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# Neurodata-based headsets for the (digital) employee well-being – responsibilities between benefit and harm

Silvia Traunwieser
*Department of Legal Theory, International and European Law, Faculty of Law, Business and Economics, University of Salzburg, Salzburg, Austria*

## Abstract

**Purpose** – This study aims to demonstrate the importance of recognizing stress in the workplace. Accurate novel objective methods that use electroencephalogram (EEG) to measure brainwaves can promote employee well-being. However, using these devices can be positive and potentially harmful as manipulative practices undermine autonomy.

**Design/methodology/approach** – Emphasis is placed on business ethics as it relates to the ethics of action in terms of positive and negative responsibility, autonomous decision-making and self-determined work through a literature review. The concept of relational autonomy provides an orientation toward heteronomous employment relationships.

**Findings** – First, using digital devices to recognize stress and promote health can be a positive outcome, expanding the definition of digital well-being as opposed to dependency, non-use or reduction. Second, the transfer of socio-relational autonomy, according to Oshana, enables criteria for self-determined work in heteronomous employment relationships. Finally, the deployment and use of such EEG-based devices for stress detection can lead to coercion and manipulation, not only in interpersonal relationships, but also directly and more subtly through the technology itself, interfering with self-determined work.

**Originality/value** – Stress at work and EEG-based devices measuring stress have been discussed in numerous articles. This paper is one of the first to explore ethical considerations using these brain–computer interfaces from an employee perspective.

**Keywords** Workplace stress detection, Digital well-being, Brain–computer interfaces, EEG, Autonomous decision, Self-determined work, Manipulation

**Paper type** Research paper

## Abbreviations

BCI = Brain–computer interface;
BVP = Blood volume pulse;
ECG = Electrocardiogram;



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EDA = Electrodermal activity;
EEG = Electroencephalogram;
GSR = Galvanic skin response;
HR = Heart rate; and
PPG = Photoplethysmography.



## Introduction

The COVID-19 pandemic has led to not only a huge increase in digitalization (Amankwah-Amoah *et al.*, 2021) but also a stronger focus on stress and health due to huge changes in everyday (working) life (Kaushik and Guleria, 2020; Zhang *et al.*, 2022). The uncertainties and dangers, especially at the onset of the pandemic (protecting vulnerable groups, lack of protective equipment, testing procedures, adequate drugs and efforts to make health-care systems operational and efficient), have justified massive and stressful restrictions on liberty from a legal and ethical perspective, at least in the short term (Forman and Kohler, 2020; Joseph, 2020; Sun *et al.*, 2022). Businesses, schools, kindergartens and universities were closed; night curfews were partly imposed; and remote working was initiated, depending on the profession. The abrupt switch to remote working, changing work demands, lack of space, caring responsibilities, intensification of work, lack of office and work equipment, feeling of constant availability, blurring of boundaries between personal and professional life and technological changes can be seen as COVID-related stressors (Bathini and Kandathil, 2019; Rodríguez-Modroño, 2022; Tavares, 2017; Wöhrmann and Ebner, 2021). The pandemic can be described as a universal and chronic stressor, according to Pfeifer *et al.* (2021), and as a normal reaction to such an extraordinary situation, it cannot be completely detached from workplace stress and technostress (Gamonal-Limcaoco *et al.*, 2022; Pfeifer *et al.*, 2021; Tarafdar *et al.*, 2007; Teasdale, 2006). Greater focus and attention to employee health, particularly mental health, is a major concern for companies (Masri *et al.*, 2023; Page and Vella-Brodrick, 2009; Rigó *et al.*, 2021). Detecting, managing and reducing stress are key factors in employee well-being (Burke and Page, 2017; Elzeiny and Qaraqe, 2018; Teasdale, 2006). Neurotechnologies designed to promote employee well-being can help improve physical and mental health (Coates McCall *et al.*, 2019; Masri *et al.*, 2023). These brain–computer interfaces are based on EEG and use algorithms to capture stress, workload, fatigue, engagement, relaxation, interest or e.g. focus (Hou *et al.*, 2015; Ijjada *et al.*, 2015; Purnamasari and Fernandya, 2019). The use and deployment of neurodata-based headsets can lead to improvements as well as deteriorations (Widdicks, 2020; Monge Roffarello and De Russis, 2019). A critical assessment from an ethical perspective is not only necessary but also helpful for organizations.

This paper starts with a clarification of the term stress and proceeds to focus on stress in the workplace. The negative effects of chronic stress on companies and employees as well as the biased, incomplete and subjective nature of conventional stress detection highlight the importance of EEG-based detection methods. Using these brain–computer interfaces, Section 2 briefly explains the concept of well-being and adds a positive aspect of digital well-being to its one-sided negative definition. In the following ethical considerations, responsibility is first explained. In addition to economic and legal responsibilities, contractual and self-chosen responsibilities are relevant in the context of employment relationships. The often-synonymous use of duty and responsibility requires closer attention, as weaker and positive duties without enforceability (as self-chosen responsibilities) play a crucial role in employee well-being. Identifying stress is a weaker positive duty as a self-chosen responsibility. Deterioration in the context of autonomy is the focus of the following ethical considerations. Reflecting on the nature of labor relations as asymmetrical and heteronomous relationships, criteria for personal autonomy are needed from a philosophical standpoint. Oshana's considerations and external criteria are used as starting points.

The use and application of neurodata-based headsets in companies can interfere with employee autonomy. In addition, the influences of coercion or manipulation in the context of autonomous decisions or self-determined work are at the center of considerations.

**Workplace stress**

Work can be meaningful and give a sense of purpose (Bailey *et al.*, 2019; Hardering, 2015; Yeoman *et al.*, 2019); however, it can also make employees sick (Bauer, 2013; Burke, 2017; Härmä *et al.*, 2006; Leka and Cox, 2008). Stress at work is not only a very complex but also an everyday phenomenon when it comes to achieving company goals, meeting deadlines, dealing with new aspects of work or technologies (Härmä *et al.*, 2006; Herrero *et al.*, 2012; Schabracq and Cooper, 2000; Williams and Normand, 2003). As Teasdale (2006) mentions, "we all perform at our best when under the right amount of pressure. There comes a point when the pressure becomes too much and our performance suffers." The association between stress and negative factors has become commonplace (Kinman and Jones, 2005). Nevertheless, it is necessary to clarify that stress is not a health impairment but a reaction to external stimuli. The response, as a broad constellation of reactions, can be a sign of physical and emotional damage [Everly and Rosenfeld, 1981/2012; International Labour Organization (ILO), 2016; Ursin and Eriksen, 2004]. This negative impact of workplace stress is the focus of this study, as it is essential for organizations to identify, manage and prevent stress (Brunner *et al.*, 2019; Hassard *et al.*, 2014; Hassard *et al.*, 2018). Due to its ambiguity, stress does not have a straightforward definition (Herrero *et al.*, 2012). Based on the classic notion according to Selye, it is "the nonspecific response of the body to any demand made upon it" (Selye, 1973). Although this study has not gone unquestioned or uncriticized (Jackson, 2014; Martin, 1984; Viner, 1999), other definitions are based on similar statements. This imbalance "involve[s] demands that tax or exceed the person's resources" (Lazarus, 1984). Furthermore, Koolhaas *et al.* (2011) state that the "environmental demand exceeds the natural regulatory capacity of an organism, in particular situations that include unpredictability and uncontrollability. Physiologically, stress seems to be characterized by either the absence of an anticipatory response (unpredictable) or a reduced recovery (uncontrollable) of the neuroendocrine reaction." The ILO's definition of stress as a harmful physical and/or emotional response because of an "imbalance between the perceived demands and the perceived resources and abilities of individuals to cope with those demands" (ILO, 2016) is consistent with the above characteristics.

All these definitions share a common theme: the presence of an imbalance that depends on the situation, person or resources available to deal with it. The focus on workplace stress has shifted toward chronic stress and its mental health repercussions, driven by evolving work environments. This is pertinent because it can lead to adverse outcomes for individuals, organizations and society (Härmä *et al.*, 2006; Herrero *et al.*, 2012; Kompier, 2006; Page *et al.*, 2014; Teasdale, 2006). Subjective factors influencing workplace stress include educational background (Lunau *et al.*, 2015; Marinaccio *et al.*, 2013), age (Marinaccio *et al.*, 2013; Galanakis *et al.*, 2009), gender (Herrero *et al.*, 2012; Marinaccio *et al.*, 2013; Galanakis*et al.*, 2009), relationship status (Galanakis *et al.*, 2009) and personality (Burke, 1999; Lecic-Tosevski *et al.*, 2011). Work environment stressors detrimental to health are multifaceted, encompassing ergonomic factors (Abbasi *et al.*, 2020; Feuerstein *et al.*, 2004; Herrero *et al.*, 2012), noise/temperature levels (Abbasi *et al.*, 2020; Sander *et al.*, 2021; Witterseh *et al.*, 2004), work design such as deadlines, workload (Bowling and Kirkendall, 2012; Zhao *et al.*, 2023), boring, monotonous tasks (Thackray, 1981), work intensification (Mauno *et al.*, 2023; Paškvan *et al.*, 2016) or digital technologies/technostress (Atanasoff and Venable, 2017; Tarafdar *et al.*, 2007) and relations/leadership (Cortina *et al.*, 2017; Lyons and Schneider, 2009; Schyns and Schilling, 2013; Sloan *et al.*, 2010; Zhou *et al.*, 2015) (Leka and Cox, 2008; Rigó *et al.*, 2021; Schabracq *et al.*, 2003).

The negative impacts of work-related stress on corporate levels are primarily evident in economic costs due to reduced productivity, increased error rates, absenteeism, turnover intentions, sick leave, unpreparedness and impaired decision-making (Teasdale, 2006). Employees may experience diverse adverse effects categorized as physical (higher blood pressure, higher heart rate, muscle tension, headache, chest pain, fatigue, insomnia, weak immune system, stomach and digestive issues, high blood sugar), emotional/cognitive (tension, anxiety, restlessness, irritability, defensiveness, mood swings, lack of motivation, poor concentration, hypersensitivity, anger, depression, increased forgetfulness, decreased ability to think clearly or focus) and behavioral reactions (impatience, quickness to argue, increased use of alcohol, drugs, tobacco, neglect of responsibilities, poor job performance) [Bickford, 2005; Canadian Centre for Occupational Health and Safety (CCOHS),), 2018; Ford *et al.*, 2011; Gedam and Paul, 2021; Kinman and Jones, 2005; Page *et al.*, 2014; Siegrist and Rödel, 2006; Teasdale, 2006].

Occupational stress and health risks are interconnected (Ganster and Rosen, 2013; Rigó *et al.*, 2021; Schabracq *et al.*, 2003). Recognizing stress is essential in promoting employee well-being (Cartwright and Cooper, 2014). Advances in digital technologies have introduced new methods for stress detection. Physiological stress symptoms can now be comprehensively monitored over the long term (heart-, brain-, muscle-, electrodermal activity, blood volume/blood pressure or skin temperature) using smartphones, wearable devices, sensors and headsets (Canali *et al.*, 2023; Garcia-Ceja *et al.*, 2018; Han *et al.*, 2017). New non-invasive methods for measuring stress provide deeper insights into stress research (Alberdi *et al.*, 2016; Can *et al.*, 2019; Canali *et al.*, 2023; Masri *et al.*, 2023; Witterseh *et al.*, 2004). Behavioral signals such as speech patterns, facial expressions, keystroke dynamics, body gestures and mobile phone usage can also indicate stress through observable external actions (Alberdi *et al.*, 2016; Can *et al.*, 2019; Lopes *et al.*, 2022; Masri *et al.*, 2023). Psychological signals, often linked to negative emotional responses like frustration, anger, anxiety and irritation, can be evaluated using self-reported questionnaires or interviews on stress levels. However, perceived and reported stress levels are inherently subjective, incomplete and biased, contributing to variations observed in studies comparing physiological and perceived stress levels (Alberdi *et al.*, 2016; Can *et al.*, 2019; Masri *et al.*, 2023). Voice and emotion recognition, coupled with physiological signals, offer promising avenues to overcome these challenges (Baird *et al.*, 2021; Giannakakis *et al.*, 2019; Koldijk *et al.*, 2016; Kyamakya *et al.*, 2021; Panicker and Gayathri, 2019; Scherer *et al.*, 2008).

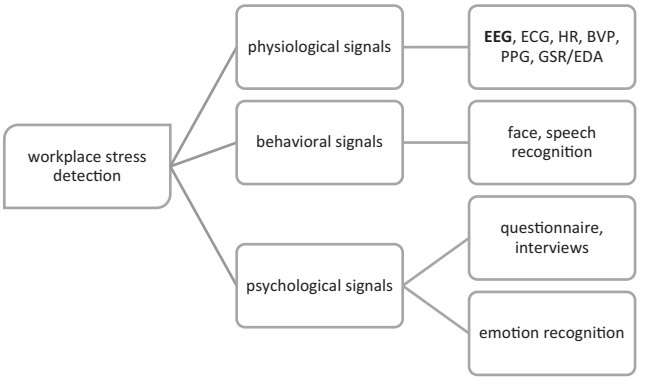
Figure 1 provides an overview of stress detection methods. To shed more light on the ethical implications, this study focuses on low-cost neurodata-based headsets that provide information on stress in real time by measuring brain waves through EEG and using AI for analysis (Vos *et al.*, 2024). Wireless and low-cost EEG recording headsets, also known as brain–computer interfaces, have a tremendously growing market. Its areas of application include gaming, education, automotive and health sectors (Ali *et al.*, 2022; He *et al.*, 2023). Neurotechnology with significant improvements in the doctor–patient relationship (e.g. epilepsy) can be transferred to the workplace to detect stress (Coates McCall *et al.*, 2019; Nagar and Sethia, 2019; Pathirana *et al.*, 2018; Soufineyestani *et al.*, 2020). In this respect, the labor sector can be added to the areas mentioned above:

> The latest neuroscience reveals that the human brain is the primary target of mental stress, because the perception of the human brain determines a situation that is threatening and stressful (Subhani *et al.*, 2017).

Using EEG for stress detection as a noninvasive neuroimaging modality based on objective and physiological signals, sensors/electrodes must be placed on the human scalp (Gedam and Paul, 2021; Masri *et al.*, 2023; critical Alberdi *et al.*, 2016). Four main frequency bands can be named:

(1) Alpha (8–13 Hz);

(2) Beta (13–30 Hz);




**Sources:** Masri *et al*. (2023) and Giannakakis *et al*. (2019)

**Figure 1.** Overview of stress detection

(3) Delta (0.1–4 Hz); and
(4) Theta (4–8 Hz).

However, in stress detection, it is mainly the alterations of alpha and theta frequency bands (Can *et al.*, 2019; Gedam and Paul, 2021; Kumar and Bhuvaneswari, 2012). According to Vos, when monitoring stress using low-cost EEG devices, "the beta, gamma and alpha frequency bands provided the highest correlation with stress" (Vos *et al.*, 2024).

These neurodata-based headsets detect stress alongside other states such as fatigue, workload, emotions, excitement, engagement, relaxation, interest and focus (He *et al.*, 2023). For a comparison of similar semi gel-free, low-cost and EEG-based headsets, see Radüntz and Meffert (2019) and Vos *et al*. (2024). The setup and data recording process usually involve a training session via an application. Depending on the device, users receive feedback on stress levels, emotions, concentration, alertness and other metrics through visualized data (Ali *et al.*, 2022; Al-Kaf *et al.*, 2020; Heunis, 2016).

**Digital well-being**

The use of neurodata-based headsets in organizations is an active action toward improving workers' health and well-being, differentiating among individual, workplace and organizational factors of employee well-being (Burke and Page, 2017; Cooper and Leiter, 2017) and psychological, physiological and social dimensions (Vakkayil *et al.*, 2017). Well-being factors in the workplace can be equated and characterized, both positively and negatively, with stress factors in the work environment, as mentioned above. One might be tempted to name this the promotion of digital well-being as digital devices support and improve employees' well-being. However, a closer look at the literature reveals that it is one-sided, focusing primarily on the overuse, dependency and reduction or non-use of digital technologies (Almourad *et al.*, 2021; Cecchinato *et al.*, 2019; Roffarello *et al.*, 2023). Yet, digital technologies, including neurodata-based headsets, also offer potential for improvement, necessitating an extension of the definition to encompass these positive aspects (Vanden Abeele, 2021). In this regard:

> Digital well-being is a subjective individual experience of optimal balance between the benefits and drawbacks obtained from mobile connectivity. This experiential state is comprised of affective and cognitive appraisals of the integration of digital connectivity into ordinary life. People achieve digital well-being when experiencing maximal controlled pleasure and functional support, together with minimal loss of control and functional impairment (Vanden Abeele, 2021).

Although further consideration is required to adapt this definition, it can be used as a starting point, extending it to the use of digital devices instead of mobile connectivity/digital media.

Creating an awareness of how, when and why a person is stressed, unfocused or unconcentrated at work and providing personalized feedback with EEG-based headsets in combination with algorithms highlight the positive aspects of these devices. There is a substantial body of literature on stress research, but recently, there has been a proliferation of EEG-based devices (Värbu *et al.*, 2022). Surprisingly, there is limited literature on the ethical implications of these brain–computer interfaces (Canali *et al.*, 2022, 2023). This gap needs to be addressed, in particular regarding autonomy in the work context.

**Ethical considerations from a business ethics point of view**

An introduction is Canali *et al.*'s (2023) paper about "Wearable technologies and stress: toward an ethically grounded approach." As organizations seek to identify and mitigate stress through appropriate measures, Canali's focus concentrates on clinical research and personal purposes for more accurate and objective stress measurements personalized through digital means, such as fitness trackers like Fitbit wristband or Garmin Smart Watch during work. However, the data were collected from a purely private perspective for medical reasons (personal, forwarding data for clinical care or data for research). By contrast, EEG-based headsets in the workplace introduce organizational interests alongside individual interests. Wearables are viewed favorably from an ethical perspective, aligning with Beauchamp and Childress' "Principles of Biomedical Ethics." These principles – beneficence, non-maleficence, autonomy and justice – affirm that individuals gain comprehensive and reliable data through wearables that operate day and night. Provided that the devices are accurate and certified, creating awareness and assessing stress levels is positive. Simultaneously, it should be noted that data or knowledge of stress can generate stress. The no-harm principle is interpreted in such a way that more harmful and invasive tests are avoided in favor of non-invasive wearables (Canali *et al.*, 2023). However, the differentiation required by Beauchamp and Childress was not fully made. Preventing harmful and invasive methods can be interpreted to maximize benefits and minimize harm according to the principle of beneficence (Beauchamp and Childress, 2019). Canali *et al.* argued that more information on stress increases decision-making autonomy (awareness and empowerment). Justice focuses on equity, enabling more people to obtain information on their stress levels (Canali *et al.*, 2023). Although not applicable to EEG-based headsets, this study presents an interesting approach. The ambivalence toward using these devices, which can also be found in BCI-supported applications, has become evident. Starting with responsibility, ethical considerations seem different, but have more parallels than expected. Additionally, autonomy should be prioritized, along with positive and negative responsibilities.

*Responsibilities*

As a multidimensional term, someone (subject of responsibility) is responsible for something (object of responsibility) to someone (instance of responsibility) related to a certain standard (economic, legal, technical, theological or moral norms) (Werner, 2011). The organization as an entity, as well as its members and representatives (directors, managers, leaders,

individuals, boards and workers' councils), can be the subject of responsibility. Actions, consequences, decisions and persons (external responsibility) can be the objects of responsibility. While these spheres and criteria of responsibility often overlap, conflicts can arise within and between norms (e.g. moral norms vs economic norms) (Loh, 2017; Wimmer, 2011). Employment relationships are defined by contractual responsibilities, which derive their binding force from agreements and can be terminated by either party (Jonas, 1984). Legal responsibilities extend beyond contractual obligations, encompassing duties such as the employer's payment obligation or duty of care (occupational health and safety, privacy), but also the employee's personal duty to work, the associated time and place requirements, as well as obligation to follow instructions (for a global overview of the links, see www1,1, 2024). In addition to the economic responsibility to make a profit to secure the company's existence and pay taxes or wages, the self-chosen areas of responsibility (e.g. CSR, work–life balance) that go beyond the legal framework are particularly interesting in business ethics (Jonas, 1984; Neuhäuser, 2011b). Although technological responsibility can be an issue in combination with stress recognition (Grunwald, 2020; Jonas, 1984; Jonas, 2016; Lenk and Maring, 2017), a narrow focus on stress detection and deployment in a company is used. It represents responsibility in the context of decisions and the implementation of those decisions, whether and how to use a BCI device for stress detection. As the subject of responsibility (the company, supervisor, management, employee) as the decision-maker as well as the object (decision) is clear, and the focus is not on those who develop and design this technology, the adapted version of the responsibility and technology (addressee problem, dilution of responsibility, sharing responsibility of engineers) can be excluded (Johnson, 2015; Lenk and Maring, 2017).

Exploring corporate responsibilities in detecting and addressing stress to promote employee health and well-being is not solely an economic responsibility for enhancing productivity and profitability (Cartwright and Cooper, 2009; Krekel *et al.*, 2019; Miller, 2016). It also is a self-chosen responsibility beyond legal requirements [GDPR (EU) 2016 / 679; AI-Act Regulation (EU) 2024/1689]. To clarify these self-chosen responsibilities, pertinent to business ethics and often voluntary (Jonas, 1984; Neuhäuser, 2011b), a closer examination of duties is necessary.

The synonymous use of the term duty and responsibility requires clarification (Neuhäuser and Buddeberg, 2015). Responsibility entails systematic identification and distribution of positive and negative duties, where abstract moral rights and duties align with specific (moral) agents (Neuhäuser, 2011a). Negative duty/responsibility can be understood as not harming someone or something (Heidbrink, 2010; Petersen, 2017). The focus of this negative duty, also called "neminem laedere," is refraining from harmful actions/consequences of actions as well as avoiding deteriorations (Mieth, 2012; Wettstein, 2010). The workplace design, in conjunction with stress at work, involves decisions and actions within the organizational sphere. Avoiding harmful practices such as perpetual deadlines, excessive workloads, work intensification (telework or flexible work blurring work–life boundaries, constant availability), ongoing technostress (malfunctioning technology, constant hardware/software updates, technological substitution of human labor), job insecurity and dysfunctional relationships and leadership is crucial for employee well-being (Atanasoff and Venable, 2017; Cortina *et al.*, 2017; Korunka and Kubicek, 2017; Leka and Cox, 2008; Rigó *et al.*, 2021; Schabracq *et al.*, 2003; Schyns and Schilling, 2013; Tarafdar *et al.*, 2007).

Furthermore, it is imperative to avoid using headsets if device security or data reliability cannot be assured. This is critical because drawing conclusions from unreliable tools may lead to incorrect, potentially harmful or misleading conclusions – e.g. misidentifying high stress levels when they are absent, and vice versa. Low-cost EEG devices show promise in stress

detection, with ten out of 15 reviewed studies reporting predictive accuracies above 90% (Vos *et al.*, 2024). However, technical considerations and data quality for machine learning models pose limitations for these inexpensive devices (Vos *et al.*, 2024). Issues such as sensor placement and count, lack of physical activity during stress detection, dry electrodes affecting brain region interpretations due to volume conduction or confounding factors, varying data among studies (e.g. EEG data only vs multimodal approaches with additional biosignals), divergent data analysis methods (machine learning algorithms), small sample sizes and differing EEG device models reduce result generalizability (Katmah *et al.*, 2021; Vos *et al.*, 2024). Furthermore, the potential impact of undisclosed mental health conditions in test subjects on predictive model accuracy warrants consideration (Vos *et al.*, 2024).

Supplementary to the imperative to do no harm as a negative duty (Attfield, 2001; Lübbe, 2000), positive duties play a pivotal yet contentious role (Birnbacher, 2015; Kamp, 1996; Kant, 1990; Lichtenberg, 2010; Mieth, 2012). Positive duties entail active actions that promote improvements, contrasting with negative duties that involve refraining from actions. This strong positive duty for example fosters occupational safety and protects employee lives. Conversely, a weaker positive duty exists to encourage the health and well-being of employees, including to identify, detect and manage stress. However, these responsibilities are often voluntary, imperfect, vague and self-imposed within the domain of business ethics, lacking legal or sometimes moral enforceability (Mieth, 2012; Neuhäuser and Buddeberg, 2015; Vogelmann, 2015). This is crucial for improving the well-being of employees and workplace design (Hardering, 2015; Parker and Grote, 2022), but the ways in which potential interventions are implemented vary. The question remains: does using these headsets not only enhance employee well-being but also potentially produce negative effects? Autonomy concerns are central. If the company provides the headset as a tool for work, used daily with data stored in a cloud accessible not only to the employee but also to immediate supervisors, the following questions arise:

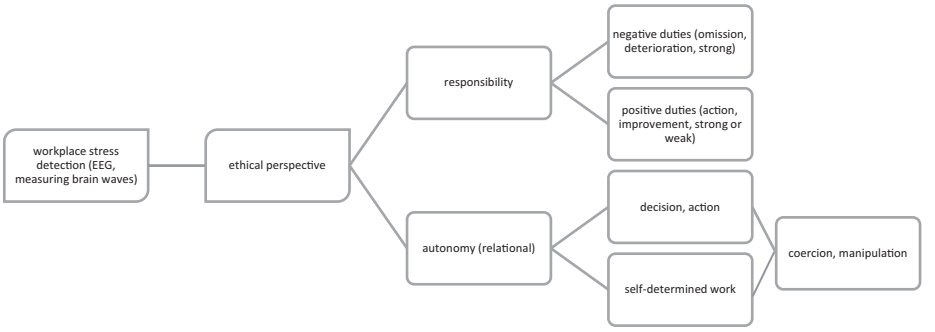
*Q1*. Does the employee have the autonomy to decide whether to use the headset? What does it need?

*Q2*. How can the provided headset interfere with self-determined work?

The following visualization summarizes what has already been mentioned about responsibility and provides an outlook in the context of autonomy considerations. Figure 2 provides an overview of ethical considerations related to responsibility and autonomy in the detection of workplace stress.

*Autonomy*

First, a brief excursion into the fields of law and economics is provided to introduce the relevance of autonomy in the work context. Relational employment and leadership relationships, in a narrower sense (bound by instructions and dependency), are characterized by asymmetrical roles with different opportunities to influence the pursuit of organizational goals (Ulrich, 1998/2002; D'Art and Turner, 2006; Schmalzried *et al.*, 2021). With the flexibilization of work and the associated dissolution of work boundaries, autonomy debates are increasingly finding their way into labor law, although it is diametrically opposed to heteronomy and subordination (Glowacka, 2021). New forms of work – from working from home and flexible work to platform work in the gig economy – have highlighted the need to adapt the law. Thus, more attention has been paid to autonomy aspects (Glowacka, 2021; Gruber-Risak and Dullinger, 2018; Hendrickx, 2018; Zlatanovic and Ostojic, 2021). While




**Source:** Author's own work

**Figure 2.** Overview of ethical considerations related to responsibility and autonomy in the detection of workplace stress

workplace autonomy as telework has found its way into new forms of work, the question remains whether autonomy in and at work as self-determined work is also possible in "traditional" subordinated forms. The need for adaptation is obvious but challenges labor law in questioning the essential characteristics of dependent versus self-employment (Gruber-Risak and Dullinger, 2018; Gruber-Risak, 2021; Güldenberg and Langhof, 2021; Güldenberg, 2021; Hendrickx, 2018; Zlatanovic and Ostojic, 2021).

From an economic perspective, which has dealt with autonomy in and at work since the late 1970s, a much more comprehensive picture has emerged. The concept of freedom of choice for employees in the performance of their work tasks, which has thus far been rather broad, can be subdivided into several categories (Kubicek *et al.*, 2017). According to Kubicek *et al.* (2017), and derived from Morgeson and Humphrey (2006), job autonomy is differentiated into scheduling autonomy in work tasks, planning autonomy in making task-related decisions and autonomy in selecting work methods:

> Initially viewed as the amount of freedom and independence an individual has in terms of carrying out his or her work assignment […], recent research has expanded this conceptualization to suggest that autonomy reflects the extent to which a job allows freedom, independence, and discretion to schedule work, make decisions, and choose the methods used to perform tasks (Morgeson and Humphrey, 2006).

These working methods can be added to when (time autonomy) and where to work (workplace autonomy) (Kubicek *et al.*, 2017). A combination of when and where to work autonomously is understood as "flexible work" (Chung and Van der Lippe, 2020; Putnam *et al.*, 2014). Flexible work location models are better known as telework or remote work (Nakrošienė *et al.*, 2019; Perry *et al.*, 2018). First, teleworking as a flexible work location model is not primarily a matter of autonomy, but rather a complementary option of choice. Moreover, despite the abundance of economic literature on job and task autonomy, there is a gap between what self-determined work means and what preconditions are necessary.

Before pointing out the ambivalence of the use of the device, it is important to briefly clarify not only the concept of autonomy, but also whether autonomy is possible in externally

determined work relationships. In this context, it is useful to distinguish between autonomous actions and decisions, and the personal autonomy as a starting point for self-determined work (Betzler, 2016). At the same time, Betzlers' maximum definition can be seen as a transition to personal and relational autonomy by including the formation of opinions, reflecting those opinions as well as their implementation despite resistance (Betzler, 2016).

According to the minimum definition of autonomy, "person P is autonomous in the minimal sense if he/she can decide and act unhindered and voluntarily" (Betzler, 2016). This requires that the person makes the decision or action not only without influence, but also with the minimum requirements of rational capacity or self-control (Berofsky, 1995; Betzler, 2016). This refers to the ability to process information appropriately (Giesinger, 2017). A parallel can be drawn to Beauchamp and Childress' explanations: they also deal with the patient's cognitive ability to process relevant information. The fact that difficulties in the doctor–patient relationship differ due to illness, dementia or minors should be mentioned only very briefly (Beauchamp and Childress, 2019). In the corporate context, competence in terms of autonomy as an average intelligent, rational and insightful person is, in my opinion, less relevant than the absence of coercion and manipulation, which might affect voluntariness.

Coercion as a threat, excluding force, is understood to influence the will of a person by altering their intentions or dispositions (Anderson, 2023; McCloskey, 1980; Nozick, 1969). Coercion exists only when an intentional and credible threat displaces a person's self-determined course of action (Anderson, 2023; Beauchamp and Childress, 2019). Susser *et al.* (2019a) identified coercion as limiting acceptable options that another person might choose, "by not undermining or circumventing the decision-making faculties, but by making the coercer's way the only acceptable one." Differentiating manipulation from coercion, "coercion is blunt and forthright: one almost always knows one is being coerced. Manipulation is subtle and sneaky" (Susser *et al.*, 2019a).

Manipulation of interpersonal interactions can be viewed as a hidden, covert, intentional and deceptive influence on a person (Susser *et al.*, 2019a; Todd, 2013). The deceptive influence can be derived from Ware's (1981) explanation:

> […] with manipulation, A has control over B to the extent that, by structuring the environment in which B chooses, he makes it more likely that, unknown to B, or in a way B does not understand, B will choose some alternatives rather than others.

Although manipulation is often associated with deception, creating false beliefs is not always a required element (Noggle, 1996; Rudinow, 1978; Susser *et al.*, 2019a). The ambivalence and vagueness of manipulation can be seen in Ackerman's list of conditions for manipulativeness: influence, shrewdness, deviousness, indirect means, artfulness, aim to benefit the manipulator, subtlety, inhabitation of rational deliberation, falsification, omission of information or e.g. deceptiveness (1995). The conclusion is that no conditions on the list are sufficient (Ackerman, 1995). Barnhill (2019) compares not only the conditions and methods but also the possible definitions and, based on Noggle's attempt at clarification (1996), arrives at the following adapted definition:

> Manipulation is intentionally directly influencing someone's beliefs, desires, or emotions such that she falls short of (the manipulator's) ideals for belief, desire, or emotion in ways typically not in her self-interest or ways that are likely not to be in her self-interest in the present context.

Another aspect of manipulation, besides the restriction and undermining of a person's autonomy, is its association with wrongness as something unethical (Ackerman, 1995), which is not addressed here.

Personal autonomy is the concretization of freedom and self-government (Bobbert and Werner, 2014). How do you want to live and work? The difficulty of the notion of autonomy is demonstrated by Dworkin:

> It is used sometimes as an equivalent of liberty (positive or negative in Berlin's terminology), sometimes as equivalent to self-rule or sovereignty, sometimes as identical with freedom of the will. It is equated with dignity, integrity, individuality, independence, responsibility, and self-knowledge. It is identified with qualities of self-assertion, with critical reflection, with freedom from obligation, with absence of external causation, with knowledge of one's own interest. It is related to actions, to beliefs, to reasons for acting, to rules, to the will of other persons, to thoughts and to principles. About the only features held constant from one author to another are that autonomy is a feature of persons and that it is a desirable quality to have (Dworkin, 1981).

According to Rössler (2011), based on one's own reasons, considerations, motives, desires, autonomy establishes responsibility and demands respect from others. To be considered an autonomous person, a person should be able to account to oneself why, in certain situations where personal choices were made, a person chose one option and not another and why a person chose to live/work in one way and not another (Rössler, 2002). Supplementary to subjective autonomy competencies (the actual capacity for reasonable self-determination), external circumstances (the scope for freedom, coercion and manipulation) may also be relevant (Bobbert and Werner, 2014; Oshana, 1998; Susser *et al.*, 2019a). In contrast to hierarchical, internalist theories (Dworkin, 1981; Frankfurt, 1989) that focus solely on a person's internal psychological state, social-relational and externalist theories better depict asymmetrical working relationships. Based on Christman (2009), a need for philosophical and political theories can be derived to the effect that the human being as a social being, embedded in social structures and in connection with other people, groups, institutions:

> Experience themselves and their values as part of ongoing narratives, and that they are motivated by interests and reasons that can only be fully defined with reference to other people and things.

Relational autonomy can be divided into weakly substantive (Benson, 2005; Mackenzie, 2008) and strongly substantive (Christman, 2009; Oshana, 1998) concepts (Oshana, 2013). At the same time, it represents a bold attempt to transfer the foundation associated with feminist theory to the world of businesses and work. However, as Baumann argued, social conditions for autonomy are accepted. How are these social conditions structured? (Baumann, 2008).

Oshana's (1998) explanations in "Personal Autonomy and Society" are the conceptual starting point. The following four conditions are relevant to personal relational autonomy (Oshana, 1998):

(1) critical reflection;

(2) procedural independence;

(3) access to an adequate range of relevant options; and

(4) social-relational properties.

The ability to reflect critically is evident when a person adopts the perspective of a third person when evaluating actions, motives or the environment. Based on this assessment, if a person accepts his or her motives as his or her own and can identify with them, they are considered authentic. Procedural independence requires an environment free from influential, coercive or manipulative factors. An adequate range of options represents a variety of real-existing choices; the scope for decision-making does not include whether a person can only choose non-autonomously. The last condition of social relations is the

realization of goals in a socially and psychologically safe environment. It is about realizing goals, values, interests and needs that differ from those of people who have influence and power over them, without being hindered or subjected to regressions that could prevent the person from realizing them (Oshana, 1998). From an internalist perspective, a lack of autonomy cannot be imputed to people who, by signing an employment contract, consciously place themselves in a freely chosen relationship bound by instruction and determined by others. However, if interpersonal relationships and social institutions that influence work life (subordination and dominance) allow for control over decisions and provide opportunities for self-development, an autonomous person would exist despite subordination (Oshana, 1998).

Rössler (2012a, 2012b) addressed meaningful work from the perspective of personal autonomy. This means being able to influence, intervene or co-decide on work processes/work design. This is work that the person has freely chosen to do and where the person's specific skills and knowledge can be used. Using one's own talent and abilities, one's own "individuality" in work and production activities in a self-determined way to realize oneself is considered essential. In addition, the work must be sufficiently complex and interesting, and its execution requires a certain amount of intelligence. For work not to be considered externally determined/heteronomous but meaningful, all these requirements must be met. Parallels can be drawn from Oshana's remarks to the extent that intelligence is linked to subjective autonomy competencies. The design of working conditions can be linked to having influence (without coercion or manipulation) in the context of work through the availability of appropriate options.

*Conclusions on stress detection and autonomous decisions*

Returning to the first question, do employees have the autonomy to decide whether to use the headset? If so, what is required to be autonomous? In addition to the possibility that the use of a headset raises awareness of a person's stress level, the device may distract from actual work, require time to adapt, cause discomfort (Duru *et al.*, 2013) and be simultaneously stressful. If the company decides that the employee may decide and act unhindered and voluntarily, use or not use the headset and adapt or ignore the feedback provided, it can be seen as an autonomous decision and action. As noted above, in employment relationships, this is less a matter of people's competence in autonomy and more a matter of the absence of coercion or manipulation. The threat of sanctions, such as dismissal, poorer transfers and financial restrictions, if the headset is not used, the feedback not only puts pressure on the employee but also influences his or her decision as a way of coercion. As a further example, consider a candidate interested in a job posting. During the interview, the candidate was presented with a declaration of commitment regarding the use of the headset, in addition to information that the employment contract would only be handed over in conjunction with the signed declaration of commitment. This can also be seen as coercion influencing the candidate's will and autonomous decisions regarding the usage of the device. Alternatively, consider the example of an employee to whom the headset is advertised as a digital tool to promote well-being without realizing that it can also be used to monitor attention, concentration and related performance (Muhl and Andorno, 2023). Manipulation owing to information asymmetry is also possible. Describing manipulation as:

> Intentionally directly influencing someone's beliefs, desires, or emotions such that she falls short of (the manipulator's) ideals for belief, desire, or emotion in ways typically not in her self-interest or ways that are likely not to be in her self-interest in the present context, Barnhill (2019) showed on the one hand the imbalance by withholding information (Clarkson *et al.*, 2007), and on the

other hand that providing information is a prerequisite for the decision-making process (Luhmann, 2009).

Instead, the question arises of whether the collection of health data raises the issue of informed consent. When digital technologies are used that allow invasions of privacy for employee monitoring (Hansson and Palm, 2005), the term "thin consent" is used (Martin and Freeman, 2003; Moore, 2000). However, when it comes to the invasion of employees' health data, this thin line of consent no longer seems sufficient (Hansson, 2006).

*Conclusions on stress detection and self-determined work*

Depending on the company's policies, the feedback provided by the headset software may influence autonomous decisions if constant and high stress levels mean not only short breaks from work but possibly even longer breaks from work. While interpersonal relationships (management, supervisor-to-employee) are at the forefront of influencing autonomous decisions through contractual instruction by coercion or manipulation, subtle forms are the focus in the context of self-determined work. Moreover, there is the question of the extent to which self-determined work is influenced by technology itself. The focus has shifted from interpersonal to technological and digital manipulation (Nyholm, 2022). This can lead to a subconscious adjustment of work performance, resulting in "anticipatory conformity" (Brown, 2000; Martin and Freeman, 2003; Rosengren *et al.*, 2017; Zuboff, 2015). Assuming that self-determined work is accepted, this represents a subtle form of a possible manipulation related to the use of digital technologies. Susser *et al.* (2019a) overview of manipulation as a "function by exploiting the manipulee's cognitive (or affective) weaknesses and vulnerabilities in order to steer his or her decision-making process towards the manipulators ends" illustrates the possibility of technology-based manipulation. Furthermore, the daily use of the device and its habituation point to its invisibility as another version of possible, potentially harmful (autonomy-based deskilling, dependency) as well as hidden manipulation (Susser *et al.*, 2019b).

## Recommendations

Although more objective, EEG-based methods for identifying stress seem beneficial and positive for employers and employees, the negative, manipulative and partially unexplored outcomes for humans should not be overlooked. Depending on whether such technologies are considered permissible in the workplace, the potential loss of human capabilities and autonomy-based deskilling must be analyzed in the future. Privacy and monitoring issues as a consequence of informational self-determination have not yet been addressed. Questions about organizational justice and fairness, while relevant to business, remain unanswered. The need for sound and reliable data is even more critical considering the growing demand for neurodata-based devices for stress detection. Further research and studies seem essential in this regard to collect data from a wider population and in the context of the workplace, but also for critical reflection from an ethical perspective.

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**Corresponding author**
Silvia Traunwieser can be contacted at: silvia.traunwieser@plus.ac.at