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Working with AI: Can stress bring happiness?

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Abstract

This paper explores the effect of artificial intelligence (AI) on employee happiness using a mixed-method approach. The first study employed semi-structured interviews to understand employees' points of view about working alongside AI algorithms and agents. The interviews and literature findings contribute to developing the subsequent study and offer the conceptual model. The second study was conducted to understand benign stress's direct and indirect effect on employee happiness via employee engagement. A sample of 200 participants who work with AI allowed us to analyse the proposed model. Findings reveal employee engagement as a mediator between benign stress and employee happiness.

Keywords: Employee Engagement; Artificial Intelligence; Benign Stress; Employee Happiness; Self-esteem.

1. Introduction

The service industries are increasingly using artificial intelligence (AI) to support customers in various areas, enabling human-AI algorithms and agents' interactions. AI can be incorporated into devices, such as computers or mobiles or have a form of a robot more or less anthropomorphized (Wirtz et al. 2018) to help in several tasks, from travel planning to room services (e.g., Belanche et al. 2020a; Flavián et al. 2021; Loureiro et al. 2021b). Tasks are activities involved in a job (Boyd and Holton 2017), and for the service sector, functions to be performed that AI can do. Consequently, AI is increasingly used in services, representing a significant source of service innovation and development (Flavián et al. 2021; Chi et al. 2022). Adopting AI in services will transform the nature of work and the workplace itself (Belanche et al. 2020b). Algorithms and AI agents will perform more tasks that currently are done by humans, complement human work, and even perform tasks beyond what humans can do. High-income economies are expected to adapt to these changes first and fast, and by 2030 one in two jobs could be significantly transformed by automation, given the tasks involved (Deshpande et al. 2021).

We can see a variety of applications of AI in services, such as service encounter interactions between customers and robots (Wirtz et al. 2018), automated social presence in the frontline without customers' needs for human interaction (Yoganathan et al. 2021), personalized recommendations to customers (Pillai and Sivathanu 2020; Loureiro et al. 2021b), or part of routine service experiences (Mende et al. 2019). However, the increased use of AI applications in services also offers additional challenges, leading to a growing fear that it will soon replace humans. AI applications will not necessarily replace humans, and the complementarity of humans and AI can be a strength for organizations (Jarrahi 2018). In the end, some tasks will be performed by humans, AI will make others, and both will work as a team, leading to collaborative intelligence (Wilson and Daugherty 2018). Nonetheless, as AI applications perform more service tasks, fewer human

employees are needed, leading human employees to focus more on tasks that AI applications do not perform (Huang and Philp, 2020).

The literature discussing AI adoption has focused its attention on automation processes (Tussyadiah 2020), AI adoption by customers (Pillai and Sivathanu 2020; Shin and Jeong 2020), ethical issues related to AI and service robots (Gurkaynak et al. 2016; Belk 2020), and antecedents of AI adoption intention such as trust (Shi et al. 2020). However, we know less about the interaction between AI algorithms and agents and the human as an employee. Recent research has recognized the paucity of input on how employees can relate to AI algorithms and agents (Li et al. 2019; Kong et al. 2021) and how critical these interactions can be for services organizations (Ashfaq et al. 2020; Pillai and Sivathanu 2020). More research on employee–AI algorithms and agents are needed from the above considerations (Belanche et al. 2020a; Tussyadiah 2020; Kong et al. 2021; Loureiro et al. 2021a). Moreover, having AI algorithms collaborating with human employees may cause stress. However, if demands are balanced with support, they can generate happiness (Nazareno and Schiff 2021), creating a sense of employee engagement (Kumar and Pansari 2015).

This research intends to address this problem and clarify the relationships and interactions among employees and AI algorithms and agents. We ground our research in the theory of stress and coping of Lazarus and Folkman (1984). The stress results from an imbalance between what individuals perceive from external and internal demands and their resources and skills to deal with them. Therefore, the research questions that lead our work are: what are the positive and negative key aspects perceived by humans when working with AI algorithms and agents in service firms? Can employee engagement mediate the relationship between benign stress and employee happiness? This research contributes to the knowledge of human-AI algorithms and agents interactions using a mix-method approach through semi-structured interviews and promoting a quantitative study. We use a mixed-method approach (Creswell and Clark 2007) with an exploratory design, in which qualitative findings are added to quantitative results to achieve a better

understanding of the research questions (Molina-Azorin 2010). We offer a model founded on stress and coping theory, analysing the effect of benign stress on employee happiness and the indirect effect via employee engagement. This research contributes to the literature by offering specific theoretical and practical implications.

This paper is structured as follows. The next section offers the related literature background, while the following section describes the overview of studies and methodological approach. After, we offer the two undertaken studies in section 4 and section 5. Finally, we present a section devoted to the overall discussion of this paper, followed by implications, limitations and future research avenues that arise from this research.

2. Theoretical background and conceptual model

We have built our conceptual model based on the literature and our exploratory qualitative study findings. Our model offers a new theoretical framework incorporating benign stress influencing employee happiness development while working with AI algorithms and agents, which can be mediated by employee engagement (see Figure 1). Our conceptual model reads as follows. Working with AI algorithms and agents can be demanding for human employees that may cause stress. However, this situation can also be positive by helping or facilitating human work, leading to what we claim in this paper as benign stress. Benign stress can be defined as a not harmful, pleasant, and kind type of stress resulting from incorporating AI algorithms and agents in the workplace to help human employees and facilitate their tasks. Our conceptual model proposes that benign stress can positively influence employee happiness, perceived as the experience of the energized employees, being enthusiastic and feeling committed about their work. Additionally, we question whether employee engagement can be a positive mediator for this relationship. Employee engagement refers to the relationship between the employees and the organization they work. We

argue that higher levels of employee engagement can positively influence benign stress on employee happiness while working with AI algorithms and agents.

[INSERT FIGURE 1 ABOUT HERE]

The next sub-sections offer a comprehensive view of existing knowledge in the literature about the concepts we use in our model.

2.1 Artificial intelligence (AI) in services

Technology is recognized as the most critical force for expanding the service sector, being AI an excellent opportunity for service firms (Huang and Rust 2021). AI is distinct from wide-ranging information technology, involving technologies that can learn, connect, and adapt (Huang and Rust, 2021). AI is often described in the literature in terms of human intelligence, such as “machines that exhibit aspects of human intelligence” (Huang and Rust 2018, p. 155), or “the ability of machines to mimic intelligent human behaviour” (Syam and Sharma 2018, p. 136). These definitions encapsulate an issue as AI is often offered as conditional on human intelligence. But, as humans learn and draw conclusions from restricted data, machines can learn from billions of data sources (Rajkomar et al. 2019). Unlike humans, AI recognizes patterns, inclinations, and intentions by combining deep learning and big data (Flavián et al. 2021), beyond the human brain intelligence’s ability.

AI can be divided into four different types of intelligence: mechanical, analytical, intuitive, and empathetic (Huang and Rust 2018). Each one of these four types of intelligence has its strengths. Mechanical AI is more indicated for standardization, while analytical, intuitive and empathetic can be used for personalization and feeling AI (Huang et al. 2019). When tasks are more repetitive, it is advisable to use mechanical AI. When tasks are more data-based, they should

be performed by analytical intelligence. If the tasks are more intuitive, it might be challenging to use only AI devices to solve the situation (Huang and Philp, 2020), so human intelligence may perform some tasks and artificial intelligence others, working as a team to solve a set of tasks (Wilson and Daugherty 2018). This symbiosis between human employees and thinking AI is called augmentation (Davenport and Kirby 2015). When the service task requires communication, experience-based and emotional solutions, it is recommended to use empathetic AI (Huang et al. 2019).

2.2 Employee happiness in the workplace

The literature has seen increased research on employee happiness in the workplace in the last few years. Many authors have attempted to identify the sources of workplace happiness (e.g., Joo and Lee 2017; Layous 2019), founding relevant combining factors contributing to this phenomenon. Employee happiness can be valuable for organizations (Seligman 2012), as happier individuals lean toward better physical and psychological health (Park et al. 2014), can handle positively with stressful events (Wood and Joseph 2010), perform better (Kun and Gadanecz 2022), and are more satisfied with their jobs (Mérida-López et al. 2019). Employees with higher levels of happiness perform better at work, are more prosocial and cooperative, have greater self-control, better self-regulation and coping abilities, more satisfying relationships, and lower levels of burnout (Chida and Steptoe 2008; Seligman 2012; Chen et al. 2018; Layous 2019).

Employee happiness is also distinct from job satisfaction, work engagement, and affective organizational commitment. An employee can experience job satisfaction, work engagement and affective organizational commitment due to various causes, such as high job control or organization-based self-esteem (Saks 2006; Mauno et al. 2007). These factors can increase overall job satisfaction, work engagement, and affective organizational commitment while remaining unrelated to the emotional experience of happiness (e.g., not increasing employee happiness)

(Fisher 2010). In this research, we define employee happiness in the workplace as the experience of energized employees, enthusiastic about their work, finding meaning and purpose in their work, having good relationships at their workplace, and feeling committed to their work (Kun and Gadanecz 2022). In our research, we claim that the use and/or interaction with AI algorithms and agents in the service workplace can increase employee happiness if suitable conditions are attained.

2.3 Stress and benign stress

From the broader construct of stress, with this research we add to the literature the concept of benign stress (Wastell and Newman 1993) associated with using AI algorithms and agents in the workplace. The literature has already devoted substantial attention to job stress from various perspectives, such as organizational, environmental, employee, and social perspectives (Parker and DeCotiis 1983; e.g., Nixon et al. 2011; Schwegker and Dimitriou 2021). Job stress is an individual's harmful physical and emotional responses due to non-congruence between the tasks and environmental requirements and the employee's needs, resources, and capabilities (Centers for Disease Control and Prevention 2020). Karasek and Theorell's (1992) study the relationship between workplace characteristics and employee stress. These authors offer three dimensions to express the stress felt by employees: demands, control, and support. Demands are psychological factors that can change the environment in the workplace, such as deadlines or tasks that need to be done fast. Control is related to the capability of the worker to use their capacities to develop tasks, such as skills, expertise, knowledge, or the possibility that employees choose what and/or how to do his/her work. Support is associated with the employee's interactions with co-workers, supervisors, and directors. When the level of support is low, the stress risk for the worker is higher (Karasek and Theorell 1992). Nonetheless, when demand is high, employees may feel in an active situation if they perceive control and have the skills and knowledge to deal with it (Karasek and Theorell 1992).

Following Lazarus and Folkman's (1984) theory of stress and coping, stress emerges from an unbalance between an individual's external and internal demands and their own personal and even social resources and skills to deal with those demands. So, the presence of AI algorithms and agents can be very demanding for human employees. They can feel unable to interact and cooperate with AI algorithms and agents, resulting in an imbalance between demands and psychological resources and psychological and technical skills to live and work in such a work environment. This condition can cause stress among human employees, as incorporating AI algorithms and agents in service firms can cause or reduce stress in the workplace (Li et al. 2019; Kong et al. 2021). AI algorithms and agents can be a positive aspect of organizations as they can help human employees with diverse tasks and even facilitate the work and generate happiness if demands are balanced with support (Wastell and Newman 1993; Riolli and Savicki 2010). When AI applications demand more effort and intensity, but at the same time, the co-workers AI support the human employee, and humans enjoy working with them, the stress can become positive non-malign stress, what we call benign stress (Wastell and Newman 1993; Penney and Spector 2005). So, we argue that benign stress with the interaction of AI technology can enhance happiness in the workplace (see Figure 1):

H1: Benign stress positively influences employee happiness.

[INSERT FIGURE 1 ABOUT HERE]

2.4 Employee engagement

Employee engagement is related to the connection between the employee and the organization they work for. In this research, we consider the five dimensions of employee engagement proposed by Kumar and Pansari: satisfaction, employee identification, employee commitment, employee loyalty and employee performance (Kumar and Pansari 2014, 2016). The first represents the employee's feelings and emotions about his/her job, colleagues, or organization and impacts the

quality of work, employee turnover and absenteeism, and the identification between employees and the organization (Heskett et al. 2008; Kumar and Pansari 2016). Employee identification is “a psychological state wherein an individual perceives himself or herself to be part of a larger whole” (Rousseau 1998, p. 217), being more open to giving everything to its success, increasing their commitment to the brand (Kumar and Pansari 2016). Employee commitment occurs when employees are so involved with the organization that they can reach the firms’ goals, showing better performances than others and are more willing to stay (Al-Sada et al. 2017; Herhausen et al. 2020). Employee loyalty can lead employees to work more and better than expected for their organizations (Kumar and Pansari 2016). Finally, employee performance is considered a competitive advantage due to the ability to deliver a good service to customers and retaining them (Harris and de Chernatony 2001; Reinartz et al. 2005).

Although we consider the five dimensions of employee engagement proposed by Kumar and Pansari (2016), our research reflects the engagement with the organization and the work with other non-human employees, AI algorithms and applications. So, the dimensions of satisfaction represent managers’ positive feelings and recognition of their work with IA. Identification is the pride, the familiarity, and the sense of ownership towards the organization that uses AI. Commitment reflects that employees are more open to delivering the service brand promise when working with AI. Loyalty means that employees tend to be more likely to stay at an organization operating with AI algorithms and agents. Finally, performance means that employees consider that their performance with AI exceeds expectations.

Knowing the relevance of employee engagement for firms and the tasks performed, we reflect on what if this level of employee engagement can contribute to the relationship highlighted in H1. Can benign stress positively influence employee happiness mediated by employee engagement? Based on the literature, we may postulate that a more engaged employee will tend to influence the outcome of the relationship mentioned above. So, we propose that happiness in a job

working with AI algorithms and agents can be enhanced by benign stress, moderated by employee engagement with the service firm working with AI:

H2: Benign stress positively influences happiness via employee engagement

2.5 Control variables

To further develop our research, we can assume that there are variables that can influence or limit the relationships we are studying. The most common are age and gender. As seen in past research pointing out the relevance of these variables in attitudes and behaviours (e.g., Spector and Brannick 2010), employees of different ages and genders may behave differently in the process between human employees and AI algorithms and agents in the workplace. So, we consider them as control variables. Additionally, one can assume that psychological factors can influence employees' attitudes and behaviours in these relationships. Due to its relevance in the literature, we questioned whether self-esteem could influence these relationships. Self-esteem is the person's overall subjective sense of personal worth or value and can be defined as how much a person appreciates, and like himself regardless of the circumstances, it is a complex state of individuals, representing the individual evaluation of their worth (Consiglio and van Osselaer 2019; Loureiro et al. 2021b). Rosenberg (1965, 1979) offered a scale dedicated to asking individuals about positive and negative feelings that they felt by themselves. In this research, this self-esteem scale is adapted to the context of human employees interacting with AI algorithms and agents in the workplace. Therefore, the self-esteem felt by human employees when working with AI algorithms and agents can affect the engagement process, as a low self-esteem can negatively influence how employees develop their engagement in the workplace (Cameron and Granger 2018; Sonnentag and Fay 2018).

3. Overview of Studies and Methodological Approach

The current research uses a mixed-method approach. We first conducted semi-structured interviews to understand employees' perspectives using the AI algorithms and agents at their workplace in the hospitality and tourism service sector. The interviews aim to understand employees' point of view about working side by side with AI algorithms and agents. The findings of the interviews contribute together with the literature review to the conceptual model analysed in the subsequent study. The second quantitative study was based on a questionnaire where we asked participants to recall their previous experience using AI algorithms and agents in a hospitality or tourism service workplace. This study aims to analyse the direct effect of benign stress on employee happiness and the indirect effect via employee engagement.

4. Study 1: working with AI: positive and negative aspects

4.1 Procedure

This study aims to understand whether service employees consider or not positive working alongside AI algorithms and agents. The research question was: does working with AI algorithms and agents develop positive and/or negative aspects for human employees? We conducted online face-to-face interviews based on a question-matrix (Pearse 2019), specifically designed for this study (see Appendix A). The option for online face-to-face interviews was due to the global pandemic of coronavirus disease 2019 (COVID-19), but simultaneously allowed the interviewer to read the interviewees' behaviours, feelings, and expressions. Also, when conducting interviews based on a semi-structured script, the interviewer is free to follow different discussion routes, having more freedom to return to a specific topic and ask for clarification on a specific aspect. A total of 9 individual interviews with participants working in Portugal's hospitality and tourism industries were held between February and March 2021. The interviews considered the interviewees' distinct roles in the industry to assure data reliability, including marketing, operations, guest services, and food & beverage, among others (see participants' profiles in Table

1). The interviews lasted from 40 to 60 min. The data treatment was made using ATLAS TI, a specific CAQDAS software which allows researchers to build networks, facilitating the articulation of the findings.

[INSERT TABLE 1 HERE]

4.2 Results

The findings reveal diverse positive and negative aspects of working with AI algorithms and agents. Our participants mentioned to have worked primarily with AI-powered concierges (e.g., to check guests in or out, to order room service) and automated data processing (e.g., automated guest messaging, automated revenue management system to optimize pricing and rate utilization). Regarding the positive aspects, the interviewees mentioned that AI could motivate and bring happiness to the workplace, contribute to an identification with the workplace, reduce workload and help with repetitive tasks, decrease stress and anxiety, increase productivity (performance), reduce costs, accelerates the development of tasks, and increase commitment (see Table 2). Participant B stated: *“when working as a team, if AI can be efficient is always good. The first thing that comes to mind is the decrease in mistakes made by the team”*. On the contrary, the interviewees revealed that AI could not entirely replace human employees and interactions. AI can have a negative impact by replacing humans in some tasks (increasing unemployment), and the participants also reveal not to trust AI in all customer interactions (see Table 1). Participant D argues that *“AI still does not have feelings, which is a good thing, but it also lacks intuition. When we are in a situation where AI collects and gathers data to transform into results, we still need human employees to close the process. I do not trust the machine to do it by itself”*. Employees may be unprepared for additional AI incorporation in service firms or not appreciate working with AI, consequently affecting employee happiness.

[INSERT TABLE 2 HERE]

4.3 Discussion

Our results show that incorporating AI algorithms and agents (Huang and Rust 2018) can complement and support human employees in specific situations. Employees consider that AI can help avoid mistakes and turns tasks easier. Having AI performing repetitive tasks can reduce anxiety and stress in the workplace among human employees, contributing to decreasing employees' stress due to the support at the workplace (Li et al. 2019; Darvishmotevali and Ali 2020). This finding is of foremost importance to our research, as we moved forward with offering the concept of benign stress (Wastell and Newman 1993; Penney and Spector 2005) associated with the use of AI algorithms and agents in the workplace after it. Stress can be benign if AI facilitates the performance of the tasks, accelerating the processes. Nonetheless, interaction requires adaptation and readjustments at the workplace as AI is a recent technology.

Our results also underline that AI can influence motivation and happiness in the workplace. Reducing the relationships between human co-workers can negatively impact trust and individuals' happiness. Additionally, our results show some anxiety about unemployment associated with introducing AI technologies in organizations, which is in line with the current literature (Flavián and Casaló 2021; Huang and Kao 2021). Therefore, participants do not recommend implementing intuitive or emphatic AI (Huang and Rust, 2018). It is considered that these types of AI are difficult to replace human beings (Lei et al. 2021). Finally, our results highlight the potential for better identification with the organization (with the AI), more significant commitment and performance. It leads us to the concept of employee engagement proposed by Kumar and Pansari (2016). The results seem to support our second hypothesis, which we formally test in study 2.

5. Study 2: Stressing happiness by working with AI

5.1 Procedure

This study aims to analyse the direct effect of benign stress on happiness and the indirect effect via employee engagement. The literature and our first study helped us reach the conceptual model tested in this study (see Figure 1). Both have pointed out the expected positive effect of non-harmful stress – which we introduce as benign stress – on employee happiness while interacting with AI algorithms and agents, and the potential role of employee engagement as a mediator since the construct – proposed by Kumar and Pansari (2016) – combines some dimensions mentioned by the interviewees. The sample was collected via Amazon’s Mechanical Turk in April 2021. This crowdsourcing system has age, gender and ethical diversity, contributing to the generalizability of the findings (Mason and Suri 2012). The sample aggregates 200 participants who work\have worked with AI algorithms and agents at the workplace in service firms (hospitality and tourism-related). Our study compensates the participants €1.25 for a less than a ten-minute task. Table 3 shows the sample profile.

[INSERT TABLE 3 HERE]

The questionnaire was first written in English (because all items were originally in English), translated to Portuguese and then back-translated into English (with the help of two native linguists) in order to assure that the Portuguese version communicated the same content as the English version (Sekaran 1983). Participants were first asked about working in the tourism industry and having experience using AI at work, and only those who responded positively were invited to respond to the questionnaire. The questionnaire was prepared to minimize recall bias and common method bias to ensure data quality. In this sense, we used commitment techniques (e.g., asking for conscientious responses) and attention questions (e.g., What colour is the sky? Make sure to select green for this answer so that we know you are paying attention) and provided memory aids (e.g., asking participants to think about the moment(s) they worked with AI algorithms and agents). The items were kept without unfamiliar words and complex syntax, and items belonging to the same

constructs were introduced at a physical distance and asked for conscientious responses and attention questions. The questionnaire was also pre-tested by eight individuals to analyse the content validity.

5.2 Measures

The measures were adapted from prior studies, and all the items were measured using a Likert-type scale from 1 (Strongly disagree) to 7 (Strongly agree). Benign stress was based on the stress scale considering the dimensions of demands and support (Karasek and Theorell 1992) but leaving the control variable aside as it does not focus on the benign effect of stress. Employee engagement was measured based on Kumar and Pansari (2016). Self-esteem was assessed through 5 items adapted from the Rosenberg Self-Esteem Scale (SES) (Rosenberg 1965, 1979), not regarding the reverse items as the literature suggest that negatively oriented items have minor impact on instrument quality, but influence measurement model and path coefficients (Dueber et al. 2021). Diverse scales have been employed to assess happiness, such as the Subjective Happiness Scale (Nawijn and Peeters 2010) or the Satisfaction with Life Scale (SWLS) (Gilbert and Abdullah 2004; Sirgy et al. 2010; Nawijn 2011; Woo et al. 2015), while another common approach (Van Boven and Gilovich 2003; Van Boven 2005; Bimonte and Faralla 2015) involves a single-item. The current research measured employee happiness using three items adapted from Van Boven and Gilovich (2003) and Bhattacharjee and Mogilner (2014).

5.3 Results

Data were treated using SmartPLS 3.0. Partial least squares (PLS) regression is a method based on an iterative combination of principal component analysis and regression to explain the variance of the constructs. It offers the advantage of being an effective analytical tool to test interactions by reducing Type II errors (Chin et al. 2003), reducing the problem by accounting for errors related to

the measures, and creating a latent construct representing an interaction term (Echambadi et al. 2006). The conceptual model presents formative constructs, so the two-stage approach was regarded (Hair et al. 2019). Factor loading lower than 0.7 were eliminated (identified with the letter ‘a’ in Table 4). The values of composite reliability (CR) and Cronbach’s alpha (CA) exceed 0.6 demonstrating the reliability of the constructs (see Table 4). Convergent validity was achieved since the average variance extracted (AVE) values of the first-order constructs are higher than 0.5 (Fornell and Larcker 1981).

[INSERT TABLE 4 HERE]

Fornell and Larcker and Heterotrait-Monotrait Ratio were employed to analyse the discriminant validity. As shown in Table 3, the square root of AVE values is higher than the inter-correlation values (Fornell and Larcker 1981), and the Heterotrait-Monotrait Ratio values are lower than 0.9 (see Table 5). The variance inflation factor (VIF) values are below 3.33 (see Table 6) (Diamantopoulos and Siguaaw 2006). Therefore, VIF values demonstrate no problem with multicollinearity. The predictive validity is measured through R^2 . The scores reveal that the modelled constructs explain 62.7% of the variance in employee engagement and 55.9% of employee happiness. The values of Q^2 (chi-squared of the Stone–Geisser criterion) are positive, so the relationships have predictive relevance (Hair et al. 2019). The model also has a good fit (0.068) (see Table 7).

[INSERT TABLE 5 HERE]

[INSERT TABLE 6 HERE]

The structural results in Table 7 reveal that the H1 is not supported since the benign stress does not significantly affect employee happiness ($\beta=0.122$; $p=0.078$). Still, benign stress can indirectly influence employee happiness through employee engagement, as the specific indirect effect is significant ($\beta=0.238$; $p<0.001$), so H2 is supported. The variance accounted for (VAF)

ranges between 0% and 100% (Helm et al. 2010). The VAF of 66.1% represents a relatively strong score, indicating that a significant portion of the total effect comes from the indirect path, so employee engagement acts as a mediator. Regarding the control variables, only self-esteem significantly affects employee engagement (see Table 7).

[INSERT TABLE 7 HERE]

5.4 Discussion

Stress is traditionally regarded as harming individuals, particularly in the workplace (Karasek and Theorell 1992; Nixon et al. 2011; Schwepker and Dimitriou 2021). Incorporating AI algorithms and agents in the workplace demands adaptations and represents support. From a positive perspective, human employees can benefit from their interaction and AI algorithms and agents. This positive perspective is regarded in this research as benign stress (Penney and Spector, 2005). When human employees acknowledge AI algorithms and agents support in the workplace (Karasek and Theorell 1992), they tend to form more positive feelings about it. But, this feeling is strengthened when human employees reveal that they are engaged with the organization. This study demonstrates that employee engagement plays an important role in developing feelings of happiness in the workplace.

Secondly, regarding the formative index of benign stress, created based on Karasek and Theorell (1992), and following the recommendations of Hair et al. (2019), support is the most relevant, with a weight of 0.886 compared to demands (weight=0.287). Thus, when human employees recognize that working with AI means that they have the support and empathy of the AI – even if the work demands more effort – humans tend to feel benign stress and that stress does not cause the same psychological and physical damage as is expected based on Lazarus and Folkman (1984).

Thirdly, identification (weight = 0.414), followed by satisfaction (weight = 0.314), are the most important dimensions – proposed by Kumar and Pansari (2016) – to form the index of employee engagement for the context of this research. Therefore, the human employees will be engaged with the service firm mainly when they feel a sense of ownership and pride in belonging to a service firm operating with AI algorithms and agents. Humans also become engaged if they receive recognition for the job well done by working with AI and feel in a good mood for the whole environment of cooperation in the service firm. The other three dimensions are also significant – commitment, loyalty, and performance – but each weight is lower (see Table 7).

Finally, as a control variable, self-esteem is revealed to have a significant effect on employee engagement (Sonnetag and Fay, 2018). As expected, human employees who feel high levels of self-esteem working at a firm with AI employees tend to become more engaged with that firm. Thus, human happiness depends on human beliefs and feelings about their self-worth and the engagement mechanism developed in the workplace with AI algorithms and agents.

6. Overall discussion

Current research has shed light on understanding the phenomenon of benign stress and employee engagement and happiness in a working environment with AI algorithms and agents. Two studies were conducted aiming (i) to understand if service employees consider or not be positive to work side by side with AI algorithms and agents and (ii) to analyse the direct effect of benign stress on happiness and the indirect effect via employee engagement. The findings lead us to discuss three main aspects.

First, incorporating AI in the workplace can generate stress and affect human well-being (Belanche et al. 2021a; Ali et al. 2022). On one side, AI algorithms and agents can negatively affect human employees. The emotional states developed in humans associated with the fear of change and the unknown can explain this negative effect. Individuals tend to fear what they do not master,

which will influence their daily tasks and duties at the workplace (Mirbabaie et al. 2022). Human employees fear the loss of human relationships in the workplace and do not believe that AI can relate to humans as humans do. Human employees may not feel confident working with non-human agents because they assume they will gradually have fewer skills than their non-human peers (Belanche et al. 2020b; Flavián and Casaló 2021). Humans also tend to fear being replaced by AI, leading to an increase in unemployment. These negative aspects are deeply associated with the lack of information and uncertainty about the future of AI work evolving in terms of technical and soft skills (Deshpande et al. 2021; Mirbabaie et al. 2022). On the other side, the positive aspects of incorporating AI in service firms can lead to benign stress when humans recognize that AI algorithms and agents can facilitate and support them on tasks, creating higher overall performance (Huang and Rust 2021; Lei et al. 2021). This positivity may allow for collaboration and interdependence between human and non-human employees. Therefore, AI can be a motivational factor instead of a concern (Li et al. 2019; Kong et al. 2021).

Second, the engagement process between employees and service firms in the presence of AI plays an important role in mediating the relationship between benign stress and happiness. Human employees who accept the presence of AI, understand its abilities and have positive psychological effects from working with AI benefit from this interaction and become more identified and satisfied with working for that firm (Ashfaq et al. 2020; Ali et al. 2022). Humans who can handle mental or emotional pressure by working with and engaging (Kumar and Pansari, 2016) with AI will be happy and intend to continue working in that firm. Finally, self-esteem also plays a role in increasing engagement with the company. Humans with high levels of self-esteem while working with AI will also tend to be more engaged. Self-esteem can be psychologically reinforced (Rosenberg, 1979) when humans receive technical training and psychological support during implementation and adaptation to use and cooperate with AI algorithms and agents (Belanche et al. 2021b; Kong et al. 2021).

7. Conclusions and implications

According to the literature, the quality of human-AI algorithms and agents' relationships are highly relevant in the service industries (e.g., Huang and Rust, 2021; Loureiro et al., 2021). Based on it, this paper aims to analyse the humans' perceived positive and negative aspects when working with AI algorithms and agents in service firms. We also intend to assess if employee engagement can mediate the relationship between benign stress and employee happiness. It is possible to underline several research outcomes based on the data collected and the results achieved.

7.1 Theoretical contributions

From a theoretical point of view, this research's contribution is threefold. First, it extends the knowledge of job stress on human-AI interaction by proposing a positive viewpoint due to benign stress. Job stress is an unstable situation in the workplace if humans feel they do not have the resources to handle the demand (Shankar 2018; Huang and Rust 2021). With the support of AI, humans can acquire more resources to undertake tasks at work and feel happy about it. Second, we show that employee engagement can mediate the relationship between benign stress and happiness. Working in the service firm alongside AI algorithms and agents can contribute to developing an identity and a sense of satisfaction. These two later dimensions are the most relevant to influence the engagement and reinforce the effect of benign stress to create a meaningful and fulfilling experience at the service firm. Finally, in this research, we assume that psychological factors can influence employees' attitudes and behaviours and have questioned whether self-esteem could influence these relationships. Based on our findings, we claim that implementing AI algorithms and agents requires psychological factors from human employees, such as self-esteem (Consiglio and van Osselaer 2019; Loureiro et al. 2021b), helping to increase employee engagement and happiness, with the service firm.

7.2 Managerial implications

As the implementation of AI at work is relatively new, from a managerial perspective, there is only nascent evidence of its risks and benefits. Even so, this research intends to provide some benefits and risks managers need to be familiar with. First, we identify the risk of job stress for employees who need to interact with AI algorithms and agents in services in service firms' workplaces. Managers should consider it while deciding about adopting these in firms as in industry 4.0 unsuitable risks may lead to overwork and stress (Moore et al. 2018). Managers must assist employees' needs in terms of training and support to transform stress into benign stress. Employees may feel awkward, ill at ease, and self-conscious facing the unknown, but gradually they may overcome it with training and support. Second, implementing AI algorithms and applications in the workplace will require developing skilled and prepared employees through training, experience, and naturally occurring adaptation ability. It implies that employees need to be trained to work, interact, and share everyday tasks in the workplace with AI algorithms and agents, but they also need to be qualified to work in ways to cultivate talents that only humans (at least, for the time being) can offer in ways that are useful for firms.

Third, AI algorithms and agents can help to oversee employees by fostering employee engagement. It may occur by motivating employees. Managers should consider several employee engagement variables such as loyalty, performance, identification, satisfaction, and commitment, as they can perform a relevant role in defining whether AI will effectively create employee engagement over the long run. AI may improve workplace relationships between employees and with AI applications whenever the potential for partnership is evident. In sum, it is noteworthy that AI technology itself may not create job stress or workplace happiness for workers. Managers should consider how it is implemented and how smooth is the transition from an AI accessible to an

integrated (blended) workplace environment to ensure the successful integration of AI in the workplace.

7.3 Limitations and future research

This research has limitations, which could also be avenues for future research. First, finding older participants for the samples in both studies was not easy. For that reason, only 11% of the sample in the second study is older than 45 and more than 80% of the participants are younger than 24 years old. Future research can try to compare behaviours between age groups with a similar number of participants but balance the age group size. Second, artificial intelligence is here to stay, inevitably, and a reality for the future. Its introduction in the workplace needs to be prepared to avoid rejection by possible human co-workers. Future research can study ways to train and educate employees about AI algorithms and applications in the workplace. Third, in this research, we study the employee-AI interactions in one culture. Studying different cultures or performing cross-cultural research can be an interesting research path (Hofstede 2001). Furthermore, we are living in a (near post) pandemic situation. The world economies suffered, and the loss of revenues is one of the pandemic costs for the service sector. People fear social contact and avoid being exposed to other humans. Artificial intelligence (and particularly robots) can be seen as a form of avoiding those contacts (Huang and Kao 2021). However, job replacement is an objection and one of the main negative aspects from employees' point of view that negatively influences engagement. Future research can focus on overcoming these objections and building employees' trust in artificial algorithms and agents.

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Figure 1. Proposed conceptual model

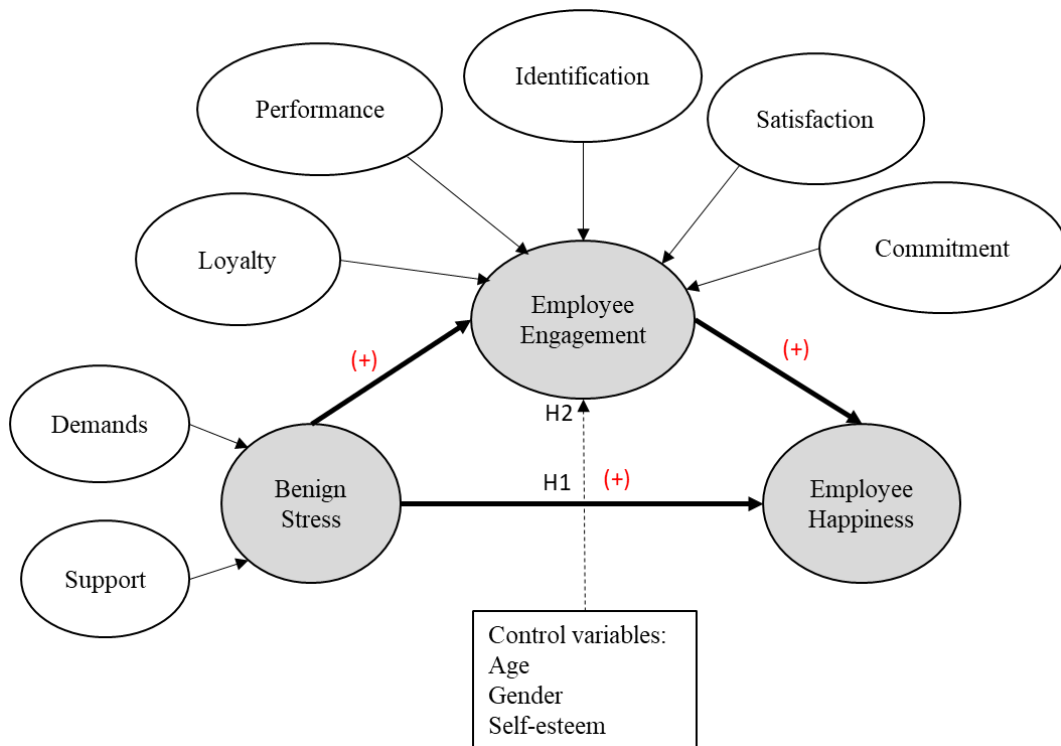


Table 1. Interview's participants profile

Participant	Gender	Age	Job role	Sector
#A	Female	35	Travel agent	Tourism industry
#B	Male	38	Event organizer	Tourism industry
#C	Female	24	Tour operator	Tourism industry
#D	Male	29	Marketing manager	Hospitality industry
#E	Male	24	Guest services	Hospitality industry
#F	Male	43	Food & Beverage manager	Hospitality industry
#G	Male	22	Tour guide	Tourism industry
#H	Female	34	Operations manager	Hospitality industry
#I	Female	32	Front desk manager	Hospitality industry

Table 2. Positive and negative aspects of working with AI algorithms and agents

Positive aspects	Negative aspects
<ul style="list-style-type: none"> • AI could motivate and bring happiness to the workplace • Higher identification with the job while working with AI • AI can reduce workload • Decrease prospective stress and anxiety • AI may increase productivity/efficiency • AI can replace human employees • AI to reduce costs • AI to turn tasks easier • Possible augmentation • AI to turn tasks faster • Increases commitment to the job while working with AI 	<ul style="list-style-type: none"> • AI cannot replace human interactions • Lack of appreciation for working with AI • Do not trust AI for customer relationship • Negative impact on replacing humans • May increase unemployment • AI cannot replace human employees • Not ready for the change • Negative impact on well-being because there is no human contact • Lack of trust in AI in all interactions with customers

Table 3. Sample profile.

<i>Demographic characteristics</i>	Frequency	Percent
<i>Gender</i>		
Male	102	51.0
Female	97	48.5
Prefer not to say	1	0.5
<i>Age</i>		
18 to 24	161	80.5
25 to 34	13	6.5
35 to 44	4	2.0
45 to 54	18	9.0
55 to 64	3	1.5
>64	1	0.5
<i>Level of education</i>		
High school	13	6.5
Bachelor	119	59.5
Master or post-graduation	68	34

Table 4 Measurement results

<i>Construct</i>	Factor loading	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
<i>Demands</i>		0.623	0.622	0.788	0.553
With AI, I need to work very fast	a				
With AI, I need to work very intensively	0.731				
With AI, I need more effort in my job	0.748				
With AI, I have enough time to do my tasks	0.751				
With AI, I have conflicts in the team	a				
<i>Support</i>		0.831	0.832	0.887	0.664
There is a calm and pleasant atmosphere working with AI	a				
I get on well with my AI co-workers	0.841				
My AI co-workers support me	0.818				
My AI co-workers understand if I have a bad day	0.813				
I get on well with my supervisors in a team with AI	0.785				
I enjoy working with AI	0.841				
<i>Loyalty</i>		0.754	0.774	0.889	0.801
I will be happy to spend the rest of my career working with AI	0.916				
I do not have an intention to stop using AI at my workplace at this moment	a				
My intention to stay is driven by the fact that I like to work with AI	0.873				
<i>Performance</i>		0.762	0.763	0.894	0.808
My performance in a team with AI exceeded expectations.	0.902				
Working with AI, the amount of opportunity for my performance improvement at my firm is high	0.896				
<i>Identification</i>		0.915	0.917	0.932	0.663
I am proud to tell others that I am part of a firm that uses AI	0.800				
I feel a sense of ownership toward this firm that uses AI	0.843				
My sense of pride toward the firm that uses AI is reinforced by its message	0.817				
While I work with AI, I view the success of the firm as my own success.	0.860				
While I work with AI, the firm is like a family to me	0.771				
If I work in a firm with AI, I will talk about this firm, usually saying "we" rather than "they."	0.778				
When someone praises this firm for using AI, it feels like a personal compliment.	0.825				
		0.902	0.903	0.927	0.719

<i>Satisfaction</i>				
When I work with AI, I receive recognition for a job well done	0.830			
In a team with AI, I feel close to people at work	0.826			
While I work with AI, I feel good about working at the firm	0.876			
When I work with AI, I feel secure about my job	0.868			
Giving me the possibility of working with AI, I believe management is concerned about me	0.838			
<i>Commitment</i>		0.882	0.891	0.927
My commitment to the firm increases because of the use of AI	0.866			0.809
Working with AI, I am very committed to delivering the brand promise to our customers.	0.908			
This firm with AI has a great deal of personal meaning for me.	0.923			
<i>Employee happiness</i>		0.753	0.770	0.859
The experience of working with AI contributes very much to my happiness in life	0.730			0.672
The experience of working with AI is very meaningful	0.895			
The experience of working with AI is very personally fulfilling	0.826			
<i>Self-esteem</i>		0.843	0.858	0.887
On the whole, I am satisfied with myself, interacting with AI at my workplace	0.849			0.612
In a team with AI, I take a positive attitude toward myself.	0.783			
I feel that I have a number of good skills to interact with AI	0.712			
I am able to interact with AI at my workplace as well as most other people	0.741			
In a team with AI, I feel that I'm a person of worth.	0.819			

Note: In the questionnaire, we explain that AI represents algorithms and robots with artificial intelligence (i.e., diverse types of algorithms and agents with artificial intelligence).
a: item eliminated; below the threshold.

Table 5. Discriminant validity: Fornell-Larcker and HTMT

Fornell-Larcker Criterion	1	2	3	4	5	6	7	8
1.Commitment	0.899							
2.Demands	0.390	0.744						
3.Employee hapiness	0.618	0.239	0.820					
4.Loyalty	0.706	0.268	0.583	0.895				
5.Performance	0.558	0.268	0.575	0.460	0.899			
6.Support	0.440	0.259	0.584	0.388	0.550	0.815		
7.Identification	0.697	0.354	0.648	0.622	0.617	0.636	0.814	
8.Satisfaction	0.635	0.414	0.674	0.544	0.576	0.661	0.625	0.848
Heterotrait-Monotrait Ratio (HTMT)	1	2	3	4	5	6	7	8
1.Commitment								
2.Demands	0.546							
3.Employee hapiness	0.755	0.329						
4.Loyalty	0.762	0.364	0.784					
5.Performance	0.675	0.343	0.757	0.595				
6.Support	0.508	0.315	0.731	0.477	0.694			
7.Identification	0.770	0.466	0.779	0.740	0.736	0.729		
8.Satisfaction	0.708	0.529	0.812	0.652	0.694	0.762	0.797	

Table 6. Collinearity Assessment for Structural Model

VIF	Employee engagement	Employee happiness
Employee engagement		2.082
Employee happiness		
Self-esteem	1.874	
Benign stress	1.908	2.082
Second-order constructs		
First-order constructs	Employee engagement	Benign stress
Commitment	2.729	
Loyalty	2.148	
Performance	1.834	
identification	3.141	
satisfaction	2.824	
Demands		1.072
Support		1.072

Note: VIF (Variance Inflation Factor) < 3.3

Table 7. Structural results

Relationship	β	Standard Deviation	T Statistics (O/STDEV)	P Values	2.5%	97.5%	f ²
<i>Direct effect</i>							
Employee engagement → Employee happiness	0.655***	0.064	10.255	0.000	0.528	0.771	0.468
Benign stress → Employee engagement	0.363***	0.052	7.034	0.000	0.261	0.463	0.210
Benign stress → Employee happiness	0.122 ns	0.069	1.767	0.078	-0.021	0.248	0.016
<i>Control variables</i>							
Gender → Employee engagement	0.084 ns	0.041	2.049	0.053	0.007	0.166	
Age → Employee engagement	0.036 ns	0.032	1.126	0.261	-0.026	0.100	
Self-esteem → Employee engagement	0.510***	0.054	9.454	0.000	0.389	0.606	
<i>Specific indirect effect</i>							
Benign stress → Employee engagement → Employee Happiness	0.238***	0.040	5.918	0.000	0.164	0.315	
<i>Second order formative</i>							
Demands → Benign stress	0.287***	0.063	4.530	0.000	0.142	0.386	
Support → Benign stress	0.886***	0.041	21.710	0.000	0.799	0.963	
Commitment → Employee engagement	0.199***	0.010	20.160	0.000	0.181	0.218	
Loyalty → Employee engagement	0.118***	0.007	17.922	0.000	0.105	0.131	
Performance → Employee engagement	0.119***	0.008	15.573	0.000	0.104	0.134	
Identification → Employee engagement	0.414***	0.013	31.772	0.000	0.391	0.441	
Satisfaction → Employee engagement	0.314***	0.013	23.553	0.000	0.289	0.339	
		R ² Employee engagement	0.672	Q ² Employee engagement	0.527	NAF	66.1%
		R ² Employee happiness	0.559	Q ² Employee happiness	0.369		
		Model fit					
		SRMR	0.068	Chi-Square	156.159		
		d_ ULS	0.304	NFI	0.855		
		d_ G	0.142				

Note: *** $p < 0.001$; ns: not significant; f²: effect size; VAF: variance accounted for;

Appendix A. Interviews script

Introduction to the subject of study (AI algorithms and agents in the hospitality and tourism industry workplace).

A brief explanation of the research goals to participants.

Opening questions about name, age, job role, academic background and level of experience interacting with AI algorithms and agents in the workplace.

Brief explanation of the four types of AI - mechanical, analytical, intuitive, and feeling - according to Huang and Rust, 2018.

Question A. Firstly, I would like to ask you all what you know about artificial intelligence in general.

Question B. How long are you interacting with AI in the workplace, and how was the adjustment made?

Question C. Have you ever felt forced to deal\work\interact with AI in the workplace environment?

Question D. Do you believe that are tasks made by humans that can be replaced by artificial intelligence?

Question E. Do you believe AI (algorithms and agents) can be a valid team member?

Question F. Do you think that AI can influence employees' psychological aspects, such as stress?

Question G. Do you think AI is helpful in your workplace and the industry (hospitality and tourism)?

Question H. What is your opinion about a team composed of human employees and AI (algorithms and agents)?

Question I: Do you think it is possible to have AI taking decisions daily without supervision?

Question J: Now I would like to present you a scenario and then make some questions.

John is a head chef at the Hotel X restaurant. The company has recently acquired and implemented several robotic arms to automate food preparation and minimise human involvement in the cooking processes in the restaurant's kitchen. These robots are capable of precisely and consistently measuring, sorting, cutting, and chopping ingredients; mixing ingredients with sauces and condiments; and cooking the food, adjusting to personalised orders from customers. One (human) kitchen staff is responsible for plating and a waiter for serving the food and interacting with customers. With the help of an AI system, John oversees the menu, recipes, and kitchen inventory, making sure that taste and freshness of the food served are guaranteed.

- a) Given this scenario which intelligence do you think the AI system possesses, mechanical, analytical, intuitive, or feeling?
- b) What would be necessary for having intuitive or feeling AI in this scenario?
- c) Which of these (i.e., types of AI) are more necessary to implement first\soon?

Question K: Considering your work environment and experience, what do you think will be the near future for the hospitality and tourism industries?

Appendix B. Descriptive statistics

Construct	Item	Mean	Median	Min	Max	Standard Deviation	Kurtosis	Skewness
Commitment	My commitment to the firm increases because of the use of AI	3.605	4.000	1.000	7.000	1.606	-0.971	-0.089
	Working with AI , I am very committed to delivering the brand promise to our customers	4.140	4.000	1.000	7.000	1.425	-0.024	-0.458
	This firm with AI has a great deal of personal meaning for me	3.920	4.000	1.000	7.000	1.498	-0.561	-0.213
Demand	With AI, I need to work very fast	3.280	3.000	1.000	7.000	1.225	0.061	0.223
	With AI, I need to work very intensively	3.360	3.000	1.000	7.000	1.323	-0.363	0.123
	With AI, I need more effort in my job	3.405	3.000	1.000	7.000	1.382	-0.622	0.056
	With AI, I have enough time to do my tasks	4.710	5.000	1.000	7.000	1.306	0.355	-0.480
Employee happiness	With AI, I have conflicts in the team	2.650	2.000	1.000	7.000	1.284	0.372	0.749
	The experience of working with AI contributes very much to my happiness in life	3.405	4.000	1.000	7.000	1.349	-0.542	-0.018
	The experience of working with AI is very meaningful	4.340	4.000	1.000	7.000	1.387	-0.278	-0.367
	The experience of working with AI is very personally fulfilling	4.645	5.000	1.000	7.000	1.407	-0.165	-0.359
	I am proud to tell others that I am part of the firm that uses with AI	4.855	5.000	1.000	7.000	1.324	-0.064	-0.485
	I feel a sense of ownership toward this firm that uses AI	4.250	4.000	1.000	7.000	1.403	-0.389	-0.387
	My sense of pride toward the firm that uses AI is reinforced by its message	4.335	4.000	1.000	7.000	1.450	-0.362	-0.322
Identification	While I work with AI , I view the success of the firm as my own success.	4.430	5.000	1.000	7.000	1.420	-0.148	-0.496
	While I work with AI , the company is like a family to me	3.530	4.000	1.000	7.000	1.486	-0.756	-0.169
	If I work in a firm with AI, I would talk about this firm, usually saying “we” rather than “they.”	3.925	4.000	1.000	7.000	1.594	-0.505	-0.235
	When someone praises this firm because of using AI, it feels like a personal compliment.	3.925	4.000	1.000	7.000	1.664	-0.897	-0.083

Construct	Item	Mean	Median	Min	Max	Standard Deviation	Kurtosis	Skewness
Loyalty	I will be happy to spend the rest of my career working with AI	3.895	4.000	1.000	7.000	1.511	-0.575	-0.346
	I do not have an intention to stop using AI at my workplace at this moment	5.235	5.000	1.000	7.000	1.556	-0.067	-0.694
Performace	My intention to stay is driven by the fact that I like to work with AI	3.310	4.000	1.000	7.000	1.474	-0.742	-0.048
	My performance in a team with AI exceeded expectations.	4.295	4.000	1.000	7.000	1.170	0.350	-0.291
	Working with AI, the amount of opportunity for my performance improvement at my firm is high	4.815	5.000	1.000	7.000	1.200	0.270	-0.320
	When I work with AI, I receive recognition for a job well done	4.200	4.000	1.000	7.000	1.418	-0.441	-0.263
Satisfaction	In a team with AI, I feel close to people at work	3.590	4.000	1.000	7.000	1.312	-0.348	-0.050
	While I work with AI, I feel good about working at the firm	4.235	4.000	1.000	7.000	1.338	0.071	-0.362
	When I work with AI, I feel secure about my job	4.175	4.000	1.000	7.000	1.362	-0.475	-0.237
	Giving me the possibility to work with AI, I believe management is concerned about me	3.915	4.000	1.000	7.000	1.469	-0.419	-0.100
	On the whole, I am satisfied with myself, interacting with AI at my workplace	4.720	5.000	1.000	7.000	1.308	0.189	-0.441
Self-esteem	In a team with AI, I take a positive attitude toward myself.	4.625	5.000	1.000	7.000	1.255	-0.090	-0.286
	I feel that I have a number of good skills to interact with AI	4.695	5.000	1.000	7.000	1.346	-0.154	-0.557
	I am able to interact with AI at my workplace as well as most other people	4.850	5.000	1.000	7.000	1.571	-0.257	-0.467
	In a team with AI, I feel that I'm a person of worth.	4.480	5.000	1.000	7.000	1.261	0.161	-0.422
Support	There is a calm and pleasant atmosphere working with AI	4.280	4.000	1.000	7.000	1.225	0.002	-0.007
	I get on well with my AI and co-workers	4.690	5.000	1.000	7.000	1.278	0.219	-0.357
	My AI co-workers support me	5.410	5.000	2.000	7.000	1.188	-0.030	-0.496
	My AI co-workers understand if I have a bad day	2.495	2.000	1.000	7.000	1.619	-0.313	0.818
	I get on well with my supervisors in a team with AI	4.690	5.000	1.000	7.000	1.270	0.468	-0.358
	I enjoy working with AI	4.960	5.000	1.000	7.000	1.268	-0.035	-0.369