermore, Murphy (1989) differentiated between a transition and a maintenance stage in an attempt to identify the processes underlying changes in job performance. Therefore, the transition occurs when individuals are new in a job, while the maintenance stage occurs when the knowledge and skills are learned and when task

solving becomes automatic. Sonnentag and Frese (2002) outline that in the transition stage cognitive ability is highly relevant, meanwhile during the maintenance stage, dispositional factors (motivation, interests, values) increase in relevance.

In this dynamic environment, performance is closely linked to the use of technology. This widespread use of technology in the work environment affects the individuals' contribution to individual performance (Campbell, 1990). Thus, with the increasing implementation of sophisticated devices, the relevance of specific skills and knowledge is less needed while other skills and knowledge are becoming relevant (Sonnetag & Frese, 2002).

Finally, the widespread use of individual performance measures in studies sustains the fact that this construct is a key variable in organizational psychology. Sonnentag and Frese (2002) affirm that individual performance is treated as a dependent variable because is an outcome that organizations will always want to enhance.

Therefore, individual performance contributes to organizational performance, but to grasp the relevance of this construct, first, we must analyse its definition.

2.3. What is individual performance?

Despite the importance of individual performance and the use of job performance as the main construct in industrial/organizational psychology, little effort has been made to clarify the concept of performance.

Campbell et al. (1970) distinguished between behaviour, performance, and effectiveness. According to these same authors (Campbell et al., 1970), behaviour refers to what an individual does in a work situation and does not include an evaluation. Performance refers to individuals' contribution to the organizational goals, and in this case, we can talk about high or low levels of performance in accordance with the individual's ability to accomplish the organization's goals, while effectiveness refers to the way these contributions are translated into results. Thus, the most extended definition of performance refers to behaviours or actions that are relevant to the goals of the organization and that can be measured or scaled (Campbell,

1990). Other authors, like Bernardin and Beatty (1984), define performance as the record of outcomes produced on a specific job or activity during a specified period. Authors agree that when conceptualizing performance, it is important to differentiate between the action or behavioural component of performance and the outcome component of performance (Campbell, 1990; Sonnentag & Frese, 2002).

Nevertheless, Sonnentag and Frese (2002) outline that in practice it is difficult to describe the action aspect of performance without taking into account also the outcome aspect. Therefore, the behavioural component of performance is usually measured through scales where the employee or someone else (e.g., the immediate supervisor) reports on the degree to which the employee performs some actions or behaviours that are relevant to organizational goals. In contrast, the outcome component of performance is usually evaluated through objective indicators that reflect the results achieved by the employee (e.g., sales figures). Outcome aspects depend also on factors other than an individual's behaviour (e.g., economic crisis).

Continuing with the analysis of the performance's definitions, which, refer to those behaviours that contribute to the organization's goals, some authors sustain that is impossible to match performance with the designated tasks (Murphy, 1989). In the workplace, individuals perform different tasks that maybe not directly contribute to the goals of the organization but surely indirectly affect them, such as cordial relationships with other co-workers. In this direction, Katz and Kahn (1966) distinguish between in-role tasks (specific task behaviours) and extra-role (spontaneous behaviours), and by doing so they extend the definition of performance, including all in and extra-role behaviours that contribute to the organizations' goals.

2.4. Performance as a multi-dimensional concept: Task performance and contextual performance

Researchers and practitioners agree that performance is multi-dimensional and consists of two main factors: core task performance and contextual performance (Borman &

Motowidlo, 1993). Task performance describes the core job responsibilities of an employee. It is also called "*in-role prescribed behaviour*" (Koopmans et al., 2011) and is reflected in specific work outcomes and deliverables as well as their quality and quantity. Meanwhile, contextual performance goes beyond formal activities and is reflected in activities such as helping co-workers or being a reliable member of the organization. Koopmans et al. (2011) refer to contextual performance as "*discretionary extra-role behaviour*". The contextual performance captures the ability of employees to engage in activities that contribute to the overall well-being of the organization. This aspect of job performance is viewed as equally important as task performance.

Motowidlo and Schmit (1999) outline that task activities usually vary across different jobs, while contextual activities are common to many jobs. Task performance is about the proficiency with which activities are carried out, while contextual performance is more related to differences in individual dispositions and personalities (Hosie & Nankervis, 2016). Therefore, abilities and skills tend to predict task performance while personality and related factors tend to predict contextual performance (Motowidlo & Van Scotter, 1994). For instance, cognitive ability was hypothesized to be more predictive of task performance than contextual performance (Anderson et al., 2001). As we can see, integrating task and contextual performance provides a more holistic conceptualisation of individuals' performance.

Furthermore, Van Dyne et al. (1995) admit that contextual performance also can include negative extra-role behaviours, which can affect the organization. Thus, when referring to extra-role behaviours, the authors outline four main characteristics: 1) volunteering; 2) intentional; 3) positive and 4) disinterested. In the classification of these behaviours, the same authors (Van Dyne et al., 1995) distinguish between organizational citizenship behaviour (OCB); pro-social organizational citizenship behaviour (PSOB); whistleblowing behaviour (WB), and principled organizational dissent (POD). OCB is defined as the "*individual behaviour that is discretionary, not directly or explicitly recognized by the formal reward system and that in the*

aggregate promotes the effective functioning of the organization" (Organ, 1988, p. 4). According to Organ (1988), OCB consists of five components: 1) altruism; 2) conscientiousness; 3) civic virtue; 4) courtesy, and 5) sportsmanship (not complaining about superficial things). PSOB is defined as the "a) *behaviour performed by a member of an organization; b) directed toward an individual, group, or organization with whom he or she interacts while carrying out his or her organizational role, and (c) performed with to promote the welfare of the individual, group, or organization toward which it is directed*" (Brief & Motowidlo, 1986, p. 711). WB is defined by Near and Miceli (1985, p. 4) as "*the disclosure by organisation members (former or current) of illegal, immoral, or illegitimate practices under the control of their employers, to persons or organisations that may be able to effect action*". POD is the expression of disagreement regarding organizational practices and policies (Kassing, 1998). Hence, while WB discloses something illegal or immoral, POD challenges something grounded on principles. The only time these two constructs overlap is when WB involves a matter of principles (Van Dyne et al., 1995).

Furthermore, the same authors (Van Dyne et al., 1995) present an integration of the extra-role literature based on affiliative and challenging behaviours, besides the already mentioned four-specific extra-role behaviours (OCB; PSOB; WB, and POD). The first dimension is affiliative/challenging, which represents a continuum that captures whether the behaviour tends to solidify/preserve the relationship (affiliative) or whether there is a possibility to damage the relationship (challenging). Affiliative behaviour also refers to helping others, while challenging also can include criticizing. The second dimension is promotive/prohibitive. This translates into whether the behaviour is intended to promote/encourage or prohibit/stop something from happening. These two dimensions lead to 1) affiliative/promotive; 2) challenging/prohibitive; 3) challenging/promotive and 4) affiliative/prohibitive. Affiliative/promotive refers to most of the work on organizational citizenship, but with a focus on helping and cooperative behaviours. Challenging/prohibitive includes WB and POD behaviours and challenging/promotive includes behaviours represented by constructive

challenges, behaviours that want to improve and not criticize. The last type of extra-role behaviour, affiliative/prohibitive includes "*stewardship behaviour*", characterized by unequal power, where a more powerful individual prohibits an action of a less powerful individual, with intending to protect the latter one.

As jobs are becoming more complex, it also will become more difficult to identify all the expected job behaviours. Hence, it is fundamental to understand the specific characteristics of in-role and extra-role behaviours in an effort to improve employee performance.

2.5. Mindfulness and individual performance. What do we know so far?

From a theoretical standpoint, mindfulness is "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*", Dane, 2011, p. 1000). Therefore, we consider it relevant to investigate this variable in relation to performance because reaching a state of consciousness suggests the effort one has to make to direct their attention toward the task in order to obtain the expected outcome. Research suggests that how individuals direct their attention affects how they make strategic decisions (Nadkarni & Barr, 2008) and if they observe and use the available resources (Weick, 1993). Thus, performing well requires not only paying attention but also actively applying one's intentions (Ajzen, 1991). Hence, in this direction, according to Chatzisarantis and Hagger (2007), mindfulness may facilitate the implementation of intentions into action.

Looking at the literature that measures the relationship between individual mindfulness and the behavioural component of performance, we observe a common denominator: all these studies confirm the existence of this relationship. Research suggests that mindfulness influences overall job performance (Dane & Brummel, 2014; Wu et al., 2016), leadership performance (King & Haar, 2017), group performance (Cleirigh & Greaney, 2015), organizational citizenship behaviour (Reb et al., 2013), deviant behaviour in the workplace (Reb et al., 2013), creative performance (Zheng & Liu, 2017), sports performance (Röthlin et al., 2016), and safety performance (Zhang et al., 2013). Therefore, all these studies measure the influence

of individual mindfulness on the employees' perception and not the actual performance. We consider this aspect an important limitation because it does not allow confirming the influence of mindfulness on the actual results.

Hence, we want to address this limitation and consequently, in the present doctoral thesis, we focus on the outcome component of performance since the results represent the pathway through which an individual's behaviour helps or hinders an organization in accomplishing its objectives (Motowidlo & Keil, 2013). Thus, assessing the actual results instead of the perceived results makes it possible to conclude if individual mindfulness produces differences in performance outcomes. We also make the distinction between trait and state mindfulness in relation to performance because as indicated in our main objective, we want to offer an integrative perspective on the relationship between the concept of individual mindfulness and performance. We know that state mindfulness is associated with increased attention (Chiesa, 2010; Verhaeghen, 2021), anyhow, it also seems logical that, if mindfulness increases the present moment attention, then trait mindfulness should also indicate individual differences in the outcome (Quickel et al., 2014). Thus, taken this together and applied in our investigation, we expected that trait mindfulness and state mindfulness (through a preceding mindfulness exercise) would influence the objective indicators of performance.

However, before commenting on the results regarding the relationship between mindfulness and performance measured with objective indicators, we first must acknowledge that the most frequent objective performance indicators applied in these studies are accuracy (e.g., number of correct answers, number of commission errors, number of omission errors, etc.), reaction time, variability in reaction time, and rigidity scores. These are the most frequently applied indicators of performance because they measure attention, which is a cognitive mechanism that may be improved by mindfulness. We also added the detection of unexpected stimuli as an objective indicator of performance because we considered it relevant in industries where safety is critical (Zhang & Wu, 2014). In this kind of industry, unsafe human

behaviours are considered one of the most important sources of injuries and accidents (Christian et al., 2009).

In the next paragraphs, we will summarise the literature that studies the relationship between mindfulness (trait and state) and objective performance. Regarding trait mindfulness, we observe that while some studies support the relationship between trait mindfulness and accuracy (Lin et al., 2018; Moore & Malinowski, 2009), other studies do not support this relationship (Fountain-Zaragoza et al., 2018; Keith et al., 2017; Quickel et al., 2014). In the same line, while from a theoretical standpoint would be plausible to expect that trait mindfulness leads to quicker reaction times, we still observed the same incongruence. Thus, studies conducted by Keith et al. (2017) and Lin et al. (2018) support that trait mindfulness is linked to shorter times, while the study conducted by Eichel and Stahl (2017) did not find a relationship between the two variables. Furthermore, regarding the variability in reaction time, the results continue to be inconclusive. Hence, while Keith et al. (2017) indicate that trait mindfulness was associated with less variability in reaction times, Eichel and Stahl (2017) obtain support for this result only when mindfulness was measured with The Freiburg Mindfulness Inventory (FMI, Buchheld & Walach, 2002), but not when it was measured with the Mindful Attention and Awareness Scale (MAAS, Michalak et al., 2008).

Shifting our attention to state mindfulness and these same indicators of objective performance, we continue to observe the same inconsistency. Hence, after a brief mindfulness exercise, Norris et al. (2018) and Zeidan et al. (2010) concluded that participants had better accuracy (proportion of correct trials) than the control group, while Larson et al. (2013) observed no group-related differences in accuracy. Regarding the relationship between state mindfulness and reaction time, we also observe that these results are contradictory (Jankowski & Holas, 2020; Larson et al., 2013; Lee & Orsillo, 2014; Watier & Dubois, 2016) and as for the variability in reaction time, we did not find any study that took into consideration this variable.

Furthermore, we observed that a 7-min mindfulness exercise increased awareness of the unexpected distractors (Schofield et al., 2015). In addition, regarding the rigidity scores, the results seem to suggest that an 8-week mindfulness program may reduce cognitive rigidity (Greenberg et al., 2010).

Therefore, after analysing all this evidence, we conclude that the inconclusive results extend to all the selected indicators of performance for both trait and state mindfulness, even though as previously explained, from a theoretical standpoint individual mindfulness is supposed to have clear effects on attention, especially since mindfulness practice is considered an informal training on attention skills (Verhaeghen, 2021). So, when and for whom does mindfulness influence performance? Moreover, could it be that the relationship between state and trait also plays an important role when measuring performance outcomes? We know that individuals can increase their levels of trait mindfulness through exercises of mindfulness (Davidson et al., 2010). However, we also know that individuals' state mindfulness is not anticipated by their initial levels of trait mindfulness (Kiken et al., 2015). This means that maybe other factors should also be taken into consideration, such as individual predispositions, characteristics of the tasks applied, and aspects of the conducted meditation (in the case of state mindfulness).

Moreover, an important aspect that influences the expected outcome is also the selected tasks. It is important that besides the standardized "*paper-and-pencil*" measures of performance, to provide a reliable assessment through computerized measures of attention. In addition, it is also important to distinguish between the characteristics of the structure of the task and the resources that the learners bring to tasks (Robinson, 2001).

With this in mind, following the framework of Robinson (2001), in the next paragraph, we distinguish between task complexity and task difficulty because we consider that the differences in the complexity of the tasks are reflected in the individual's perception of task difficulty (Robinson, 2001).

2.6. The relationship between task complexity and task difficulty

In the following section, we seek to understand the construct of task complexity, as well as the differences between objective vs. subjective, complexity vs. difficulty, and the influence of these constructs on task performance.

A very common mistake in literature is confusing task complexity with task difficulty. Robinson (2001) did an important contribution to the literature by distinguishing task complexity from task difficulty. The author reserves the term task complexity for the objective approach to complexity. Complementarily, he refers to the subjective and individual perceptions of complexity as task difficulty.

In this way, Robinson (2001) opts for an objective approach to task complexity according to the distinction by Campbell (1988). Task complexity is not a matter of subjective interpretation (e.g., level of complexity perceived by an individual) or a matter of person-task interaction (e.g., the same task is more complex for a novel than for expert workers). The individual perception of task complexity (that can depend on task characteristics, personal resources, personal characteristics, and many other factors) is what he calls task difficulty.

In this line, Robinson (2001) defines task complexity as the set of attentional, memory, reasoning, and other information processing demands imposed by the structure of the task. Specifically, for any learner, a simple task will always be less demanding than a complex task since the differential in cognitive demands (e.g., attention, working memory) is a fixed and invariant feature of the task. Thus, according to Robinson (2001) task complexity will help explain within learner variance when performing any two tasks.

At the same time, Robinson (2001) insists that the task cognitive factors contributing to task complexity must be distinguished from learner factors, which may make a task more or less difficult. This leads us back to the idea that complexity and difficulty cannot be in a fixed relationship to each other, because learners differ not only in the resources they pose but also in the way that these resources may be affected by temporarily limiting factors (e.g.,

motivation). Thus, task difficulty will help explain between learner variance in performance on the tasks because it is determined by those factors that make the differences between them in the extent of available cognitive resources.

Task difficulty or subjective and individual perceptions of task complexity depend on numerous factors. Bell and Ruthven (2004) suggest that task difficulty can be affected by three factors: 1) the difficulty of understanding what information is required, 2) the difficulty of searching, and 3) the difficulty of interpreting importance. In the same manner, Kim (2006) says that 1) the learner's characteristics, 2) the intrinsic task characteristics (e.g., target information), and 3) intrinsic process characteristics (e.g., navigation on a website) are the factors that influence the difficulty of a task. Therefore, we can see that the subjective perspective of the individual influences the task difficulty, depending on the learner's perception, interpretation, and judgment of the objective complexity of the task (Kim, 2006).

Another important aspect that we must take into consideration is the task conditions. Robinson (2001) warns that the task conditions refer to participation factors, such as the direction of the information (one-way or two-way) and the communicative objectives of the task performance, not the learners' factors. In addition, the context of the task performance is another condition that influences the learners' perception, and thus, influences the outcome of the tasks.

2.7. Task complexity and task performance

As we have mentioned before, increasing the complexity of a task involves a higher demand for cognitive resources (Robinson, 2001). An interesting question is how this increase in task cognitive demands will affect task performance. In this regard, Liu and Li (2011) warn that this influence depends on different factors, such as 1) the measurement and operationalization of the task complexity, 2) the measurement of task performance, 3) task characteristics, and 4) the learner's characteristics.

According to Liu and Li (2011), the relationship between task complexity and task performance can take at least four different ways:

a. Positive: Very few studies show a positive relationship between task complexity and task performance. Two studies suggest that task learners with expert systems acquired more procedural knowledge in complex tasks than in simple tasks (Asare & Mc Daniel, 1996; Marshall & Byrd, 1998). Another study found that female auditors showed greater efficiency on highly complex tasks rather than on low complex tasks (O´Donnel & Johnson, 2001).
b. Negative: Other studies indicate that task complexity is negatively related to task performance (Bonner, 1994; Jacko et al., 1995; Pepinsky et al., 1960). For instance, decision accuracy was better under low complexity tasks (Jacko et al., 1995).
c. Contingent: Other studies suggest that the relationship between task complexity and task performance can be different under different conditions. For example, Tan et al. (2002) found that task performance declined while increasing task complexity only under combinations of low knowledge and high accountability. This kind of evidence suggests that the relationship between task complexity and task performance can be more complex than initially expected and raises the need for future research to explore other moderating variables in the relationship between both variables.
d. Inverted-U shape: This has been only found in the relationship between visual complexity and performance. Particularly, Wood (1986) found that higher levels of complexity at first might lead to higher levels of challenge and have a positive effect on performance, however, it might lead to lowered performance, by the moment that the task demands exceed the learner's capacities (Wood, 1986).

In conclusion, the literature review shows that the relationship between task complexity and task performance can be positive, negative, contingent, or inverted-U shape. However, most of the studies found that it is negative. This negative impact on performance can

be explained through the human information-processing model, which sustains that complex tasks involve challenges for individuals in processing the available information (Jacko & Ward, 1996). On that account, a simple task will always be less demanding than a complex task, since all the characteristics mentioned above are fixed features of the tasks. Hence, a less resource-demanding task implies a lower error rate, and/or faster solving. In contrast, complex tasks make greater demands on resources. However, Robinson (2001) also outlines that better results could happen from repeating the same task, whether simple or complex, since task practice and automatization reduce resource demands.

In this doctoral thesis, concretely in studies 2 and 3, we manipulate task complexity by using different levels of complexity for our selected tasks. We want to explore if the relationship between trait mindfulness and task performance differs on different levels of task complexity. Furthermore, we also measure the task difficulty to check if the participants perceived the different levels of complexity for the indicated tasks (manipulation check).

2.8. Synthesis

The variable of individual performance is fundamental in organizational psychology because is the variable that drives the economy. As its most basic definition refers to those behaviours that contribute to the organization's goals, individual performance is considered a multidimensional concept. In this direction, the literature distinguishes between task performance and contextual performance in an attempt to increase the individual's own readiness to perform organizationally valuable behaviours. However, much more research is needed, because performance in a work role is a complex phenomenon, which makes it difficult to measure. Hence, is fundamental to see the difference between the behavioural component of performance and the outcome component. The behavioural component of performance is usually measured through scales reporting the probability that individuals will exhibit/perform behaviours relevant to the organizational goals. Meanwhile, the outcome component of performance is measured through objective indicators and shows the individuals' results in

contributing to the organization's objectives. Therefore, interested in the outcome component of performance, we directed our attention to the relationship between individual mindfulness and performance. The investigation on this subject reflects the inconclusive results regarding individual mindfulness (trait and state mindfulness) and objective indicators of performance. More specifically, while some studies confirm the relationship between individual mindfulness and performance (Lin et al., 2018; Moore & Malinowski, 2009; Norris et al., 2018; Zeidan et al., 2010), others suggest quite the opposite (Keith et al., 2017; Larson et al., 2013; Lee & Orsillo, 2014; Quickel et al., 2014). Moreover, as we apply objective indicators of performance we consider it important to follow the framework of Robinson (2001) and distinguish between task complexity and task difficulty to help us see if the differences in the cognitively defined complexity of tasks are also found in the learner perceptions of task difficulty. Hence, to contribute to this line of research, 2 of our 3 studies are measuring through an experimental approach the relationship between individual mindfulness and objective indicators of performance in an effort to provide accurate answers regarding whether individual mindfulness is associated with objective performance.

CHAPTER III: THESIS OBJECTIVES AND METHODOLOGY

3.1. Introduction

This chapter describes the methodology and the analyses applied in each of the three studies of this doctoral thesis. We begin this chapter with a summary of the general objectives of the thesis and the research questions (see Figure III. 1). We then continue with the description of the samples and the data collection procedures for each study. Next, we present the measures applied to operationalise our variables, and finally, we describe the analyses applied in the three studies.

3.2. Thesis objectives and research questions

This thesis aims to contribute to a further understanding of the relationship between individual mindfulness and objective performance. Individual mindfulness has gone from being seen as a central aspect of Buddhist practices to a therapeutic tool (Mindfulness-Based Stress Reduction program; MBSR, Kabat-Zinn, 1982) and finally a concept intersecting with workplace functioning. This increasing popularity of mindfulness is due not only to its specific characteristics but also because integrating mindfulness in the workplace seems to be the answer to ensure well-being and performance (Hyland et al., 2015).

However, even if mindfulness seems to be a popular construct in the organizational world, we still do not know when and for whom mindfulness is working. Thus, when we take a closer look at the relationship between mindfulness and objective performance, we see that the research is underdeveloped (Dane, 2011). In a recent meta-analysis, Verhaeghen (2021) still indicates the fact that most of the studies are focused on the effects of mindfulness on well-being. As an attention-related concept, research must continue exploring mindfulness in relation to performance to assure a more realistic perspective of its potential in the organizational environment. Nevertheless, to provide this realistic perspective it is mandatory to distinguish between trait and state mindfulness not only to provide an accurate measurement of this concept but also an integrated view of the beneficial outcomes. We know that even though trait and state mindfulness are related, in that individuals with high trait mindfulness are

more receptive to experiencing momentary mindfulness, their effects are independent (Brown & Ryan, 2003). We also know, from a theoretical standpoint, that mindfulness is related to attention (Watiers & Dubois, 2016) but we still have a limited understanding of when this relationship appears; if mindful individuals perform better (considering objective indicators); or in which way they perform better (more accurate, faster). Hence, maybe the characteristics of the task can moderate the effects of mindfulness on performance, or maybe when we take both trait and state mindfulness into consideration, the interaction between both of them can influence the outcomes.

Therefore, our research has three main objectives: (1) to address the emergence of mindfulness in the workplace and see the gaps in the literature, (2) to investigate the relationship between trait mindfulness and objective performance, while taking into consideration the moderating role of task complexity and (3) to investigate the relationship between state mindfulness and objective performance, while taking into consideration the moderating role of trait mindfulness and the moderating role of task complexity.

As we have seen in Chapter I, there is not a single definition of mindfulness, with scholars having difficulty translating mindfulness into a clear operationalized construct. Moreover, according to different studies (Bergomi et al., 2013a; Quickel et al., 2014), the current mindfulness scales do not capture the Buddhist notion of mindfulness, but intervention effects (e.g., present moment awareness). Thus, it is mandatory to address which aspects of mindfulness should be included in a scale and the kind of relationships existing between them. This current situation highlights the need for a critical overview of the current research in an effort to clarify and solve the gaps concerning the concept of mindfulness in organizations.

Therefore, this is the first research question we wanted to answer: **What are the main gaps in the literature concerning the concept of individual mindfulness?**

We attempt to answer this question in Study 1, where we review the literature on individual mindfulness regarding definitions, characteristics, measures, and outcomes and by

doing so; we identify the gaps we need to address. This first study was necessary because, despite its growing popularity, mindfulness is still a concept that has received little attention in the organizational literature (Hyland et al., 2015).

Knowing the difference between trait and state mindfulness, as well as the difficulty in operationalizing this construct, we wanted to provide the same attention to trait and state mindfulness to assure an integrated conclusion regarding the observed outcome. That being the case, we see that trait mindfulness is associated with performance (Dane & Brummel, 2014; Reb et al., 2014; Zhang et al., 2013). However, all these results are measured subjectively, and they do not indicate the actual differences in outcomes. Moreover, when we look at the results measured with objective indicators, the studies contradict each other (Fountain-Zaragoza et al., 2018; Keith et al., 2017; Lin et al., 2018; Quickel et al., 2014). This led us to our second overall question: **Does trait mindfulness influence objective performance?**

Furthermore, some authors indicate that the effects of mindfulness may be influenced by task complexity (Zhang et al., 2013) because task complexity is considered an important determinant of both human behaviour and task performance (Liu & Li, 2011). This led us to our third question: **Does task complexity moderate the relationship between trait mindfulness and objective performance?**

We attempt to answer our second and third questions in Study 2 by examining through an experimental design the relationship between trait mindfulness and objective performance, as well as the moderating role of task complexity in a Stroop task (Stroop, 1935). The objective indicators measured are 1) accuracy, errors of commission, errors of omission, 2) reaction time, 3) variability in reaction times, and 4) detection of unexpected stimuli. We created four different Stroop tasks with different levels of complexity to measure the increasing level of complexity because of the differences imposed by the structure of the tasks (Robinson, 2001).

Regarding state mindfulness, we observe that most of the studies that applied mindfulness-based interventions have focused on health-related outcomes rather than

outcomes concerning attention, memory, or learning (Watier & Dubois, 2016). Moreover, the few studies that did measure the effects of state mindfulness on performance outcomes focused on subjective judgments, thus, we cannot indicate with certainty the observed results. Furthermore, we also see the same inconsistency in the results regarding state mindfulness and objective performance, with studies that support the effects of mindfulness on performance (Geisler et al., 2017; Lee & Orsillo, 2014; Norris et al., 2018; Quaglia et al., 2019; Zeidan et al., 2010) and studies that do not support this outcome (Larson et al., 2013; Polak, 2009; Watier & Dubois, 2016). Moreover, we see that the majority of studies (Mrazek et al., 2013; Pagnoni, 2012; Wadlinger & Isaacowitz, 2011), have applied meditation instead of brief exercises when testing the relationship between mindfulness and objective performance. Thus, our fourth question is: **Does state mindfulness provoked through a brief mindfulness exercise influence objective performance?**

Furthermore, according to some authors (Watier & Dubois, 2016), the aforementioned inconsistency, regarding the contradictory results described above, could be caused by the moderating effect of trait mindfulness. This possible explanation is grounded on the fact that individuals with high trait mindfulness may experience more frequent states of consciousness than individuals with low trait mindfulness (Brown & Ryan, 2003). However, Watier and Dubois (2016), indicate that there are very few studies that measure the interactions between state and trait mindfulness. Thus, our fifth question is: **Does trait mindfulness moderate the relationship between state mindfulness and objective performance?**

We also are still interested in the role of task complexity in the relationship between state mindfulness and objective performance, so our sixth question is: **Does task complexity moderate the relationship between state mindfulness and objective performance?**

Therefore, Study 3 will attempt to answer our fourth, fifth, and sixth questions by measuring the relationship between state mindfulness and objective performance, as well as

assessing the moderating role of trait mindfulness and task complexity, in the aforementioned relationship. This study will measure five objective indicators of performance in three cognitive tasks: 1) accuracy, errors of commission, errors of omission, 2) reaction time, 3) variability in reaction times, 4) detection of unexpected stimuli and 5) rigidity scores.

Figure III. 1.

Thesis objectives, research questions and the studies

	MAIN THESIS OBJECTIVES	Research questions	
STUDY 1	Mindfulness at work and in organizations	Research question 1	? ? Mindfulness at work?
STUDY 2	The relationship between trait mindfulness and objective performance: The moderator role of task complexity	Research questions 2 and 3	*Task complexity* ↓ Trait mindfulness → Objective performance **Control variables**: Age, gender, specialization, familiarity with the task, conscientiousness, neuroticism and intelligence
STUDY 3	The relationship between state mindfulness and objective performance: The moderator role of trait mindfulness and task complexity	Research questions 4, 5, and 6	*Task complexity* ↓ State mindfulness → Objective performance ↑ *Trait mindfulness* **Control variables**: Age, gender, specialization, familiarity with the task, conscientiousness, neuroticism, intelligence and meditation frequency

3.3. Samples and data collection procedures

Taking into consideration that Study 1 was a review, it did not have a sample. Study 2 and Study 3 have been carried out with two different samples formed of university students. The data has been collected at the University of Valencia.

3.3.1. Samples

3.3.1.1. Study 2

This study included data from a sample of 139 undergraduate students enrolled in Psychology and Labour Relations, and Human Resources courses (59.7% psychology and 40.3% labour relations and human resources). Their gender distribution was 21% males and 79% females. The high imbalance in gender distribution is caused by the specialities of which the sample is representative. The ages of the students in this sample ranged from 17 to 49 years (*M*= 20.9, *SD*= 4.25).

3.3.1.2. Study 3

The data from this study came from a different sample of undergraduate students (*N*= 217) enrolled in Psychology, Labour Relations and Human Resources and Social Work (62.7% Psychology; 30.4% Labour Relations and Human Resources, and 6.9% Social Work). The gender distribution of the sample was the following: 20% males and 80% females. The ages of the students in the sample ranged from 18 to 56 years (*M*= 21.6, *SD*= 4.12). The participants were randomly assigned to either a mindfulness group (*n*= 109) or a control group (*n*= 108).

3.3.2. Data collection procedures

Both Study 2 and Study 3 were carried out in accordance with the Declaration of Helsinki and approved by the local ethics committee. The data collection for Study 2 was from October to December 2018 and the data collection for Study 3 was from November 2020 to February 2021. Regarding the data collection process for Study 3, first, we had to postpone it, due to the pandemic, and then we had to extend the gathering of the data over a period of 4 months because we had to respect the protocols for COVID-19, thus each participant (*N*= 217) was tested individually. A pilot study was conducted prior

to Study 2 (*n*= 4) and Study 3 (*n*= 8) to assure and anticipate any possible issues that could eventually lead to the failure of the research procedure.

The participants for Study 2 and Study 3 were contacted via email to establish the planning. Participation was voluntary and confidentiality and anonymity were guaranteed.

For both studies, participants only attended one session in a university's laboratory and they were tested in groups of two (Study 2) and individually (Study 3). For Study 2, the estimated length of a session was around 60 min and comprised two differentiated blocks: paper and pencil questionnaire administration and computer task administration. Meanwhile, for Study 3 the estimated length of a session was around 90 minutes and comprised three main parts: paper and pencil questionnaires, the experimental conditions, and the tasks (two of the tasks were computer administrated (Stroop and SART) and one was on paper (water jar task)). In each of these studies, prior to completing the questionnaires and beginning the tasks, the participants received standard instructions to avoid biases.

3.4. Experimental conditions

In the case of Study 3, it is important to first present the experimental conditions for a better understanding of the methodological aspects that will be indicated in the following paragraphs.

Therefore, in Study 3, the participants were randomly assigned either to a mindfulness condition or to a control condition. In the experimental condition, the participants listened to an 8-min guided meditation tape (mindfulness), while in the control condition, they received the instruction to wait for the same amount of time (8 minutes). The guided meditation (see Annex 1) was based on classic mindfulness instructions used in MBSR for beginners. A typical instruction was "*Momentarily turn off the switch that connects you to the world around you and choose now to put your mind's attention on your inside, on your breath*". The audio recording was presented through the computer speakers and was recorded by a professional mindfulness meditation instructor. Furthermore, while the audio recording was presented through the computer speakers, the experimenters were in an adjacent room to the participant.

3.5. The tasks applied

We selected, designed, and applied different tasks in our two experimental studies. More specifically, in Study 2, we examined the relationship between trait mindfulness and objective indicators of performance during a Stroop task (Stroop, 1935). In Study 3, we examined the relationship between state mindfulness and objective indicators of performance during 1) the same Stroop task applied in Study 2 (Stroop, 1935), 2) the Sustained Attention to Response Task (SART; Mrazek et al., 2012) and 3) the water jar task based on the water jar paradigm developed by Luchins (1942). These tasks are suitable for mindfulness research because it allows us to apply measures of attention, which is the performance indicator most related to mindfulness (Moore & Malinowski, 2009). Specifically, through the Stroop task (Stroop, 1935), and the SART (Mrazek et al., 2012) we measured the participant's ability to focus, sustain, and direct their attention (Moore & Malinowski, 2009), and detect unexpected stimuli while through the water jar task we captured the participants' ability to miss obvious adaptive solutions (Greenberg et al., 2010). To recode the objective indicators of performance for the Stroop task and SART we employed software (E-prime 2.0) and for the water jar task, we used paper and pencil.

As we have aforementioned, we applied the Stroop task (Stroop, 1935), in both Study 2 and Study 3. The only differences in this task, between Study 2 and Study 3, were the absence of the multiple option answer (regarding the questions for measuring the detection of unexpected stimuli) and the absence of the time limit for the stimuli in Study 3. Thus, in the following lines, we begin by describing the only common task applied in both of the experimental studies, besides the aforementioned differences, and then we continue with the description of the remaining tasks.

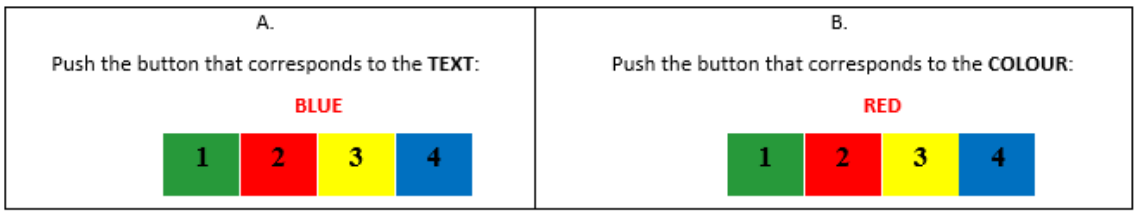
3.5.1. The Stroop task

In Study 2 and Study 3, we applied an adapted Stroop task (Stroop, 1935) that we divided into four different tasks for our experiment. The administered tasks were similar to the original version by Stroop (1935). Specifically, when there is a mismatch between the name of a colour ("*green*", "*red*", "*yellow*", or "*blue*") and the colour it is printed on (e.g., the word "*yellow*" printed in blue ink instead

of yellow ink), it takes longer to name the colour of the word. Thus, the participant is more susceptible to errors when the colour of the ink does not match the name of the colour. In Study 2, the screen time for each stimulus was 4 seconds, and, as we already have mentioned, in Study 3 we eliminated the time limit. We developed three series of 16 stimuli for the first and second tasks. These 16 stimuli were obtained by combining 4 colours (blue, green, red, and yellow) with the text instruction, respectively, for each colour. More precisely, on the first task, participants had to indicate the colour that matched the text of the word, whereas on the second task; they had to indicate the colour that matched the colour of the word. All the corresponding instruction was given in written format on the screen at the beginning of each task. After reading it and confirming that they understood the instruction, they began the tasks. In addition, for the the first and the second task, the participants had a practice session for 4 stimuli. The answers were registered by pressing 1 for green, 2 for red, 3 for yellow, and 4 for blue. These numbers always remained on the screen in the squares with the corresponding colours (see Figure III. 2). These numbers with the corresponding colours were the same for all the tasks. Each of these three series of 16 stimuli contained 4 congruent stimuli (the name and colour of the word matched) and 12 incongruent stimuli (the name and the colour of the word did not match). Therefore, the test material consisted of 48 stimuli (one per screen). We applied a randomization procedure to determine the order of appearance of the 16 stimuli in each of the 3 series, in this manner assuring that the same word or colour could not appear two times in a row.

Figure III. 2.

Example of the tasks (A. Task 1- example of the incongruent stimulus; B. Task 2 – example of the congruent stimulus)

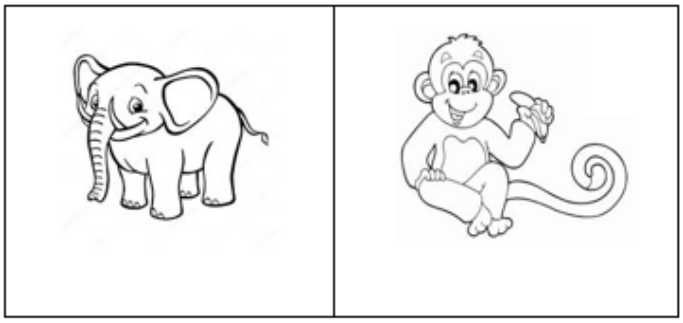


On the third task, the participants had to indicate either the colour that matched the text of the word or the colour that matched the colour of the word, according to the specific instruction that appeared on each screen for each stimulus. This time, the test material was 32 stimuli (one per screen). These 32 combinations were obtained by combining the 4 words with the 4 colours and the instructions for the text or colour (4x4x2). Nevertheless, as we have previously mentioned, the same word or colour could not appear two times in a row, so, again, we applied a randomization procedure, with a total of 8 congruent stimuli and 24 incongruent stimuli.

The fourth task had the same instructions as the third task. The participants had to indicate either the colour that matched the text of the word or the colour that matched the colour of the word, according to the specific instruction for each stimulus. The only difference between Task 4 and Task 3 was the presence of distractors and the randomization procedure. Thus, taking into consideration the randomization procedure, the order and combination of the word-colour pairs were different for Task 3 and Task 4. However, regarding the presence of distractors, we introduced images of animals (see Figure III. 3) in black ink and with no colour as distractors. The distractors appeared twice alternatively, in the centre of 4 screens (3rd, 11th, 19th, and 27th). They appeared from the beginning of the stimuli presentation and disappeared in 2 seconds.

Figure III. 3.

The distractors



3.5.2. Sustained Attention to Response Task (SART)

The SART task is a 6-min GO/NOGO computerized mind-wandering task (Mrazek et al., 2012). The indicators of performance for this task are associated with task disengagement, with failures of

omission to targets (SART errors) generally suggesting more distraction (Mrazek et al., 2012). Participants were asked to press click as quickly as possible to frequent nontargets (i.e., Go trials; all numbers except the number "*3*") and to refrain from pressing the spacebar in response to infrequent targets (i.e., NoGo trials; the number 3). Stimuli were presented for 250 ms, with an interstimulus interval of 900 ms. The interstimulus was "*#*" and appeared before each target, therefore, participants know that the interstimulus is always followed by a target. The participants did not receive any feedback after the training or task trials.

3.5.3. The water jar task

The water jar task was based on the water jar paradigm developed by Luchins (1942) and was designed to measure the Einstellung effect, a term used to describe rigid thought patterns formed through experience, which prevent applying more adaptive approaches and solutions (Greenberg et al., 2010). We applied the same problems used in the study of Greenberg et al.'s (2010) study, from whom we asked permission to use these already formulated problems. The first trials were set trials, solvable by the formula B-A-2C, in which they had to add one B jar, subtract one A jar, and subtract 2 C jars (e.g., obtaining 100 units of water with jars the capacity of 21, 127, and 3 units by performing 127-21-3-3= 100). Once 6 out of the maximum of 10 set trials were correctly solved, participants were presented with 4 critical trials, solvable both by the complex B-A-2C formula and by a more simple formula: either A+C or A-C (e.g. obtaining 20 units of water with jars the capacity of 23, 49, and 3 units by performing 23-3= 20, as opposed to using the more complex formula 49-23-6= 20). The last two problems were two extinction trials, solvable only with the simple formula (see Table III. 1).

Table III. 1.

Water jar task problems

Trial type	Jar A	Jar B	Jar C	Goal to obtain	Shortest solution
Example	29	3	0	20	A-3B
Set	31	61	12	6	B-A-2C
Set	22	57	10	15	B-A-2C
Set	18	59	16	9	B-A-2C
Set	20	67	13	21	B-A-2C
Set	22	57	10	15	B-A-2C
Set	21	127	3	100	B-A-2C
Set	18	43	10	5	B-A-2C
Set	24	52	3	22	B-A-2C
Set	19	42	3	17	B-A-2C
Set	14	163	25	99	B-A-2C
Critical	18	48	4	22	A+C
Critical	15	39	3	18	A+C
Critical	23	49	3	20	A-C
Critical	7	16	2	5	A-C
Extinction	14	39	8	6	A-C
Extinction	13	37	5	18	A+C

3.6. Variables

The research measured a total of 35 variables across the two empirical studies. If we were to refer to the measurement of these 35 variables, we must consider that we applied 2 scales for trait mindfulness (MAAS and CAMS-R). Furthermore, we also divided state mindfulness into State Mindfulness of Mind (SMS Mind) and State Mindfulness of Body (SMS Body). Since Study 2 and Study 3 were conducted in a Spanish university, the participants received all the questionnaires and tasks in Spanish. Thus, we had to traduce the Cognitive and Affective Mindfulness Scale–Revised (CAMS-R, Feldman et al., 2007) and the State Mindfulness Scale (SMS, Tanay & Bernstein, 2013). For both scales, the translation from English to Spanish followed the double-translation and reconciliation procedure (ITC, 2018). However, we must add that in the case of SMS (Tanay & Bernstein, 2003), even though we had a Spanish version (Ullrich-French et al., 2017), we changed the translation of some of the questions. We considered this step necessary because the Spanish version of the scale was adapted in the context of physical activity, which is not our context. Nevertheless, we asked

permission from Ullrich-French et al. (2017) to use this questionnaire as a base for our translation. In the case of the SMS scale, we proceeded like this, meaning we took into consideration the translated scale by Ullrich-French et al. (2017) because we wanted to ensure a structured and coherent content of the items in accordance with the already translated version of the aforementioned scale.

Confirmatory factor analyses (CFA) of the five scales (trait mindfulness (2 scales), state mindfulness, conscientiousness, and neuroticism) were carried out to gain evidence of the validity of these measures (see section 3.7.1.1 Confirmatory factor analyses). Moreover, besides Cronbach's alpha, we used the factor loadings obtained in the CFAs to check the subscales' reliability with the estimation of omega coefficients (McDonald 1999; McNeish 2018).

There were several scales, which remained the same in terms of the content, thus, we are describing the common measures from Study 2 and Study 3 in the following lines.

3.6.1. Common measures to Study 2 and Study 3

3.6.1.1. Trait mindfulness

Trait mindfulness was measured with the Mindfulness Attention Awareness Scale (MAAS) which is a 15-item scale originally adapted from Brown and Ryan (2003) by Soler et al. (2012). The scale ranged from 1 (almost never) to 6 (almost always). A sample item is "*I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there*". The scale had a Cronbach alpha value of .85 in Study 2 and .83 in Study 3. The value obtained for McDonald's omega coefficient in Study 2 and Study 3 was .86.

3.6.1.2. Objective performance

The common measures, in the case of objective performance, in Study 2 and Study 3 were accuracy, errors of commission, errors of omission, reaction time, variability in reaction time, and detection of unexpected stimuli. These indicators were recorded with the E-prime 2.0 software. Accuracy (ACC) indicates the number of correct answers. Errors of commission (Ec) indicate the number of wrong responses. Errors of omission (Eo) indicate the number of responses that are not registered in the given time. Reaction time (RT) is the mean reaction time value in milliseconds for all

the stimuli included in the task. Variability in reaction time (RTSD) was estimated as the standard deviation for the reaction time values in milliseconds on all the stimuli included in the task.

The detection of unexpected stimuli was measured similarly in Study 2 and Study 3, but with a slight difference. The detection of unexpected stimuli as formulated in Study 2 contains the following sample items with the multiple-choice answers: 1) "*Did you see any unexpected stimulus on the screen while doing the task*?" (answer: yes/no); 2) "*Can you remember what it was*?" (answer: a plant/an animal/a transport/domestic utensil/I did not distinguish it/I did not see anything); 3) "*Did you see what it was*?" (answer: whale/rhinoceros/elephant/hippo/I did not distinguish it/I did not see anything); 4) "*Did you see what it was*?" (answer: dog/monkey/cat/koala/I did not distinguish it/I did not see anything); 5) "*What side of the screen did it appear on*?" (answer: lower right/ upper left/ in the centre/ lower left/ upper right/I do not remember/I did not distinguish it/I did not see anything). For each question, there was only one right answer, and subjects who gave the right answer were given a 1 in the item. The score in the detection of unexpected stimuli was computed as the sum of 1 obtained in the 5 items. In Study 3, the same 5 items are used, but we did not give multiple-choice answers, thus the participants had to give their own answers.

3.6.1.3. Task complexity

It was measured only for the adapted Stroop task (Stroop, 1935), in which the four tasks were presented from lower to higher levels of complexity, in agreement with the differences in cognitive processing demands (Robinson, 2001).

3.6.1.4. Task difficulty

It was measured with a 1-item scale only for the adapted Stroop task (Stroop, 1935). The participants had to indicate on a scale that ranged from (0 = very easy to 9 = very difficult), the degree of difficulty of the task they have just completed. More specifically, the sample item was "*Please indicate the degree of difficulty of the task you have just completed".*

3.6.1.5. Control variables

We introduced seven control variables: age, gender, specialization, familiarity with the tasks, conscientiousness, neuroticism, and intelligence. Gender was coded as dummy variable (1= male, 2= female) in both Study 2 and Study 3. We consider it relevant to add, that in Study 2 we considered specialization as dummy variable (1= psychology, 2= labour relations, and human resources). However, in Study 3 we treated specialization (Dummy 1_Specialization was coded as: 1= participants who were at Labour Relations and Human Resources specialization, 0= others; Dummy 2_Specialization was coded as: 1= participants who were at Social Work specialization, 0= others, with individuals at Psychology specialization serving as a comparison) as dummy variable.

3.6.1.5.1. Familiarity with the task

The scale is made up of 3-items rated on a 6-point Likert response scale ranging from 1 (strongly disagree) to 6 (strongly agree). The items for this scale were: *"I heard about this task in one of my courses, during my college years"; "I previously did tasks like this"; and "I am familiar with the type of task I just did*". The scale had a Cronbach alpha value of .71 (familiarity Stroop task) in Study 2, and in Study 3 the values were .83 (familiarity Stroop task) and .89 (familiarity water jar task).

3.6.1.5.2. Conscientiousness and Neuroticism

We applied the Spanish version (Cordero et al. 2008) of the Five-Factor Reduced Personality Inventory (NEO-FFI, Costa & McCrae, 1992) with 12 items per dimension to measure conscientiousness and neuroticism. Items were answered on a 5-point Likert response scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item for conscientiousness is "*I have a lot of self-discipline*" and for neuroticism "*Sometimes it seems to me that I am worth absolutely nothing*".

Taking into account the results of the CFAs carried out (see chapter V and VI, section Results) a reduced version of the neuroticism scale composed of 11 items was used in both Study 2 and Study 3. The Cronbach alpha value for conscientiousness in Study 2 was .84 and in Study 3 was .81. The Cronbach alpha value for neuroticism in Study 2 was .84 and in Study 3 was .87. The

McDonald's omega coefficient for conscientiousness in Study 2 was .87 and in Study 3 the value was .86. Regarding neuroticism, the McDonald's omega coefficient was .86 in Study 2 and .89 in Study 3.

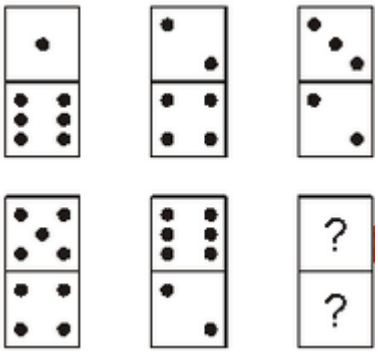
3.6.1.5.3. Intelligence

Intelligence was measured with the Spanish version (Cruz et al. 1988) of the Domino Test D-70 (Kowrousky & Rennes, 1988), which is considered a general intelligence test. The material of the D-70 is non-verbal and has 44 elements, preceded by 4 examples (see Figure III. 4, for one of these 4 examples). In a limited amount of time (25 min), the participants must find the solution by ordering the dominoes according to a law they must discover.

Figure III. 4.

Example of solved exercise of D-70

Example:



The numbers from the superior side increase by 1: 1, 2, and 3. Answers: 5, 6, and 0.

The number from the inferior side decrease by 2: 6, 4, and 2. Answers: 4, 2, and 0.

3.6.2. Study 3 measures

3.6.2.1. Trait mindfulness

In Study 3, trait mindfulness was also measured with the Cognitive and Affective Mindfulness Scale–Revised originally adapted from Feldman et al. (2007) and translated into Spanish following the double-translation and reconciliation procedure (ITC, 2018). It is a 12-item scale and was designed to address *attention*, *present-focus*, *awareness*, and *acceptance/non-judgment of thoughts and feelings*, which all converge in a single total score. Sample items are "*It is easy for me to concentrate on what I am doing"* (attention component), "*I am able to focus on*

the present moment" (present focus component); "*I can usually describe how I feel at the moment in considerable detail*" (awareness component) and "I *am able to accept the thoughts and feelings I have"* (acceptance component). The scale ranged from 1 (almost never) to 6 (almost always). This scale had a Cronbach's alpha value of .79 and a McDonald's omega coefficient value of .88.

3.6.2.2. State mindfulness

State mindfulness was measured with the 21-item adapted Spanish version (Ullrich-French et al., 2017) of the State Mindfulness Scale (SMS, Tanay & Bernstein, 2013). Taking into consideration that the Spanish version was adapted in the context of physical activity, we changed the translation following the double-translation and reconciliation procedure (ITC, 2018) of some of the questions with permission from Ullrich-French et al. (2017) to use this questionnaire as a base for our translation. The scale consists of 15 items measuring State Mindfulness of Mind (e.g., "*It was interesting to see the patterns of my thinking*") and 6 items measuring State Mindfulness of Body (e.g., "*I felt in contact with my body*") immediately following a mindfulness induction exercise. Items are rated on a five-point Likert scale ranging from 1 (not at all) to 5 (very well). This scale had a Cronbach's alpha value of .91 for SMS Mind and .82 for SMS Body. In addition, the McDonald's omega coefficient value for SMS Mind was .93, and SMS Body was .86.

3.6.2.3. Objective performance

We added as an objective indicator of performance the rigidity score for the water jar task. To compute the *rigidity score* we followed the instructions from Greenberg et al.'s (2010) study. For each critical or extinction trail solved with the discovered formula, one rigidity point was given. Exclusion from the analyses criteria included calculation errors, the use of fractions, or other alternative solutions.

3.6.2.4. Control variables

In Study 3, besides the aforementioned control variables (age, gender, specialization, familiarity with the tasks, conscientiousness, neuroticism, and intelligence) we also included the meditation frequency. The meditation frequency scale was measured with one item "*How often do*

you usually do meditation activities (yoga, mindfulness)?". The participants rated each statement on a 6-point Likert scale ranging from 1 (never) to 6 (always).

3.7. Data Analysis

3.7.1. Preliminary data analysis

3.7.1.1. Confirmatory factor analysis

Considering the fact that our first study is a review, we only performed confirmatory factor analysis (CFA) to validate the factorial structure of the questionnaires applied in Study 2 and Study 3 using the programme Mplus (Muthén & Muthén, 1998–2012). The criteria to evaluate the CFA's was the same for all models. The model fit was evaluated using the chi-square statistic and the other four goodness of fit indices, such as the Root-Mean-Square Error of Approximation (RMSEA; Steiger, 1990), the Comparative Fit Index (CFI; Bentler, 1990), the Tucker–Lewis index (TLI; Tucker & Lewis, 1973), and the Weighted Root Mean Square Residual (WRMR; Muthén, 1994-2004). RMSEA values close to 0 would mark a good fit, values between .08 and .05 would mark a moderate fit, and <.1 would mark poor fit (Browne & Cudeck, 1993). According to Hu and Bentler (1999), CFI values close to 1 would indicate a good fit, while values above .90 would suggest an acceptable fit. TLI values close to 1 would indicate good fit and values close to 0 would indicate a poor fit, however, is accepted to use a value of .90 as an indication of good model fit (Tucker & Lewis, 1973). According to Yu and Muthén (2002), the Mplus manual indicates that WRMR values below .90 would suggest a good model fit, nevertheless, Yu (2002) recommends a higher cutoff of 1.0.

Study 2

In this study, we ran a one-factor CFA model for the trait mindfulness scale (MAAS), and we ran a two-factor CFA model for the two personality dimensions (conscientiousness and neuroticism).

Study 3

In Study 3, we ran a one-factor CFA model for trait mindfulness measured with MAAS, one second-order latent factor (mindfulness), and four first-order latent factors (attention, present-focus, awareness, and acceptance) for trait mindfulness measured with CAMS-R, a two-factor model for state

mindfulness scale (F1 State mindfulness of Mind and F2 State mindfulness of Body), and a two-factor model for the two personality scales (conscientiousness and neuroticism).

3.7.1.2. Descriptive analyses, reliability analyses, and correlations

For Study 2 and Study 3, descriptive statistics (e.g., means and standard deviations) were calculated and reported for the data within each study. The internal consistency of the scales (as reported above) was calculated using Chronbach's alpha coefficient. Nevertheless, for both Study 2 and Study 3, as we have already mentioned, we also used the factor loadings derived from the CFAs to estimate the omega coefficient as an additional estimation of reliability (McDonald 1999; McNeish 2018).

In Study 2 and Study 3, we also performed correlations as preliminary analyses among all continuous variables of the study.

3.7.2. Data analysis for hypothesis testing

3.7.2.1. Manipulation checks

We conducted different manipulation checks in both Study 2 and Study 3, as follows:

3.7.2.1.1. Manipulation of the complexity levels

A one-way within-subjects ANOVA was conducted to compare the participants' perception of the difficulty of each of the four tasks of the adapted Stroop task (Stroop, 1935) in both Study 2 and Study 3. Thus, this analysis allowed us to check the perceived level of complexity of the four tasks.

3.7.2.1.2. Independent t-test

In Study 3, we applied an independent t-test to examine any group differences between participants randomly assigned to the experimental and the control group on five variables (trait mindfulness, intelligence, neuroticism, conscientiousness, and meditation frequency) and to check the effectiveness of the intervention. We could conclude that the intervention was effective if participants in the experimental group show a higher score on state mindfulness than participants in the control group.

3.7.2.1.3. ANCOVA

In Study 3, a one-way analysis of covariance (ANCOVA) was run to also check the effectiveness of the intervention, following a more rigorous approach, as some relevant control variables were included. Concretely, we examined whether SMS Mind and SMS Body scores differed between the experimental and control group while controlling for trait mindfulness (MAAS, CAMS-R), meditation frequency, and conscientiousness.

3.7.2.2. Multiple hierarchical regression analyses

To test the hypotheses from Study 2, we conducted multiple hierarchical regression analyses in SPSS (version 24), first entering the demographic control variables (age, gender, specialization, and familiarity with the tasks), second entering the two personality variables (conscientiousness and neuroticism), third entering intelligence, and, finally, trait mindfulness.

In Study 3, we performed multiple hierarchical moderated regression analyses in SPSS (version 24), first entering the demographic control variables (age, gender, specialization, familiarity with the tasks, and meditation frequency), second entering the two personality variables (conscientiousness and neuroticism), third entering intelligence, fourth entering state mindfulness (as the intervention proved to be significant we used the condition (experimental/control), Locklear et al., 2020), and finally entering trait mindfulness (moderator variable) and the interaction effect between state mindfulness and trait mindfulness. Furthermore, to probe the interaction effects, we used the Process macro for SPSS (Hayes, 2018) to compute simple slopes for high and low values of the moderator (i.e., one standard deviation above and below the sample mean) and to plot the corresponding regression lines. Moreover, taking into consideration the equivalence between moderated regression analysis and factorial analysis of variance (Hayes, 2018), we used the "*conditional effect of X on Y at values of the moderator*" information in the Process output to estimate mean differences.

CHAPTER IV: MINDFULNESS AT WORK AND IN ORGANIZATIONS

Goilean, C., Gracia, F. J., Tomás, I., & Subirats, M. (2020). Mindfulness en el ámbito del trabajo y de las organizaciones (Mindfulness at work and in organizations). *Papeles del psicólogo*, 41(2), 139-146. doi: 10.23923/pap.psicol2020.2929

Abstract

Ninety percent of the research on mindfulness has been developed in the last decade. In this context, it is important to carry out review papers that synthesize and integrate the knowledge generated and to identify research gaps and areas in which it is necessary to continue advancing in the coming years. This is the aim of the present paper, although its scope is limited to mindfulness at work and in organizations. After explaining its origin and arrival in the workplace, we define mindfulness and its main characteristics, making a distinction between trait and state mindfulness. Next, we summarize the main research findings about mindfulness predictors and mindfulness outcomes, and finally, we suggest several areas for future research. In general terms, research findings suggest that mindfulness is a relevant factor in enhancing health and psychological well-being in the workplace.

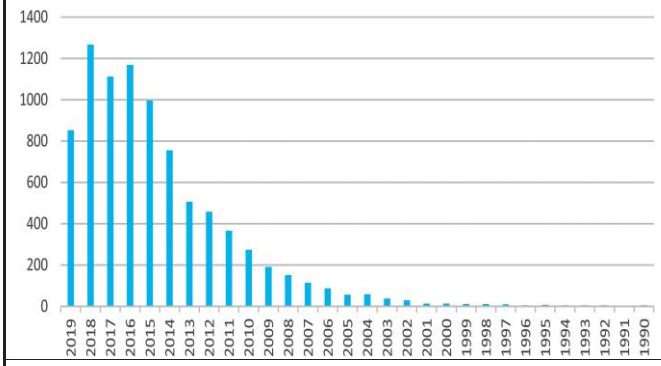
Keywords: mindfulness, workplace, organizations, review.

4.1. Introduction

We are not revealing anything new if we start this article by pointing out that mindfulness is in fashion. The amount of research reflects this interest. A bibliographic search carried out by our team on Web of Science, reveals a total of 8,579 works that contain the word 'mindfulness' in the title. Figure IV. 1 shows their historical evolution. As can be seen, there is a clear upward trend. In fact, since 2010 there have been 7,749 papers produced, which means that 90% of the studies on mindfulness were undertaken during the last decade.

FIGURE IV. 1.

EVOLUTION OF SCIENTIFIC WORKS ON MINDFULNESS



Source: Web of Science (17 July 2019). Before 1990, only 21 jobs are counted, so for pragmatic reasons, we have decided not to include this data in the graph.

However, despite the undoubted popularity of mindfulness, its arrival in the workplace and in organizations has been far more limited. When we narrowed the initial search down to this field, the results went from 8,579 to 215 works, most of which were written in the last 10 years. Although there is no doubt that mindfulness in the field of work and organizations has received less attention, a significant enough number of studies are now available to make it relevant to attempt to synthesize the knowledge that has been discovered in this time.

Precisely the aim of this article is to provide a review of the literature on mindfulness in the field of work and organizations, to synthesize the main research findings, and to suggest future lines of research.

4.2. Theoretical background

4.2.1. Origins of mindfulness and its arrival in the workplace

The mindfulness that is taught and practiced in Western secular societies closely follows the methods of mind training in the Buddhist tradition (Hyland et al., 2015). In Buddhist practice, mindfulness is the act of seeing things as they really are, as they take place in the present moment (Gunaratana, 2011) and it is cultivated through the practice of meditation (Conze, 1956). However, we

must point out that mindfulness is a psychological state whose appearance does not necessarily require meditation (Brown & Ryan, 2003).

Secular mindfulness training began with the influential work of Kabat-Zinn (Kabat-Zinn, 1982; Kabat-Zinn et al., 1985), who designed a program aimed at providing relief to inpatients with chronic illness and pain. The Mindfulness-Based Stress Reduction (MBSR) program has been successful for nearly 40 years in significantly reducing pain, stress, anxiety, and other symptoms. Its success has been such that other similar programs have been developed, in its wake, to address not only chronic diseases but also other problems such as substance abuse or eating disorders. It has been in the last 15 years that mindfulness training has been extended to the workplace and organizational settings and other non- clinical settings (Hyland et al., 2015).

4.2.2. Conceptualization of mindfulness

4.2.2.1. Definition of mindfulness

One of the first attempts to clarify the concept of mindfulness was by Dane (2011). Based on eleven definitions of mindfulness, this author concluded that three characteristics were common to most of them.

First of all, mindfulness is a state of consciousness. It is not a quality that some people have, and others do not. On the contrary, obtaining a "*mindful*" state of consciousness is a capacity inherent in human nature, something that can be experienced by most people at any given time. However, there may be individual differences in the degree and frequency with which some people will experience this state of consciousness. In other words, mindfulness is a state-level concept that can also be evaluated at the trait level.

Secondly, the state of consciousness characteristic of mindfulness consists of focusing attention on the phenomena that are taking place in the present. Mindfulness is a focus on the here and now and requires placing all one's attention on the present, as opposed to being preoccupied with thoughts about the past or future (Brown & Ryan, 2003).

Third, this state of present-moment awareness involves paying attention to both external and internal stimuli (Brown & Ryan, 2003; Dane, 2011).

In summary, we can define mindfulness as "*a state of consciousness in which attention is focused on external and internal phenomena of the present*" (Dane, 2011, p. 1000).

4.2.2.2. The acceptance or "non-judgment" component of mindfulness

Hyland et al. (2015) state that another element common to most definitions is that mindfulness implies paying attention to stimuli in an open and tolerant manner, without making value judgments, and without the attention being affected by memories, the traces of past events, or other cognitive biases.

In relation to this issue, Sutcliffe et al. (2016), after analysing fourteen definitions of articles published since 2010, concluded that the acceptance or "*non-judgment*" component of mindfulness is a controversial issue. The view of mindfulness as "*non- judgmental*" is aligned with the Buddhist tradition that emphasizes the importance of adopting an open and accepting attitude towards the events one encounters, refraining from making judgments and therefore maintaining a "*non-judging*" attitude. However, a different perspective views mindfulness as "*an active state of mind that is characterized by extracting novel differences that result from being (1) situated in the present; (2) sensitive to context and perspective; and (3) guided (but not governed) by rules and routines*" (Langer, 2014, p. 11). As Hyland et al. (2015) also recognize, this is an alternative definition that understands mindfulness as an "*active mode of information processing*" (Langer, 1989, p. 138), which requires categorizing, judging, and problem solving, activities that are inconsistent with concepts such as acceptance and "*non-judgment*". This alternative conceptualization is relevant to the understanding of the concepts of collective mindfulness or "*mindful organizing*" (Weick et al., 1999), or organizational mindfulness (Vogus & Sutcliffe, 2012), which are highly relevant to safe performance in highly reliable organizations where safety is critical (e.g., nuclear power plants, commercial aviation, air traffic control, hospitals, etc.), but which are beyond the scope of this paper.

4.2.3. Mindfulness trait and mindfulness state

As we have previously stated, the definitions of mindfulness refer to a state of consciousness, but mindfulness can also be understood as a personality trait (Dane, 2011). Mindfulness state refers to the degree to which a person pays attention and is actually aware of stimuli that are occurring in the present (Brown & Ryan, 2003), while mindfulness trait is the duration, frequency, and intensity with which a person tends to participate in states of mindfulness (Hülsheger et al., 2013). People who are high in mindfulness trait will more often experience those states of consciousness in which the attention is focused on both external and internal phenomena that are taking place in the present moment. Research indicates that, because of innate tendencies, some people may be in a "*mindful*" state of consciousness more often than others (Giluk, 2009). However, regardless of the mindfulness trait, everyone can experience mindfulness states in specific situations.

Although trait mindfulness and state mindfulness are related, such that people with trait mindfulness are more likely to mindful moments, the effects of the two are independent (Brown & Ryan, 2003). Circumstantial experiences of mindfulness (mindfulness state) predict positive outcomes regardless of individual predisposition (mindfulness trait).

Another line of research examines whether and how mindfulness intervention programs (e.g., training) affect mindfulness trait and mindfulness state. With respect to mindfulness state, studies reveal that the practice of mindfulness can lead to positive effects (increased mindfulness state), which can even be sustained long after the intervention has ended (Cleirigh & Greaney, 2015; Mrazek et al., 2013).

More surprisingly, research suggests that the mindfulness trait can be modified through these intervention programs. Specifically, Kiken et al. (2015), using a longitudinal design, found that people who experienced greater increases in mindfulness state also increased more in mindfulness trait.

4.2.4. Mindfulness predictors

There is ample evidence of the success of a range of programs based on meditation and other exercises and techniques for the development of mindfulness (e.g., Hafenbrack et al., 2014; Kaplan et al., 2017). Beyond this, research is scarce, and little is known about how organizations can cultivate mindfulness at work. Only a few studies suggest that mindfulness can be increased not only through meditation programs, but also through a number of organizational and work-related factors, such as support provided by both the organization and the supervisor (Olafsen, 2017; Reb et al., 2013), or the degree of autonomy in the workplace (Lawrie et al., 2018; Reb et al., 2013). Conversely, organizational constraints and high work demands may make it difficult for this to occur (Lawrie et al., 2018; Reb et al., 2013).

4.3. Benefits of mindfulness and explanatory mechanisms

The study of the consequences of mindfulness has received much more attention from researchers, although it has focused primarily on understanding its relationship to psychological well-being and health, and less attention has been paid to its relationship to job performance or productivity. Therefore, in this section, we aim to synthesize the results of research affecting psychological well-being and health, and more specifically, those studies that have linked mindfulness to stress, resilience, job satisfaction, engagement, and physical health.

4.3.1. Mindfulness and work stress

From the beginning, the applications of mindfulness in the workplace and in organizations were closely linked to stress reduction programs (e.g., MBSR; Hyland et al., 2015).). There is ample empirical evidence showing that mindfulness interventions (e.g., through training) reduce stress in the workplace (e.g., Aikens et al., 2014; Jayewardene et al., 2017; Zołnierczyk-Zreda et al., 2016). In addition, some studies also find a negative relationship between mindfulness trait and stress (Grover et al., 2017; Hülsheger et al., 2013).

Several explanations have been given as to why mindfulness would help reduce stress. The first explanation is based on the attentional resources and focus on the present, which are

characteristic of mindfulness. People who are high in mindfulness (trait or state) focus their attention on the present moment rather than letting their minds "ruminate" on problems and consequences that are beyond their control (Weick & Putnam, 2006). The focus on the present also prevents them from thinking about the consequences of not being able to successfully cope with current demands, which could increase stress.

An alternative but complementary explanation is that mindfulness helps people to separate the characteristics of the environment from their reactions to them (Kabat-Zinn, 1994). People with high levels of mindfulness dissociate their reactions from the environment, and in this dissociation, they recognize that stressors take place in the environment. This implies that they separate the recognition of stressors in the environment from their automatic reactions to those stressors. Grover et al. (2017) integrate both explanations into their model. Based on the job demands-resources model (JD-R) (Xanthopoulou et al., 2007), these authors propose that mindfulness is a personal resource that can reduce stress in three different ways: (1) by directly decreasing the perception of work demands, (2) by directly decreasing psychological stress, and (3) by cushioning the relationship between work demands and stress. They obtained support for all three hypotheses.

A third explanation focuses on coping responses (Donald & Atkins, 2016). People with high mindfulness traits use more efficient coping strategies to reduce stress. An important distinction when referring to coping strategies distinguishes between "*approach*" and "*avoidance*". An "*approach*" coping strategy involves reducing stress by taking steps to directly eliminate the stressor or reduce its impact, while an "*avoidance*" strategy reduces stress by taking action to avoid direct contact with the stressor (Carver & Connor-Smith, 2010). The "*avoidance*" strategy has been associated with poorer psychological well-being while the "*approach*" has been associated with greater well-being (Penley et al., 2002; Roesch et al., 2005). Complementarily, mindfulness trait has been associated with greater use of the "*approach*" strategy and less use of the "*avoidance*" strategy (Bergomi et al., 2013b; Weinstein et al., 2009).

4.3.2. Mindfulness and resilience

Mindfulness intervention programs have also been associated with improving resilience in various occupations, such as nurses and midwives (Foureur et al., 2013), teachers (Meiklejohn et al., 2012), soldiers (Jha et al., 2010), and police officers (Kaplan et al., 2017). On the other hand, although outside the field of work, Keye and Pidgeon (2013) found that the mindfulness trait in college students predicted resilience, suggesting that it may be a psychological resource that contributes to well-being.

4.3.3. Mindfulness and job satisfaction

Job satisfaction is the most widely used indicator of hedonic well-being in the work environment. Hülsheger et al. (2013) suggest three possible explanations for expecting a positive association between mindfulness and job satisfaction. The first draws on affective events theory (AET, Weiss & Cropanzano, 1996). According to this theory, work events are the immediate causes of employees' affective reactions, and in turn, these reactions predict job satisfaction. As mentioned above, mindful people focus their attention on the present, in an open way, without making value judgments. Both characteristics help them to observe stressful events more objectively, without being influenced by negative thought patterns (e.g., "*I won't be able to do it*", "*I won't finish on time*"), and consequently, to perceive work events as less stressful. Evaluating a challenging event as less stressful triggers fewer negative and more positive affective reactions, and ultimately leads to a more positive evaluation of the work situation (e.g., greater job satisfaction).

The second explanation is that mindfulness is positively related to job satisfaction because it promotes self-determined behaviour (behaviour that is consistent with the individual's needs and values). By reducing automatic functioning and paying attention to both external and internal stimuli that take place in the present, mindfulness helps acquire a greater awareness of one's true values and needs (Shapiro et al., 2006). This can help people who are high in mindfulness to choose behaviours that are congruent with those values and that allow them to meet their personal needs (e.g., whether to accept a promotion or not).

The third explanation suggests that mindfulness improves job satisfaction through the mediated effect of emotion regulation (e.g., Hayes & Feldman, 2004; Shapiro et al., 2006), and particularly through the strategy of "*surface acting*". Surface acting consists of altering external emotional expression without changing the actual feeling, which involves suppressing negative emotional expressions and faking positive emotional expressions (e.g., smiling at the client despite being tired) (Grandey, 2000). Hülsheger et al. (2013) argue that mindfulness should be negatively related to surface acting, which in turn is negatively related to job satisfaction (e.g., see the meta-analysis by Hülsheger & Schewe, 2011).

Hülsheger et al. (2013) conducted two diary studies to investigate the relationship between mindfulness and job satisfaction. Study 1 revealed that mindfulness trait and mindfulness state were positively related to satisfaction. Study 2 showed that mindfulness intervention contributed to improving mindfulness state, which in turn was positively associated with satisfaction. The authors also obtained partial support (only in study 1), on the mediating role of emotion regulation, and more specifically, of surface acting, in the relationship between mindfulness and job satisfaction.

4.3.4. Mindfulness and work engagement

Research has shown that mindfulness can be linked to feelings of engagement (vigor, dedication, absorption) in one's daily work (Coo & Salanova, 2017; Dane & Brummel, 2014; Leroy et al., 2013; Zivnuska et al., 2016). The most common explanation for this relationship is that mindfulness can promote engagement by helping people see activities in new and interesting ways. We can find this explanation, referred to as "*beginner's mind*" (an open mind that approaches phenomena as if seeing them for the first time), in almost any study that carries out mindfulness interventions. An alternative explanation is that an employee who is high in mindfulness will notice when he is distracted, and this awareness will motivate him to refocus, to remain "*engaged*" in the present moment, enabling him to return to the task (Zivnuska et al., 2016).

4.3.5. Mindfulness and physical health

For decades, clinical psychologists and medical professionals have applied mindfulness techniques to help people with physical health problems. Focusing on the workplace, Wolever et al. (2012) found that a mindfulness intervention program produced several health benefits such as lowering blood pressure, improving breathing rate, and improving heart rate.

Taken together, these results tell us about the positive role of mindfulness on psychological well-being and health, and they enable us to understand the increasing frequency of mindfulness training programs in organizations.

4.4. Implementing mindfulness training programs in organizations

There is ample empirical evidence that organizations can increase the frequency of employees' mindfulness experiences by implementing mindfulness training programs. These programs are based on the 8-week training course developed by Jon Kabat-Zinn, which has been slightly adapted to facilitate its delivery in organizations. Typical courses range in length from 5 to 12 weeks, with one training session per week lasting between 60 and 90 minutes, and the expectation of a daily practice of between 10 and 15 minutes. Although more intensive courses such as one-day or multi-day retreats and online courses have appeared and have had positive results (e.g., Jayewardane et al., 2017), there are doubts that they can achieve all the potential benefits (Langer & Moldoveanu, 2000).

Hyland et al. (2015) justified the implementation of mindfulness programs in the workplace based on four benefits: managing employee stress; improving the development of high-potential workers; encouraging engagement and reducing burnout; and helping employees cope with organizational change.

- *Managing employee stress.* Reducing stress has obvious benefits for individuals, but it can also have benefits for the organization. The European Agency for Safety and Health at Work (EU-OSHA) estimates that employee stress has an economic cost of around 136 million euros per

year (mostly due to sickness absence), an amount that represents between 2.6% and 3.8% of the gross domestic product (GDP).

- *Improving the development of workers with high potential*. Leadership development is a priority for most organizations. U.S. organizations spent about $24 million on leadership development in 2013. Lack of self-awareness is one of the biggest obstacles to leadership growth and development. High-potential leaders often accumulate a historical record of success, which makes them vulnerable to becoming overconfident in their own capabilities and less receptive to the feedback they may receive from others. Through mindfulness programs, leaders can increase their awareness or knowledge about their strengths and areas for improvement, and be more open to feedback, ideas, and contributions from others.
- *Encouraging engagement and reducing burnout*. Previous research has linked mindfulness to increased engagement and decreased burnout. Mindfulness training programs can help organizations increase employee engagement and commitment and reduce burnout, especially for jobs characterized by high stress and high burnout.
- *Helping employees to cope with organizational change*. Organizational change initiatives often fail because of employees' resistance to change. Research findings suggest that mindfulness can help employees cope with organizational change because it reduces the stress associated with the sense of loss of control that often occurs during organizational change, it reduces positions of self-defensiveness, it encourages objectivity and a deferment of judgment until careful consideration of the facts, and it increases cognitive flexibility.

4.5. Future lines of research

We would like to end this article by identifying areas where there are still important unknowns that should inspire future research efforts. First, it has become clear throughout this review that little is generally known about what factors contribute to experiences of mindfulness at work and what organizations can do to enhance mindfulness (Lawrie et al., 2018). So far, researchers have been inclined to study the consequences of mindfulness; understanding its predictors has generated less

attention. However, if mindfulness is an important asset in the work environment for promoting psychological well-being and health, identifying its main predictors is relevant. The discovery of its predictors should enable organizations, and the psychologists and other practitioners working in them, to create the conditions that favor the occurrence of experiences of mindfulness at work and their maintenance over time.

Second, in this emphasis on understanding the consequences of mindfulness, not all variables have received the same attention. Research has focused primarily on studying the effects of mindfulness on psychological well-being and health, and the effects of mindfulness on performance have been much less studied (Dane, 2011). This gap is relevant to the extent that work, organizational, and human resources psychologists must make the two aims compatible: seeking the welfare of workers, and at the same time, ensuring a performance of each of the organizational members and teams that contributes to achieving the goals of the organization.

Thirdly, research on mindfulness in the field of work and organizations has focused on the individual level, with less attention paid to the team and organizational levels. However, when we refer to work and organizations, understanding collective phenomena is paramount. Thus, the whole line of research on collective mindfulness (or mindful organizing), and organizational mindfulness, is of great relevance and should be one of the lines of future research (Vogus & Suttcliffe, 2012; Weick et al., 1999). It is also of great interest to try to understand the trans-level effects (e.g. does the fact that a team is composed of people that are more or less high in mindfulness influence the collective mindfulness of the team, or can a leader who stimulates the collective mindfulness of the team end up developing the individual mindfulness of each of its members?) (Sutcliffe et al., 2016).

4.6. Conclusions and practical implications

Throughout this review, it has become clear that mindfulness can be a relevant factor to take into account in order to enhance health and well-being in the workplace, in its three aspects: as a personality trait, to be taken into account in personnel selection processes, especially in jobs where high levels of stress are expected; as a state, facilitating mindfulness experiences at work (e.g.,

stimulating a climate of organizational support or eliminating organizational restrictions); and through the implementation of training programs.

CHAPTER V: CLARIFYING THE RELATIONSHIP BETWEEN TRAIT MINDFULNESS AND OBJECTIVE PERFORMANCE

Goilean, C., Gracia, F.J. & Tomás, I. Clarifying the relationship between trait mindfulness and objective performance. *Current Psycholgy* (2021). https://doi.org/10.1007/s12144-021-02414-y

Abstract

The present study focused on the relationship between trait mindfulness and the outcome component of performance, evaluated with objective indicators. In particular, four objective performance indicators were studied: accuracy, reaction time, variability in reaction times, and detection of unexpected stimuli. Because attention and awareness have been described as core components of mindfulness, and previous research suggests that mindfulness is associated with improved attention skills, this study predicted that trait mindfulness would be positively related to objective indicators of high performance (accuracy, detection of unexpected stimuli) and negatively related to objective indicators of low performance (reaction time, variability in reaction time), on an attention task. Moreover, the study predicted that the relationship between trait mindfulness and objective performance would be modulated by task complexity. University students (139) completed mindfulness, intelligence, and personality questionnaires and completed an adapted Stroop task (Stroop, 1935) in E-prime 2 software. To test our hypotheses, we performed hierarchical multiple regression analyses in SPSS. Our results revealed that trait mindfulness is not related to objective indicators of performance in an attention task, except for the detection of unexpected stimuli. Going further with our analyses, we also confirmed the important role of intelligence in performance outcomes. Finally, task complexity was not playing a moderator role in the relationship between mindfulness and objective performance. Our research contributes to the literature on mindfulness and objective performance, providing empirical evidence for the relationship between trait mindfulness and the detection of unexpected stimuli. Study limitations and avenues for future research are discussed.

Keywords: trait mindfulness, objective performance, attention, awareness, accuracy.

5.1. Introduction and theoretical background

Mindfulness has gone from being a practice associated with Buddhism, and only marginally practiced by some Westerners, to becoming increasingly popular. The development of the Mindfulness-Based Stress Reduction program by Kabat-Zinn (1982) was a milestone in the evolution of mindfulness. Its success led to the appearance of other similar clinically oriented mindfulness-based programs that effectively addressed specific conditions such as substance abuse or eating disorders (Appel & Kim-Appel, 2009). In the past fifteen years, the popularity of mindfulness has reached the academia and the workplace (Hyland et al., 2015).

Research into effectiveness of mindfulness in education shows that mindfulness enhanced well-being (Collard et al., 2008), academic success (Meiklejohn et al., 2012), learning and grades (Bakosh et al., 2015; Barbezat & Bush, 2014), empathy (Beddoe & Murphy, 2004), emotion regulation and cognitive control (Bowlin & Baer, 2012), creativity (Zenner et al., 2004), self-efficacy (Keye & Pidgeon, 2013) and increased capacity for emotional intelligence (Snowden et al., 2015). On the contrary, mindfulness decreased anxiety (Beddoe & Murphy, 2004). Therefore, incorporating mindfulness in academic settings reflects its utility in achieving social, emotional and academic benefits.

In the same line, throughout the past two decades, mindfulness in the workplace has been associated with many benefits for health and psychological well-being. For instance, reduced stress (Donald & Atkins, 2016) and emotional exhaustion (Hülsheger et al., 2013), increased work engagement (Leroy et al., 2013), job satisfaction (Hülsheger et al., 2013), resilience (Jha et al., 2010), emotional intelligence (Chu, 2010), and the quality of relationships with others (Brown et al., 2007).

Less attention has been paid to the association between mindfulness and individual performance (Dane, 2011). This is a relevant research gap because organizations expect all employees to contribute to achieving organizational goals (e.g., productivity, quality) through their performance. Organizations need high-performing individuals in order to meet their goals, deliver the products and services they specialize in, and ultimately achieve a competitive advantage

(Sonnentag & Frese, 2002). Furthermore, work and organizational psychologists and other professionals working in human resources are expected to make individual needs and organizational goals compatible and contribute to employee well-being and organizational productivity (Mohrman et al., 1986). If research reveals that mindfulness contributes to workplace performance (at least in some jobs or for some tasks), organizations should incorporate the evaluation of candidates' trait mindfulness into recruitment and personnel selection processes. Organizations could also implement intervention programs to enhance mindfulness at work (Hülsheger et al., 2015) or create the best conditions (e.g., increase job control) for states of mindfulness in their employees while doing their work (Donald & Atkins, 2016). If mindfulness has successfully reached the workplace because of its many health benefits, demonstrating that it can also contribute to improving performance would be an important step in consolidating it and keeping it from becoming a fad.

The relevant question is whether mindfulness is associated with performance and, if so, when. Correctly addressing this question involves clarifying what kind of mindfulness and performance we are interested in.

Mindfulness has been defined as "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*" (Dane, 2011, p. 1000). Although most definitions of mindfulness refer to a *state* of consciousness, mindfulness can also be understood as a personality trait (Dane, 2011). State mindfulness refers to the extent to which an individual is currently aware of and paying attention to stimuli occurring in the present (Brown & Ryan, 2003), whereas trait mindfulness refers to the duration, frequency, and intensity with which an individual tends to engage in states of mindfulness (Hülsheger et al., 2013). Research indicates that, due to dispositional tendencies, some people may be in a mindful state of consciousness more often than others (Giluk, 2009). Individuals with high trait mindfulness will more frequently experience states of consciousness where their attention is focused on present-moment phenomena occurring both externally and internally. Although trait and state mindfulness are related, in that individuals with a mindful disposition are more likely to experience momentary mindfulness, their

effects are independent (Brown & Ryan, 2003). In the present study, we focus on the relationship between trait mindfulness and performance.

The most extended definition of performance refers to behaviours or actions that are relevant to the goals of the organization and can be measured or scaled (Campbell, 1990). However, authors agree that when conceptualizing performance, it is important to differentiate between the process, action, or behavioural component of performance and the outcome component of performance (Campbell, 1990; Sonnentag & Frese, 2002). The outcome component of performance refers to the consequences or results of the individual's behaviour. In this study, we focus on the outcome component of performance.

The behavioural component of performance is usually measured through scales where the employee or someone else (e.g., the immediate supervisor) reports on the degree to which the employee performs some actions or behaviours that are relevant to organizational goals. In contrast, the outcome component of performance is usually evaluated through objective indicators that reflect the results achieved by the employee (e.g., sales figures).

Research in the educational setting relates mindfulness with academic performance, such as attention (Semple et al., 2010), working memory (Jha et al., 2010), and academic self-efficacy (Hanley et al., 2015), however these studies use self-reported questionnaires; therefore the results are based on students' perceptions and not on objective indicators. Indeed, there are studies that present results obtained with objective indicators, but the results are not conclusive. For instance, Stillman et al. (2014) found a negative relationship between trait mindfulness and sequence learning in two tasks: Alternating Serial Response Time Task (ASRT, Howard Jr. & Howard, 1997) and Brief Test of Adult Cognition by Telephone (BTACT, Tun & Lachman, 2006). However, Bellinger et al. (2015) examined performance in a high-pressure laboratory setting and found that trait mindfulness indirectly improved math performance by reducing anxiety. Through our study, we attempt to obtain additional evidence regarding the relationship between trait mindfulness and objective performance in an undergraduate sample, in an effort to clarify the relationship between these two variables.

Considering the organizational environment, most previous research has focused on the effects of trait mindfulness on the behavioural component of performance, including overall performance (Dane & Brummel, 2014), intra-role or task performance (Reb et al., 2017), extra-role performance or organizational citizenship behaviour (Reb et al., 2013), counterproductive performance or deviant behaviour in the workplace (Reb et al., 2013), and creative performance (Zheng & Liu, 2017), or very specific types of performance, such as safety performance (Zhang et al., 2013) or sports performance (Röthlin et al., 2016). Thus, all these studies focus on the effects of trait mindfulness on perceptions or subjective judgments about employee's behaviours, and they do not allow us to draw any conclusions about whether trait mindfulness produces differences in performance outcomes evaluated with objective indicators.

In our study, we aim to overcome this limitation by focusing on the relationship between trait mindfulness and the outcome component of performance, evaluated with objective indicators. Most of the studies that have examined the effects of trait mindfulness on objective performance were conducted in a laboratory context (Eichel & Stahl, 2017; Fountain-Zaragoza et al., 2018; Keith et al., 2017; Lin et al., 2018; Moore & Malinowsky, 2009; Quickel et al., 2014; Schmertz et al., 2009), although some field studies also exist (Shao & Skarlicki, 2009). In these studies, there is considerable variability not only in the type of task performed by the participants, but also in the performance indicators or objective measures obtained. The most frequent objective performance indicators used in these studies are accuracy (e.g., number of correct answers, number of commission errors, number of omission errors, etc.), reaction time, and variability in reaction time. Fewer studies calculate the speed or time employed to perform the task (Quickel et al., 2014) or use efficiency indicators with scores that take both speed and accuracy into account (Moore & Malinowsky, 2009).

Therefore, this paper aims to study the relationship between trait mindfulness and individual objective performance. Specifically, four objective indicators of performance are studied: accuracy, reaction time, variability in reaction times, and detection of unexpected stimuli. Because of their relevance for work performance, accuracy, reaction time, and variability in reaction times

are among the most widely researched objective performance indicators. These are the most applied objective indicators because in the majority of the studies (Eichel & Stahl, 2017; Fountain-Zaragoza et al., 2018; Keith et al., 2017; Larson et al., 2013; Lin et al., 2018; Moore & Malinowsky, 2009; Quickel et al., 2014) attention is the performance indicator most related to mindfulness. Therefore, the enumerated indicators are needed to ensure effective performance metrics, and including them in our study makes it possible to compare our findings with those obtained in previous research. Additionally, we include the detection of unexpected stimuli in our study. Today, organizations increasingly face dynamic and uncertain environments. In these environments, managing unexpected stimuli becomes a critical competency. Detection of unexpected stimuli and events is critical in some industries (e.g., nuclear power plants, commercial aviation, air traffic management) in order to react quickly and properly and avoid any negative consequences that could end in catastrophe (Weick & Sutcliffe, 2015). We intend to contribute to extending previous research by shedding some light on the following research questions: Do mindful individuals (individuals high in trait mindfulness) perform better (considering objective indicators)? If so, in what sense? First, are they more accurate? Second, do they react faster when facing an external stimulus? Third, is their performance more consistent? Lastly, are they better able to detect the appearance of unexpected stimuli? As we argue in the following paragraphs, based on the results of previous literature, these relevant questions remain unanswered.

For Quickel et al. (2014), if mindfulness enhances focused attention, then trait mindfulness should predict individual differences in attentional control. However, in the case of accuracy, the results are far from conclusive. For instance, Keith et al. (2017) found no relationship between trait mindfulness and errors (commission and omission) on a computerized Go/No-Go task (The Test of Variables of Attention, TOVA). Similarly, Quickel et al. (2014) found no relationship between trait mindfulness and the number of correct answers on two different tasks: the Symbol Digit Modalities Test, (Smith, 1982) and the Computer Adaptive Adjustable 2-Back Task. In contrast, Moore and Malinowsky (2009) identified a positive relationship between trait mindfulness and precision on two

different tasks: the Stroop-test (Stroop, 1935) and the attention test d-2 (Brickenkamp & Zilmer, 1998). Finally, two other studies found mixed evidence of the relationship between these two variables. On the one hand, Fountain-Zaragoza et al. (2018) did not find a relationship between trait mindfulness and precision on a Go/No-Go type task, and they only found a positive association for one of the two precision indicators obtained on a Word-Continuous Performance Task. On the other hand, on the Eriksen flanker task (Eriksen & Eriksen, 1974), Lin et al. (2018) revealed that individuals that are more mindful made fewer errors in the incongruent stimuli condition; however, these differences were not observed in the case of congruent stimuli.

From a theoretical approach, mindfulness would be expected to lead to shorter reaction times and less variability in reaction times, due to the mindful individual's ability to attend to the present and maintain this attention throughout the task (Brown & Ryan, 2003). However, again the results are far from conclusive. Regarding reaction time, whereas Keith et al. (2017) revealed that trait mindfulness was associated with shorter reaction times, Eichel and Stahl (2017) did not find a relationship between the two variables, despite using two different instruments to measure mindfulness (The Freiburg Mindfulness Inventory FMI, Buchheld & Walach, 2002; and the Mindful Attention and Awareness Scale MAAS, Michalak et al., 2008). Additionally, Lin et al. (2018) found that trait mindfulness was associated with shorter reaction times in the case of incongruent stimuli, suggesting that individuals with high levels of mindfulness focus their attention on the relevant stimulus, the target, ignoring the rest.

Regarding variability in reaction times, results are again inconsistent. Keith et al. (2017) showed that trait mindfulness was associated with less variability in reaction times. However, Eichel and Stahl (2017) found a relationship between the two variables only when mindfulness was measured with the FMI, but not when it was measured with the MAAS.

The above-mentioned discrepant results on the objective indicators of performance highlight the need for further clarification of the role of trait mindfulness. Additionally, we included detection of unexpected stimuli, which is quite relevant in industries where safety is critical (Zhang et al., 2013;

Zhang & Wu, 2014). Mindful individuals are more aware of risks in the system and the potential appearance of unexpected stimuli and events. Therefore, they can preclude automatic information processing and categorical thinking, biased judgements, and "do what you always do" reactions (Bishop et al., 2004; Brown et al., 2007; Zhang et al., 2013).

Furthermore, some authors have suggested that the effects of mindfulness on objective performance could be modulated by task complexity. Task complexity is defined as the set of attentional, memory, reasoning, and other information processing demands imposed by the structure of the task (Robinson, 2001). Although mindfulness may have several positive outcomes, it may also have costs due to its time-consuming nature. Zhang et al. (2013) argued that the benefits of mindfulness could depend on task complexity. On complex tasks, the benefits of being mindful greatly outweigh the time cost because small errors or missing information can seriously undermine the overall performance. However, on simple tasks, the benefits of being mindful may not exceed its time cost. In the context of a nuclear power plant, Zhang et al. (2013) found some evidence for this hypothesis. For high complexity task holders, trait mindfulness was positively associated with task and safety performance (rated by their supervisors), whereas for low complexity task holders, trait mindfulness was negatively associated with task performance and not related to safety performance. However, we did not find any previous studies addressing whether task complexity moderates the relationship between trait mindfulness and objective performance.

Regarding the type of task, with some exceptions (see Pareja et al., 2015 for the incidence of mindfulness on performance on a driving task), most of the studies include cognitive tasks. On these types of tasks, attentional demands are essential in achieving good performance (Eichel & Stahl, 2017; Fountain-Zaragoza et al., 2018; Keith et al., 2017; Lin et al., 2018; Moore & Malinowsky, 2009; Quickel et al., 2014).

In this study, we used an adapted Stroop task (Stroop, 1935) to test participants' ability to focus, sustain, and direct their attention and detect unexpected stimuli. The participants were asked to attend to either the colour or the semantics of the words on a computer using E-prime 2 (Schneider

et al., 2012). According to MacLeod (1991), the Stroop effect is one of the most reliable phenomena in reaction time research because it forces the individual to check the compatibility of the possible responses cognitively. This task is suitable for mindfulness research because the gradual increase in task complexity requires the ongoing reinvestment of participants' attention to achieve good performance (Moore & Malinowski, 2009).

In sum, the purpose of the present study is to examine the relationship between trait mindfulness and four indicators of individual objective performance, and the moderating role of task complexity. Moreover, we want to find out whether this relationship is maintained or variance is added when we consider intelligence and two personality variables (conscientiousness and neuroticism) that are also associated with performance. To achieve our goal, we conducted a study in a laboratory setting and employed software (E-prime 2.0) to recode the objective indicators of performance on a Stroop task (Stroop, 1935).

Based on the discussion above, we hypothesize the following:

H1. Mindfulness is positively related to accuracy and negatively related to errors of commission and errors of omission. We expect that higher trait mindfulness, the stronger the effect.

H2. Mindfulness is negatively related to reaction time and variability in reaction time.

H3. Mindfulness is positively related to the detection of unexpected stimuli (in high complexity tasks).

H4. The relationship between mindfulness and objective performance is moderated by task complexity, in such a way that this relationship is stronger in tasks with high complexity than in tasks with low complexity.

5.2. Method

5.2.1. Participants

This study examined data from 139 participants (21% males and 79% females). The observed imbalance in the distribution by gender can be explained as the sample is representative of the undergraduate students from the Faculty of Psychology and the Faculty of Social Sciences. Concretely,

participants recruited were undergraduate students enrolled in Psychology and in Labour Relations and Human Resources courses (59.7% psychology and 40.3% labour relations and human resources). Their participation was in exchange for course credit. Their ages ranged from 17 to 49 years (*M*= 20.9, *SD*= 4.25). Power analysis using G*Power with three predictors (i.e., independent variable, moderator, and interaction), α-level = 0.05, and medium effect size f^2= 0.15, suggests that to attain 95% power we need to recruit at least *N*= 119 participants (Faul et al., 2009). Thus, with the recruited sample size, we ensured to have sufficient statistical power to detect relevant effects.

5.2.2. Procedure

The study was carried out in accordance with the Declaration of Helsinki and approved by the local ethics committee. Informal consent was obtained. A pilot study (*n*= 4) was conducted to sort out any possible problems that might lead to the failure of the research procedure. Regarding the study sample, the individuals were contacted via email to establish the planning.

Participants only attended one session, and they were distributed in groups of two; for the first part of the session, they were in the same room completing the questionnaires and for the second part of the session, they were tested individually. The estimated length of a session was around 60 minutes and comprised two differentiated blocks: paper and pencil questionnaire administration and computer task administration. The session took place in the university's laboratory. Prior to completing the questionnaires and beginning the tasks, the individuals received standard instructions to avoid biases. In the first part of the session, the participants first completed the informed consent and then questionnaires collecting demographic information (age, gender, and specialization), other control variables (conscientiousness, neuroticism, intelligence), and trait mindfulness. In the second part of the session, for task administration, each individual was given a chronometer, taken to a private, sound-attenuated testing room, and seated facing a monitor. The tasks were based on Stroop tasks (Stroop, 1935). These tasks were administered to each participant individually. We divided the Stroop task into 4 tasks with different levels of complexity on a computer, using E-prime 2 software. This software recoded accuracy (ACC), errors (commission errors Ec and omission errors Eo,), and reaction

time (RT). Task 1 and Task 2 were composed of 48 stimuli each. Task 3 and Task 4 included 32 stimuli each. Each stimulus was shown on a different screen. Participants had 4 seconds to answer each stimulus. The computer software moved on to the next screen once the participant had answered or after 4 seconds had passed. The participants were advised to answer before the time limit (4 seconds) and avoid making errors. In order to stimulate participants' motivation, they were told that the best participant (with the least amount of errors in the shortest time) would receive a 30-Euro prize. After verbally confirming that they understood the oral instructions and the written instructions on the monitor, the participants began the tasks. On the first and second tasks, they had a short practice session consisting of 4 stimuli. Between the tasks, we introduced a 3-minute break. Every time the participants finished the tasks, they received verbal approval to use the chronometers and control the 3-minute break; meanwhile, the investigator prepared the following task. At the end of each of the four tasks, within the E-prime 2 environment, the participants had to complete some questions about the perceived difficulty of the task and their subjective performance, and only for Task 4, participants had to answer a set of questions about the presence of distractors. Finally, at the end of the experiment, again in E-prime 2, they had to answer a questionnaire about their previous familiarity with Stroop tasks.

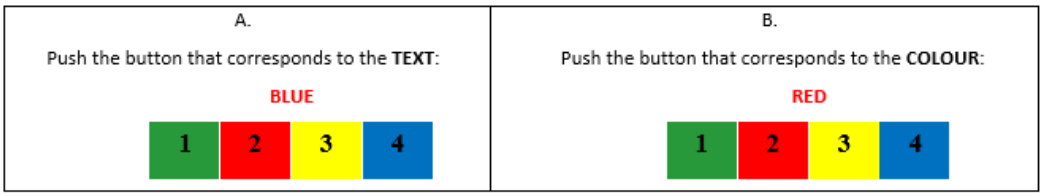
5.2.3. The task

The Stroop task is a demonstration of interference in the reaction time on a task. The administered tasks were similar to the original version by Stroop (1935). When the name of a colour ("*green*", "*red*", "*yellow*", or "*blue*") is printed in a colour that is different from the name (e.g., the word "*red*" printed in blue ink instead of red ink), it takes longer to name the colour of the word, and the participant is more prone to errors than when the colour of the ink matches the name of the colour. As mentioned above, we created four different tasks for our experiment. For each of these tasks, the screen time for each stimulus was 4 seconds. For the first and the second tasks, we generated three series of 16 stimuli. These 16 stimuli were the result of combining 4 colours (blue, green, red, and yellow) with the text instruction, respectively, for each colour. Specifically, on the first task,

participants had to indicate the colour that matched the text of the word, whereas on the second task; they had to indicate the colour that matched the colour of the word. The corresponding instruction was given in written format on the screen at the beginning of each task. After reading it and communicating to the investigator that they understood the instruction, they began the tasks. Participants had to indicate the colour of the word by pressing 1 for green, 2 for red, 3 for yellow, and 4 for blue. The numbers always remained on the screen in the squares with the corresponding colours (see Figure V. 1). These numbers with the corresponding colours were the same for all the tasks. Each of these three series of 16 stimuli contained 4 congruent stimuli (the name and colour of the word matched) and 12 incongruent stimuli (the name and the colour of the word did not match). Thus, the test material consisted of 48 stimuli (one per screen). The same word or colour could not appear two times in a row. We used a randomization procedure to determine the order of appearance of the 16 stimuli in each of the 3 series.

Figure V. 1.

Example of the tasks (A. Task 1- example of the incongruent stimulus; B. Task 2 – example of the congruent stimulus)

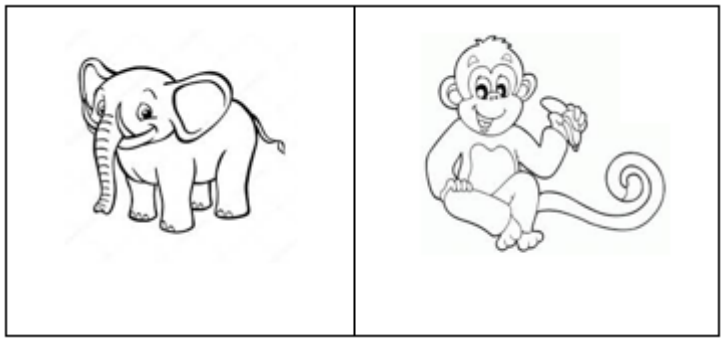


On the third task, the participants had to indicate either the colour that matched the text of the word or the colour that matched the colour of the word, according to the specific instruction that appeared on each screen for each stimulus. The test material consisted of 32 stimuli (one per screen). The 32 combinations were obtained by combining the 4 words with the 4 colours and the instructions for the text or colour (4x4x2). The same word or colour could not appear two times in a row. We applied a randomization procedure, with a total of 8 congruent stimuli and 24 incongruent stimuli.

For the fourth task, the instructions were the same ones used for the third task. The participants had to indicate either the colour that matched the text of the word or the colour that matched the colour of the word, according to the specific instruction for each stimulus. The difference between Task 4 and Task 3 was the presence of distractors and the randomization procedure. Regarding the presence of distractors, we introduced images of animals (see Figure V. 2) in black ink and with no colour as distractors. The distractors appeared in the centre of 4 screens (more precisely on the 3rd, 11th, 19th, and 27th); each distractor appeared twice alternatively. They appeared from the beginning of the stimuli presentation and disappeared in 2 seconds. Regarding the randomization procedure, the order and combination of the word-colour pairs were different for Task 3.

Figure V. 2.

The distractors



5.2.4. Measures

Trait Mindfulness

Trait mindfulness was measured using the 15-item Spanish version (Soler et al., 2012) of the Mindfulness Attention Awareness Scale (MAAS, Brown & Ryan, 2003). It is the most widely used instrument for the evaluation of dispositional mindfulness. The MAAS operationalizes mindfulness as a single factor related to attention. A sample item is "*I tend to walk quickly to get where I'm going without paying attention to what I experience along the way*". Items are rated on a six-point Likert scale ranging from 1 (almost never) to 6 (almost always). The total score was obtained after reversing the items (i.e., high scores indicate high trait mindfulness). The MAAS (Brown and Ryan 2003) is a

coherent self-report questionnaire that demonstrated adequate reliability in a number of studies (α= .82, Quickel et al., 2014; α= .80; Fountain-Zaragoza et al., 2018). The Spanish version (Soler et al., 2012) also demonstrated a good internal consistency (α= 85, Muro et al., 2017).

Objective performance

Several indicators of objective performance were obtained: accuracy was estimated as the number of correct responses on the task, errors of commission, errors of omission, reaction times, variability in reaction times, and detection of unexpected stimuli.

Accuracy (ACC) was estimated as the number of correct responses on the task.

Errors of commission (Ec) were estimated as the number of incorrect responses given by the participant on the task.

Errors of omission (Eo) were estimated as the number of stimuli that were not responded to by the participant (time was up before answering).

Reaction time (RT) was estimated as the mean reaction time values in milliseconds for all the stimuli included in the task.

Variability in reaction time (RTSD) represents the individual stability of information processing speed (Eichel & Stahl, 2017). The RTSD for each task was estimated as the standard deviation for the reaction time values in milliseconds on all the stimuli included in the task.

Detection of unexpected stimuli

After finalizing Task 4, the participants answered five questions about the distractors that appeared during the task. Each question had multiple-choice answers. The items were the following: 1) "*Did you see any unexpected stimulus on the screen while doing the task?*" (answer: yes/no); 2) "*Can you remember what it was*?" (answer: a plant/an animal/a transport/domestic utensil/I did not distinguish it/I did not see anything); 3) *"Did you see what it was*?" (answer: whale/rhinoceros/elephant/hippo/I did not distinguish it/I did not see anything); 4) "*Did you see what it was*?" (answer: dog/monkey/cat/koala/I did not distinguish it/I did not see anything); 5) "*What side of the screen did it appear on*?" (answer: lower right/ upper left/ in the centre/ lower left/upper right/I

do not remember/I did not distinguish it/I did not see anything). For each item, there was only one right answer. A total score was obtained by adding up the correct answers on the five items. Thus, this variable ranged from 0 to 5, with a higher score indicating more accuracy in perceiving the distractors.

Task difficulty

Participants had to indicate the level of difficulty of the task they had just performed on a 10-point Likert scale ranging from 0 (very easy) to 9 (very difficult).

Task complexity

It was measured according to the levels of complexity of the four tasks, which were presented from lower to higher levels of complexity. On Task 1, participants had to indicate the colour that matched the text of the word. On Task 2, they had to indicate the colour that matched the colour of the word. On Task 3, they had to indicate the colour that matched the text of the word or indicate the colour that matched the colour of the word, according to the specific instruction presented with the stimulus. Finally, Task 4 was similar to Task 3, but we included four distractors. The tasks were assumed to have an increasing level of complexity because of the differences in cognitive processing demands (Robinson, 2001).

Manipulation of the complexity levels

A one-way within-subjects ANOVA was conducted to compare the participants' perception of the difficulty of each of the four tasks. This analysis aimed to check whether the participants perceived the level of complexity of the different tasks. Results of the ANOVA [$F(3,414)= 107.53$, $p < .001$, $\eta 2= 0.44$] indicated significant differences. The pairwise comparison results indicated no statistically significant differences in the perceived difficulty level between Task 1 and Task 2 ($p= .07$) or Task 3 and Task 4 ($p= .24$). However, statistically significant differences were found in the perceived difficulty level of Tasks 1 and 2 in comparison with Tasks 3 and 4, with the latter showing a higher level of perceived difficulty. Thus, we decided to categorize the tasks according to two complexity levels: low complexity tasks (1 and 2) and high complexity tasks (3 and 4).

Control variables

We tested the potential influence of seven control variables: age, gender, specialization, familiarity with the tasks, conscientiousness, neuroticism, and intelligence. According to the literature, there are age and gender differences in mindfulness (Sturgess, 2012), and so we controlled for these demographic variables. Moreover, given that mindfulness may be especially beneficial for domain experts (Dane, 2011), we asked participants to report their specialization and familiarity with the tasks. Additionally, in order to observe whether the effect of mindfulness can be differentiated from other trait-like variables, we controlled for conscientiousness and neuroticism (Giluk, 2009). Finally, because intelligence is a predictor of performance on some cognitive tasks (Shakeel & Goghari, 2017), we also controlled this construct. We treated gender (1= male, 2= female) and specialization (1= psychology, 2= labour relations and human resources) as dummy variables, and age and intelligence were used as continuous variables.

Familiarity Scale

We measured familiarity with the tasks on a 3-item scale. The sample items for this scale were: *"I heard about this task in one of my courses, during my college years"; "I previously did tasks like this";* and *"I am familiar with the type of task I just did".* The participants rated each statement on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree).

Conscientiousness and Neuroticism

To assess personality dimensions (conscientiousness and neuroticism), the two selected facets from the Spanish version (Cordero et al., 2008) of the Five-Factor Reduced Personality Inventory (NEO-FFI, Costa & McCrae, 1992) were administered, with 12 items per dimension. A sample item for conscientiousness is "*I never seem to be able to get organized*", and for neuroticism "*I rarely feel scared or anxious*" (reverse-coded). The participants rated each statement on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). NEO-FFI showed good reliability in previous studies (α= 0.79 for conscientiousness and α= 0.80 for neuroticism; Giluk, 2009) as well as the Spanish version, with values of the Cronbach's α fluctuating between .71 and .82 (Poch, 2009). Moreover, the validity of this

instrument has been demonstrated in different studies (Magalhães et al., 2014; McCrae & Costa, 2004).

Intelligence

To measure intelligence, we used the Spanish version (Cruz et al., 1988) of the Domino Test D-70 (Kowrousky & Rennes, 1988). The material that forms the D-70 is non-verbal, represented by dominoes ordered according to a law the participant must discover in order to continue the series started and find the solution required. The test has 44 elements, preceded by 4 examples. Individuals had limited time to complete the test (25 minutes).

5.2.5. Data analyses

All the variables were screened for missing data and distributional assumptions prior to analysis. Confirmatory factor analyses (CFA) were carried out to test the factorial structure of the mindfulness scale and the two personality dimensions using Mplus version 8 (Muthén & Muthén, 1998-2012) and WLSMV estimation. A single-factor model was tested for mindfulness and a two-factor model for the two personality scales (conscientiousness and neuroticism). Model fit for the CFA was evaluated using commonly recommended fit indices: Chi-Square Test of Model Fit (χ^2), Root Mean Square of Approximation (RMSEA), Tucker-Lewis Fit index (TLI), the Comparative Fit Index (CFI) and the Weighted Root Mean Square Residual (WRMR). These indicators must provide results close to the acceptable scores provided by Hu and Bentler (1999). Therefore, for a model to demonstrate satisfactory fit, it must obtain the χ^2 values closer to zero RMSEA < 0.08 (closer to zero); CFI ≥ 0.90; TLI ≥ 0.95 and WRMR <1.0.

Descriptive statistics (mean, standard deviation) and reliability were estimated for all continuous variables, and the Pearson correlation coefficient was estimated among the study variables. To test our hypotheses, we performed hierarchical multiple regression analyses in SPSS (version 24), first entering the demographic control variables (age, gender, specialization, and familiarity with the tasks), and then entering the two personality variables (conscientiousness and neuroticism), intelligence, and, finally, trait mindfulness. To evaluate the statistical significance of the

parameter estimates, we used one-tailed tests, which are suitable for directional hypotheses (Erickson & Nosanchuk, 1977; Wonnacott & Wonnacott, 1984).

5.3. Results

The CFA conducted to test a one-factor model for the mindfulness scale demonstrated satisfactory fit ($\chi^2(90)= 167.82$, $p< .001$; RMSEA= 0.079, CFI= .924, TLI= .911, WRMR= .842). However, the fit of the two-factor model for the two personality dimensions (conscientiousness and neuroticism) was not satisfactory ($\chi^2(251)= 629.746$, $p< .001$; RMSEA= 0.104; CFI= .791; TLI= .770; WRMR= 1.451). The values on the modification indices suggested correlating the residuals of the items ("*Before doing an action, I always consider its consequences"* and *"Sometimes I act first and think later")* (MI= 24.38), and the residuals of the item ("*I have clear objectives and I strive to achieve them in an orderly manner")* and the item ("*I work hard to achieve my goals")* (MI= 25.98), all of them from the conscientiousness scale. Considering the similarities in the wording and the content of each pair of items, we introduced the suggested modifications, which resulted in a better fit of the model, but without reaching satisfactory values ($\chi^2((249)= 584.21$, $p< .001$; RMSEA= 0.098; CFI= .815; TLI= .795; WRMR= 1.376). The results of the modification indices suggested the elimination of the item "*Sometimes I do things impulsively and then I regret it*" from the neuroticism scale because it showed a relevant weight on the conscientiousness scale (MI= 88.50). Applying this modification, along with the correlated residuals, the two-factor model exhibited adequate goodness of fit indices ($\chi^2((227)= 359.982$, $p< .001$; RMSEA= 0.065; CFI= .921; TLI= .912; WRMR= 1.031). Hence, the score on the neuroticism scale was obtained with only 11 items. We also checked the subscale reliabilities with omega coefficients (McDonald, 1999; McNeish, 2018). The value obtained for McDonald's omega in the case of NEO-FFI was .86 for neuroticism and .87 for conscientiousness, while for the MAAS was .86.

As indicate above, hierarchical multiple regression analyses were applied to test our hypotheses. For all regression models, the assumptions (no collinearity; independence, normality and homoscedasticity of residuals) were met in this data set. The descriptive statistics, correlations, and

scale reliabilities for mindfulness, control variables, and the dependent variables (performance indicators) for low and high complexity tasks are reported in Table V. 1. As expected, mindfulness was positively correlated with conscientiousness and negatively with neuroticism, but it was not significantly related to age, gender, or intelligence. Intelligence was the only variable that correlated with all the indicators of objective performance for low complexity tasks. Meanwhile, for high complexity tasks, intelligence was positively correlated with accuracy and detection of unexpected stimuli, and negatively with errors of commission, errors of omission, reaction time, and variability in reaction time. Nevertheless, for low complexity tasks, neuroticism only correlated (positively) with errors of omission, and conscientiousness and mindfulness did not correlate with any variable. Instead, in the case of high complexity tasks, neuroticism, conscientiousness, and mindfulness did not correlate with any of the performance indicators.

To test our hypotheses, we performed multiple hierarchical regression analyses, as described above. The results of these analyses for low and high complexity tasks can be seen in Table V. 2 and Table V. 3.

Table V. 1.

Means, standard deviations, correlations, and reliabilities for mindfulness, control variables, and for performance indicators.

	M	SD	1	2	3	4	5	6	7	8
1. Mindfulness	4.21	0.77	*(.85)*							
2. Age	20.91	4.25	-.03							
3. Gender	-	-	-.16	.06						
4. Specialization	-	-	-.09	-.22**	-.05					
5. Familiarity	3.41	1.47	.02	.00	.01	-.56**	*(.71)*			
6. Conscientiousness	3.42	0.66	.43**	.16	.09	-.32**	.27**	*(.84)*		
7. Neuroticism	2.86	0.73	-.45**	-.14	-.01	.12	-.07	-.33**	*(.84)*	
8. Intelligence	29.33	4.68	-.01	.04	.03	-.36**	.15	.12	-.13	
9. ACC_L	89.94	8.28	.01	-.28**	-.16	-.15	-.01	-.06	.03	.30**
10. Ec_L	5.60	7.90	.01	.29**	.15	.13	.02	.05	-.06	-.27**
11. Eo_L	.47	1.20	-.12	.03	.14	.17*	-.07	.10	.22**	-.30**
12. RT_L	1225.53	260.40	-.03	.18*	.18*	.33**	-.25**	.00	.09	-.53**
13. RTSD_L	419.59	140.11	.01	.05	.11	.32**	-.21*	.01	.07	-.46**
14. ACC_H	55.78	6.34	.09	-.05	-.07	-.30**	.04	.04	-.10	.47**
15. Ec_H	5.99	5.11	-.10	.08	.07	.27**	-.01	.03	.10	-.35**
16. Eo_H	2.23	2.64	-.02	-.04	.03	.19*	-.07	-.13	.04	-.45**
17. RT_H	1964.81	275.985	.09	.21*	.11	.18*	-.15	-.00	-.03	-.48**
18. RTSD_H	716.60	147.212	-.01	-.11	.04	.14	.02	-.09	.10	-.44**
19. Det. of unexp. st	.88	0.223	.07	-.24**	-.02	-.07	.08	-.05	.09	.27**

Note:* $p<.05$, ** $p<.01$; Reliabilities are measured with Cronbach's alpha and displayed on the diagonal in brackets.; Gender (1=male, 2=female); Specialisation (1=psychology, 2=labour relations and human resources);; ACC_L= accuracy for low complexity tasks; Ec_L= errors of commission for low complexity tasks; Eo_L= errors of omission for low complexity tasks; RT_L= reaction time for low complexity tasks; RTSD_L= variability in reaction time for low complexity tasks; ACC_H= accuracy for high complexity tasks; Ec_H= errors of commission for high complexity tasks; Eo_H= errors of omission for high complexity tasks; RT_H= reaction time for high complexity tasks; RTSD= variability in reaction time for high complexity tasks; Det. of unexp. st= detection of unexpected stimuli.

Table V. 2.

Multiple regression for low complexity tasks

	Dependent Variable									
	ACC_L		Ec_L		Eo_L		RT_L		RTSD_L	
Predictor Variable	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*
Step 1	.173**		.168**		.057*		.216**		.130**	
Age		-.35**		.35**		.07		.25**		.11
Gender		-.15*		.14*		.15*		.18*		.12
Specialization		-.34**		.32**		.22*		.37**		.33**
Familiarity		-.20*		.20*		.06		-.05		-.03
Step 2	.062*		.051*		.143**		.207**		.153**	
Conscientiousness		-.05		.02		.24**		.12		.13
Neuroticism		.01		-.05		.26**		.07		.05
Intelligence		.26**		-.24**		-.24**		-.47**		-.40**
Step 3	.000		.001		.007		.000		.000	
Mindfulness		-.02		.03		-.11		.01		.01
Total R^2	.236		.219		.208		.423		.283	

Note: *p<.05, ** p<.01; ACC_L= accuracy for low complexity tasks; Ec_L= errors of commission for low complexity tasks; Eo_L= errors of omission for low complexity tasks; RT_L= reaction time for low complexity tasks; RTSD_L= variability in reaction time for low complexity tasks.

Table V. 3.

Multiple regression for high complexity tasks

	Dependent Variable											
	ACC_H		Ec_H		Eo_H		RT_H		RTSD_H		Det of. unexp. st	
Predictor Variable	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*
Step 1	.136**		.134**		.040		.108**		.039		.075*	.075*
Age		-.14*		.17*		.01		.25**		-.06		-.27**
Gender		-.08		.08		.04		.11		.05		-.01
Spec.		-.45**		.44**		.23*		.22*		.20*		-.13
Fam.		-.21*		.23*		.06		-.03		.13		.01
Step 2	.146**		.080**		.177**		.200**		.179**		.076*	
Consc.		-.05		.12		-.10		.02		-.05		-.03
N.		-.06		.10		-.06		-.06		.02		.09
Int.		.40**		-.27**		-.45**		-.48**		-.45**		.29**
Step3	.003		.005		.000		.008		.000		.021*	.
Mindf.		.07		-.09		.01		.11		.03		.18*
Total R^2	.285		.220		.217		.316		.218		.172*	

Note: * $p<.05$, ** $p<.01$; Mindf. = Mindfulness; Spec. = Specialisation; Fam= Familiarity; Consc= Conscientiousness; N= Neuroticism; Int.= Intelligence; ACC_H= accuracy for high complexity tasks; Ec_H= errors of commission for high complexity tasks; Eo_H= errors of omission for high complexity tasks; RT_H= reaction time for high complexity tasks; RTSD= variability in reaction time for high complexity tasks; Det. of unexp. st= detection

Results indicated that there were no relationships between mindfulness and accuracy, errors of commission, and errors of omission for low or high task complexity (p> .05). Moreover, we did not find a significant relationship between mindfulness and reaction time and variability in reaction time for low or high complexity tasks (p> .05). Therefore, Hypotheses 1 and 2 were not supported. However, the analysis revealed that mindfulness was positively related to the detection of unexpected stimuli (β= .18, p= .04). Thus, Hypothesis 3 was supported.

Finally, because the results were similar for low and high task complexity, we could conclude that task complexity did not play a moderating role in the relationship between mindfulness and objective performance. Thus, Hypothesis 4 was not supported.

These results indicate that mindfulness did not affect the performance indicators (except for the detection of unexpected stimuli). Thus, we decided to perform additional analyses to explore the relevance of personality variables and intelligence beyond the effect of mindfulness. Our correlational and regression analyses seemed to indicate that intelligence was the most relevant variable, and so we decided to check the same hypotheses by introducing the variables in a different order: step 1: age, gender, specialization, and familiarity; step 2: mindfulness; step 3: the two personality variables (conscientiousness and neuroticism); step 4: intelligence.

Results of the additional analyses (see Table V. 4) indicated that, after controlling for mindfulness and personality variables, intelligence had a positive relationship with accuracy and negative relationships with errors of commission, errors of omission, reaction time, and variability in reaction times (p<.01). The pattern of relationships was the same for low and high complexity tasks. Additionally, intelligence showed positive relationships with detection of unexpected stimuli in high complexity tasks (p<.01).

Table V. 4.

Multiple regression for low and high complexity tasks

	Dependent Variables (Low Complexity Tasks)									
	ACC_L		Ec_L		Eo_L		RT_L		RTSD_L	
Predictor Variable	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.173**		.168**		.057*		.216**		.130**	
Age		-.35**		.35**		.07		.25**		.11
Gender		-.15*		.14*		.15*		.18*		.12
Specialization		-.34**		.32**		.22*		.37**		.33**
Familiarity		-.20*		.20*		.06		-.05		-.03
Step 2	.003		.004		.006		.002		.003	
Mindfulness		-.05		.07		-.08		.05		.06
Step 3	.002		.000		.091**		.021		.016	
Consc.		-.04		.00		.27**		.10		.11
Neuroticism		-.03		-.00		.26**		.15*		.11
Step 4	.058**		.047**		.054**		.184**		.133**	
Intelligence		.26**		-.24**		-.25**		-.47**		-.40**
Total R^2	.236**		.219**		.208**		.423**		.283**	

Table V. 4.

Multiple regression for low and high complexity tasks (cont.)

	Dependent Variables (High Complexity Tasks)											
	ACC_H		EC_H		EO_H		RT_H		RTSD_H		Det of unexp. st	
Predictor Variable	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*
Step 1	.136**		.134**		.040		.108**		.039		.075*	
Age		-.14*		.17*		.01		.25**		-.06		-.27**
Gender		-.08		.08		.04		.11		.05		-.01
Specialization		-.45**		.44**		.23*		.22*		.20*		-.13
Familiarity		-.21*		.23*		.06		-.03		.13		.01
Step 2	.001		.002		.000		.018*		.000		.002	
Mindfulness		.03		-.05		.01		.14		.01		.05
Step 3	.009		.020		.011		.003		.011		.016	
Consc.		.06		.14		-.12		-.04		-.07		-.08
Neuroticism		-.10		.11		.02		.05		.09		.11
Step 4	.139**		.064**		.166**		.186**		.168**		.079**	
Intelligence		.41**		- .28**		-.44**		-.47**		-.45**		.31**
Total R^2	.285**		.220**		.217**		.316**		.218**		.172**	

Note: * p<.05, ** p<.01; Consc= Conscientiousness; ACC_L= accuracy for low complexity tasks; Ec_L= errors of commission for low complexity tasks; Eo_L= errors of omission for low complexity tasks; RT_L= reaction time for low complexity tasks; RTSD_L= variability in reaction time for low complexity tasks; Spec. = Specialisation; Fam= Familiarity; Mindf. = Mindfulness; Consc= Conscientiousness; N= Neuroticism; Int.= Intelligence; ACC_H= accuracy for high complexity tasks; Ec_H= errors of commission for high complexity tasks; Eo_H= errors of omission for high complexity tasks; RT_H= reaction time for high complexity tasks; RTSD_H= variability in reaction time for high complexity tasks; Det. of unexp. st= detection of unexpected stimuli

5.4. Discussion

The present study sought to clarify the relationship between trait mindfulness and objective performance. Our findings reveal that trait mindfulness was positively related to detection of unexpected stimuli. However, trait mindfulness was not related to accuracy, reaction time, or variability in reaction time. Moreover, task complexity did not moderate the hypothesized relationship between trait mindfulness and objective performance.

We suggest three possible explanations for these unexpected findings that should be explored in future studies. The first explanation draws on the distinction between trait and state mindfulness. When predicting performance, the important thing might not be how mindful one is (trait mindfulness), but rather how mindful one is in a specific situation (state mindfulness). In our study, we evaluated trait mindfulness before performing the Stroop task. However, we did not evaluate state mindfulness at any time. We assumed that individuals with high trait mindfulness would be in a mindful state of consciousness throughout the Stroop task, but this might not be the case. In future studies, to evaluate participants´ trait mindfulness, we could induce a state of mindfulness in the experimental group (e.g., through a meditation exercise), but not in the control group, before performing the experimental task. In this way, we could find out whether trait mindfulness or state mindfulness plays a more important role in predicting objective performance, and their interaction effects (e.g., both may be necessary in order to find individual differences in objective performance).

The second explanation refers to the operationalization of trait mindfulness. In the literature, we can find several instruments for the operationalization of trait mindfulness. These instruments differ in aspects such as the conceptualization of mindfulness, the mindfulness components they evaluate, or the greater or lesser weight they give to each of these components. In our case, we employed MAAS (Brown & Ryan, 2003), which is the most commonly used instrument for the evaluation of trait mindfulness. Future studies that compare different mindfulness operationalizations can be of great interest, as in the studies by Schmertz et al. (2009) and Quickel et al. (2014). For example, Schmertz et al. (2009) applied three mindfulness scales (MAAS, Brown & Ryan, 2003;

Cognitive and Affective Mindfulness Scale-Revised, CAMS-R, Feldman et al., 2007; Kentucky Inventory of Mindfulness Skills, KIMS, Baer et al., 2006) to examine the relationship between trait mindfulness and performance on two sustained attention tasks: Conners' Continuous Performance Test II (CPT-II, Conners, 2000) and the Paced Auditory Serial Addition Test (PASAT, Gronwall & Sampson, 1974). They found mixed evidence because CPT-II target omissions were correlated with MAAS and CAMS-R, but reaction time on the CPT-II and PASAT performance was not related to any mindfulness scale. Furthermore, several studies (Grossman, 2008; Grossman & Van Dam, 2011) indicate the need for new approaches to discover whether self-ratings of mindfulness reflect how mindful individuals truly are.

The third explanation is related to the nature of the tasks. It is possible that mindfulness improves objective performance on some tasks, but not on others. Future studies should determine to what degree mindfulness can be important for objective performance on some kinds of tasks and not on others. In our paper, we build on previous studies suggesting that mindfulness could be important in high complexity tasks, but not in low complexity tasks (Zhang et al., 2013). We expected that task complexity would moderate the relationship between trait mindfulness and objective performance. However, our hypothesis was not supported. One possible explanation is that we were not able to create enough range variability. Although we created four tasks that supposedly differed in complexity, the fact that the participants had a time limit to answer (i.e., 4 seconds) could make all the tasks somewhat complex. Our data provide some evidence supporting a range restriction argumentation. Means on task difficulty perceived by the participants ranged from 4.24 (task 1) to 7.01 (task 4) on a scale from 0 to 9, which means that perceived difficulty ranged from "not easy/not difficult" to "quite difficult". Furthermore, tasks with an imposed time limit and quick answer can cause everyone to increase their level of attention and concentration to achieve good performance, thus reducing individual differences between individuals with high and low trait mindfulness. There is considerable evidence that individual differences and personality traits become less relevant when the intensity of the situation is very high (i.e., when situational clues are very strong; Mischel, 1973). Future studies should include different types of tasks. Along with the level of complexity, we think it is quite

relevant to explore how trait mindfulness is associated with objective performance on tasks without a time limit. The lack of a time limit should increase the likelihood of mind-wandering (i.e., the mind travelling from present to past and future during task performance) in individuals with low trait mindfulness, which would negatively affect their objective performance. This kind of research will allow us to explore how mindfulness affects performance on different types of tasks and identify those tasks where differences in mindfulness can explain differences in performance.

Our study contributes to previous research in two ways. First, we have provided new empirical evidence about the relationship between trait mindfulness and objective performance. Despite the relevance of having productive employees, research on the relationship between trait mindfulness and objective performance is scarce. Most of this research has focused on three indicators (accuracy, reaction time, and variability in reaction time), and the results are far from conclusive, indicating the need for more research. In line with some previous work, in our study, we also found no relationship between trait mindfulness and accuracy (Keith et al., 2017; Quickel et al., 2014), reaction time (Eichel & Stahl, 2017), or variability in reaction time (Schmertz et al., 2009). However, the existence of other studies that have found significant associations indicates the need for further research that includes moderating variables to try to clarify the circumstances in which trait mindfulness predicts objective performance. In this vein, we suggested some avenues for future research above.

Second, we introduced a performance variable that had hardly been studied before but could be highly relevant in many organizational environments: the detection of unexpected stimuli. Our findings indicate that trait mindfulness is positively related to the detection of unexpected stimuli. Awareness of the present moment is actually the defining characteristic of mindfulness (Brown & Ryan, 2003). This allows individuals to enhance their self-regulation and, therefore, decrease automatic behaviours, information processing, categorical thinking, biased judgements, and “do what you always do” reactions (Bishop et al., 2004; Brown et al., 2007; Zhang et al., 2013). These self-regulatory

processes would be responsible for the greater capacity of mindful individuals to detect unexpected stimuli.

This finding has relevant practical implications. Today, management of unexpected stimuli and events is a core competency in the dynamic and uncertain environments faced by most organizations, especially in industries where safety is a priority (Zhang et al., 2013; Zhang & Wu, 2014). In high-risk industries and high reliability organizations and teams, detection of unexpected stimuli and management of unexpected events and uncertainty are especially critical, in order to react quickly and properly. This readiness to react would help to avoid any negative consequences that might end in a catastrophe that could cause environmental, social, and human harm and high economic costs (Weick & Sutcliffe, 2015). Our findings reveal that individuals with high trait mindfulness are better at detecting unexpected events than individuals with low trait mindfulness. Therefore, at least in those industries, organizations, and teams where detecting and managing unexpected events is critical to safe and reliable performance, managers and HR experts should incorporate the evaluation of candidates' trait mindfulness into the personnel recruitment and selection process. Trait mindfulness can be extremely important for selection in a high-risk environment, where it would be desirable to have an employee with a high level of risk-awareness who can detect unexpected stimuli quickly and alert the organization to act swiftly in response to the unexpected event.

Some limitations of the present study have been mentioned throughout the discussion. First, we only used one instrument to evaluate mindfulness (MAAS, Brown & Ryan, 2003). We chose this two-construct scale because it treats mindfulness as the two components of consciousness (attention and awareness), but for more accurate results, future studies should use other scales (e.g., FFMQ, Baer et al., 2006; CAMS-R, Feldman et al., 2007).

Another limitation is that the sample only included undergraduate students. This points to a need for further research to determine whether this relationship (trait mindfulness with detection of unexpected stimuli) is also found in samples from high-risk environments (pilots, air traffic controllers,

doctors etc.). Nevertheless, the current study represents a first step in gaining empirical support for this relationship.

5.5. Conclusions

In summary, our research contributes to the literature on mindfulness and objective performance by providing empirical evidence for the relationship between trait mindfulness and the detection of unexpected stimuli. The present study adds fuel to the complex issue of mindfulness and objective indicators of performance. It also highlights the relevance of trait mindfulness, not only as a personal benefit, but also as a benefit in the work environment. Further studies are needed that take these aspects into consideration and explore this relationship using other samples in work environments (e.g., high-risk organizations).

CHAPTER VI: STATE MINDFULNESS AND OBJECTIVE PERFORMANCE. THE MODERATOR ROLE OF TRAIT MINDFULNESS

Abstract

The present study focused on the relationship between state mindfulness (induced by a brief 8-min mindfulness exercise) and the outcome component of performance, evaluated with objective indicators (accuracy, reaction time, variability in reaction times, detection of unexpected stimuli, and rigidity scores). Moreover, the study predicted that the relationship between state mindfulness and objective performance would be modulated by trait mindfulness and task complexity. Participants (*N*= 217) were randomly assigned to a brief mindfulness exercise condition or to the control condition (they had to wait for the same amount of time, 8-min). The participants completed trait mindfulness, state mindfulness, intelligence, and personality questionnaires and completed an adapted Stroop task (Stroop, 1935), a Sustained Attention to Response Task (SART; Mrazek et al., 2012), and the water jar task (Luchins, 1942). To test our hypotheses, we performed hierarchical multiple regression analyses and moderated regression analyses in SPSS. The results indicated that state mindfulness was not related to the enumerated objective performance indicators, except for reaction time. However, the intervention proved significant and there was an interaction effect between state and trait mindfulness for low complexity tasks, detection of unexpected stimuli, and rigidity scores. Furthermore, we managed to confirm the moderating role of task complexity in the relationship between mindfulness and reaction time for the Stroop task with the highest level of complexity (task 4). Our research makes significant contributions to the literature on individual mindfulness and objective performance. Limitations and directions for future research are also discussed.

Keywords: state mindfulness, trait mindfulness, task complexity, objective performance, attention.

6.1. Introduction

Particularly over the last decade, there has been a huge interest in the investigation of mindfulness as a trait (one's predisposition to be mindful in day-to-day life; Baer et al., 2006) and as a trainable skill (state mindfulness) through specific forms of meditation (Chiesa & Malinowski, 2011). The reason for this interest is that mindfulness appears to have broadly positive impacts not only on human functioning (Brown et al., 2007) but also in the workplace. For instance, a growing body of research shows that mindfulness has been associated with reduced stress (Donald et al., 2016), with increased work engagement (Leroy et al., 2013), with improved sleep quality and duration (Hülsheger et al., 2015), with job satisfaction (Hülsheger et al., 2013), with resilience (Jha et al., 2010) and with emotional intelligence (Chu, 2010).

However, the results from the aforementioned studies still leave some important gaps that need to be addressed. First, most of the previous studies have focussed on the relationship between mindfulness and the perceptions of individuals' behaviours (subjective performance). We observed this inconsistency not only for trait mindfulness (Goilean et al., 2021) but also for state mindfulness. Thus, research is still underdeveloped regarding the relationship between mindfulness and individual performance measured with objective indicators. This is an important research gap because demonstrating through objective indicators that mindfulness contributes to performance allows us to check if state mindfulness influences individuals in the expected outcomes. Second, few of the studies (Mrazek et al., 2013; Pagnoni, 2012; Wadlinger & Isaacowitz, 2011) that measure state mindfulness, have applied meditation to check for the relationship between mindfulness and objective performance. Research is also needed to assess how brief mindfulness exercises may affect objective performance. In a society where the context of work is dynamic and uncertain, typical of modern work, the successful responses involve considering new guidelines for the development of capacities needed to thrive in complexity (King & Haar, 2017), which in this case, could be represented by brief single session mindfulness exercise. Third, another identified gap is the absence of studies that test the relationship between state mindfulness and performance while controlling for trait mindfulness. If

research supports the moderator role of trait mindfulness, then managers and HR experts should incorporate the evaluation of candidates' trait mindfulness into the personnel recruitment and selection process (Goilean et al., 2021). Fourth, research is still underdeveloped regarding the modulator role of task complexity in the relationship between mindfulness and objective performance. Hence, studying both trait and state mindfulness in this study will help clarify the potential role of task complexity.

In an attempt to address these research gaps, the purpose of the current study is to examine the relationship between state mindfulness (induced by a brief mindfulness exercise) and objective performance in three cognitive tasks in an undergraduate sample, while also testing for the moderator role of trait mindfulness and task complexity. Specifically, we predict that an 8-minute mindfulness exercise will improve the outcome component of performance (the results of the individual's behaviour) evaluated through objective indicators. We also predict that subjects with low trait mindfulness will be more favoured from the brief mindfulness exercise than subjects with high trait mindfulness will.

Our study makes four potential contributions. First, our research adds to the small number of studies testing the relationship between state mindfulness and objective performance (measured with objective indicators). Second, this study contributes to increasing the understanding of the efficacy of a brief mindfulness exercise on performance. In this regard and from a practical point, we may provide additional support for low-cost-effective mindfulness sessions. Third, we explore trait mindfulness as a moderator of state mindfulness. By testing this moderator role, we try to explain the inconsistent results from previous research that tested the relationship between brief single sessions of mindfulness exercise on objective performance. Fourth, we also address task complexity as a moderator in the relationship between state mindfulness and objective performance. Hence, our study will add more evidence in clarifying and integrating the potential role of task complexity. More specifically, by testing the moderator role of task complexity, we want to prove that being mindful is more beneficial for objective performance in complex tasks than in simple ones.

6.2. Theoretical background

6.2.1. State mindfulness and objective indicators

Mindfulness can be defined as "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*" (Dane, 2011, p. 1000). As we mentioned before, we distinguish between state and trait mindfulness. State mindfulness refers to the extent to which an individual is currently aware of and paying attention to stimuli occurring in the present (Brown & Ryan, 2003), whereas trait mindfulness refers to the duration, frequency, and intensity with which an individual tends to engage in states of mindfulness (Hülsheger et al., 2013). Although meditation is not necessary to induce the state of consciousness of mindfulness (Brown & Ryan, 2003; Dane, 2011), the pathway to cultivating mindfulness is indeed through meditation. Moreover, even though trait and state mindfulness are related, in that individuals with a mindful disposition are more likely to experience momentary mindfulness, their effects are independent (Brown & Ryan, 2003).

According to McCloy et al. (1994, p. 30), performance has been defined as the "*behaviours or actions that are relevant to the goals of the organization in question*". Performing well not only requires paying attention to the here and now but also requires actively implementing one's plans and intentions into action (Ajzen, 1991). Chatzisarantis and Hagger (2007) suggest that mindfulness may facilitate the implementation of intentions into action.

We know that mindfulness training cultivates moment-to-moment awareness of the self and environment (Wallace, 2006). Therefore, after mindfulness training, one would expect significant changes in attention and an increase in the state of mindfulness of the participants. However, interestingly enough, the results are quite different. For instance, Sedlmeier et al. (2012) combined the effects of all attention measures from 22 meditation intervention studies and found a medium effect. In the same line, Chiesa and Malinowski (2011) realized a systematic review of 23 studies and concluded that focused-attention meditation may be associated with effects on selective and executive attention, whereas open-monitoring meditation may increase sustained attention. In a

different line, Lao et al. (2016) after analysing 18 studies found no significant effects. In addition, Verhaeghen's (2021) meta-analysis of 40 studies did not find a significant effect of the contents of the interventions (with focused attention as the baseline) but did identify the focused attention as the only intervention component that led to a significant effect.

Regarding the objective performance indicators, in this study, we measure accuracy (e.g., number of correct answers, number of commission errors, number of omission errors, etc.), reaction time, variability in reaction times, detection of unexpected stimuli, and rigidity scores (see Method section). Because of their relevance for work performance, accuracy, reaction time, and variability in reaction times are among the most widely researched objective performance indicators. These are the most applied objective indicators because, in the majority of the studies (Jankowski & Holas, 2020; Johnson et al. 2015; Larson et al., 2013; Lee & Orsillo, 2014; Norris et al., 2018; Quaglia et al., 2019; Watier & Dubois, 2016; Zeidan et al., 2010), attention is the cognitive mechanism that improves as a result of mindfulness.

Additionally, we include the detection of unexpected stimuli in our study since it is quite relevant in industries where safety is critical (Zhang et al., 2013; Zhang & Wu, 2014). For instance, in the study of Schofield et al. (2015), the participants completed an inattentional blindness task (Most et al., 2001) during which an unexpected distractor appeared on the computer monitor. The results indicate that a 7-minute mindfulness exercise increased awareness of the unexpected distractor.

We also want to measure the rigidity scores because we know that experience can blind us from seeing obvious solutions (Greenberg et al., 2010), but since state mindfulness is considered "*a beginner's mind*" (Bishop et al., 2004) and is focused on the present moment, then it may reduce this cognitive rigidity. More precisely, we want to investigate the tendency to be ''*blinded*'' by experience, and overlook simple, obvious novel solutions to a given problem. In this direction, we acknowledge the study of Greenberg et al. (2010) who adopted the water jar paradigm developed by Luchins (1942) and found that experienced mindfulness meditators were less blinded by experience and were better able than pre-meditators to identify the simple novel solution in the water jar task.

Taking into consideration the fact that we are applying a brief mindfulness exercise we decided to take a closer look at the results from the studies that also applied brief interventions and measured the performance with the aforementioned indicators. Several studies investigated the effects of a brief mindfulness exercise on accuracy, but findings are far from conclusive. After a brief mindfulness intervention of four sessions, Zeidan et al. (2010) showed that brief mindfulness training was effective at improving visual-spatial processing, working memory, and executive functioning on several cognitive tasks. However, they found no differences across sessions or between groups for the computer adaptive 2-back task, indicating that it was performed at the same level of accuracy across the two conditions. In addition, also Larson et al. (2013) indicate no group-related differences in accuracy (they exclude the errors of omission, and measure only the errors of commission) in a modified Flanker task (Eriksen & Eriksen, 1974). On the contrary, Norris et al. (2018) showed that after a 10 minutes mindfulness meditation tape, participants had better accuracy (proportion of correct trials) than the control group on incongruent trials on a Flanker task (Eriksen & Eriksen, 1974). In the same manner, Quaglia et al. (2019) identified efficient cognitive control for the mindfulness group, as indexed by accuracy (errors of commission and errors of omission), during an emotional go/no-go task.

Empirical findings are also inconsistent regarding reaction time. In a modified emotional Stroop switching task, Lee and Orsillo (2014) found that a 20-min mindfulness exercise reduced reaction times for naming the font colour of both threatening and neutral words in patients with generalized anxiety disorder compared to a mind-wandering control condition. In the same line, after a 10-minute recorded mindfulness exercise, Jankowski and Holas, (2020) found reduced overall reaction times (i.e., for both switch and no-switch trials) in mindfulness compared with worry and free mind-wandering conditions. Meanwhile, Larson et al. (2013) found there were non-significant differences between the mindfulness and control groups for response times in a modified Flanker task (Eriksen & Eriksen, 1974), after a 14-min audio mindfulness intervention. In addition, Watier and Dubois (2016) did not manage to find differences in reaction time between emotional and neutral words in the Emotional Stroop task (Williams et al., 1996). Nevertheless, regarding variability in

reaction time, we observe that studies, which included this variable, have measured the relationship between trait mindfulness and other variables (Eichel & Stahl, 2017, Keith et al., 2017). To be more specific, we did not manage to find studies that investigated this variable in relation to state mindfulness.

Regarding the detection of unexpected stimuli, as we aforementioned, results suggest that a 7-min mindfulness exercise increased awareness of the unexpected distractor (Schofield et al., 2015), and regarding the rigidity scores, the results also suggest that mindfulness may reduce this cognitive rigidity (Greenberg et al., 2010). We must mention that in the case of rigidity scores, the participants underwent an 8-week mindfulness program.

6.2.2. The moderator role of trait mindfulness

According to Watier and Dubois (2016), one plausible explanation for the inconsistent results described above is that the efficacy of brief single-session mindfulness exercises might be moderated by trait mindfulness. Research shows that, due to dispositional tendencies, some people may be in a mindful state of consciousness more often than others may (Giluk, 2009). Individuals with high trait mindfulness will more frequently experience states of consciousness where their attention is focused on present-moment phenomena occurring both externally and internally. Therefore, Watier and Dubois (2016) suggest that maybe a brief single-session mindfulness exercise might not be enough to affect participants who already have a natural tendency to be in a state of mindfulness. In fact, in their study, Watier and Dubois (2016) found that the induction of state mindfulness through brief single-session mindfulness exercises was more beneficial for those participants with low trait mindfulness. In the same line, Geisler et al. (2017) conducted a study to investigate the benefits of a short mindfulness exercise for mindfulness novices in a performance situation. They used a heart rate measurement and concluded that trait mindfulness moderated the effect of an 8-minute mindfulness exercise on distracting evaluative thoughts, but only for the participants with low trait mindfulness.

With this study, we aim to shed some light on this line of research, by investigating not only the relationship between state mindfulness and objective performance in cognitive tasks but also the interaction effect of state and trait mindfulness on the relationship with objective performance. Consequently, if the relationship between state mindfulness and the outcome component of objective performance were moderated by trait mindfulness, then the organizations would be able to better adapt the duration of a mindfulness intervention according to the characteristics of their employees or select only those employees that can benefit of this kind of intervention (i.e., an 8-minutes mindfulness exercise).

6.2.3. The moderator role of task complexity

Furthermore, we are also interested in the role of task complexity because while some research suggests that the relationship between mindfulness and objective performance can be modulated by this variable (Zhang et al., 2013), other research sustains the contrary (Goilean et al., 2021). Hence, according to Zhang et al. (2013) being mindful is more beneficial for the complex task because in this kind of task, small errors could affect performance, while in simple tasks being mindful cannot surpass its time cost. The authors obtained support for this hypothesis in the context of a nuclear power plant. However, when we tested for this relationship in Study 2 (Goilean et al., 2021), our results suggested the opposite. Hence, we approach again this variable in Study 3 intending to provide some clarifying answers.

6.2.4. State mindfulness and the tasks applied

In this study, we used three well-established cognitive tasks, which allowed us to test participants' ability to focus, sustain, direct their attention, and detect unexpected stimuli (1. an adapted Stroop task (Stroop, 1935), 2. a Sustained Attention to Response Task (SART; Mrazek et al., 2012)) and also to capture the participants' notion of missing obvious adaptive solutions (3. the water jar task was based on the water jar paradigm developed by Luchins (1942)) (see Method section for a description). Moore and Malinowski (2009) suggest that the Stroop task is adequate for investigating mindfulness because the gradual increase in task complexity requires the ongoing reinvestment of

participants' attention to achieve good performance. So, we used an adapted Stroop task that we already applied in a previous study focused on trait mindfulness and objective performance (Goilean et al., 2021), thus this study is a continuation of our findings regarding individual mindfulness and objective performance. The second task, the SART is a commonly used sustained attention task and we chose it as a measure of working memory, sustained attention, mind wandering, and impulse/inhibitory control. The third and last task, the water jar paradigm was designed to measure the Einstellung effect, a term used to describe rigid thought patterns formed through experience which prevent identifying more adaptive approaches and solutions. We had chosen this task over other measures of rigidity since it directly captures the ability to miss obvious adaptive solutions that lie right ''*under the nose*'' due to being caught up in learned and repetitive thought patterns (Greenberg et al., 2010).

In sum, this paper aims to study the relationship between state mindfulness and objective performance. Specifically, five objective indicators of performance are studied: 1) accuracy, 2) reaction time, 3) variability in reaction times, 4) detection of unexpected stimuli and 5) rigidity scores. Moreover, we want to test the moderator role of trait mindfulness and task complexity in the relationship between state mindfulness and objective performance. To achieve our goal, we conducted a study in a laboratory setting and employed software (E-prime 2.0) to recode the objective indicators of performance on a Stroop task (Stroop, 1935) and SART. The water jar task was performed with pen and paper.

Based on the discussion above, we hypothesize the following:

H1. State mindfulness is positively related to accuracy (H1a) and negatively related to errors of commission (H1b) and errors of omission (H1c).

H2. State mindfulness is negatively related to reaction time (H2a) and variability in reaction time (H2b).

H3. State mindfulness is positively related to the detection of unexpected stimuli.

H4: State mindfulness is negatively related to rigidity scores.

H5: There is an interaction effect of state and trait mindfulness on the relationships stated in the previous hypotheses:

H5a: The positive relationship between state mindfulness and accuracy (H5a1), and the negative relationship of state mindfulness with error of commission (H5b1) and errors of omission (H5c1) is stronger for participants with low trait mindfulness than for participants with high trait mindfulness.

H5b: The negative relationship of state mindfulness with reaction time (H5a2) and variability in reaction time (H5b2) is stronger for participants with low trait mindfulness than for participants with high trait mindfulness.

H5c: The positive relationship between state mindfulness and detection of unexpected stimuli is stronger for participants with low trait mindfulness than for participants with high trait mindfulness.

H5d: The negative relationship of state mindfulness with rigidity scores is stronger for participants with low trait mindfulness than for participants with high trait mindfulness.

H6: The relationship between state mindfulness and objective performance is moderated by task complexity, in such a way that this relationship is stronger in tasks with high complexity than in tasks with low complexity.

6.3. Method

6.3.1. Participants

This study examined data from 217 participants (20% males and 80% females). This present imbalance of gender distribution can be explained through the imbalance in the participants' specialization. More specifically, the participants recruited were undergraduate students enrolled in Psychology, Labour Relations and Human Resources, and Social Work (62.7% Psychology; 30.4% Labour Relations and Human Resources, and 6.9% Social Work). The participants were randomly assigned to either a mindfulness group (*n*= 109), or a control group (*n*= 108). Their participation was in exchange for course credit. Their ages ranged from 18 to 56 years (*M*= 21.6, *SD*= 4.12).

6.3.2. Procedure

The study was carried out in accordance with the Declaration of Helsinki and approved by the local ethics committee. Informal consent was obtained. A pilot study (*n*= 8) was conducted to sort out any possible problems that might lead to the failure of the research procedure. Regarding the study sample, the individuals were contacted via email to establish the planning.

Participants only attended one session and they were tested individually respecting COVID-19 protocol. The session took place in the university's laboratory. Prior to completing the questionnaires and beginning the tasks, the individuals received standard instructions to avoid biases. The estimated length of a session was around 90 minutes and comprised three main parts: 1) the questionnaires, 2) the experimental conditions and 3) the tasks. In the first part of the session, participants first completed the informed consent and then questionnaires collecting demographic information (age, gender, and specialization), other control variables (conscientiousness, neuroticism, and intelligence), trait mindfulness (two scales), and a question concerning the frequency of practicing any form of meditation. In the second part of the sessions, the participants from the experimental group were assigned to listen to an 8-minute mindfulness exercise (see Annex 1) or they had to wait for 8 minutes (control group). Participants next answered a questionnaire for state mindfulness. In the third and last part of the session, we began administrating the three tasks: Stroop and SART (recorded in E-prime 2) and the water jar task using paper and pencil.

6.3.3. Experimental and control conditions

Participants were randomly assigned to listen to an 8-minute guided meditation tape (Annex 1) recorded by a professional mindfulness meditation instructor (experimental group), or they had to wait for 8 minutes (control group). Specifically, we informed the individuals in the experimental group that they would hear a short audio meditation exercise that would help them to take a mental break at any time of the day. The mindfulness meditation tape was based on classic mindfulness instructions used in MBSR that led participants through a breath-focused mindfulness exercise orientated towards beginners. It included instructions, such as "*Observing your breath will*

allow you to immediately connect with your inner refuge, with the here and now" and "*Now bring your mind's attention to the rhythmic movement of your abdomen as you breathe in and out*". In this way, participants orient and sustain their attention to the present moment. The audio recording was presented through the computer speakers, and the experimenters were in an adjacent room to the participant during the audio recording. Furthermore, regarding the control condition, participants only received the instruction to wait for the same amount of time (8 minutes).

6.3.4. The tasks

6.3.4.1. The adapted Stroop task

This task was already designed and applied in a previously published study (Goilean et al., 2021), hence all the procedures, all the steps, and all the detailed characteristics are described in the aforementioned study. The only difference regarding to the Stroop task applied in Study 2 is the absence of the time limit for the stimuli.

6.3.4.2 SART task

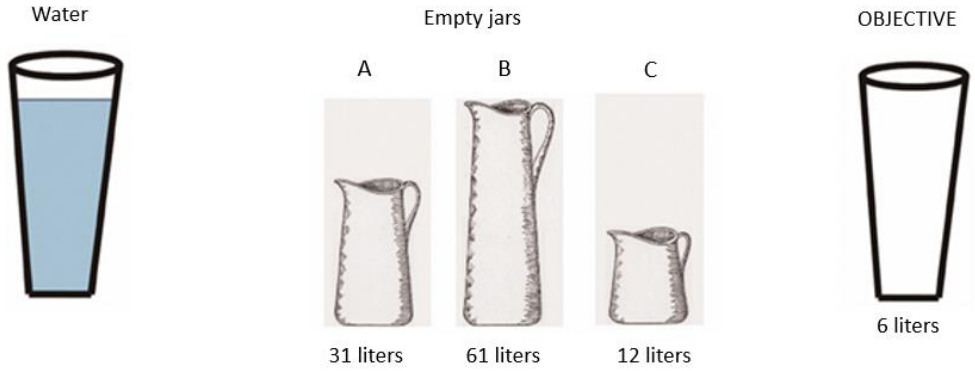
The SART is a 6-minute, computerized mind-wandering task (Mrazek et al., 2012) in which participants are instructed to press click in response to frequent nontargets (i.e., Go trials; all numbers except the number "*3*") and to refrain from pressing the spacebar in response to infrequent targets (i.e., NoGo trials; the number 3). Participants were provided with a limited response time of 250 ms, with an interstimulus interval of 900 ms. The interstimulus used was "*#*". Participants were not provided with any feedback after the training or task trials. Mind wandering is measured during the SART when lapses of attention occur and participants fail to respond correctly on task trials.

6.3.4.3 Water jar task

This task was realised in PowerPoint format, but the answers were requested on paper. Onscreen were three jars marked A, B, and C with numbers indicating their size, and a target cup indicating the goal to obtain (see Figure VI. 1).

Figure VI. 1.

(Example of the onscreen jars)



The problems for this task were the ones from Greenberg et al.'s (2010) study, from whom we asked permission to use the already formulated problems. The first trials were set trials, solvable by the formula B-A-2C, in which they had to add one B jar, subtract one A jar, and subtract 2 C jars (e.g., obtaining 100 units of water with jars the capacity of 21, 127, and 3 units by performing 127-21-3-3= 100). Once 6 out of the maximum of 10 set trials were correctly solved, participants were presented with 4 critical trials, solvable both by the complex B-A-2C formula and by a simple formula: either A+C or A-C (e.g. obtaining 18 units of water with jars the capacity of 15, 39, and 3 units by performing 15+3= 18, as opposed to using the more complex formula – 39-15-3-3= 18). The last two problems were two extinction trials, solvable only with the simple formula (see Table VI. 1).

Table VI. 1.

Water jar task problems

Trial type	Jar A	Jar B	Jar C	Goal to obtain	Shortest solution
Example	29	3	0	20	A-3B
Set	31	61	12	6	B-A-2C
Set	22	57	10	15	B-A-2C
Set	18	59	16	9	B-A-2C
Set	20	67	13	21	B-A-2C
Set	22	57	10	15	B-A-2C
Set	21	127	3	100	B-A-2C
Set	18	43	10	5	B-A-2C
Set	24	52	3	22	B-A-2C
Set	19	42	3	17	B-A-2C
Set	14	163	25	99	B-A-2C
Critical	18	48	4	22	A+C
Critical	15	39	3	18	A+C
Critical	23	49	3	20	A-C
Critical	7	16	2	5	A-C
Extinction	14	39	8	6	A-C
Extinction	13	37	5	18	A+C

6.3.5. Measures

Trait Mindfulness

Trait mindfulness was measured using 2 scales. The first scale was the 15-item Spanish version (Soler et al., 2012) of the Mindfulness Attention Awareness Scale (MAAS, Brown & Ryan, 2003). This scale measures the general tendency to be attentive to the present moment in daily experiences. The 15 items used in the MAAS operationalizes mindfulness as a single factor related to attention and use a 6-point Likert scale ranging from 1 (almost never) to 6 (almost always). A sample item is "*I tend not to notice feelings of physical tension or discomfort until they really grab my attention*." The total score was obtained after reversing the items (i.e., high scores indicate high trait mindfulness).

The second scale was the Cognitive and Affective Mindfulness Scale–Revised (CAMS-R, Feldman et al., 2007). This 12-item scale was translated from English to Spanish following the double-translation and reconciliation procedure (ITC, 2018). The CAMS-R takes a multi-dimensional

view of mindfulness as a broad construct that includes four components: attention, present-focus, awareness, and acceptance. A sample item is "*It is easy for me to concentrate on what I am doing* (attention component). Items are rated on a six-point Likert scale ranging from 1 (almost never) to 6 (almost always). We used a global score for this scale.

State mindfulness

State mindfulness was measured with the 21-item adapted Spanish version (Ullrich-French et al., 2017) of the State Mindfulness Scale (SMS, Tanay & Bernstein, 2013). We had to change the translation of some of the questions (it was adapted in the context of physical activity), but we asked permission from Ullrich-French et al. (2017) to use this questionnaire as a base for our translation. This scale was also translated from English to Spanish following the double-translation and reconciliation procedure (ITC, 2018). The measure assesses State Mindfulness of Mind (e.g., "I *was aware of what was going on in my mind*") and State Mindfulness of Body (e.g., "*I noticed physical sensations come and go*") immediately following a mindfulness induction. Items are rated on a five-point Likert scale ranging from 1 (not at all) to 5 (very well).

Objective performance

As we have already mentioned, we applied various indicators of objective performance: accuracy, errors of commission, errors of omission, reaction time, variability in reaction time, detection of unexpected stimuli, and rigidity score. A detailed description of these indicators, except for the rigidity score, is in the aforementioned published study (Goilean et al., 2021). Nevertheless, regarding the detection of unexpected stimuli, we applied the same measure with the difference that in this present study we do not give multiple-choice answers, thus the participants must give their own open answers.

To compute the *rigidity score* we followed the instructions from Greenberg et al.'s (2010) study. One rigidity point was given for each critical or extinction trial solved using the complex formula. Exclusion from analyses criteria included calculation errors, the use of fractions, or other alternative solutions (any other method to obtain the given result).

Task difficulty for the adapted Stroop task was measured with a 10-point Likert scale (0= very easy to 9= very difficult).

Task complexity was measured for the adapted Stroop task, in which four tasks were presented from lower to higher levels of complexity, according to the differences in cognitive processing demands (Robinson, 2001).

Manipulation of the complexity levels

Differences in participants' perception of difficulty among the four Stroop's tasks were tested with one-way within-subjects ANOVA. The ANOVA results [$F (2.60, 560.59)= 171.12$, $p<.001$, $\eta p^2= .44$] indicated significant differences. According to pairwise comparisons, Task 1 and Task 2 did not differ in the perceived difficulty ($p= .30$), meanwhile, Task 3 and Task 4 differed in the perceived difficulty ($p<.01$). Therefore, tasks 1 and 2 were perceived as the least difficult ones, then task 3 was perceived as more difficult, and task 4 was perceived as the most difficult task. Thus, we decided to categorize tasks 1 and 2 in the same level of complexity (*low complexity tasks*) and differentiate the complexity between task 3 and task 4.

Control variables

We introduced eight control variables: age, gender, specialization, familiarity with the tasks, conscientiousness, neuroticism, intelligence, and meditation frequency. The decision of choosing these variables was based on the evidence found in different studies. For instance, Sturgess (2012) indicates that are age and gender differences in mindfulness. Moreover, we asked participants to report their specialization and familiarity with the tasks because according to Dane (2011) mindfulness could be beneficial for domain experts. Furthermore, we controlled for conscientiousness and neuroticism (Giluk, 2009) to make sure that the effect of mindfulness can be differentiated from other trait-like variables. In addition, we controlled intelligence, because it is a predictor of performance on different cognitive tasks (Shakeel & Goghari, 2017). Finally, meditation frequency was measured with the item "*How often do you usually do meditation activities (yoga, mindfulness)*?". The participants rated each statement on a 6-point Likert scale ranging from 1

(never) to 6 (always). We treated gender (1= male, 2= female) and specialization (Dummy 1_Specialization was coded as 1= participants who were at Labour Relations and Human Resources specialization, 0= others; Dummy 2_Specialization was coded as 1= participants who were at Social Work specialization, 0= others, with individuals at Psychology specialization serving as a comparison) as dummy variables.

Familiarity Scale

We measured familiarity for both Stroop and water jar task with a 3-item scale (see Goilean et al., 2021 for a detailed description). Items were rated from 1 (strongly disagree) to 6 (strongly agree).

Conscientiousness and Neuroticism

To measure conscientiousness and neuroticism, we administered the two selected facets from the Spanish version (Cordero et al. 2008) of the Five-Factor Reduced Personality Inventory (NEO-FFI, Costa & McCrae, 1992) with 12 items per dimension. A sample item for conscientiousness is "*I am efficient and effective in my work*", and for neuroticism "*I am pretty emotional stable*" (reverse-coded). Participants rated the extent to which various statements described them on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Intelligence

We administered the Spanish version (Cruz et al. 1988) of the Domino Test D-70 (Kowrousky & Rennes, 1988), which is considered a general intelligence test. The objective of the D-70 test is to assess the ability to conceptualize and apply systematic reasoning to new problems through the abstraction and understanding of relationships. D-70 consists of several series of dominoes, arranged spatially, in which the existing relationship between them must be discovered and extended to a new element. The test has 44 elements, preceded by 4 examples and it must be completed in 25 minutes.

6.3.6. Data analyses

Confirmatory factor analysis (CFA) was used to provide evidence of validity (based on the internal structure) for trait and state mindfulness scales, as well as for neuroticism and conscientiousness scales. CFA was performed using Mplus version 8 (Muthén & Muthén 1998-2012) and WLSMV estimation. Therefore, a single-factor model was tested for MAAS, a second-order factor model for CAMS-R, a two-factor model for SMS, and a two-factor model for the two personality scales (conscientiousness and neuroticism). Model fit was evaluated by calculating: the Chi-Square Test of Model Fit (χ^2), the Root Mean Square of Approximation (RMSEA), the Tucker-Lewis Fit index (TLI), the Comparative Fit Index (CFI), and the Weighted Root Mean Square Residual (WRMR). Values less than 3 are considered a good fit using (χ^2)/df value. The cut-off points for the rest of the indices to show an optimal fit were: RMSEA< 0.08 (closer to zero); CFI ≥ 0.90; TLI ≥ 0.90 and WRMR< 1.0 (Hu & Bentler, 1999). Factor loadings derived from the CFAs were also used to estimate the omega coefficient as an estimation of reliability.

We performed preliminary analyses (means, standard deviations, correlations) for all continuous variables of the study. To assess the reliability of the measures, we computed not only Cronbach's alpha but also calculated the omega coefficients (McDonald 1999; McNeish 2018). To check the differences between the experimental and the control group, as well as the effectiveness of the intervention we applied the independent-t test and ANCOVA. To test our hypotheses, we performed hierarchical multiple moderated regression analyses in SPSS (version 24), first entering the demographic control variables (age, gender, specialization, familiarity with the tasks, and meditation frequency), second entering the two personality variables (conscientiousness and neuroticism), third entering intelligence, fourth entering state mindfulness (if the intervention proves to be significant we will use the condition (experimental/control), Locklear et al., 2020), and finally entering trait mindfulness (moderator variable) and the interaction effect between state mindfulness and trait mindfulness. To evaluate the statistical significance of the parameter estimates, we used one-tailed

tests, which are suitable for directional hypotheses (Erickson & Nosanchuk, 1977; Wonnacott & Wonnacott, 1984).

6.4. Results

6.4.1. Confirmatory factor analysis and omega coefficients

The CFA conducted to test a one-factor model for MAAS demonstrated satisfactory fit (χ^2= 165.85, df= 90, RMSEA= 0.06, CFI= .95, TLI= .95, WRMR= .84). However, the CFA model tested with one second-order latent factor (mindfulness) and four first-order latent factors (attention, present-focus, awareness, and acceptance) for CAMS-R was not satisfactory (χ^2= 196.94, df= 50, RMSEA= 0.12, CFI= .89, TLI= .85, WRMR= 1.16). The values on the modification indices suggested correlating the residuals of 4 pairs of items: 1) ("*I am preoccupied by the past"* and "*I am preoccupied by the future"*-recoded) (MI= 30.27); 2) ("*I am able to accept the thoughts and feelings I have"* and "*I try to notice my thoughts without judging them"*) (MI= 26.96); 3) ("*I am able to pay close attention to one thing for a long period of time"* and "*I am able to focus on the present moment"*) (MI= 25.10); and 4) ("*I am able to focus on the present moment"* and "*It is easy for me to concentrate on what I am doing"*) (MI= 20.11). Considering the fact that we have a global score of the scale and the existing similarities in the wording and the content of each pair of items we introduced the suggested modifications, which resulted in satisfactory values (χ^2 = 101.526, df= 46, RMSEA= 0.08, CFI= .96, TLI= .94, WRMR= .80).

According to Tanay and Bernstain (2013) we tested a two-factor model for the SMS scale (*F1 State Mindfulness of Mind* (SMS Mind) and *F2 State Mindfulness of Body* (SMS Body)), but the fit of the model was not satisfactory (χ^2= 612.940, df= 188, RMSEA= 0.10, CFI= .91, TLI= .90, WRMR= 1.38) and suggested correlating the residuals of five pairs of items, all them belonging to the same factor: 1) ("I *felt closely connected to the present moment"* and "*I felt that I was experiencing the present moment fully"*) (MI= 37.34); 2) ("*I noticed physical sensations come and go"* and "*I noticed various sensations caused by my surroundings (e.g., heat, coolness, the wind on my face")*) (MI= 27.27); 3) ("*I noticed pleasant and unpleasant thoughts"* and "*I noticed pleasant and unpleasant emotions"*) (MI= 26.20); 4)

("*I was aware of what was going on in my mind"* and "*I noticed thoughts come and go"*) (MI= 23.41); and 5) ("*I noticed pleasant and unpleasant emotions"* and "*I was aware of different emotions that arose in me"*) (MI= 20.65). After correlating the residuals of the five pairs of items, the obtained model fit was acceptable: χ^2 = 486.780, df= 183, RMSEA= 0.09 CFI= .94, TLI= .93, WRMR= 1.19.

The fit of the two-factor model for the two personality dimensions (conscientiousness and neuroticism) was not satisfactory (χ^2= 1302.010, df= 251, RMSEA= 0.14, CFI= .68, TLI= .65, WRMR= 2.18). The results of the modification indices suggested the elimination of item 21 "*Sometimes I do things impulsively and then I regret it*" from the neuroticism scale because it showed a relevant weight on the conscientiousness scale (MI= 240.82). Applying this modification resulted in (χ^2= 670.846, df = 229, RMSEA = 0.10, CFI = .85, TLI = .83, WRMR= 1.53) and a suggestion to correlate the residuals of item ("*Sometimes I act first and then I think"*, recoded) and the item ("*Before taking action, I always consider its consequences"*) (MI= 88.13). After applying this modification, the goodness of fit indices was barely satisfactory (χ^2= 670.846, df = 229, RMSEA= 0.09, CFI= .88, TLI= .86, WRMR= 1.41). Hence, the score on the neuroticism scale was obtained with only 11 items.

Factor loadings obtained in the CFAs were used to check the subscales' reliability with the estimation of omega coefficients (McDonald 1999; McNeish 2018). The value obtained for McDonald's omega in the case of NEO-FFI was .89 for neuroticism and .86 for conscientiousness, while for the MAAS was .86, for CAMS-R was .88, for SMS Mind was .93 and for SMS Body was .86. Reliability for the scales was also estimated using Cronbach's Alpha coefficient (see Table VI. 2).

6.4.2. Manipulation checks

First, we conducted an independent t-test to examine any group differences between participants randomly assigned to the experimental and the control group, on the following variables: trait mindfulness, intelligence, neuroticism, conscientiousness, and meditation frequency. The results indicated no significant differences between groups for trait mindfulness measured with MAAS [*t*(215)= .88, p= .38] as well as for trait mindfulness measured with CAMS-R [*t*(215)= .941, p= .35]. We also did not find differences between groups for intelligence [*t(*211.85)= 20, p= .84], neuroticism

[*t*(213)= -.81, p= .42], and meditation frequency [*t*(215)= -.48, p= .63]. However, we did find differences between groups for conscientiousness [*t*(213)= 2.46, p= .02], therefore, we will also control for this variable in the ANCOVA.

Second, we checked the effectiveness of the intervention. The results of the independent t-test indicated statistically significant differences across the experimental and control groups for both SMS Mind [*t*(215)= -4.88, p<.001] and SMS Body [*t*(215)= - 3.12, p<.001], with mean values higher in the experimental group. Therefore, the results support the effectiveness of our intervention.

Third, a one-way analysis of covariance (ANCOVA) was run to examine whether SMS Mind and SMS Body scores differed between the experimental and control group while controlling for trait mindfulness (MAAS, CAMS-R), meditation frequency, and conscientiousness. Preliminary analyses were completed to assess the assumptions of normality, linearity, homogeneity of regression slopes, and homogeneity of variance.

Regarding SMS Mind, results of the ANCOVA indicated a significant effect of condition on SMS Mind (F(1, 209)= 12.93, p<.001, ηp^2= .06). Estimated marginal means were lower in the control (M= 3.21, SE= .07) when compared with the intervention conditions (M= 3.57, SE= .07). Regarding SMS Body, results of the ANCOVA indicated a significant effect of condition on SMS Body (F(1, 209)= 27.66, p<.001, ηp^2= .12). Estimated marginal means were lower in the control (M= 3.06, SE= .08) than in the intervention condition (M= 3.66, SE= .08).

Therefore, once the effectiveness of our intervention was supported, we proceed to test whether the condition (experimental/control) influenced the objective performance, and the moderator role of trait mindfulness on this relationship (Locklear et al., 2020).

6.4.3. Descriptive statistics and reliability of the scales

The descriptive statistics, correlations, and scale reliabilities for mindfulness trait and state, and control variables are reported in Table VI. 2. As we can see, MAAS was positively correlated with age and conscientiousness, and negatively with neuroticism, while CAMSR-R was positively correlated with familiarity with water jar tasks and conscientiousness, and negatively correlated with neuroticism.

SMS Mind and SMS Body were positively correlated with meditation frequency and negatively correlated with intelligence, however, only SMS Mind was positively correlated with conscientiousness.

Table VI. 3 shows the descriptive statistics, correlations for mindfulness scales, control variables, and dependent variables (performance indicators) for all three tasks. We must mention that we did not obtain results for errors of omission in Stroop tasks because this task did not have a time limit, thus the software recorded 0 errors of omission. Intelligence was the only variable that correlated with almost all the indicators of objective performance for the Stroop Task and SART but did not correlate with the rigidity scores from the water jar task. Concretely, for Stroop tasks, intelligence was positively correlated with accuracy and detection of unexpected stimuli, and negatively with errors of commission, reaction time, and variability in reaction time. For SART, intelligence was positively correlated with accuracy and negatively correlated with errors of omission and variability in reaction time. Also regarding SART, only SMS Body was positively correlated with reaction time. Interestingly enough, conscientiousness, neuroticism, as well as MAAS, CAMS-R, and SMS Mind did not correlate with any other variable.

Table VI. 2.

Means, standard deviations, correlations, and reliabilities for mindfulness and control variables

	Range	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. MAAS	1-6	4.52	.74	*(.83)*													
2. CAMS-R	1-6	3.48	.77	.42**	*(.79)*												
3. SMS Mind	1-5	3.38	.75	.03	.12	*(.91)*											
4. SMS Body	1-5	3.35	.87	-.01	.11	.67**	*(.82)*										
5. Age	-	21.06	4.12	.18**	.12	-.02	-.05										
6. Gender	-	-	-	-.02	-.09	-.03	-.01	-.05									
7. Dummy 1_Special	0-1	-	-	-.07	-.10	.11	.09	-.04	-.11								
8. Dummy 2_Special	0-1	-	-	-.10	-.06	.10	.08	-.17*	.09	-.17**							
9. Fam. Stroop	1-6	3.42	1.65	.12	.08	.02	.04	.06	-.03	-.45**	-.13	*(.83)*					
10. Fam. WJT	1-6	2.80	1.77	.13	.16*	-.05	-.03	.10	-.01	-.38**	-.22**	.46**	*(.89)*				
11. Med. frequency	1-6	2.10	1.11	-.02	.04	.17*	.15*	-.05	.08	-.11	.04	.08	.02				
12. Consc.	1-5	3.47	.67	.37**	.42**	.14*	.11	.08	.10	-.14*	-.08	.12	.10	.08	*(.81)*		
13. Neuroticism	1-5	3.06	.82	-.38**	-.63**	-.01	.02	-.18**	.25**	-.03	.01	.02	-.06	.13	-.24**	*(.87)*	
14. Inteligence	-	28.16	5.79	-.06	.09	-.20**	-.15*	-.02	-.03	-.32**	-.17*	.14*	.22**	-.08	-.001	-.05	

Note:* $p<.05$, ** $p<.01$; Reliabilities are measured with Cronbach's alpha and displayed on the diagonal in brackets. Gender (1= male, 2= female); Dummy 1_Special= was coded as: 1=participants who were at Labour Relations and Human Resources specialization, 0=others; Dummy 2_Special. was coded as: 1=participants who were at Social Work specialization, 0=others, with individuals at Psychology specialization serving as comparison; Fam Stroop= Familiarity Stroop; Fam. WJT= Familiarity Water Jar Task; Med. frequency= Meditation frequency.

Table VI. 3. *Means, standard deviations, and correlations for mindfulness, control variables, and performance indicators for Stroop tasks, SART and water jar tasks*

	M	SD	MAAS	CAMS-R	SMS Mind	SMS Body	Age	Gender	Dummy 1_Special	Dummy 2_Special	Fam. Stroop	Fam. WTJ	Med. freq.	Consc.	N.	Int.
ACC_Low	212.32	13.33	.09	.08	-.08	-.08	-.02	.05	-.16*	-.03	.04	-	.00	.12	-.03	.25**
ACC_task3	29.34	3.42	.07	.11	-.10	-.004	-.20**	.04	-.17*	-.01	.03	-	-.06	.12	-.01	.27**
ACC_task4	29.88	2.68	-.03	-.01	-.06	-.02	-.16*	-.04	-.08	-.001	.08	-	-.07	.04	.00	.22**
Ec_Low	4.06	5.50	-.10	-.06	.06	.10	-.10	-.04	.11	.04	-.001	-	.00	-.11	.03	-.18**
Ec_task3	2.65	3.41	-.07	-.11	.09	-.004	.19**	-.04	.16*	.01	-.03	-	.06	-.12	.004	-.26**
Ec_task4	2.10	2.68	.03	.01	.06	.02	.16*	.03	.08	.00	-.08	-	.07	-.03	-.01	-.21**
Rt_Low	1304.63	276.26	.06	-.02	.02	.02	.10	.06	.17*	.06	.00	-	.01	.06	-.07	-.45**
Rt_task3	2569.41	613.26	-.04	.06	.05	-.04	.14*	-.03	.05	.19**	-.03	-	.07	-.02	-.05	-.36**
Rt_task4	2733.18	711.08	-.01	.07	-.001	-.07	.12	-.03	.12	.16*	-.08	-	.03	.03	-.11	-.38**
RTSD_Low	591.18	247.58	.08	-.004	.07	.08	.00	-.01	.16*	.07	.01	-	.02	.07	-.04	-.37**
RTSD_task3	1610.40	871.71	-.05	-.03	-.02	-.07	-.02	-.10	-.10	.28**	.01	-	.03	-.10	.04	-.25**
RTSD_task4	1576.56	817.54	-.03	.03	-.04	-.11	-.002	-.04	.09	.15*	-.07	-	.09	-.06	-.08	-.28**
Det. of unexpect. st	3.43	.95	-.10	.00	-.001	-.01	-.12	-.05	-.14*	.11	.04	-	.09	-.12	-.05	.14*
ACC_SART	171.89	27.60	-.09	-.02	.02	.11	-.001	-.02	-.07	.01	-	-	.10	-.12	03	.17*
Ec_SART	9.44	4.82	.06	.10	-.02	-.003	.00	-.12	.13	.14*	-	-	-.07	.05	-.08	-.12
Eo_SART	41.74	25.61	.08	-.01	-.01	-.11	.00	.05	.05	-.02	-	-	-.10	.11	-.02	-.16*
Rt_SART	305.33	87.45	-.09	-.03	.04	.14*	.03	-.09	.05	-.04	-	-	.10	-.10	-.02	-.02
RTSD_SART	234.76	51.10	-.07	-.09	.05	.12	.07	.02	.16*	.02	-	-	.05	-.03	.01	-.22**
Rigidity WJT	3.18	2.17	.01	-.10	-.15	-.11	.04	-.02	.13	-.13		-.30**	-.22**	-.02	.03	.00

Note: * $p<.05$, ** $p<.01$; Gender (1=male, 2=female); Dummy 1_Special= was coded as 1=participants who were at Labour Relations and Human Resources specialization, 0=others; Dummy 2_Special. was coded as 1=participants who were at Social Work specialization, 0=others, with individuals at Psychology specialization serving as comparison; Fam. Stroop= Familiarity Stroop; Consc= Conscientiousness; N= Neuroticism; Int.= Intelligence; MAAS= Mindfulness Attention Awareness Scale; CAMS-R= Cognitive and Affective Mindfulness Scale-Revised; ACC= accuracy; Acc_Low= accuracy low complexity tasks; Ec= errors of commission; Ec_Low= errors of commission for low complexity tasks; RT= reaction time; RT_Low= reaction time for low complexity tasks; RTSD= variability in reaction time; RTSD_Low= variability in reaction time for low complexity tasks; Rigidity WJT= rigidity scores for water jar task; Det. of unexp. st= detection of unexpected stimuli; Fam. WJT= Familiarity Water Jar Task; Med. freq. = Meditation frequency

6.4.4. Hypothesis testing: Test of direct and moderated effects

To test our hypotheses, we performed hierarchical multiple regression analyses and moderated regression analyses, as described above. For all regression models, the assumptions (no collinearity; independence, normality, and homoscedasticity of residuals) were met in this data set. The results of these analyses for Stroop tasks, SART, and water jar task can be seen in Tables VI. 4, VI. 5, and VI. 6.

Table VI. 4. *Multiple moderated regressions for accuracy and errors of commission for Stroop tasks*

	Dependent Variable											
	ACC_low		ACC_task3		ACC_task4		Ec_Low		Ec_task3		Ec_task4	
Predictor Variable	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*
Step 1	.037		.094**		.047		.031		.090**		.047	
Age		-.05		-.24**		-.18**		-.08		.24**		.18**
Gender		.05		.03		-.03		-.05		-.04		.03
Dummy 1 S.		-.21**		-.25**		-.10		.16		.25**		.10
Dummy 2 S.		-.08		-.10		-.04		.07		.11		.04
Familiarity Stroop		-.06		-.07		.04		.08		.07		-.04
Meditation frequency		-.02		-.09		-.09		-.02		.09		.09
Step 2	.010		.013		.002		.006		.013		.001	
Conscientiousness		.09		.11		.04		-.07		-.11		-.04
Neuroticism		-.03		-.02		-.01		-.02		.02		.00
Step 3	.043**		.039**		.034**		.025*		.036**		.032**	
Intelligence		.23**		.22**		.21**		-.17*		-.21**		-.20**
Step 4	.006		.000		.001		.007		.000		.001	
Condition		-.08		-.003		-.03		.09		-.003		.03
Step 5	.011		.011		.002		.022		.010		.001	
MAAS		.08		.10		-.01		-.08		-.10		.01
condition x MAAS		.08		-.06		-.04		-.13		.06		.04
Step 5	.000		.012		.009		.000		.012		.009	
CAMS-R		.01		.11		-.05		.01		-.11		.06
condition x CAMS-R		-.02		-.08		-.09		-.02		.08		.09
Total R^2_1	.107		.157		.085		.090		.150		.083	
Total R^2_2	.096		.158		.093		.069		.151		.090	

Note: * $p<.05$, ** $p<.01$; Dummy 1_Special= was coded as 1= participants who were at Labour Relations and Human Resources specialization, 0=others; Dummy 2_Special. was coded as 1= participants who were at Social Work specialization, 0= others, with individuals at Psychology specialization serving as comparison; Condition = state mindfulness (0= control group, 1= experimental group); MAAS= Mindfulness Attention Awareness Scale (trait mindfulness); CAMS-R= Cognitive and Affective Mindfulness Scale-Revised (trait mindfulness); ACC= accuracy; ACC_Low= accuracy for low complexity tasks; Ec= errors of commission; Ec_Low= errors of commission for low complexity tasks; Total R^2_1= Total R^2 conducted for the model with MAAS in Step 5; Total R^2_2= Total R^2 conducted for the model with CAMSR in Step 5. In models with interactions, the variables were mean centered prior to the analysis.

Table VI. 5. *Multiple moderated regression for reaction time, variability in reaction time and detection of unexpected stimuli for Stroop tasks*

	Dependent Variable													
	Rt_Low		Rt_task3		Rt_task4		Det. of unexp. st		RTSD_Low		RTSD_task3		RTSD_task4	
Predictor Variable	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*
Step 1	.074**		.088**		.083**		.051		.055		.097**		.055	
Age		.15*		.20**		.18**		-.13		.05		.02		.05
Gender		.06		-.04		-.04		-.07		-.004		-.12		-.06
Dummy_1		.28**		.15		.20**		-.15		.26**		-.04		.15
Dummy_2		.15*		.26**		.23**		.05		.14		.29**		.19*
Familiarity Stroop		.14		.05		.02		-.03		.14		.02		.00
Meditation frequency		.02		.08		.06		.07		.04		.02		.11
Step 2	.007		.000		.008		.025		.009		.008		.007	
Conscientiousness		.07		-.003		.05		-.16*		-.01		-.06		-.05
N.		-.03		-.02		-.06		-.12				.05		-.09
Step 3	.152**		.092**		.100**		.011		.097**		.061**		.054**	
Intelligence		-.43**		-.34**		-.35**		.12		-.35**		-.27**		-.26**
Step 4	.003		.002		.017*		.003		.000		.005		.009	
Condition		-.05		-.04		-.13*		-.05		-.01		-.08		-.10
Step 5	.012		.012		.010		.011		.006		.000		.002	
MAAS		-.02		-.11		-.10		-.06		.03		-.02		-.06
condition x MAAS		-.11		-.06		-.05		-.09		-.07		.00		.00
Step 5	.018		.014		.009		.046**		.002		.007		.007	
CAMS-R		-.07		.11		.05		-.01		-.05		.06		.02
condition x CAMS-R		.13*		-.10		-.09		-.22**		.03		-.07		-.09
Total R2_1	.248		.194		.217		.102		.166		.171		.127	
Total R2_2	.254		.196		.216		.136		.163		.178		.132	

Note: * $p<.05$, ** $p<.01$; Dummy 1_Special= was coded as 1=participants who were at Labour Relations and Human Resources specialization, 0=others; Dummy 2_Special. was coded as 1=participants who were at Social Work specialization, 0=others, with individuals at Psychology specialization serving as comparison; Condition = state mindfulness (0= control group, 1= experimental group); MAAS= Mindfulness Attention Awareness Scale (trait mindfulness); CAMS-R= Cognitive and Affective Mindfulness Scale-Revised (trait mindfulness); RT= reaction time; RT_Low= reaction time for low complexity tasks; RTSD= variability in reaction time; RTSD_Low= variability in reaction time for low complexity tasks; Det. of unexp. st= detection of unexpected stimuli; Total R^2_1= Total R^2 conducted for the model with MAAS in Step 5; Total R^2_2= Total R^2 conducted for the model with CAMSR in Step 5. In models with interactions, the variables were mean centered prior to the analysis.

Table VI. 6. *Multiple moderated regression for SART and water jar task*

	Dependent Variables											
	ACC_SART		Ec_SART		Eo_SART		Rt_SART		RTSD_SART		Rigidity WJT	
Predictor Variable	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*	ΔR^2	*β*
Step 1	.016		.066**		.015		.027		.044		.193**	
Age		-.01		.04		.00		.04		.11		.02
Gender		-.03		-.11		.05		-.09		.03		.03
Dummy_1		-.06		.17*		.03		.07		.19*		-.05
Dummy_2		-.01		.19**		-.02		-.02		.07		-.21**
Fam.WJT	-	-		-		-.11		-		.08		-.20**
Med. freq.		.10		-.05				.13				-.40**
Step 2	.018		.010		.014		.013		.001		.000	
Consc.		-.14		.10		.13		-.12		-.03		-.01
N.		-.02		-.01		.02		-.05		.01		.01
Step 3	.025*		.002		.027*		.000		.025*		.002	
Int.		.18*		-.04		-.18*		-.01		-.18*		.05
Step 4	.006		.001		.004		.011		.000		.009	
Condition		.08		-.04		-.07		.11		-.02		-.10
Step 5	.002		.007		.001		.008		.011		.017	
MAAS		-.05		.06		.04		-.10		-.12		.03
condition x MAAS		.02		-.07		-.004		-.003		-.03		.13
Step 5	.012		.010		.014		.002		.012		.030	
CAMS-R		.02		.13		-.04		-.06		-.14		-.13
condition x CAMS-R		-.11		.03		.12		-.02		.05		.17*
Total R^2_1	.066		.086		.062		.059		.081		.220	
Total R^2_2	.076		.089		.074		.053		.082		.234	

Note: * $p<.05$, ** $p<.01$; Dummy 1_Special= was coded as 1=participants who were at Labour Relations and Human Resources specialization, 0=others; Dummy 2_Special. was coded as 1=participants who were at Social Work specialization, 0=others, with individuals at Psychology specialization serving as comparison; Fam. WJT= Familiarity Water Jar Task; Med. freq. = Meditation frequency; Consc= Conscientiousness; N= Neuroticism; Int.= Intelligence; Condition = state mindfulness (0= control group, 1= experimental group); MAAS= Mindfulness Attention Awareness Scale (trait mindfulness); CAMS-R= Cognitive and Affective Mindfulness Scale-Revised (trait mindfulness); ACC= accuracy; Ec= errors of commission; Eo=errors of omission; RT= reaction time; RTSD= variability in reaction time; Rigidity WJT= rigidity scores for water jar task; Total R^2_1= Total R^2 conducted for the model with MAAS in Step 5; Total R^2_2= Total R^2 conducted for the model with CAMSR in Step 5. In models with interactions, the variables were mean centered prior to the analysis

As the intervention proved to be effective, state mindfulness was included in the analysis as "condition" (0= control group, 1= experimental group). Results indicated that there were no relationships (p>.05) between state mindfulness (condition) and accuracy, errors of commission, and errors of omission for both Stroop tasks (see Step 4 on Table VI. 4) and SART (see Step 4 on Table VI. 6). However, we did find a significant negative relationship (p>.05) between state mindfulness (condition) and reaction time for Stroop task 4 (See Step 4 in Table VI. 5). Nevertheless, results showed that there were no relationships (p>.05) between state mindfulness (condition) and variability in reaction time for Stroop tasks (see Steps 4 on Table VI. 5) and SART (see Step 4 in Table VI. 6). Therefore, H1 was not supported and H2 was partially or barely supported. In addition, H3 and H4 were not supported, the results indicating that there were no significant relationships (p>.05) between state mindfulness (condition) and detection of unexpected stimuli (see Step 4 in Table VI. 5) and neither for state mindfulness and rigidity scores (see Step 4 on Table VI. 6).

However, the analysis revealed that there was an interaction effect of state and trait mindfulness stated in the previous relationships. Thus, H5 was partially supported. More specifically, as can be seen on Table VI. 5 (see Step 5 "CAMSR x condition") trait mindfulness measured with CAMS-R moderated the relationship between state mindfulness and reaction time for low complexity tasks (β= .13, p= .04), and it also moderated the relationship between state mindfulness and detection of unexpected stimuli (β= -.22, p<.001). Furthermore, trait mindfulness measured with CAMS-R moderated the relationship between state mindfulness and rigidity scores (β= .17 p= .02) (see Step 5 "CAMSR x condition" on Table VI. 6). Moreover, regarding H6, as aforementioned, we did find a significant negative relationship (p>.05) between state mindfulness (condition) and reaction time but only for the Stroop task with high complexity, task 4 (See Step 4 in Table VI. 5). This means that H6 is supported.

To further probe the interaction effects, we used the Process macro for SPSS (Hayes, 2018) to compute simple slopes for high and low values of the moderator (i.e., one standard deviation above and below the sample mean) and to plot the corresponding regression lines. Moreover, following the

equivalence between moderated regression analysis and factorial analysis of variance (Hayes, 2018), we used the "*conditional effect of X on Y at values of the moderator*" information in the Process output to estimate mean differences. According to Hayes "*the regression-based procedure exploits information about mean differences contained in the entire model derived from estimates based on the complete sample*" (Hayes, 2018, p. 300).

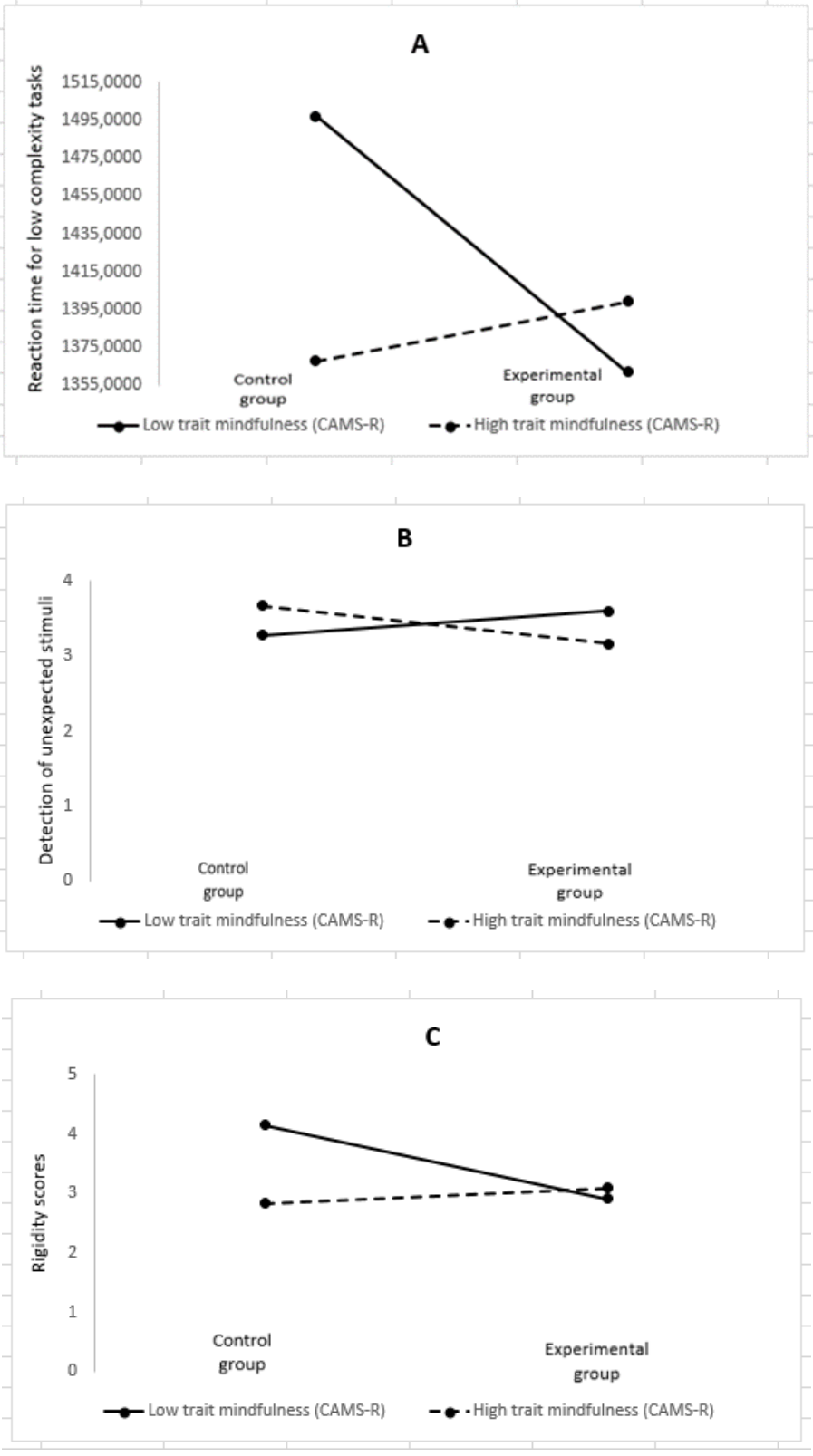
Therefore, the results showed (see graphic A in Figure VI. 2) that the slope estimating the relationship between state mindfulness (condition: experimental vs control group) and reaction time (for low complexity tasks in Stroop) was negative and statistically significant for subjects with low trait mindfulness measured with CAMS-R (*b*= -135.30, *p*= .01), but the relation was non-statistically significant for subjects with high trait mindfulness measured with CAMS-R (*b*= 31.26, *p*= .30). Furthermore, in the control group, there were statistically significant differences in mean values of reaction time between subjects with low and high trait mindfulness measured with CAMS-R (*b*= -83.71, *t*(201)= -1.85, *p*= .04), with subjects low in trait mindfulness showing higher reaction time. Regarding the experimental group, there were no statistically significant differences in mean values of reaction time between subjects with low and high trait mindfulness measured with CAMS-R (*b*= 24.07, *t*(201)= .54, *p*= .30).

Looking at the relationship between state mindfulness (condition: experimental vs control group) and detection of unexpected stimuli, the results showed (see graphic B in Figure VI. 2) that the simple slope was positive and statistically significant for subjects with low trait mindfulness measured with CAMS-R (*b*= .31, *p*= .04), but the relation was negative and statistically significant for subjects with high trait mindfulness measured with CAMS-R (*b*= -.51, *p*<.001). Moreover, in the control group, there were significant differences in mean values of detection of unexpected stimuli between subjects with low and high trait mindfulness measured with CAMS-R (*b*= .25, *t*(201)= 1.81, *p*= .04), with subjects high in trait mindfulness showing higher detection of unexpected stimuli. However, in the experimental group, subjects with low trait mindfulness detected a higher number of unexpected stimuli than subjects with high trait mindfulness (*b*= -.28, *t*(201)= -2.03, *p*= .02).

Finally, the results showed (see graphic C in Figure VI. 2) that the slope estimating the relationship between state mindfulness (condition: experimental vs control group) and rigidity scores was negative and statistically significant for subjects with low trait mindfulness measured with CAMS-R (b= -1.24, p<.001), but the relation was non-statistically significant for subjects with high trait mindfulness measured with CAMS-R (b= .27, p= .28). Moreover, in the control group, subjects with low trait mindfulness showed higher rigidity than subjects with high trait mindfulness (b= .-92, t(201)= -2.13, p= .02). However, in the experimental group, there were no statistically significant differences in mean values of rigidity between subjects with low and high trait mindfulness (b= .13, t(201)= .35, p= .37).

Figure VI. 2.

Graphics representing the probed interactions



6.5. Discussion

The main objective of the present study was to clarify the relationship between state mindfulness and objective performance and test the moderator role of trait mindfulness in this relationship. Our findings revealed that state mindfulness was not related to the enumerated objective performance indicators, except for reaction time. However, the intervention proved significant and there was an interaction effect between state and trait mindfulness for some of the objective performance indicators.

Overall, we did not get support for our hypotheses regarding the relationship between state mindfulness and objective performance. In the next few lines, we connect these findings with previous literature and suggest several possible explanations for these unexpected results that should be explored in future studies. First, we anticipated that a brief 8-min mindfulness exercise would increase state mindfulness and would predict objective performance. However, although state mindfulness increased because of the brief 8-min mindfulness exercise, we did not find a relationship between state mindfulness and accuracy, errors of commission, and errors of omission. Findings in previous studies regarding the relationship between state mindfulness and accuracy were not consistent. Whereas some studies revealed an improvement in accuracy after a brief mindfulness exercise (Norris et al., 2018; Quaglia et al., 2019), our findings are in support of those previous studies that did not find any relationship between state mindfulness and accuracy (Larson et al.,2013; Polak, 2009; Zeidan et al., 2010).

Regarding reaction time and variability in reaction time, we did not find any relationship between state mindfulness and variability in reaction time. To our knowledge, our study was the first to explore this relationship, so future research could shed some light on this question. Nevertheless, we did find a significant negative relationship between state mindfulness and reaction time for the Stroop task with the highest level of complexity (task 4). In other words, an increase in state mindfulness led to a better reaction time but only in the most complex task. Previous findings in the literature regarding the relationship between state mindfulness and reaction time were contradictory.

Whereas some studies informed of a negative relationship (i.e., state mindfulness decreases time reaction) (Jankowski & Holas, 2020; Lee & Orsillo, 2014; Norris et al., 2018), some others did not find a significant relationship between both variables (Larson et al., 2013; Watier and Dubois, 2016). Contradictory findings in the literature suggest the possible existence of moderator variables and the need to advance the knowledge of boundary conditions. In this sense, our findings suggest that task complexity could be a moderator in the relationship between state mindfulness and reaction time. The negative relationship between both variables was only observed in the most complex task (task 4) but not in the less complex ones (tasks 1 and 2, and task 3). In the same line, Zhang et al. (2013) investigated the influence of trait mindfulness on task and safety performance in a sample of 136 Chinese nuclear power plant operators and concluded that mindfulness influences in high complexity tasks, but not in the low complexity ones.

Moreover, we did not find a relationship between state mindfulness and detection of unexpected stimuli and either between state mindfulness and rigidity scores. In this case, our results are contradictory with the findings of Schofield et al. (2015), who found that the induction of a brief mindful state facilitated the identification of an unexpected distractor. In the same manner, we also contradict Greenberg et al. (2010), who showed that 8-week mindfulness practice reduces cognitive rigidity. One possible explanation for these results may be the moderating effects of trait mindfulness (Geisler et al., 2017; Watier & Dubois, 2016), but also the difference between our intervention (8-minutes) and Greenberg et al.'s (2010) intervention length (8 weeks). We must outline that another possible explanation for the fact that state mindfulness was not related to the enumerated objective performance indicators (except reaction time) may be the low dosage of mindfulness practice students received. We applied an 8-min mindfulness exercise and maybe larger sessions and frequent practices are more likely to produce larger effects associated with measurable gains (Creswell, 2016). This interpretation is consistent with other studies, which suggest that depending on the methods, quality, and dosage of mindfulness interventions, mindfulness training can have both short-term and long-term effects (Davidson & Kaszniak, 2015). In the same line, Verhaeghen

(2021) also adds that even the duration of the intervention has an effect; thus, to increase attention performance we must increase the number of sessions. Hence, future studies should consider not only the content of the mindfulness exercise but also the number of sessions to encourage an increase in performance.

We also must mention as a possible explanation for our results the applied mindfulness scales (MAAS and CAMS-R for trait mindfulness and SMS for state mindfulness). There is still an ongoing debate about the operationalizing of mindfulness, with some authors (Grossman, 2008; 2011; Quickel et al., 2014) sustaining that these scales do not capture the Buddhist notion of mindfulness, but intervention effects (e.g., present moment awareness) which are translated in mindfulness. Future investigations should address this issue and try to explore other creative ways of measuring mindfulness.

Regarding the moderating role of trait mindfulness in the relationship between state mindfulness and objective performance, we obtained significant interaction effects for most of the objective performance indicators. Particularly, trait mindfulness moderated the relationship between state mindfulness and reaction time for low complexity tasks, detection of unexpected stimuli, and rigidity scores.

The relationship between state mindfulness and reaction time for low complexity tasks was negative and statistically significant for subjects with low trait mindfulness measured with CAMS-R. This means that, in the low complexity tasks, those participants low in trait mindfulness from the experimental group showed less reaction time than the participants low in trait mindfulness from the control group. Thus, participants with low levels of trait mindfulness showed better performance (i.e, lower reaction time) when they carried out a brief single mindfulness exercise before doing the task. This finding suggests that people with low levels of trait mindfulness can get some benefits, such as reducing their reaction time if they do a brief mindfulness exercise before facing a not-very complex cognitive task. However, this brief mindfulness exercise is not able to improve the performance of people with high levels of trait mindfulness. Perhaps, in a mindfulness exercise, the

focus is on sensations and feelings that arise, thus, attention is not as strongly directed as in a cognitive task, where specific characteristics, such as alerting and orienting are usually connected with trait mindfulness (Verhaeghen, 2021). Nevertheless, in the control group, participants with high trait mindfulness had less reaction time than participants with low trait mindfulness.

Regarding the relationship between state mindfulness and detection of unexpected stimuli, we obtained that those participants high in trait mindfulness showed lower performance (i.e., they detected less unexpected stimuli) under the experimental condition compared to the control one. Furthermore, in the experimental condition, subjects with low trait mindfulness detected a higher number of unexpected stimuli than subjects with high trait mindfulness, while, in the control condition, subjects high in trait mindfulness showed higher detection of unexpected stimuli. Maybe the type of mindfulness exercise and the way we measured state mindfulness influenced the association between the specific trait and state mindfulness facets (Bravo et al., 2018). In other words, a mindfulness exercise that targets a specific facet of mindfulness may enhance the relationship between that facet and the most similar trait mindfulness facet, which in our case was focused attention exercise on body and breath and the attention given to the present moment (Dane, 2011, p. 1000). Therefore, while this type of activity may be positive for increasing attention for subjects with low trait mindfulness, it may be negative for subjects with high trait mindfulness, for whom this exercise may have led to excessive attention to their thoughts and reduced attention to what is happening in their environment.

Finally, regarding the relationship between state mindfulness and rigidity, our brief mindfulness exercise did not affect subjects with high trait mindfulness, as results were similar regardless of whether they were in the experimental or control group. However, the exercise did benefit the participants with low trait mindfulness, obtaining lower rigidity scores when being part of the experimental group. This proves the benefit of our brief mindfulness exercise and it shows the importance of trait mindfulness in the context of objective performance. Thus, participants with low

levels of trait mindfulness might have more benefits in the context of a brief mindfulness exercise than participants with high levels of trait mindfulness (Geisler et al., 2017; Watier & Dubois, 2016).

6.5.1. Theoretical contributions

There are several theoretical contributions of our study:

First, our work contributes to shedding some light on the understudied relationship between mindfulness and performance. Most studies on mindfulness in the workplace have focused on its relationship to well-being and health. Less attention has been given to its relationship to performance (Verhaeghen, 2021). In addition, the results offered by these studies to date are contradictory and far from conclusive (Larson et al., 2013; Lee & Orsillo, 2014; Zeidan et al., 2010). The study of the relationship between mindfulness and performance is of great relevance not only at the individual level, but also for organizations because they seek to improve the performance of their workers in order to increase their own competitiveness. Moreover, the present study has additional merits that are scarcely found in the literature, such as the operationalization of performance through objective indicators, the use of several objective performance indicators, the measurement of both trait mindfulness and state mindfulness, the use of different types of tasks, the consideration of the complexity of the task as a possible modulating variable, and the study of all these variables under laboratory conditions and including a control group. We applied three different cognitive tasks that allowed us to measure participants' ability to focus, sustain, direct their attention and detect unexpected stimuli (Stroop task, SART) as well as to capture the participants' notion of missing obvious adaptive solutions (water jar task). Consequently, through our broad range of tasks that also were with and without time limits we assured to include the cognitive set of functions, mentioned previously, found to be enhanced by mindfulness and meditation exercises (Malinowski, 2013). We also included a control group, while many other studies did not even use a control group (Jamieson & Tuckey, 2017), which allowed us to see differences in performance between our two groups. Specifically, our study reveals (1) significant relationships between trait mindfulness and objective performance, (2) the moderating role of task complexity in the relationship between mindfulness and reaction time for the

Stroop task with the highest level of complexity (task 4), and (3) the moderating role of trait mindfulness in the relationship between state mindfulness and objective performance. The results are promising and invite us to continue with this line of research. In the following paragraphs, we see in more detail the theoretical contributions of these three particular findings.

Second, our work contributes to clarifying the relationship between trait mindfulness and objective performance. Particularly, we have seen that in the control group, participants with high trait mindfulness obtained better performance results (lower reaction time, higher detection of unexpected stimuli, and lower rigidity scores) than participants with low trait mindfulness. The first thing that stands out is that no type of relationship is observed between trait mindfulness and different indicators of accuracy in performing the task (e.g., correct answers, errors of omission, and errors of commission). Other variables, such as intelligence, seem to be much more relevant in explaining the relationship with accuracy (see also Study 2 of this thesis already published, Goilean et al., 2021). However, trait mindfulness is associated with better performance when other objective performance indicators are considered. Specifically, people high in trait mindfulness react faster, that is, their reaction time is shorter. In addition, they detect more unexpected stimuli and show greater cognitive flexibility. These three elements of performance (reaction time, detection of unexpected events, and cognitive flexibility) are highly relevant for safe performance in what is known as high-reliability organizations (nuclear power plants, air traffic control towers, aviation…) that often face unexpected events to which they must respond in a resilient way to avoid a catastrophe (Weick & Suttcliffe, 2015).

Third, our study also contributes to a better understanding of the modulating role of task complexity in the relationship between mindfulness and performance. The contradictory results found in the literature suggest the possible existence of moderating variables. One of them is task complexity, which we also studied in Study 2 of this thesis. In this study, we have found that task complexity does not appear to moderate the relationship between mindfulness and accuracy. However, task complexity plays a relevant role as a moderator in reaction time. Specifically, we have found that state mindfulness is negatively associated with reaction time only in the most complex task. That is, those

high in mindfulness state react faster than those low in mindfulness state, but only when the task acquires a certain complexity. In less complex tasks, state mindfulness alone is not able to explain differences in reaction times. Precisely, another interesting finding of our study is that in simple tasks trait mindfulness moderates the relationship between state mindfulness and reaction time. Specifically, people low in trait mindfulness decrease their reaction time when mindfulness is induced through a brief exercise like the one used in our study; however, this does not occur in people high in trait mindfulness. Taken as a whole, these results help to further clarify the modulating role of task complexity in the relationship between mindfulness and objective performance and encourage us to continue considering this variable in future studies.

Finally, our work contributes to the literature by showing the interaction effects between trait mindfulness and state mindfulness in their relationship with objective performance. This is probably the most valuable theoretical contribution of our study. Few studies have previously studied possible interactions between trait and state mindfulness. In our study, we theorized that there could be interaction effects between both variables. Specifically, we hypothesized that trait mindfulness could moderate the relationship between state mindfulness and objective performance, so that the relationship between both variables was stronger in people with low trait mindfulness and weaker in people with high trait mindfulness. In general, the results have supported our hypothesis. The induction of state mindfulness through a brief mindfulness exercise before performing the task did not produce improvements in accuracy, but it did produce improvements in reaction time, detection of unexpected stimuli, and cognitive flexibility in those people low in trait mindfulness. That is, those low in trait mindfulness decreased their reaction time, detected more unexpected stimuli, and showed greater cognitive flexibility when a mindfulness state was induced by performing a brief mindfulness exercise. However, the same exercise did not entail any benefit for those high in trait mindfulness, who even worsened their performance in the case of the detection of unexpected stimuli. Our work is one of the first to show interaction effects between state mindfulness and trait mindfulness and represents an important advance that could help clarify the contradictory results found in the

literature when trying to understand the relationship between mindfulness and performance. Along with the complexity of the task as a moderating variable, it seems necessary to consider the interactions between trait and state mindfulness when understanding the relationship between mindfulness and performance. Future research should continue along this promising line.

6.5.2. Practical implications

At least two practical implications follow from our findings. Firstly, the results of our work suggest that workers low in trait mindfulness can improve their performance in tasks of a cognitive nature by performing a brief mindfulness exercise before starting their work (e.g., at the beginning of the working day). A simple investment of 8 minutes increases mindfulness state and can lead to improving reaction times, the detection of unexpected events, and the cognitive flexibility of those people who, due to personality characteristics, do not tend to pay high attention to the present. The improvement of individual performance is relevant to the extent that this contributes in turn to the improvement of organizational performance. This implication is even more important if we consider that nowadays, at least in developed countries, with a majority of companies in the tertiary sector, most jobs involve more mental demands than physical ones, and tasks of a cognitive nature are a very important part of them.

The second practical implication derived from our study is that not everyone will benefit from this type of intervention. Our work shows that for workers high in trait mindfulness, that is, those who, by their own nature, already have a high awareness of the present moment, this exercise does not produce benefits in their performance and can even be harmful, as in the case of detection of unexpected stimuli. Hence, it follows that before the organization implements an intervention strategy such as the one mentioned in our work (i.e., a brief mindfulness exercise), it would be necessary to identify those individuals who can really benefit from it (those with low trait mindfulness) and discard those others in which not only will it not have any benefit but could even be harmful (those high in trait mindfulness). For the diagnosis of trait mindfulness, it would be sufficient to use any of the instruments that were mentioned in our study for this purpose (for example, the MAAS). By acting in

this way, we would be enhancing that organizations can create time-sensitive, accessible, and cost-efficient interventions (Hyland et al., 2015).

6.5.3. Limitations

Our study has also some limitations. First, we only included undergraduate students, so further research is needed to determine whether this relationship (state mindfulness with objective performance) and the moderator role of trait mindfulness is also found in other samples of professional work groups. Second, even if we found that our brief mindfulness exercise proved to be effective, the effects of this kind of exercise on meditation-naïve individuals could be temporary (Norris et al., 2018). Thus, future studies should continue to investigate the effects of brief mindfulness exercises on this kind of sample in order to assure lasting effects on performance.

6.5.4. Conclusion

In conclusion, our research contributes to the literature on mindfulness and objective performance by providing empirical evidence for the relationship between state mindfulness and objective performance, especially when moderated by trait mindfulness. Our study highlights the importance of conducting further research on mindfulness and performance because this allows individuals to acquire additional resources that not only benefit them but also their workplace.

CHAPTER VII: GENERAL DISCUSSION

7.1. Introduction

This chapter will integrate the most important research findings of the three studies within this thesis. We will highlight how these findings contribute to and broaden the current understanding of the relationship between individual mindfulness and objective performance. Thus, we begin this chapter by reminding the main objectives of this research and the research questions we wanted to answer summarizing the main results of each of the three studies. Then, we outline the main theoretical findings of our research. Next, we comment on the main practical implications, and finally, we discuss the general limitations of our three studies as the bases for new possible research questions.

7.2. Study objectives

While the research on mindfulness is well-defined in psychology and medicine, we see that the research regarding the relationship between mindfulness and performance is still underdeveloped (Dane, 2011). According to Chiesa and Malinowski (2011), there are at least 26 systematic reviews or meta-analyses that examined the efficacy of mindfulness-based interventions on health-related outcomes, whereas there is only one meta-analysis that focused on the impact of mindfulness on cognitive functioning. Furthermore, the meta-analysis conducted by Verhaeghen (2021) also suggests the same idea, that most of the research on mindfulness is related to clinical benefits and well-being.

However, acknowledging the fact that mindfulness provides numerous physical and psychological benefits, researchers have begun exploring the workplace benefits of this concept, finding that mindfulness can also enhance employee well-being and effectiveness (Hyland et al., 2015). Thus, numerous studies have linked mindfulness with reduced work stress (Donald et al., 2016; Jayewardene et al., 2017), increased resilience (Jha et al., 2010; Roche et al., 2014), increased job satisfaction (Hülsheger et al., 2013; Wongtongkam et al., 2017) and increased work engagement (Dane & Brummel, 2014; Leroy et al., 2013).

Most scholars have defined mindfulness as the awareness that comes from paying attention to the present moment (Bishop et al., 2004; Kabat-Zinn, 1994), thus, from these descriptions, it would

be expected that mindfulness would have effects on attention. Nevertheless, when we take a closer look at the existing evidence regarding the relationship between mindfulness and performance, despite the promising outcomes shown in most of the studies, more research is needed to help understand when and for whom mindfulness influences performance. Thus, it is important to distinguish between trait and state mindfulness and investigate both constructs in relation to performance in order to see whether the results are related to trait personality variables or state-related changes. Alternatively, maybe the interaction between trait and state mindfulness is the key to obtaining the expected outcomes. Furthermore, is also important to see when the individuals perform better and what kind of tasks are necessary to be able to test the performance indicators.

Our research wanted to contribute to a further understanding of the relationship between mindfulness and objective performance through three main aims. First, we wanted to address the emergence of mindfulness in the workplace and highlight the view of the current literature regarding the concept of mindfulness. It was important to obtain a global perspective of mindfulness in the organizational literature in order to address the main gaps. Second, we wanted to investigate the relationship between trait mindfulness and objective performance, while taking into consideration the moderating role of task complexity. Previous research suggested that the relationship between trait mindfulness and performance could vary for different levels of task complexity (Zhang et al., 2013). Third, we wanted to investigate the relationship between state mindfulness and objective performance while taking into consideration the moderating role of trait mindfulness and the moderating role of task complexity. It is fundamental to check for the interaction between trait and state mindfulness because baseline trait mindfulness has been found to moderate the effects of standard duration mindfulness-based interventions on self-report measures of subjective well-being, hope, empathy, and post-intervention trait mindfulness (Shapiro et al., 2011). Overall, this investigation allows us to go beyond the subjective judgments of the individuals and actually draw conclusions about whether mindfulness produces differences in performance outcomes evaluated with objective indicators.

To reach the abovementioned objectives, we carried out three studies, more specifically, one review and two experimental studies with different samples of students from the University of Valencia. We summarize the main research questions and integrate the most important findings within each of our studies below, not going into too much detail as the detailed discussion of each study's findings has already been presented in the previous chapters.

7.3. Main findings

We began our research by attempting to provide an overview of what mindfulness is, where it originated from, its definition and main characteristics, the distinction between trait and state mindfulness, main antecedents and outcomes, the implementation of mindfulness training programs in organizations, and future research avenues. This led us to ask the question: what are the main gaps in the literature concerning the concept of individual mindfulness? We attempted to answer this question in Study 1, where through a revision of more than 400 articles we provided a more substantial understanding of the concept of individual mindfulness, and we showed and explained how individual mindfulness could benefit employees and organizations. Thus, we were also able to discuss not only mindfulness interventions and how they could be applied within organizations, but also, we were able to propose new directions for researchers and practitioners. An important step in this direction was to follow Dane's definition of mindfulness. More specifically, after analysing eleven definitions, Dane (2011, p. 1000) defines mindfulness as "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*". We considered fundamental this definition regarding the objectives of our research because it integrates the most important features of mindfulness: 1) a state of consciousness, 2) focusing attention on the present-moment, and 3) mindfulness involves attending to external and internal present-moment states. Furthermore, we also insist on the difference between state and trait mindfulness to provide more evidence regarding their relationship. We continue analysing the antecedents of mindfulness, as well as the benefits of mindfulness in the workplace while also trying to understand how mindfulness contributes

to these consequences. The findings from this first study made us want to contribute further evidence regarding the influence of mindfulness on performance since this is an important research gap.

Thus, after differentiating between trait and state mindfulness, we wanted to expand our understanding of the relationship between trait mindfulness and performance. When we look at the results concerning this relationship, we found that most studies are measuring performance subjectively and provide support for this relationship (Dane & Brummel, 2014; Reb et al., 2012). However, those studies that used objective indicators of performance showed contradictory results (Fountain-Zaragoza et al., 2018; Keith et al., 2017). This led us to ask our second research question: does trait mindfulness influence objective performance? In Study 2, through an experimental design, we focused on the relationship between trait mindfulness and the outcome component of performance, evaluated with objective indicators (accuracy, reaction time, variability in reaction times, and detection of unexpected stimuli) on an attention task. More specifically, we conducted the study in a laboratory setting and employed software (E-prime 2.0) to recode the objective indicators of performance on a Stroop task (Stroop, 1935). Our results revealed that trait mindfulness was not related to objective indicators of performance in an attention task, except for the detection of unexpected stimuli. This showed that individuals with high trait mindfulness are better at detecting unexpected events than individuals with low trait mindfulness.

Study 2 also attempted to investigate if the relationship between mindfulness and objective performance is moderated by task complexity. It has been argued that the benefits of mindfulness could depend on task complexity (Zhang et al., 2013). Being mindful may be more beneficial for improving performance in complex tasks, where small errors or missing information could seriously affect the whole outcome, whereas, in simple tasks, the benefits of being mindful may not exceed its time cost (Zhang et al., 2013). This led us to ask the following question in Study 2: does task complexity moderate the relationship between trait mindfulness and objective performance? We, therefore, tested the moderating role of task complexity in the relationship between trait mindfulness and objective performance. We divided the Stroop task into 4 tasks with different levels of complexity. The

tasks were assumed to have an increasing level of complexity because of the differences in cognitive processing demands (Robinson, 2001). The results indicated that task complexity did not play a moderating role in the aforementioned relationship. The general finding of no relationship between trait mindfulness and performance in most of the objective indicators of performance was replicated in tasks with four different levels of task complexity. Therefore, the expected moderator role of task complexity in the relationship between trait mindfulness and performance did not receive empirical support. Looking for any explanation for this unexpected finding we discussed that maybe the fact that we only applied one type of task (Stroop task) with an imposed time limit to answer caused everyone to increase their level of attention and concentration to achieve good performance, and in this way, the differences between individuals with high and low trait mindfulness were reduced. For this reason, in Study 3, we included other tasks (not only Stroop tasks with different levels of complexity) and excluded the time limit to answer (only for the Stroop task).

The overall results obtained in Study 2 provided new empirical evidence concerning the relationship between trait mindfulness and objective performance. Thus, even though overall we were not able to support the influence of trait mindfulness on objective performance, we did manage to obtain a positive relationship between trait mindfulness and the detection of unexpected stimuli. These findings suggest the relevance of trait mindfulness, not only as a benefit to individuals but also as a work-related benefit, especially in working environments where is imperative to pay attention to the early detection of unexpected stimuli. We will come back to this finding in the practical implications.

After concluding in Study 2 that trait mindfulness is not related to objective indicators of performance in an attention task, we wanted to further examine the role of mindfulness and its relationship with objective performance. So, we became interested in the impact that state mindfulness may have on performance. Looking at the studies regarding the influence of state mindfulness it seemed that the focus was on mindfulness-based interventions with health-related outcomes rather than outcomes regarding cognitive functioning (Watier & Dubois, 2016). In addition,

these mindfulness-based interventions are usually delivered over long periods (8 weeks) and with a duration between 1-2 hours, which makes these interventions impractical not only for delivery in organizations (Hyland et al., 2015) but also prohibited in laboratory experiments (Watier & Dubois, 2016), where brief sessions of state mindfulness should be induced. Despite this aspect, we also observed inconsistency in the results regarding state mindfulness and objective performance, with studies providing support for this relationship (Lee & Orsillo, 2014; Norris et al., 2018) and studies not providing support for it (Larson et al., 2013; Polak, 2009). This led us to ask the question: does state mindfulness induced through a brief mindfulness exercise influence objective performance? To answer this question, we investigated if a brief mindfulness exercise (8 minutes) improves the outcome component of performance (the results of the individual's behaviour) evaluated through objective indicators (accuracy, reaction time, variability in reaction times, detection of unexpected stimuli, and rigidity scores). This study was also conducted in a laboratory setting and we employed software (E-prime 2.0) to recode the objective indicators of performance on two tasks: 1. The Stroop task (Stroop, 1935) with four different levels of complexity and 2. a Sustained Attention to Response Task (SART; Mrazek et al., 2012). For the third task, the water jar task, the answers were registered on paper. Our findings indicated that state mindfulness was not related to the enumerated objective performance indicators, except for reaction time. Maybe the brief mindfulness exercise of 8-min was not enough to support this relationship for all the aforementioned objective indicators of performance, and more longer and frequent sessions are necessary to assure the expected results (Creswell, 2016; Davidson & Kaszniak, 2015).

Study 3 also wanted to examine the moderating role of trait mindfulness in the relationship between state mindfulness and objective performance. In this direction, according to Water and Dubois (2016), it could happen two different things. First, it could be that a brief mindfulness exercise may not be enough for individuals with already high levels of trait mindfulness, and second, maybe these same individuals (with high levels of trait mindfulness) might be more aware than those with low trait mindfulness might (Watier & Dubois, 2016). Hence, we considered it relevant to test for this

interaction because either way, it is reasonable to suppose that trait mindfulness would influence the efficacy of the exercise. Thus, this led us to ask the question: Does trait mindfulness moderate the relationship between state mindfulness and objective performance?

Our results indicated that trait mindfulness moderated the relationship between state mindfulness and reaction time for low complexity tasks, detection of unexpected stimuli, and rigidity scores. More specifically, regarding the relationship between state mindfulness and reaction time for low complexity tasks, we found that participants low in trait mindfulness from the experimental group showed less reaction time than the participants low in trait mindfulness from the control group. This means that individuals with low levels of trait mindfulness can obtain better results (less reaction time) if they have a brief mindfulness exercise before a simple task. Nevertheless, the same exercise of mindfulness is not beneficial for people with already high levels of trait mindfulness. However, in the control group, high levels of trait mindfulness lead to better reaction time. Regarding the relationship between state mindfulness and detection of unexpected stimuli, we observed that participants high in trait mindfulness detected fewer unexpected stimuli under the experimental condition compared to the control one. Participants with low levels of trait mindfulness from the experimental group detected a higher number of unexpected stimuli than those in the control group. This means that a brief mindfulness exercise is beneficial for individuals with low trait mindfulness, while for those with high levels of trait mindfulness can lead to excessive attention to their inner thoughts (depending on the mindfulness exercise nature) and consequently to low performance. Furthermore, we observed in the control group, that high levels of trait mindfulness led to a high number of detected stimuli. Last, regarding the relationship between state mindfulness and rigidity scores, the results were the same (both experimental and control group) for participants with high trait mindfulness. This finding implies that people high in trait mindfulness were not prejudiced or benefited because they participated in the brief mindfulness exercise. However, our brief mindfulness exercise proved to benefit individuals with low trait mindfulness, obtaining lower rigidity scores than those in the control condition. Furthermore, in the control

group, high trait mindfulness leads to low rigidity scores. This finding implies that there is a positive relationship between trait mindfulness and cognitive flexibility. In other words, people high in trait mindfulness behave more flexibly (they are less rigid) than people low in trait mindfulness.

Furthermore, we also wanted to check for the moderator role of task complexity, since we did not manage to confirm this contribution in our second study. In this direction, maybe state mindfulness plays a more important role in predicting objective performance, and perhaps as a result task complexity moderates this relationship. This led us to ask the question: does task complexity moderate the relationship between state mindfulness and objective performance? The results suggested that task complexity could be a moderator in the relationship between state mindfulness and reaction time. To be more specific, the negative relationship between both variables was only observed in the most complex task (task 4) but not in the less complex ones (tasks 1 and 2, and task 3). This means that being mindful is more beneficial for improving performance in complex tasks.

Overall, the results obtained in Study 3 outline the relevance of mindfulness in the workplace. Firstly, we did not manage to get support for the relationship between state mindfulness and accuracy, errors of commission, errors of omission, variability in reaction time, detection of unexpected stimuli, and rigidity scores. Thus, although these are not the expected results, we consider that maybe other factors come into play, such as the moderating role of trait mindfulness or the moderating role of task complexity (as we later confirm). Secondly, we managed to get support for the moderator role of trait mindfulness in the relationship between state mindfulness and reaction time for low complexity tasks, detection of unexpected stimuli, and rigidity scores. More specifically, state mindfulness provoked through a brief mindfulness exercise improved reaction time, detection of unexpected stimuli, and cognitive flexibility in the participants with low trait mindfulness. This suggests that our brief mindfulness exercise leads participants with low levels of trait mindfulness to respond faster, detect more unexpected stimuli, and obtain greater cognitive flexibility. Quite the contrary, this same exercise, proved to be detrimental for participants with already high levels of trait mindfulness, especially in the case of the detection of unexpected stimuli, where they identified even fewer

distractors. Thirdly, we also observed in the control group, that high levels of trait mindfulness are associated with faster reaction time, higher detection of unexpected stimuli, and lower rigidity scores. This result suggests that trait mindfulness is associated with objective measures of attention (Verhaeghen, 2021). Fourthly, we managed to get support for the relationship between state mindfulness and the reaction time for the Stroop task with the highest level of complexity (task 4). This means that a high level of state mindfulness leads to a faster reaction time, but only in a complex task, therefore suggesting that task complexity could be a moderator for this aforementioned relationship (Zhang et al., 2013).

In summary, the evidence gained from the three studies allowed us to contribute to the literature on mindfulness and performance. In doing so, we managed to reach all three of our research objectives. First, by identifying the gaps we needed to address regarding the relationship between individual mindfulness and performance. Second, by getting support for the relationship between trait mindfulness and detection of unexpected stimuli. Third, by providing support for several important contributions: 1) the relationship between state mindfulness and reaction time for the Stroop task with the highest level of complexity (task 4); 2) the moderating role of trait mindfulness in the relationship between state mindfulness and reaction time for low complexity tasks, detection of unexpected stimuli and rigidity scores; 3) the conclusion that a brief mindfulness exercise is beneficial only for those with low trait mindfulness; 4) the relationship between trait mindfulness and objective indicators of performance (in the control group); 5) the conclusion that task complexity plays a relevant role as a moderator in reaction time, but only for the most complex task.

The general objective of this current thesis was to contribute to a further understanding of the relationship between individual mindfulness and objective performance. Thus, we consider, that the insight gained from our three studies allowed us to accomplish our main objective. First, our research identified significant relationships between trait mindfulness and objective performance. We managed to confirm the positive relationship between trait mindfulness and the detection of

unexpected stimuli (Study 2 and Study 3) as well as the influence of trait mindfulness on reaction time and rigidity scores (Study 3). Thus, high trait mindfulness leads to identifying a high number of unexpected stimuli (Study 2), and as well, in the control group (Study 3), participants with high trait mindfulness obtained faster reaction time, identified more distractors, and had low rigidity scores. These objective indicators of performance are extremely important in industries where safety is a priority and any consequence could be disastrous (Weick & Sutcliffe, 2015). In addition, it is important to outline that in both studies, we did not manage to confirm the influence of trait mindfulness on accuracy. Maybe, other factors, such as intelligence (Goilean et al., 2021) are more relevant in the case of accuracy. Second, we also provide important implications regarding the relationship between state mindfulness and objective performance (Study 3). We found that state mindfulness is not related to accuracy (errors of commission, errors of omission), variability in reaction time, detection of unexpected stimuli and rigidity scores. This result is also relevant because suggests the need to consider possible moderating variables, such as task complexity and the interaction between state mindfulness and trait mindfulness. It makes sense since the advantage of being mindful depends on the complexity of the task (Zhang et al., 2013) or maybe a brief mindfulness exercise is not enough for the participants with already high levels of trait mindfulness (Watier & Dubois, 2016). Third, we provide important results regarding the moderating role of task complexity in the relationship between individual mindfulness and objective performance. Hence, we observed that task complexity did not moderate the relationship between trait mindfulness and accuracy (Study 2), but it did moderate the negative relationship between state mindfulness and reaction time, but only for the most complex task (task 4, Study 3). According to this result (Study 3), a higher level of state mindfulness leads to a faster reaction time, but only in the case of high complexity tasks, while for simple tasks, state mindfulness alone is not able to provide the expected outcome. Thus, being mindful is more beneficial for enhancing complex task performance (Zhang et al., 2013). Fourth, we provide important explanations regarding the interaction effects between trait and state mindfulness in their relationship with objective performance (Study 3). More specifically, we found the participants with low levels of trait

mindfulness obtained better reaction time for low complexity tasks, detected more unexpected stimuli, and had low rigidity scores. Meanwhile, this same exercise did not advantage participants with high levels of trait mindfulness, who even worsened their performance in the case of the detection of unexpected stimuli. Maybe, in the case of individuals with high levels of mindfulness, a brief mindfulness exercise is not enough to affect them (Watier & Dubois, 2016), but it also raises some questions considering that higher levels of trait mindfulness are associated with higher performance on attention tasks (Moore & Malinowski, 2009).

In conclusion, this present thesis adds to the literature on individual mindfulness and objective performance by providing empirical evidence for the aforementioned relationship. Furthermore, this investigation has additional merits, since the results are obtained in a controlled environment (laboratory) while using software (E-prime 2) and applying different cognitive tasks. Nevertheless, our contributions also highlight the need for more research to continue exploring the relationship between individual mindfulness and objective performance.

7.4. Theoretical implications

In this section, we combine the results of our three studies, and we explain the way they contribute to the research on individual mindfulness by filling important research gaps and clarifying some inconsistencies within the literature.

Altogether, the three studies conducted within this thesis helped to significantly expand our understanding of the association between individual mindfulness and objective performance. We were able to recompile all the information regarding the concept of individual mindfulness and highlight that most of the research about mindfulness in the workplace focused on the effects of mindfulness on psychological well-being and health and very little research studied the effects of mindfulness on performance. This further provided us with an original approach that allowed for the examination of this aforementioned relationship. More specifically, we managed to apply an experimental design in two of our studies and record objective indicators of performance (accuracy, reaction time, variability in reaction times, detection of unexpected stimuli, and rigidity scores) from

different cognitive tasks. The selected cognitive tasks measured a set of cognitive functions (to direct and focus attention, to detect unexpected stimuli, and to overlook obvious solutions) found to be enhanced by mindfulness. Our results point out the complex relationship between individual mindfulness and objective performance adding to the limited evidence that measures this concept objectively and shifting our reasoning to the nature of mindfulness itself.

Through this research, we were able to broaden the understanding of individual mindfulness, as definitions of mindfulness can refer to a state of consciousness, but mindfulness can also be understood as a personality trait (Dane, 2011). Thus, in Study 1, we reviewed the literature in order to provide an overview of what is the concept of individual mindfulness and its application in the organizational literature. We considered that Dane's (2011, p. 1000) definition, according to which mindfulness is "*a state of consciousness in which attention is focused on present-moment phenomena occurring both externally and internally*" was the most appropriate to our research objectives. Nevertheless, it was also relevant to indicate antecedents of mindfulness, for a better understanding of the conditions that facilitate mindfulness at work. Thus, although most studies have emphasized the role of meditation programs (Kabat-Zinn, 2003) to enhance mindfulness, organizational and supervisor support (Olafsen, 2017), job demands and job control (Lawrie et al., 2017), and job experience (Dane, 2011) seem to affect the extent that mindfulness will manifest in the workplace. We also reviewed studies that have linked mindfulness with work stress (Donald et al., 2016), resilience (Roche et al., 2014), job satisfaction (Hülsheger et al., 2013), engagement (Leroy et al., 2013), and physical health (Wolever et al., 2012). It was also worth noting the fact that organizations can develop employees' mindfulness through the implementation of mindfulness training programs (Hyland et al., 2015) because mindfulness training in organizations may be a positive addition that can help employees. From this first study, we were able to prove the lack of investigation regarding the concept of individual mindfulness and performance and further develop the following studies based on this identified research gap.

In the following lines, we emphasize the contributions regarding the relationship between individual mindfulness and objective performance. However, we also consider it important to include as contributions the unexpected results, because they only amplified the need to continue investigating to clarify the aforementioned relationships. Hence, even though the results from Study 2 showed that trait mindfulness was not related to objective indicators of performance (except detection of unexpected stimuli), we continued to investigate this variable in our third study and proved that high levels of trait mindfulness led to faster reaction time, higher detection of unexpected stimuli and lower rigidity scores. Nevertheless, also regarding the results from Study 3, even if we found that state mindfulness was negatively associated with reaction time for the Stroop task with the highest level of complexity, we did not manage to find any relationship between state mindfulness and the other indicators of performance. Thus, we consider that through these unexpected findings, we add more evidence to the complex relationship between individual mindfulness and objective performance and outline the need to continue investigating in this direction.

Furthermore, as we previously said, we made several substantial contributions to the literature regarding the relationship between trait mindfulness and objective performance. First, even if Study 2 did not support a relationship between trait mindfulness and objective indicators of performance, we considered it important to continue investigating in this direction because there is evidence supporting this relationship (Keith et al. 2017; Lin et al., 2018; Moore & Malinowsky, 2009). Second, in connection with the aforementioned relationship, in Study 3, we concluded that in the control group, participants with high trait mindfulness obtained better performance results than participants with low trait mindfulness. In other words, these results clearly show that trait mindfulness directs attention to specific stimuli, thus, higher levels of trait mindfulness led to improved performance. These participants had faster reaction times, detected a higher number of unexpected stimuli, and had lower rigidity scores. Thus, we managed to solidify the theory, according to which mindfulness is often described as a specific kind of quality of attention by finding that trait mindfulness

relates to attention (Verhaeghen, 2021; Zeidan et al., 2010). Third, and one of the most important contributions from Study 3, trait mindfulness moderated the relationship between state mindfulness and reaction time for low complexity tasks, detection of unexpected stimuli, and rigidity scores. To our knowledge, only two studies (Geisler et al., 2017; Watier & Dubois, 2016) have explored the interaction effects between trait and state mindfulness in a performance situation and found that trait mindfulness can moderate the efficacy of the mindfulness exercise but only for participants with low levels of trait mindfulness. In our research, the results suggested that after the brief mindfulness exercise, participants with low levels of trait mindfulness showed better performance than participants with high trait mindfulness. This suggests that maybe one session of mindfulness may not be sufficient for participants who already have high levels of trait mindfulness. Of particular relevance, here is the fact that trait mindfulness influences the success of the exercise. Therefore, it is mandatory to take into account this variable in the case of applying a mindfulness exercise and consider that it can be especially beneficial for individuals with low trait mindfulness.

Another relevant contribution is made regarding the moderator role of task complexity. We studied this variable in both Study 2 and Study 3. More specifically, we only managed to get support for the moderator role of task complexity in reaction time (Study 3). Thus, in the most complex tasks, state mindfulness is negatively associated with reaction time. This means that individuals with high levels of state mindfulness have faster reaction time in complex tasks. In connection to this, we must outline that we found that in simple tasks trait mindfulness moderates the relationship between state mindfulness and reaction time. Hence, only for individuals with low levels of trait mindfulness, the reaction time decreases when state mindfulness is provoked. We, therefore, show that the benefits of mindfulness could depend on task complexity (Zhang et al., 2013). As we can observe, this contribution is extremely important in sustaining the modulating role of task complexity in the relationship between mindfulness and objective indicators of performance.

Moreover, the present research (Study 2 and Study 3) also measured a variable that had hardly been studied before (the detection of unexpected stimuli) and by doing so, we got support

for the positive relationship between trait mindfulness and the detection of unexpected stimuli. This means that mindful individuals are more likely to be more aware of their co-workers' failures and the potential risks in the system because being mindful can prevent an automatic reaction (Bishop et al., 2004). Apart from Zhang and Wu (2014) and Zhang et al. (2013), who suggested that trait mindfulness could enhance safety behaviour, only our study managed to obtain a similar result, in this case for the detection of unexpected stimuli. Nevertheless, our result is even more significant since it was measured objectively.

We also consider as relevant contribution the nature of the tasks applied. We applied different cognitive tasks that measured through a software (E-prime 2) the participants' ability to focus, sustain, direct their attention and detect unexpected stimuli (Stroop task, SART). Nevertheless, we also applied paper and pencil tasks (water jar task) that measured the participants' notion of missing obvious adaptive solutions. Accordingly, we assured to have the cognitive set of functions that is enhanced by mindfulness and mindfulness exercise (Malinowski, 2013). Furthermore, based on the results from Study 2 (Stroop task), we considered including in Study 3 different tasks with and without time limits because tasks with an imposed time limit can lead to a high level of attention, and this translates into a good performance. Therefore, individual differences and personality traits are not as important when situational clues are very strong (Mischel, 1973).

Overall, the present research has provided promising results that invite us to continue with this line of research, especially since 2 of our 3 studies have had an experimental approach. To be more specific, we consider that all the exposed contributions are even more significant taking into consideration the fact that we managed to conduct 2 of our 3 studies in a laboratory setting and employed a software to recode the objective indicators of performance in different tasks.

7.5. Practical implications

Aside from the different theoretical implications, the results from this work have also different practical implications for employees and organizations. The three studies within this thesis

outline the relevance of individual mindfulness not only as a personal benefit in daily life but also as an important benefit in the workplace.

First, our results indicated that individuals with high trait mindfulness are better at detecting unexpected events than individuals with low trait mindfulness. In organizations where safety is critical, such as in high-risk organizations (e.g., hospitals, nuclear plants, air traffic management, etc.) it is mandatory to be aware and alert of possible unexpected stimuli or situations in order to react quickly and properly (Weick and Sutcliffe, 2007). Our findings suggest that mindful people are more likely to have a higher level of safety performance meaning they are more prone to avoid cognitive failures or errors which are common causes of accidents because they are more aware of the external environment and internal processes (Herndon, 2008). Therefore, at least in this type of industry, it would be highly recommended to select individuals with high trait mindfulness. In other words, managers and HR experts should include the evaluation of candidates' trait mindfulness in their selection processes.

Second, we demonstrated that a brief 8-min. mindfulness exercise proved to be effective in improving the performance in some indicators of our selected tasks for subjects low in trait mindfulness. Thus, even if mindfulness training for the workplace has been adapted with weekly shorter classes, lasting from 1 to 2 hours (Hyland et al., 2015), it still can be impractical. A better option is offered through shorter brief mindfulness exercises, such as the one implemented in Study 3 of this doctoral thesis, which can enhance attention skills in a short timeframe.

Third, by getting support for the interaction effects between state and trait mindfulness in a performance situation, we outline the necessity of measuring trait mindfulness in the case of a brief mindfulness exercise. Based on the difference between subjects with high and low trait mindfulness in the application of a brief mindfulness exercise, we provide the combination of when this kind of mindfulness exercise must be applied in order to assure its success in the workplace setting. Results of this doctoral thesis indicate that the individuals who already had high levels of trait mindfulness did not benefit as much as the individuals with low levels of trait mindfulness did.

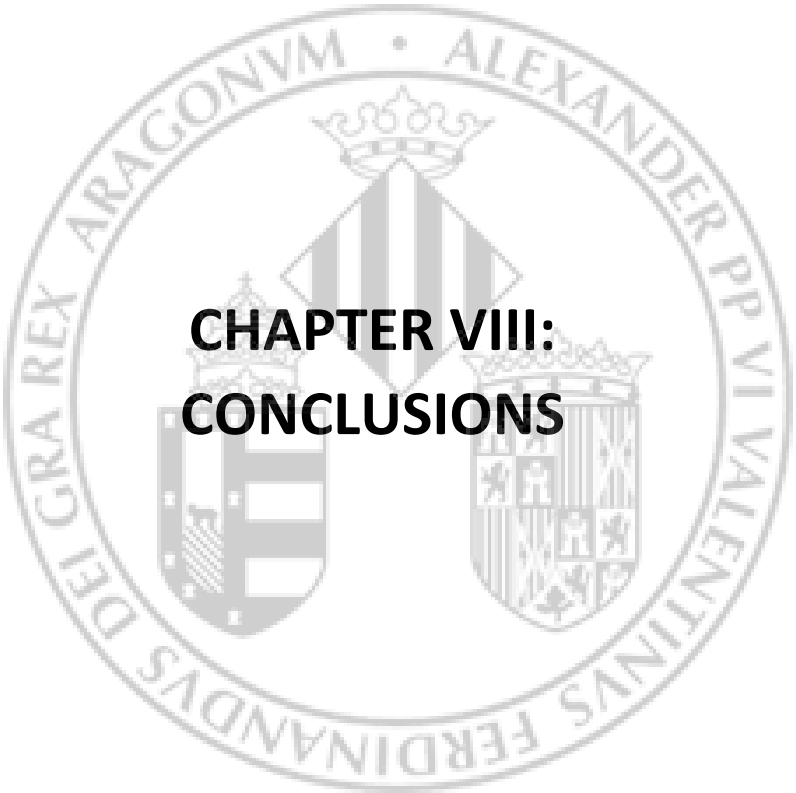
Hence, in the moment of implementing a mindfulness exercise or a mindfulness intervention, it is also necessary to integrate trait mindfulness.

7.6. Limitations

Although the present research has an original approach and contributes to the literature regarding the concept of individual mindfulness, it has several limitations. We must remark that in the following lines, we indicate the common limitations of our studies, while the specific limitations of each study are described in detail in the corresponding chapter.

First, in our two experimental studies, we only included undergraduate students. With this being said it is important to check whether the aforementioned relationships (trait mindfulness with detection of unexpected stimuli and state mindfulness with objective performance) and the moderator role of trait mindfulness are also found in other samples of professional work groups (e.g., pilots, waiters, doctors, etc.).

Second, it is important to acknowledge the limitations of the existing mindfulness scales that can extend to our findings. As we already have mentioned in Chapter I of this thesis, the complexity of the concept of mindfulness translates into the difficulty of comprehending the construct in the current self-report measures. Thus, each scale has advantages and disadvantages causing debate regarding which aspects of mindfulness must be included in a scale (Bergomi et al., 2013a). Hence, to measure trait mindfulness we applied MAAS in Study 2 and MAAS and CAMS-R in Study 3, and in this third study, we also measured state mindfulness with SMS. Future studies should consider applying other measures, such as measures of neurobiological changes in an effort to provide an even more accurate perspective on individual mindfulness.



CHAPTER VIII: CONCLUSIONS

8. Conclusions

In general, the following main contributions can be drawn from the three articles comprised in this thesis:

1. The research on individual mindfulness in the workplace focused primarily on studying the effects of mindfulness on psychological well-being and health, but the effects of mindfulness on performance have been much less studied (Dane, 2011). Particularly relevant is the lack of investigation concerning the relationship between individual mindfulness and objective indicators of performance (Study 1). In this doctoral thesis, we tried to contribute to this research gap with two experimental studies. Particularly, we contributed to previous research by exploring the relations between trait and state mindfulness and several indicators of objective performance (accuracy, errors of commission, errors of omission, reaction time, variability in reaction time, detection of unexpected stimuli, and rigidity scores), the moderator role of task complexity, and the potential interactions between trait and state mindfulness.
2. Two out of three studies of the current thesis had an experimental approach and used a modern software (E-prime 2) to register the results. They were conducted in a laboratory context and allowed us to measure objectively the relationship between the variables of interest.
3. Trait mindfulness had a positive impact on the detection of unexpected stimuli. We suggest that, at least in industries where safety is critical, the evaluation of candidates' trait mindfulness should be included in the personnel recruitment and selection process (Studies 2 and 3).
4. State mindfulness was not related to accuracy (errors of commission, errors of omission), variability in reaction time, detection of unexpected stimuli, and rigidity scores (Study 3). However, this result suggests the need to consider possible moderating variables, such as task complexity and the interaction between state mindfulness and trait mindfulness.

5. An 8-min mindfulness exercise was effective to induce state mindfulness and increase objective performance, particularly in individuals with low levels of trait mindfulness (Study 3).
6. Trait mindfulness moderated the relationship between state mindfulness and reaction time for low complexity tasks, detection of unexpected stimuli, and rigidity scores. Although the induction of state mindfulness through the 8-min mindfulness exercise was beneficial for individuals low in trait mindfulness, its impact was more complex in the case of individuals high in trait mindfulness. Thus, the practical implication of this result is that not everyone seems to benefit from a brief mindfulness exercise, this meaning that organizations should consider measuring trait mindfulness before implementing such an intervention (Study 3).
7. The moderating role of task complexity. More specifically, task complexity did not moderate the relationship between trait mindfulness and accuracy (Study 2), but it did moderate the negative relationship between state mindfulness and reaction time, but only for the most complex task (task 4, Study 3). In this case is relevant to acknowledge that in less complex tasks, state mindfulness alone is not able to explain differences in reaction times.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RESUMEN

Este apartado contiene el resumen de la presente tesis doctoral. Comienza ofreciendo una visión general sobre la relevancia de este trabajo, para después dar seguimiento a los objetivos de la presente tesis, la metodología aplicada y los principales resultados obtenidos. Finaliza con las conclusiones derivadas en base a los resultados de los estudios realizados, y se comentan brevemente las implicaciones y las limitaciones de la presente tesis doctoral.

VISIÓN GENERAL

En las últimas décadas, ha aumentado el interés por el concepto de mindfulness. Poco a poco, los académicos organizacionales, los profesionales, los empleados y los psicólogos han empezado a mostrar interés por el estudio y la comprensión del mindfulness (Hyland et al., 2015).

¿Pero que es el mindfulness? La definición más conocida de mindfulness es proporcionada por Kabat-Zinn (1994, p. 4): "*prestar atención de una manera particular: a propósito, en el momento presente y sin juzgar*". Sin embargo, Dane (2011) hizo uno de los primeros intentos de clarificar el concepto de mindfulness partiendo de once definiciones de mindfulness. En ese mismo artículo, Dane (2011, p. 1000) concluía que el mindfulness es " *un estado de consciencia en el que la atención se focaliza sobre fenómenos externos e internos del presente*".

El interés por el mindfulness se debe a que parece tener un impacto positivo en el funcionamiento del ser humano (Brown et al., 2007). Así, diferentes estudios sugieren que el mindfulness es una herramienta para tratar diferentes trastornos psicológicos y físicos (Baer, 2003; Chiesa y Malinowski, 2011). Concretamente, el mindfulness parece afectar positivamente a la atención, la cognición, la emoción y el comportamiento (Good et al., 2016).

En esta dirección, un creciente número de trabajos también sugieren que estos efectos positivos mencionados pueden extenderse al entorno organizacional (Hyland et al., 2015; Reb & Choi, 2014; Sutcliffe et al., 2016). Somos conscientes de que los lugares de trabajo actuales son cada vez más exigentes, con largas jornadas laborales y un entorno competitivo que lleva a los empleados a niveles de estrés cada vez mayores. Por otra parte, también observamos la "*plugged-in-nature*" de la sociedad (la conexión constante con la tecnología), donde se promueve la disponibilidad constante como

característica del lugar de trabajo (Reb y Choi, 2014). Por lo tanto, todas estas características actuales del trabajo moderno parecen hacer que el mindfulness sea una herramienta atractiva para las organizaciones.

Además, la accesibilidad del mindfulness en el ámbito organizativo se ha visto facilitada por varias razones. En primer lugar, la popularidad del Método de Reducción del Estrés basado en Mindfulness (MBSR), desarrollado por Kabat-Zinn. A partir del éxito de esta intervención inicial, se han desarrollado diferentes programas basados en mindfulness que han demostrado su eficacia, como la Terapia Cognitiva Basada en Mindfulness (MBCT; Segal et al., 2002), la Terapia Dialéctica Conductual (Linehan, 1993) y la Terapia de Aceptación y Compromiso (Hayes, 2012). Las intervenciones de mindfulness parecen reducir el estrés (Donald et al., 2016; Sweeny y Howell, 2017), aumentar el compromiso laboral (Leroy et al., 2013), la satisfacción laboral (Hülsheger et al., 2013), la resiliencia (Jha et al., 2010), la inteligencia emocional (Chu, 2010) y la calidad de las relaciones con los demás (Baer, 2003). En segundo lugar, el mindfulness ofrece una perspectiva diferente del concepto de atención (Vogus y Sutcliffe, 2012). Las medidas de mindfulness rasgo se centran en la capacidad de mantener la atención, mientras que las prácticas que se enseñan en los programas/intervenciones basados en mindfulness se centran en el proceso atencional, como las prácticas de consciencia (Prakash et al., 2020). En tercer lugar, el mindfulness se utiliza para abordar los retos del lugar de trabajo. Empresas de todo el mundo incorporan aspectos de mindfulness a su cultura para promover el bienestar y la eficacia, especialmente en entornos profesionales de gran estrés (Davidson et al., 2003).

Sin embargo, son escasos los estudios que se han centrado en analizar la relación entre mindfulness y el rendimiento individual (Dane, 2011). Esto puede explicarse por el hecho de que la mayoría de las investigaciones se centran en los beneficios de mindfulness relacionados con la salud. Watier y Dubois (2016) resaltan que hay al menos 26 revisiones sistemáticas que se centran en analizar el efecto de mindfulness sobre el bienestar, mientras que solamente hay un meta-análisis que se centra en analizar el impacto del mindfulness en el funcionamiento cognitivo (Chiesa y Malinowski,

2011). Además, cuando observamos los resultados de la relación entre el mindfulness individual y el rendimiento, vemos que el mindfulness tiene efectos positivos sobre el desempeño laboral (Dane, 2011), desempeño creativo (Zheng & Liu, 2017), desempeño de tarea (Reb et al., 2017) y desempeño deportivo (Röthlin et al., 2016). Sin embargo, todos estos resultados miden las percepciones de los individuos en cuanto a la relación entre mindfulness individual y rendimiento y no nos permiten confirmar objetivamente estos hallazgos. A esto se añade la dificultad de conceptualizar el mindfulness, que deriva en problemas relativos a cómo evaluar este constructo. Aunque existe la idea clásica de que mindfulness implica "*atención receptiva y consiente de los acontecimientos presentes*" (Brown et al., 2007, p. 212), existe una considerable ambigüedad en cuanto a los elementos de mindfulness que deben incluirse en las escalas. Quickel et al. (2014) sugieren que tal vez las escalas actuales captan los efectos de la intervención en lugar de la naturaleza budista del mindfulness. Además, cuando observamos los resultados relativos a la relación entre mindfulness y el rendimiento objetivo, vemos que estos no son consistentes. Mientras que algunos estudios ofrecen evidencia empírica que apoya la relación entre el mindfulness individual y el rendimiento objetivo (Larson et al., 2013; Lin et al., 2018; Polak, 2009), otras investigaciones no confirman estas mismas relaciones (Calma-Birling y Gurung, 2017; Keith et al., 2017; Quickel et al., 2014).

Teniendo en cuenta todos estos aspectos, el objetivo general de esta tesis doctoral es contribuir a una mayor comprensión de la relación entre el mindfulness individual y el rendimiento objetivo. El enfoque adoptado se basa en dos aspectos principales. Primero, la distinción entre mindfulness rasgo y mindfulness estado, y segundo, el uso de indicadores objetivos para ampliar la investigación de los efectos del mindfulness individual sobre el rendimiento. En última instancia se pretende contribuir al conocimiento del concepto de mindfulness individual, más concretamente, queremos explorar si el mindfulness rasgo está asociado al rendimiento objetivo, analizando el papel moderador de la dificultad de la tarea; y también queremos evaluar ver si el mindfulness estado está asociado al rendimiento objetivo, analizando el papel moderador tanto del mindfulness rasgo como de la dificultad de la tarea.

OBJETIVOS

El objetivo general de esta tesis es contribuir a una mayor compresión de la relación entre el mindfulness individual y el rendimiento objetivo. Este objetivo general se desglosa en tres objetivos específicos que se corresponden con los tres estudios de este trabajo:

Objetivo 1 (Estudio 1): A través de una revisión se pretende sintetizar e integrar la información de los principales resultados de la literatura sobre antecedentes y consecuentes del mindfulness para poder identificar y abordar algunas de las lagunas identificadas en la literatura. Se pretende dar respuesta a la siguiente pregunta de investigación: **¿Cuáles son las principales lagunas en la literatura sobre el concepto de mindfulness individual**?

Objetivo 2 (Estudio 2): A través de un diseño experimental se pretende estudiar la relación entre mindfulness rasgo y el rendimiento objetivo individual, teniendo en cuenta el papel modulador de la complejidad de la tarea. El estudio se ha realizado en un laboratorio de la universidad y se ha empleado un software (E-prime 2.0) para medir cuatro indicadores objetivos de rendimiento: precisión, tiempo de reacción, variabilidad en los tiempos de reacción y detección de estímulos inesperados de la tarea Stroop (Stroop, 1935). Las preguntas de investigación que se plantean son las siguientes: 1) **¿Influye el mindfulness rasgo en el rendimiento objetivo?** y **2) ¿La complejidad de la tarea modula la relación entre el mindfulness rasgo y el rendimiento objetivo?**

Objetivo 3 (Estudio 3): A través de un diseño experimental se pretende investigar la relación entre mindfulness estado y el rendimiento objetivo, teniendo en cuenta el papel modulador de mindfulness rasgo y el papel modulador de la complejidad de la tarea. En este trabajo se midieron cinco indicadores objetivos de rendimiento (precisión, tiempo de reacción, variabilidad en los tiempos de reacción, detección de estímulos inesperados y puntuaciones de rigidez cognitiva) en tres tareas distintas: Stroop (Stroop, 1935), tarea de atención sostenida en la respuesta (SART, Mrazek et al., 2012) y la tarea de la jarra de agua (Luchins, 1942). Las preguntas de investigación que se plantean son las siguientes: **1) ¿Influye el mindfulness estado provocado por un breve ejercicio de mindfulness en el rendimiento objetivo?; 2) ¿El mindfulness rasgo modula la relación entre el mindfulness estado y el**

rendimiento objetivo? y **3) ¿La complejidad de la tarea modula la relación entre el mindfulness estado y el rendimiento objetivo?**

METODOLOGIA

En este apartado nos centraremos en el Estudio 2 y el Estudio 3, ya que ambos estudios tenían un diseño experimental, mientras que el Estudio 1 era una revisión. Además del procedimiento de recogida de datos, explicaremos las tareas aplicadas y en el caso del Estudio 3 explicaremos también las condiciones experimentales para una mejor comprensión de los aspectos metodológicos que se indicarán en los siguientes subapartados.

Participantes del Estudio 2 (Capítulos III y V)

Los participantes en el Estudio 2 (*N*= 139) eran estudiantes universitarios matriculados en cursos de Psicología y Relaciones Laborales y Recursos Humanos (59,7% de Psicología y 40,3% de Relaciones Laborales y Recursos Humanos). Esta muestra presentaba una marcada diferencia en la distribución por género (21% de hombres y 79% de mujeres) que puede explicarse por las dos especialidades en las que estaban matriculados los estudiantes (especialidades en la que el porcentaje de mujeres es mayoritario). Las edades de los participantes en esta muestra oscilaban entre los 17 y los 49 años (*M*= 20.9, *DT*= 4.25).

Participantes del Estudio 3 (Capítulos III y VI)

Los participantes de este estudio (*N*= 217) son estudiantes matriculados en Psicología (62,7%), Relaciones Laborales y Recursos Humanos (30,4%) y Trabajo Social (6,9%) y fueron asignados aleatoriamente a un grupo de mindfulness (n= 109) o a un grupo control (n= 108). La edad de los participantes de la muestra oscilaba entre los 18 y los 56 años (M= 21,6, SD= 4,12) y la distribución por género fue de un 20% de hombres y un 80% de mujeres. Este desequilibrio en la distribución por género puede explicarse por las especialidades en las que están matriculados los alumnos de la muestra.

Procedimiento de recogida de datos

Es importante mencionar que tanto el Estudio 2 como el Estudio 3 fueron aprobados por el Comité de Ética de la Universitat de València y ambos estudios se desarrollaron de acuerdo con las directrices de la Declaración de Helsinki. Las muestras de los Estudios 2 y 3 estuvieron compuestas por individuos diferentes. El proceso de recolección de datos se realizó entre octubre y diciembre de 2018 para el Estudio 2, y entre noviembre de 2020 y febrero de 2021 para el Estudio 3. En el caso del Estudio 3 se tiene que mencionar que debido a la situación de la pandemia de la Covid-19, se tuvo que modificar las fechas planeadas inicialmente y posponer la recogida de datos; posteriormente, cuando la recogida de datos ya fue posible, se tuvo que seguir los protocolos de COVID-19. Es decir, todos los participantes recibieron la intervención correspondiente (según estuvieran en el grupo experimental o control) de forma individual, y cumplimentaron los cuestionarios en sesiones individuales. En ambos estudios, para anticiparnos a cualquier posible fallo, realizamos un estudio piloto previo al Estudio 2 (*n*= 4) y previo al Estudio 3 (*n*= 8).

En ambos estudios la participación fue voluntaria y se contactó con los participantes por correo electrónico para organizar la sesión. En concreto, asistieron a una sesión en grupos de dos para el Estudio 2 e individualmente para el Estudio 3. Antes de cumplimentar los cuestionarios y realizar las tareas, ofrecimos instrucciones estándar para evitar sesgos. En el Estudio 2, la sesión duraba unos 60 minutos y se dividió en dos partes: 1) la administración del cuestionario en formato de lápiz y papel, y 2) la administración de la tarea con ordenador (tarea de Stroop; Stroop, 1935). La sesión en el Estudio 3 fue de unos 90 minutos, estando dividida en tres partes: 1) administración de los cuestionarios de lápiz y papel, 2) aplicación de las condiciones experimentales, y 3) realización de las tareas (dos de las tareas fueron administradas por ordenador (Stroop y SART) y una tercera fue en papel (tarea de la jarra de agua)).

Condiciones experimentales (Estudio 3)

En el Estudio 3 los participantes fueron asignados aleatoriamente a una condición de mindfulness o a una condición de control. En la condición de control tuvieron que esperar 8 minutos,

mientras que en la condición experimental tuvieron que escuchar una cinta de meditación guiada con una duración de 8 minutos (mindfulness). La meditación guiada (véase el Anexo 1) se basaba en las instrucciones clásicas de mindfulness utilizadas en la MBSR para principiantes. Esta meditación guiada se presentó a través de los altavoces del ordenador y fue grabada por un instructor profesional de meditación de mindfulness. Además, mientras los participantes escuchaban la meditación, los experimentadores se encontraban en otra sala. Una instrucción típica era "*Lleva ahora la atención de tu mente al movimiento rítmico de tu abdomen al introducir y sacar el aire. Concéntrate solo en esa zona, observa el movimiento, el vaivén de tu abdomen, cada vez que inhalas y exhalas*".

Las tareas (Estudios 2 y 3)

En las siguientes líneas, comentaremos brevemente las tareas aplicadas en el Estudio 2 y el Estudio 3.

La tarea de Stroop

Tanto en el Estudio 2 como en el Estudio 3 se aplicó una tarea Stroop adaptada (Stroop, 1935) con 4 niveles de dificultad (Tareas 1, 2, 3 y 4, con nivel de dificultad creciente). Esta tarea permite medir el retraso en el tiempo de reacción entre estímulos congruentes e incongruentes. En el Estudio 2 había límite de tiempo para realizar cada ensayo de la tarea (concretamente, el estímulo aparecía durante 4 segundos), mientras que en el Estudio 3 se eliminó el límite de tiempo. Creamos tres series de 16 estímulos para la primera y la segunda tarea (Tareas 1 y 2) combinando 4 colores (azul, verde, rojo y amarillo) con la instrucción de texto, respectivamente, para cada color (16 estímulos con 4 estímulos congruentes-el nombre y el color de la palabra coincidían) y 12 estímulos incongruentes (el nombre y el color de la palabra no coincidían). Así, en la primera tarea, se tenía que indicar el color que coincidía con el texto de la palabra y en la segunda tarea, el color que coincidía con el color de la palabra. El total de estímulos fue de 48 (uno por pantalla) y su orden de aparición fue aleatorio. En la primera y la segunda tarea, los participantes tenían la posibilidad de hacer una sesión de practica (4 estímulos). Todas las instrucciones correspondientes aparecían en la pantalla al principio de cada tarea y los participantes tenían que responder pulsando 1 (verde), 2 (rojo), 3 (amarillo) y 4 (azul). Estos

números siempre permanecían en la pantalla en las casillas con los colores correspondientes (véase la Figura III. 2 del Capítulo III).

Además, la cuarta y la tercera tarea (Tareas 3 y 4) tenían las mismas instrucciones. La única diferencia entre la tarea 4 y la 3 era la presencia de distractores y el procedimiento de aleatorización. Las instrucciones eran indicar el color que correspondía al texto de la palabra o el color que correspondía al color de la palabra, según la instrucción que recibían en cada ensayo. En cuanto a los distractores, se introdujeron imágenes de animales (véase la Figura III. 3 en el Capítulo III) en tinta negra y sin color que se colocaron en el centro de 4 pantallas (en las pantallas correspondientes a los ensayos o estímulos 3º, 11º, 19º y 27º). Cada distractor aparecía dos veces alternativamente y desaparecía en 2 segundos. El total de estímulos fue de 32 (uno por pantalla) y se obtuvo combinando las 4 palabras con los 4 colores y las 2 instrucciones del texto o del color (4x4x2). Una vez más, se aplicó un procedimiento de aleatorización, con un total de 8 estímulos congruentes y 24 incongruentes.

Tarea de atención sostenida en la respuesta (SART)

Esta tarea es una tarea GO/NOGO aplicada con el ordenador que pide a los participantes que no pulsen la barra espaciadora en respuesta a estímulos infrecuentes (ensayos NoGo; el número 3) y que pulsen lo más rápidamente posible para los estímulos frecuentes (ensayos Go; todos los números excepto el número "*3*"). Los estímulos se presentaron en la pantalla durante 250 milisegundos, con un interestímulo "*#*" entre estímulos de 900 ms. Esta tarea indica que cuantos más errores de omisión se producen más elevado ha sido el nivel de distracción (Mrazek et al., 2012).

La tarea de la jarra de agua

La tarea de la jarra de agua (Luchins, 1942), mide el efecto Einstellung, un término utilizado para describir patrones de pensamiento rígidos que pueden afectar a la resolución de problemas nuevos (Greenberg et al., 2010). Esta tarea siguió los mismos problemas utilizados en el estudio de Greenberg et al. (2010), a quienes se pidió permiso. Los primeros problemas eran ensayos de conjunto, que se pueden resolver mediante la fórmula B-A-2C (donde A, B y C corresponden a las cantidades representadas por las jarras que aparecen en el problema; ver Tabla III. 1 del Capítulo III). Una vez que

se resolvían correctamente 6 de un máximo de 10 ensayos establecidos, se presentaban a los participantes 4 ensayos críticos, resolubles tanto con la fórmula compleja B-A-2C como con una fórmula más sencilla: A+C o A-C. Los dos últimos problemas eran dos ensayos de extinción, solucionables sólo con la fórmula simple, tal como aparece recogido en la Tabla III. 1 del Capítulo III.

Variables

Mindfulness rasgo

Esta variable se midió con 2 escalas diferentes. En concreto, en el Estudio 2 y en el Estudio 3 se aplicó la Escala de Consciencia de Atención Plena (Mindfulness Attention Awareness Scale, MAAS; Brown y Ryan, 2003). La MAAS es una escala compuesta por 15 ítems adaptada al castellano por Soler et al. (2012). Los ítems se responden en una escala de respuesta que oscila entre 1 (casi nunca) y 6 (casi siempre). Un ejemplo de ítem es: "*Encuentro difícil estar centrado en lo que está pasando en el presente*". Esta escala tuvo un valor alfa de Cronbach de .85 en el Estudio 2 y de .83 en el Estudio 3. El valor obtenido para el coeficiente omega de McDonald en el Estudio 2 y el Estudio 3 fue de .86.

La segunda escala, Escala revisada de Consciencia Cognitiva y Afectiva (Cognitive and Affective Mindfulness Scale-Revised, CAMS-R, Feldman et al., 2007) se aplicó sólo en el Estudio 3. Esta escala de 12 ítems fue traducida para realizar esta investigación, siguiendo el procedimiento de doble traducción y reconciliación (ITC, 2018). La escala mide la atención, la concentración en el presente, la conciencia y la aceptación/sin juicio de los pensamientos y sentimientos, que se resumen en una única puntuación total. Un ejemplo de ítem: "*Puedo tolerar el dolor emocional*". La escala de respuesta oscila entre 1 (casi nunca) y 6 (casi siempre). Esta escala tuvo un valor alfa de Cronbach de .79 y un valor del coeficiente omega de McDonald de .88.

Mindfulness estado

El mindfulness estado se midió con la versión española adaptada de 21 ítems (Ullrich-French et al., 2017) de la Escala de Mindfulness Estado (State Mindfulness Scale, SMS; Tanay y Bernstein, 2013). Una vez que recibimos el permiso, utilizamos el cuestionario de Ullrich-French et al. (2017) como base para nuestra traducción siguiendo el procedimiento de doble traducción y reconciliación

(ITC, 2018). La escala tiene 15 ítems que miden mindfulness estado mental (SMS Mente) y 6 ítems que miden mindfulness estado corporal (SMS Cuerpo). Los ítems se responden en una escala de 1 (nada) a 5 (muy bien) justo después de un ejercicio de inducción a la atención plena (mindfulness). Un ejemplo de ítem para el SMS Mente es, "*Sentía que estaba experimentando el momento presente plenamente*" y para el SMS Cuerpo "*Me daba cuenta de cómo las sensaciones físicas iban y venían*". El valor del alfa de Cronbach es de .91 para el SMS Mente y de .82 para el SMS Cuerpo. El valor del coeficiente omega de McDonald fue .93 para el SMS Mente y .86 para el SMS Cuerpo.

Rendimiento objetivo

Todos los indicadores de rendimiento se miden en el software E-prime 2.0 en ambos estudios (Estudio 2 y Estudio 3), excepto las puntuaciones de rigidez que se obtuvieron para la tarea de la jarra de agua que fue administrada con lápiz y papel en el Estudio 3. A continuación, se describen los indicadores objetivos de rendimiento que se han medido:

- Precisión (Acc) = número de aciertos
- Errores de comisión (Ec)= número de respuestas erróneas
- Errores de omisión (Eo)= número de respuestas que no se registran en el tiempo determinado
- Tiempo de reacción (RT)= el valor medio del tiempo de reacción en milisegundos para todos los estímulos incluidos en la tarea
- Variabilidad del tiempo de reacción (RTSD) es la desviación estándar de los valores del tiempo de reacción (RT)
- La detección de estímulos inesperados contiene cinco preguntas: 1) "¿Has visto algún estimulo inesperado en la pantalla mientras realizabas la tarea"? (respuesta: sí/no); 2) "¿Puedes recordar qué era?" (respuesta: una planta/un animal/un transporte/un utensilio doméstico/no lo distinguí/no vi nada); 3) "¿Has visto lo que era?" (respuesta: ballena/rinoceronte/elefante/hipopótamo/no lo distinguí/no vi nada); 4) "¿Has visto lo que era?" (respuesta: perro/mono/gato/koala/no lo distinguí/no vi nada); 5) "¿En

qué parte de la pantalla ha aparecido?" (respuesta: abajo a la derecha/ arriba a la izquierda/ en el centro/ abajo a la izquierda/ arriba a la derecha/ no me acuerdo/ no lo distinguí/ no vi nada). La puntuación se calculó como la suma de respuestas correctas obtenidas en los 5 ítems, por lo tanto, esta variable presenta valores entre 0 y 5. Las únicas diferencias entre el Estudio 2 y el Estudio 3, fue que en el Estudio 3 los participantes no tenían respuestas de opción múltiple.

- Las puntuaciones de rigidez se calcularon sólo para la tarea de la jarra de agua siguiendo las instrucciones del estudio de Greenberg et al. (2010). Así, por cada problema crítico/extinción resuelta con la fórmula descubierta (B-A-2C) en lugar de con la otra alternativa más simple (A+C o A-C), se dio un punto de rigidez. Los errores de cálculo, fracciones u otras soluciones alternativas no fueron considerados respuestas correctas.

Complejidad de la tarea

Esta variable se midió sólo para la tarea Stroop (Stroop, 1935). Las cuatro tareas se presentaron de menor a mayor nivel de complejidad, de acuerdo con las diferencias en las demandas de procesamiento cognitivo (Robinson, 2001).

Dificultad de la tarea

Los participantes debían indicar en una escala (0= muy fácil a 9= muy difícil), la dificultad de la tarea que acababan de realizar.

Variables control

Además de las variables principales, también incluimos una serie de variables de control. Así, en el Estudio 2 se incluyeron como variables control: la edad, el género, la especialización, la familiaridad con las tareas, el tesón, el neuroticismo y la inteligencia. En el Estudio 3, además de las variables de control mencionadas, se añadió la frecuencia de meditación.

El género se codificó como variable dummy (1= hombre, 2= mujer) tanto en el Estudio 2 como en el Estudio 3. La especialización también fue codificada como variable dummy tanto en el Estudio 2

como en el Estudios 3, aunque utilizando diferente número de variables dummy, en función del número de especialidades o grados que cursaban los estudiantes de la muestra. Concretamente, en el Estudio 2 se utilizó una única variable dummy (1= psicología, 2= relaciones laborales y recursos humanos), mientras que en el Estudio 3 fueron necesarias dos variables dummy (Dummy 1_Especialización se codificó como: 1= participantes que estaban en la especialización de Relaciones Laborales y Recursos Humanos, 0= otros; Dummy 2_Especialización se codificó como: 1= participantes que estaban en la especialización de Trabajo Social, 0= otros, sirviendo de comparación los individuos en la especialización de Psicología).

Familiaridad con la tarea

Se trata de una escala de 3 ítems que presentan valores entre 1 (totalmente en desacuerdo) y 6 (totalmente de acuerdo). Los ítems son: "*He oído hablar de este tipo de tarea en alguna de mis asignaturas, a lo largo de la carrera*"; "*He realizado este tipo de tarea con anterioridad*"; y "*Estoy familiarizado con el tipo de tarea que acabo de realizar*". La escala tuvo un valor alfa de Cronbach de .71 (familiaridad con la tarea Stroop) en el Estudio 2, y en el Estudio 3 los valores fueron de .83 (familiaridad con la tarea Stroop) y .89 (familiaridad con la tarea jarra de agua).

Personalidad: Tesón y Neuroticismo

Para medir estas variables se aplicó la versión española (Cordero et al. 2008) del Inventario de Personalidad de Cinco Factores Reducidos (NEO-FFI, Costa & McCrae, 1992). Los 12 ítems de cada dimensión se respondían en una escala que presentaba valores entre 1 (muy en desacuerdo) y 5 (muy de acuerdo). Un ejemplo de ítem para la dimensión de tesón es " *Trabajo mucho para conseguir mis metas*" y para la dimensión de neuroticismo "*A menudo me siento tenso e inquieto*". Además, hay que indicar que teniendo en cuenta los resultados de los análisis factoriales confirmatorios (AFCs) realizados (véanse Capítulos V y VI, sección Resultados) se aplicó una versión reducida de la subescala de neuroticismo (11 ítems) tanto en el Estudio 2 como en el Estudio 3. El valor alfa de Cronbach para la subescala de tesón en el Estudio 2 fue de .84 y en el Estudio 3 de .81. El valor alfa de Cronbach para la subescala de neuroticismo en el Estudio 2 fue de .84 y en el Estudio 3 de .87. El coeficiente omega

de McDonald para la subescala de tesón en el Estudio 2 fue de .87 y en el Estudio 3 el valor fue de .86. En cuanto a la subescala de neuroticismo, el coeficiente omega de McDonald fue de .86 en el Estudio 2 y de .89 en el Estudio 3.

Inteligencia

Para medir la inteligencia se aplicó la versión española (Cruz et al. 1988) del Test de Dominó D-70 (Kowrousky y Rennes, 1988). El D-70 se considera un test de inteligencia general. Consiste en material no verbal, representado por fichas de dominó. La prueba consta de 44 ítems, precedidos de 4 ejemplos (véase la Figura III. 4. En el Capítulo III, para uno de estos 4 ejemplos). En 25 minutos, los participantes deben encontrar la solución a la continuación de una serie en las fichas de dominó, según una secuencia que deben descubrir.

ANÁLISIS DE DATOS

Análisis preliminares

Análisis factorial confirmatorio

Se validó la estructura factorial de los cuestionarios aplicados en el Estudio 2 y el Estudio 3 aplicando modelos de AFC mediante el programa Mplus (Muthén & Muthén, 1998-2010). El criterio para evaluar los AFCs fue el mismo para todos los modelos. Concretamente, el ajuste de los modelos de AFC se evaluó mediante los siguientes índices de ajuste: el índice de Chi-cuadrado ($\chi 2$), la Raíz del Error Cuadrático Medio de Aproximación (RMSEA); el Índice Tucker-Lewis (TLI); el índice de Ajuste Comparativo (CFI) y la Raíz Cuadrada Media Residual Ponderada (WRMR). Según Hu y Bentler (1999), un modelo demuestra un ajuste satisfactorio, si los valores χ^2 son más cercanos a cero, RMSEA <0.08 (más cercano a cero), CFI ≥ 0.0, TLI ≥ 0.95 y WRMR <1.0.

En el Estudio 2, se puso a prueba un modelo AFC de un factor para la escala de mindfulness rasgo (MAAS), y un modelo AFC de dos factores para las dos dimensiones de personalidad (tesón y neuroticismo).

En el Estudio 3, se pusieron a prueba diferentes modelos de AFC: 1) modelo de un factor para el mindfulness rasgo medido con el MAAS; 2) modelo de un factor latente de segundo orden

(mindfulness), y cuatro factores latentes de primer orden (atención, concentración en el presente, consciencia y aceptación) para el mindfulness rasgo medido con el CAMS-R, 3) un modelo de dos factores para la escala de mindfulness estado (F1 SMS Mente y F2 SMS Cuerpo), y 4) un modelo de dos factores para las dos subescalas de personalidad (tesón y neuroticismo).

Análisis descriptivos, análisis de fiabilidad y correlaciones

Se calcularon y describieron los estadísticos descriptivos (las medias y las desviaciones estándar) para las variables del Estudio 2 y del Estudio 3. La fiabilidad de las escalas (como se informó anteriormente) se calculó mediante el coeficiente alfa de Chronbach de consistencia interna. Además, tanto para el Estudio 2 como para el Estudio 3, también utilizamos las saturaciones factoriales derivadas de los AFC para estimar el coeficiente omega como una estimación adicional de la fiabilidad (McDonald 1999; McNeish 2018).

Análisis de datos para la comprobación de hipótesis

Comprobaciones de manipulación

Tanto en el Estudio 2 como en el Estudio 3, realizamos diferentes comprobaciones de manipulación como se indica en las siguientes líneas:

Comparación de los niveles de complejidad

En el Estudio 2 y el Estudio 3, realizamos una ANOVA intra de un factor para comparar la percepción de los participantes sobre la dificultad de las cuatro tareas (Tarea 1, 2, 3, 4) de la tarea Stroop adaptada (Stroop, 1935). Este análisis se aplicó con la intención de comprobar el nivel percibido de la complejidad de las cuatro tareas.

Comparaciones entre grupo experimental y grupo control

En el Estudio 3 se se utilizó la prueba t para muestras independientes para examinar diferencias entre los participantes asignados aleatoriamente al grupo experimental y al grupo control en cinco variables (mindfulness rasgo, inteligencia, neuroticismo, tesón y frecuencia de meditación), así como para comprobar la eficacia de la intervención. La intervención se considerará eficaz si los

participantes del grupo experimental muestran una puntuación más alta en mindfulness estado que los participantes del grupo control.

Comprobación de la eficacia de la intervención

En el Estudio 3 también se aplicó un análisis de covarianza de un factor (ANCOVA). Este análisis se realizó para comprobar también la eficacia de la intervención, pero siguiendo un enfoque más riguroso, ya que se incluyeron algunas variables de control relevantes. Más específicamente, examinamos si las puntuaciones de SMS Mind y SMS Body diferían entre el grupo experimental y el de control mientras se controlaba el mindfulness rasgo (MAAS, CAMS-R), la frecuencia de meditación y el tesón.

Análisis de regresión múltiple jerárquica

En el Estudio 2 realizamos análisis de regresión múltiple jerárquica con el programa SPSS (versión 24) para poner a prueba las hipótesis del estudio. En primer lugar, se introdujeron las variables demográficas de control (edad, género, especialización y familiaridad con las tareas), en segundo lugar, se introdujeron las dos variables de personalidad (tesón y neuroticismo), en tercer lugar, se introdujo la inteligencia y, por último, el mindfulness rasgo.

En el Estudio 3 realizamos análisis de regresión múltiple moderada jerárquica con el programa SPSS (versión 24). Los pasos fueron los siguientes: primero se introdujeron las variables demográficas de control (edad, género, especialización, familiaridad con las tareas y frecuencia de meditación), segundo se introdujeron las dos variables de personalidad (tesón y neuroticismo), tercero se introdujo la inteligencia, cuarto se introdujo el mindfulness estado (como la intervención resultó ser significativa utilizamos la condición (experimental vs control), Locklear et al., 2020), y finalmente se introdujo el mindfulness rasgo (variable moderadora) y el efecto de interacción entre el mindfulness estado y el mindfulness rasgo. Además, para interpretar los efectos de interacción, utilizamos la macro Process de SPSS (Hayes, 2018) para calcular las pendientes simples para valores altos y bajos del moderador (es decir, una desviación estándar por encima y por debajo de la media de la muestra) y para trazar las líneas de regresión correspondientes. Además, teniendo en cuenta la equivalencia entre

el análisis de regresión moderada y el análisis factorial de la varianza (Hayes, 2018), utilizamos la información del "*efecto condicional de X sobre Y en los valores del moderador*" en el output de Process para estimar las diferencias de medias.

CONCLUSIONES

El objetivo general de esta tesis fue contribuir al estudio de la relación entre el mindfulness individual y el rendimiento objetivo. En primer lugar, es importante distinguir entre el mindfulness rasgo y el mindfulness estado en relación con el rendimiento objetivo; esta distinción permitirá poder concluir si las relaciones encontradas se dan con variables que representan patrones de respuesta estables y reiterados en el tiempo (rasgo), y/o con variables que representan conductas transitorias y fluctuantes en el tiempo (estado). Por otra parte, también es relevante tener en cuenta no solo los indicadores de rendimiento objetivo, sino también las características de las tareas (en concreto, la complejidad de la tarea). En las siguientes líneas, comentamos las contribuciones específicas de cada estudio, para dar lugar a la integración de los resultados y las implicaciones.

El **Estudio 1** fue una revisión, que nos proporcionó una perspectiva global sobre el concepto de mindfulness en el mundo de las organizaciones, centrándose en la definición y las principales características, en la distinción entre mindfulness rasgo y estado, como también resaltando los principales antecedentes, los beneficios de la implementación de programas de entrenamiento de mindfulness en las organizaciones y futuras líneas de investigación. Asimismo, mediante una revisión de más de 400 artículos, hemos identificado una importante laguna en la investigación, más concretamente en el estudio de la relación entre el mindfulness individual y el rendimiento. La mayoría de la investigación se ha centrado en los efectos del mindfulness sobre el bienestar psicológico y la salud, mientras que se ha prestado muy poca atención a los efectos del mindfulness sobre el desempeño (Dane, 2011). Por lo tanto, realizamos los siguientes estudios de la presente tesis (Estudio 2 y Estudio 3) en un esfuerzo por abordar la carencia identificada.

A través de un diseño experimental el **Estudio 2** se centra en la relación entre mindfulness rasgo y el rendimiento evaluado con cuatro indicadores objetivos en una tarea de atención: 1)

precisión, 2) tiempo de reacción, 3) variabilidad en los tiempos de reacción, y 4) detección de estímulos inesperados. Además, este estudio también intentó investigar si la relación entre mindfulness rasgo y el rendimiento objetivo está moderada por la complejidad de la tarea. Concretamente, el estudio se desarrolló en un laboratorio y empleó un software (E-prime 2.0) para recodificar los indicadores objetivos de rendimiento en una tarea Stroop (Stroop 1935). Los resultados indicaron que el mindfulness rasgo no estaba relacionado con los indicadores objetivos de rendimiento en una tarea de atención, excepto con la detección de estímulos inesperados. Además, el papel modulador de la complejidad de la tarea en la relación entre el mindfulness rasgo y el rendimiento objetivo no recibió apoyo empírico. Estos resultados sugieren no solo la necesidad de seguir investigando la relación entre el mindfulness rasgo y el rendimiento objetivo, sino también resaltan el papel del mindfulness como un beneficio relacionado con el trabajo, y no sólo para los individuos.

En el **Estudio 3**, a través de un diseño experimental nos centramos en la relación entre el mindfulness estado y el rendimiento evaluado con 5 indicadores objetivos: 1) precisión, 2) tiempo de reacción, 3) variabilidad en los tiempos de reacción, 4) detección de estímulos inesperados y 5) puntuaciones de rigidez, en tres tareas de atención (Tarea Stroop, Tarea de atención sostenida en la respuesta (SART), Tarea de la jarra de agua). Además, se puso a prueba el papel modulador del mindfulness rasgo y de la complejidad de la tarea en la relación entre el mindfulness estado y el rendimiento objetivo. Los resultados indicaron que la intervención resultó significativa, ya que los individuos del grupo experimental mostraron valores superiores en mindfulness estado que los del grupo control. Sin embargo, el mindfulness estado no presentó relaciones significativas con los indicadores objetivos de rendimiento enumerados, excepto con el tiempo de reacción. Concretamente, los individuos del grupo experimental presentaron menor tiempo de reacción en la tarea Stroop más compleja. Por otra parte, los resultados ofrecieron evidencia del efecto de interacción entre el mindfulness rasgo y el mindfulness estado en su relación con el tiempo de reacción en las tareas de baja complejidad, en su relación con la detección de estímulos inesperados, y en su relación con las puntuaciones de rigidez. La inducción del mindfulness estado a través de un breve

ejercicio de meditación antes de realizar la tarea no produjo mejoras en la precisión, pero sí en el tiempo de reacción, la detección de estímulos inesperados y la flexibilidad cognitiva en aquellas personas con bajo nivel de mindfulness rasgo. Además, se pudo constatar que el mismo ejercicio no supuso ningún beneficio para los que tenían un mindfulness rasgo alto. Finalmente, los resultados también indica que la complejidad de la tarea desempeña un papel relevante como modulador en la relación entre mindfulness estado y el tiempo de reacción. Concretamente, la inducción de mindfulness reduce el tiempo de reacción, pero solamente en tareas complejas. Todos estos resultados sugieren la necesidad de seguir investigando la relación entre mindfulness y desempeño.

No podemos cerrar este apartado sin resaltar en líneas generales varias implicaciones teóricas y prácticas de la presente tesis. Los resultados de nuestros tres estudios ofrecen importantes contribuciones con respecto a la relación entre el mindfulness individual y el rendimiento objetivo. Primero, nuestro trabajo ofrece una perspectiva amplia e integral sobre el concepto de mindfulness en las organizaciones y resalta las carencias y la necesidad de profundizar en el estudio sobre la relación entre el mindfulness individual y el desempeño. Segundo, dos de nuestros tres estudios tuvieron un diseño experimental desarrollándose en un laboratorio y empleando un software para recodificar los indicadores objetivos de rendimiento en diferentes tareas de atención. Tercero, nuestro trabajo contribuye a clarificar la relación entre el mindfulness rasgo y el mindfuness estado con el rendimiento objetivo. En esta dirección los resultados confirman que altos niveles de mindfulness rasgo conducen a un mejor rendimiento, como también confirman los efectos de interacción entre mindfulness rasgo y mindfulness estado en su relación con el rendimiento objetivo. Cuarto, los beneficios del mindfulness parecen depender de la complejidad de la tarea (Zhang et al., 2013), teniendo en cuenta que encontramos que en las tareas simples el mindfulness rasgo modera la relación entre el mindfulness estado y el tiempo de reacción.

Con respecto a las implicaciones practicas queremos destacar que teniendo en cuenta que los individuos con alto nivel de mindfulness rasgo son mejores para detectar eventos inesperados que los individuos con bajo nivel de mindfulness rasgo se destaca la importancia de incluir la evaluación de

mindfulness rasgo de los candidatos en el proceso de selección. Otra implicación practica es la posibilidad de aplicar nuestro breve ejercicio de mindfulness que ha demostrado su eficacia en algunos indicadores de las tareas seleccionadas. Sin embargo, para que el ejercicio o la intervención sea eficiente, es necesario tener en cuenta el mindfulness rasgo. Los resultados indican que los individuos que ya tenían altos niveles de mindfulness rasgo no se beneficiaron tanto de la intervención como los individuos con bajos niveles de mindfulness rasgo. Por lo tanto, es fundamental tener en cuenta la variable mindfulness rasgo y orientar las intervenciones breves a beneficiar y potenciar la atención en individuos que presentan bajo mindfulness rasgo.

Para terminar, vamos a comentar algunas limitaciones de la presente tesis doctoral. Primero, en los dos estudios empíricos sólo incluimos estudiantes universitarios, lo cual limita la generalizabilidad de los resultados. Por lo tanto, sería interesante poner a prueba estas relaciones en muestras de grupos de trabajo profesionales (por ejemplo, pilotos, camareros, médicos, etc.). Otra limitación hace referencia a las escalas utilizadas para medir mindfulness. En esta tesis se han utilizado escalas de autoinforme para medir tanto el mindfulness rasgo como el mindfulness estado. Sin embargo, tal como ha sido destacado en la literatura, la complejidad del concepto de mindfulness lleva a la dificultad de traducir el constructo en una escala (Bergomi et al., 2013a). Por eso sería interesante en futuros estudios utilizar también otras medidas (ej., medidas de los cambios neurobiológicos) que permitan recoger indicadores objetivos del mindfulness.

En conclusión, la presente tesis doctoral confirma a través de un diseño experimental la influencia del mindfulness rasgo y el mindfulness estado en relación con el desempeño objetivo.


ALEXANDER PP VI VALENTINVS FERDINANDVS DEI GRA REX ARAGONVM

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ANNEX 1: Brief mindfulness exercise

Bienvenido, bienvenida a esta meditación exprés para tomar un respiro mental en cualquier momento del día.

[Pausa]

Apaga momentáneamente el interruptor que te conecta con el mundo que te rodea y elige ahora poner la atención de tu mente en tu interior, en tu respiración. [Suena un cuenco tibetano]

[Pausa]

Observar tu respiración te permitirá de forma inmediata conectar con tu refugio interior, con el aquí y el ahora.

[Pausa larga]

Lo primero que haremos es observar la respiración de forma general. Percibe como es tu respiración, si es lenta o agitada, si es rítmica o irregular, si es profunda o superficial. No juzgues ni cambies nada, solo observa.

[Pausa larga]

Lleva ahora la atención de tu mente al movimiento rítmico de tu abdomen, al introducir y sacar el aire. Concéntrate solo en esa zona, observa el movimiento, el vaivén de tu abdomen, cada vez que inhalas y exhalas.

[Pausa larga]

¡Perfecto! ahora nos concentraremos en pequeños detalles. Observa solamente la parte delantera de tu abdomen. Nota cómo la tripa se desplaza hacia fuera cuando introduces el aire y como regresa a su posición original cuando lo expulsas.

[Pausa larga]

¡Muy bien! Ahora, concentrarte solamente en la parte lateral de las costillas, nota cómo se expanden hacia los lados cada vez que inhalas el aire y cómo regresan a su posición cuando exhalas. Esfuérzate por percibir todos los detalles que puedas.

[Pausa larga]

Por último, intenta percibir el contacto de tu piel con la ropa, cada vez que inhalas y exhalas. ¿Puedes notarlo? Esfuérzate por percibir qué partes de tu cuerpo rozan la ropa cada vez que inhalas y exhalas.

[Pausa larga]

¡Perfecto! Aquí termina el ejercicio. Lo has hecho muy bien. ¡Felicítate por ello! Ya has conseguido detener los pensamientos automáticos y has controlado tu mente durante unos minutos. Esto te permitirá un respiro mental y tu concentración y serenidad se verán mejoradas para ser más eficientes. Gracias por tu participación.

[Suena un cuenco tibetano]