Doing harm by '*First, do no harm*'?

The effects of patient safety culture on employee green behavior

Master Thesis

MSc Global Business & sustainability

Rotterdam School of Management, Erasmus University Rotterdam

Anouk de Reeder (596651)

Coach: Sai Kalvapelle, Co-reader: Martin de Bree

30-06-2022

Abstract

Healthcare is a highly polluting industry and attention to the need for making this sector more sustainable is growing. In this transition, the role of healthcare workers has been overlooked in research, whereas employee green (environmentally friendly) behavior (EGB) of employees is considered to be of crucial importance to macro-level corporate sustainability and corporate sustainable performance. EGB is influenced by the context in which employees operate, which is in healthcare determined by patient safety culture, focused on minimizing preventable patient safety incidents. This study aims to explore the effects of patient safety culture on employee green behavior in a healthcare organization in a mixed methods case study in a Dutch academic hospital. Qualitative methods include semi-structured interviews (followed by thematic analysis) and quantitative methods include a web-based survey. The main findings were that patient safety culture (1) involves a presumable underlying assumption of a pursuit to avoid *any* patient safety risk, (2) has led to the formation of a rigid environment in which there is little room for (sustainable) change and (3) is heavily prioritized over sustainability, which is disadvantageous for EGB. Directions for future research include exploring how sustainability could be embedded in patient safety risk management.

Statement of originality

This document is written by MSc student Anouk de Reeder who declares to take full responsibility for the contents of this document. I declare that the text and the work presented in this document are original and that no sources other than those mentioned in the text and its references have been used in creating it. The Rotterdam School of Management is responsible solely for the supervision of completion of the work, not for the contents.

Acknowledgements

This thesis marks the end of an exciting academic journey. Writing this thesis would not have been possible without the help of several people that I'd like to thank. Firstly, I want to thank both my coach Sai Kalvapelle and my co-reader Martin de Bree for their insightful advice and helpful feedback that has helped to take my research to a higher level. Furthermore, I'd like to thank Kim van Nieuwenhuizen, Ilse Markensteijn and Elise Blondel for managing the LDE thesis lab about sustainable hospitals. The lectures, workshops and field trips were tremendously interesting and helped me shaped a view of the current topic of healthcare in sustainability in all its dimensions. I'd also like to thank my peers in the thesis lab for their support, interesting conversations and of course the fun we had during this project: Lisanne Wigchert, Rixt van der Giessen, Lieke de Rouw, Alice Wu, Marleen Ungerathen, Robin Weij, Ingena Both, Elaine van Ee and Cathelijne Pallandt. Lastly, I want to thank all of the enthusiastic LUMC employees that were involved in this research. Their stories and aspirations about the future of healthcare were truly inspiring.

Table of Contents

Introduction

First, do no harm.

This phrase is well known to anyone working in the healthcare sector and describes the basic principle they (ought to) follow. Despite this commitment, healthcare is actually causing harm by its high environmental impact and associated negative consequences, like respiratory illness, malnutrition and heat-related illnesses caused by extreme weather events, food and water insecurity, insect-borne diseases, water and food-borne diseases and social instability (Sherman et al., 2020). On a global level, it is estimated that healthcare accounts for about 1-5% of total environmental impacts (depending on what indicator is selected). However, this number differs greatly between low-income and high-income countries: the healthcare sector in the Netherlands is accountable for about 7% of greenhouse gas emissions (Zijp et al., 2021).

Sustainability in healthcare is still in its infancy (Pinzone et al., 2012), although its importance is increasingly recognized as proven by initiatives like the Green Deal on Sustainable Healthcare in the Netherlands (*Green Deal Duurzame Zorg | RIVM*, n.d.). Programs like these and available research mainly focus on the 'technical' aspects of sustainability, e.g. what specific measures can be taken to decrease carbon emissions or waste and what the potential of 'green' buildings is (Wood et al., 2016). Furthermore, research in the field of sustainability in healthcare tends to focus on systemic changes, like the potential of prevention (Sherman et al., 2020). However, organizational and managerial aspects of *implementing* sustainability in healthcare organizations have received far less attention. In research about corporate sustainability, the importance of the 'human factor' is increasingly being recognized. Specifically, employees are considered to be of crucial importance to

macro-level corporate sustainability and corporate sustainable performance in the form of employee green behavior (EGB) (Strauss et al., 2017; Zhang et al., 2021). EGB consists of two types: task-related and proactive EGB. Task-related EGB is performed within the context of an employees' required job duties (Norton et al., 2015, p. 105), whereas proactive EGB goes beyond organizational expectations and can be defined as green behavior involving personal initiative that exceeds organizational expectations. EGB contributes to the implementation of organizational environmental regulations, improving environmental performance, developing sustainable innovations and contributes to a green organizational reputation (Mi et al., 2020).

The field of research on EGB has expanded tremendously over the last couple of years and especially focuses on contextual factors that foster it, which gives managers the opportunity to create a 'green work climate' in which EGB is promoted (Norton et al., 2012). In a green work climate, an employee perceives that the organizational culture reflects the pursuit of being an environmentally friendly organization (Tahir et al., 2019).

In healthcare, the work context is heavily influenced by the *patient safety culture*, which may in turn affect EGB (Sammer et al., 2010). Patient safety culture can be seen as a specific form of organizational culture in which a focus on minimizing preventable harm is central. This is to be achieved by not blaming mistakes to individual healthcare workers, but to inadequate systems in which these workers operate. Instead of punishing individuals for incidents, learning from mistakes is central to avoid them in the future (Granel-Giménez et al., 2022; Kaplan & Forst, 2017; Sammer et al., 2010). A culture of safety is not exclusively found in healthcare, but also in sectors in which errors can lead to detrimental consequences and even disasters, like aviation and nuclear power plants (Kirwan et al., 2019; Pronovost et al., 2003). Organizations like these are also referred to as high reliability organizations (Kirwan et al., 2019; Pronovost et al., 2003; Sammer et al., 2010). Visible practices (also

referred to as 'artefacts') of patient safety culture aimed to prevent human error are checklists, standardized protocols and time-outs during surgeries (Lark et al., 2018).

However, several patient safety practices and standards have negative consequences in the form of being a major driver of avoidable pollution and wasted resources. These practices are mostly related to infection prevention and include single-use instruments (Clements et al., 2020; Thiel et al., 2018), energy-intensive HVAC systems (Gordon, 2020) and the high use of disposable gloves (Lee, 2013; Singh et al., 2021). The evidence of these practices is mixed and ambiguous, whereas they do lead to a high environmental burden. Thus, this indicates that there seems to be a sustainability tension in healthcare between the environmental and social dimension, as patient safety can be classified as a form of social sustainability (Eizenberg & Jabareen, 2017; Hahn et al., 2015). At the same time (elements of) patient safety cause environmental damage, which leads to a temporal tension: the current system is focused on ensuring short-term social sustainability, but in the long-term social sustainability is at threat because of the involved public health risks of environmental damage (Hahn et al., 2015). Thus, in healthcare it seems to be overlooked that environmental sustainability itself can in fact be seen as a case of patient safety, as it prevents (environmental) pollution that involves public health risks. This tension between patient safety and environmental sustainability has already been identified in research on a systemic level (Sherman et al., 2020). However, it has not been investigated yet how it affects healthcare workers and their pro-environmental behavior (EGB).

Little research has been done on EGB in a healthcare setting or in any other high reliability organization. However, previous studies on perceptions of environmental sustainability of healthcare workers indicated that they feel sustainability is important and feel they a responsibility to address it, but that this did not lead to them taking actions in the organization (Anåker et al., 2015; Dunphy, 2014). It was also found that they behaved at

home more sustainably than at work. This indicates a pro-environmental attitude – behavior gap, in which the organizational context (PSC) seems to hinder EGB in a way. Predicting how exactly *how* patient safety culture might affect EGB is complex. This is, despite the vast amount of research on the subject, because of a limited understanding of patient safety culture due to the high amount of quantitative research. Understanding organizational culture in all its dimensions requires rich interpretative methods, which is hardly done in this field (Churruca et al., 2021).

The goal of this research is to explore why pro-environmental attitudes and a felt responsibility to make healthcare more sustainable does generally not lead to actual sustainable actions and behaviors in healthcare workers by examining the effects of the patient safety culture on EGB (Anåker et al., 2015; Dunphy, 2014). The research aims to answer the following research question:

How does patient safety culture affect employee green behavior (EGB) in healthcare organizations?

Our study contributes to existing literature in multiple areas. Firstly, it expands the field of research on patient safety culture literature by examining PSC qualitatively and examining it thoroughly on all levels of organizational culture. Currently, 95,5% of studies on patient safety culture exclusively used self-report surveys to assess safety culture, which leads to a limited illustration of the complex phenomenon (Churruca et al., 2021). Secondly, we contribute to the research field of sustainability in healthcare by approaching it at the micro (organizational) level. Currently, research either focuses on technical possibilities or on more systemic, abstract changes. Besides, in this field Sherman et al. (2020) recognized a

research gap in the relationship between safety and sustainability, to which our study can add knowledge.

Furthermore, our research can help inform healthcare managers in recognizing how EGB is currently fostered or hindered in the organizational context. This knowledge can help them in creating an environment in which EGB is stimulated. Increasing EGB is relevant as it increases organizational sustainable performance (especially task-related EGB), which is needed to achieve the agreements in the Green Deal on Sustainable Healthcare (*Green Deal Duurzame Zorg | RIVM*, n.d.). Moreover, it can help in identifying new opportunities and contribute to innovation (proactive EGB), especially as non-managerial employees have strong knowledge of daily operations that reaches deeper than managerial ('top-down') knowledge (Weigt-Rohrbeck & Linneberg, 2019).

The structure of this research is as follows. Firstly, a review of the current literature on sustainability in healthcare, EGB and patient safety culture is given. Secondly, the methodology is described, which includes justification for the chosen methods and describes how the data was collected and analyzed. Thirdly, the results are described. Lastly, the results are interpreted and discussed and limitations and directions for future research are described.

Literature review

Sustainability in healthcare

Organizations increasingly focus on sustainable development and on limiting their environmental impacts as the potentially detrimental consequences of mankind are increasingly being recognized and they feel responsible to take actions (Myers et al., 2021; Steffen et al., 2015). Sustainable development can be defined as "meeting the needs of the present generation without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 41). While the healthcare sector has a major environmental impact, it has stayed behind in terms of sustainable development compared to other sectors (Rodriguez et al., 2020). This environmental impact consists of the emission of greenhouse gases, waste generation, air pollution and use of (scarce) water (Haines & Patz, 2004; Lenzen et al., 2020; Sherman et al., 2020). On a global level, it is estimated that healthcare accounts for about 1-5% of total environmental impacts (depending on what indicator is selected). However, this number differs greatly between low-income and high-income countries: the healthcare sector in the Netherlands is accountable for about 7% of greenhouse gas emissions (Zijp et al., 2021). Hospitals are significant polluters and account for about 35% of total emissions of health services (Keller et al., 2021). A paradox can be found in the field of healthcare and its environmental impact: the core mission is preventing and curing diseases, but the sector itself contributes to climate change, which in turn causes detrimental health risks and diseases. Environmentally-mediated health effects include respiratory illness, malnutrition and heat-related illnesses caused by extreme weather events, food and water insecurity, insect-borne diseases, water and food-borne diseases and social instability (Sherman et al., 2020).

Awareness of the importance of sustainability amongst healthcare professionals has been low (Walpole et al., 2019), but over recent years attention has grown in both practice

and research. In the Netherlands, the covenant 'Green Deal on Sustainable Healthcare' was constituted in 2018 and focuses on speeding up the transition to a more sustainable healthcare system (*Green Deal Duurzame Zorg | RIVM*, n.d.). This deal by more than 300 stakeholders (including the Dutch Ministry of Health, Welfare and Sport) and focuses on both social and environmental sustainable targets: carbon reduction, socially and environmentally responsible procurement, fewer pharmaceutical residues in drinking water and a healthy environment for care workers and patients (*Green Deal Duurzame Zorg | RIVM*, n.d.). Furthermore, research attention has grown as well and research on sustainability in healthcare has touched upon a broad variety of themes and fields. Sherman et al. (2020) described the research scope of sustainable healthcare in a narrative review, in which they identify several areas of research. The first area is about healthcare emissions and attracted the most attention in research. This area includes calculations of the environmental impacts of the healthcare sector as a whole (top-down research) and calculations of environmental impacts of specific products, pharmaceuticals and care pathways, mostly done by using Life Cycle Assessments (LCAs) (Langstaff & Brzozowski, 2017; Shani & Mohrman, 2012). These analyses help identify environmental hotspots in hospitals (Keller et al., 2021).

The second area in sustainable healthcare research is about effects of the implementation of sustainable practices in hospitals, which emphasizes the lack of sustainability metrics in existing reporting systems. Furthermore, research increasingly broadens its scope in recognizing that the implementation of sustainable practices (e.g. green-building design) is not only beneficial for the environment, but also for patients and staff members in terms of well-being (Wood et al., 2016). Besides, the current sole focus on patient outcomes and safety complicates the implementation of sustainable measures. An example of this can be found in standards regarding infection prevention. A common principle regarding infection control is that there is "no limit to the cost or material required

to avoid any risk of healthcare acquired infection" (Sherman et al., 2020, p. 7). Furthermore, evidence of standards currently in use to prevent infections is often mixed and ambiguous. An example of this can be found in standards for heating, ventilation and air-conditioning (HVAC), which is highly energy-intensive, and disposable gloves and single-use medical devices leading to high amounts of waste (Lee, 2013). The last theme Sherman et al. (2020) briefly touch upon is the lack of knowledge and education regarding sustainability amongst healthcare workers. Based on the current findings of research in this field, Sherman et al. (2020) conclude that in order to become more sustainable, all aspects of the healthcare delivery system require re-thinking and re-designing.

The narrative research exposes that most research is either about specific (practical) alternatives in decreasing environmental impact (e.g. using different anesthetics with lower greenhouse gas properties), or about sustainability in healthcare on a systemic level, which includes rethinking current medical standards and exploring the effects of prevention (Sherman et al., 2020). Research on the role of the employee in the transition to sustainable healthcare is underexposed. There has been some research on the perception of healthcare workers on environmental sustainability in their work (Anåker et al., 2015; Dunphy, 2014). A study about the perception of nurses of climate change and environmental issues indicated that nurses feel they have a responsibility to address these issues. However, this does not lead to actions as other job demands are perceived as more important (Anåker et al., 2015). Another study shows that healthcare workers that cared for the environment took more sustainable actions in their personal lives and their professional lives, which indicates situational constraints in the work environment (Dunphy, 2014). Both studies indicate a pro-environmental attitude – behavior gap (Bamdad, 2019) and suggest that the work environment affect people in a way that it hinders their environmentally friendly behavior, but it did not examine *why* this was the case.

Employee green behavior

In the field of sustainable development, the importance of employees has increasingly been recognized, which has led to research attention to employee green behavior (EGB) (EGB) (Katz et al., 2022). The success of organizational strategies and related practices to become more environmentally sustainable relies on the response of employees to these strategies and practices, expressed in the form of EGB (Davis et al., 2012; Mi et al., 2020; Yeşiltaş et al., 2022). EGB contributes to the implementation of organizational environmental regulations, improvement of environmental performance, development of sustainable innovations and the formation of a green organizational reputation (Mi et al., 2020; Ones & Dilchert, 2012). EGB can be classified into two types: task-related (required) EGB and proactive (voluntary) EGB. Task-related EGB is green behavior performed within the context of an employees' required job duties (Norton et al., 2015, p. 105). Task-related EGB involves conforming to organizational policies and procedures and choosing responsible alternatives in methods of work. Proactive EGB goes beyond organizational expectations and can be defined as green behavior involving personal initiative that exceeds organizational expectations (Boiral & Paillé, 2012; Norton et al., 2015; Ramus & Killmer, 2007). Proactive EGB can help in identifying new opportunities and contribute to innovation, especially as non-managerial employees have strong knowledge of daily operations that reaches deeper than managerial ('top-down') knowledge (Weigt-Rohrbeck & Linneberg, 2019). Based on theories on organizational citizenship behavior, Boiral and Paillé (2012) identified three subtypes of voluntary EGB. The first type is referred to as eco-initiatives and involves taking personal initiatives in the workplace. Eco-civic engagement is the second type and involves supporting and engaging with projects and initiatives taken by the organization. The last type is eco-helping behavior, which involves helping and encouraging colleagues to become more environmentally friendly in the work place (Boiral & Paillé, 2012).

The level of expression of EGB is influenced by personal characteristics as well as situational factors (Norton et al., 2015). Research has found that a pro-environmental attitude often does not lead to ecological behavior because of situational constraints (Kaiser & Gutscher, 2003; Klöckner & Oppedal, 2011), which is most frequently explained by the theory of planned behavior (TPB) (figure 1), which has proven its explanatory value in this field of research (Goncalo & Katz, 2020; Kaiser & Gutscher, 2003; Katz et al., 2022; Norton et al., 2015; Wesselink et al., 2017). TPB states that the main antecedent of a behavior is someone's intention to do the behavior, which is shaped through attitudes, norms and perceived behavioral control. Attitudes include positive evaluations of the behavior and more specifically about whether someone thinks the behavior leads to certain desired outcomes. Norms entail the perceived social pressure to execute the behavior. Perceived behavioral control is someone's belief in how hard it is to execute the behavior, which includes self-efficacy (Ajen, 2002). The latter is influenced by influences like time, opportunity and dependence on others (Kaiser & Gutscher, 2003). All three elements of the theory of planned behavior have been shown to EGB intentions (Katz et al., 2022).
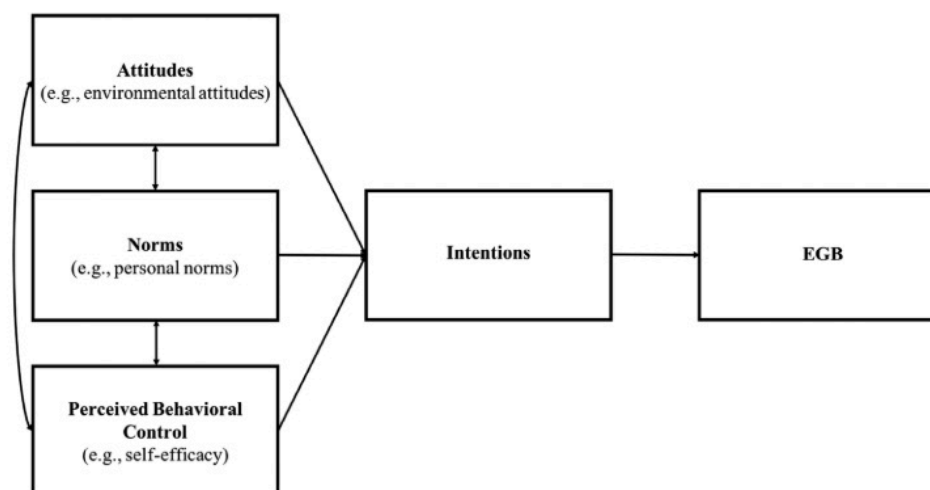

Figure 1: theory of planned behavior applied to EGB (Katz et al., 2022)

Factors affecting EGB

Personal factors affecting EGB identified in previous research include individual traits like conscientiousness, someone's pre-existing pro-environmental attitude (someone's concern for the environment), environmental beliefs and environmental knowledge (Kim et al., 2020; Liobikiene & Poškus, 2019; Norton et al., 2015). Habits play a role in the way that habits at home, like separating waste, can lead to showing the same behavior in the workplace because of a 'spillover' effect (Blazejewski et al., 2018). Furthermore, job factors like job satisfaction, organizational commitment and organizational identification are positively correlated with EGB (Katz et al., 2022). Person-organization fit has been found to promote EGB in the workplace (Mi et al., 2020). When the personal values of an employee align with the values of the organization, he/she experience a sense of belonging to the organization. This leads to positive attitudes and behaviors towards the organization, including EGB.

A variety of situational factors affect EGB. Organizations can influence these situational factors to create a 'green work climate' as this is shown to promote EGB (Norton et al., 2014). A work climate is perceived as 'green' if an employee feels that the organizational culture reflects the pursuit of being an environmentally friendly organization (Tahir et al., 2019). This consists of perceived (environmental) norms, shaped by employees' perceptions of how the organization and co-workers view environmental sustainability. A finding by the study by Norton, Zacher and Ashkanasy (2014) is that the two types of EGB were affected differently, depending on the type of norm. Green work climate perceptions of the organization (injunctive norms: 'what ought to be done') were only positively associated with task-related EGB, and perceptions of colleagues (descriptive norms: 'what people actually do') were only positively associated with proactive EGB.

Furthermore, perceived organizational environmental support is part of a green work climate. If an employee perceives organizational support for EGB, their affective commitment to EGB is increased, which consequently leads to higher engagement to EGB (Kim et al., 2020). Perceptions of organizational support is the degree to which an employee believes an organization values their work and cares about their welfare. Organizations can use Green HRM (GHRM) practices aiming to form a green organizational culture (Zhu et al., 2021). GHRM is the alignment of HRM practices with organizational environmental goals and includes trainings, rewards and incentives (Cantor et al., 2012; Graves et al., 2013; Kim et al., 2020).

Patient safety culture

EGB in healthcare organizations specifically has received little research attention thus far. As shown, there are many situational factors that affect EGB. However, the context of healthcare organizations is shaped by Patient Safety Culture (PSC), a specific form of organizational culture which in turn might affect EGB. The focus on the importance of patient safety culture was triggered by the publication of the book 'To Err is Human: Building a Safer Health System' by the Institute of Medicine (IOM), an NGO focused on providing advice related to health and health policy (Kohn et al., 2000). This publication revealed that in the U.S. yearly approximately 99,000 patients died due to errors that could have been prevented. Furthermore, the report made specific recommendations in order to improve patient safety and lower the number of preventable harmful events. Recommendations included constituting a national Center for Patient Safety, setting performance standards and expectations for safety, incorporating safety systems in organizations, which includes leadership and simplification (Kohn et al., 2000). This publication led to public pressure to improve patient safety and ultimately led to the patient

safety movement, in which different healthcare stakeholders (e.g. governments, regulatory groups) tried to make efforts to improve safety in healthcare, initially mostly focused on establishing patient safety standards and metrics.

After the initial focus on developing standards and metrics, the focus of the patient safety movement moved to the need for a culture of safety (patient safety culture; PSC) (Lark et al., 2018). PSC fundamentally revolves around not blaming mistakes on individual healthcare workers, but on inadequate systems in which these workers operate. PSC revolves around learning from these mistakes to avoid them in the future (Granel-Giménez et al., 2022; Kaplan & Forst, 2017; Sammer et al., 2010). This is referred to as a "just culture" in which employees feel safe to admit mistakes and in which mistakes are seen as 'learning points'. Furthermore, there is a strong focus on evidence-based practice, which entails that decisions on patient care are based on the best available and relevant evidence (Sonğur et al., 2018).

A culture of safety is not exclusively found in healthcare, but also in sectors in which errors can lead to detrimental consequences and even disasters, like aviation and nuclear power plants (Kirwan et al., 2019; Pronovost et al., 2003; Sammer et al., 2010). Organizations like these are also referred to as high reliability organizations. In building a safer healthcare system, practices from other high reliability organizations were applied, like checklists similar to those used by pilots in aviation and briefing protocols derived from the military (Lark et al., 2018).

Patient safety culture has gained massive attention in both research and practice, yet results on the efficiency of patient safety interventions in lowering preventable errors and harm are mixed (Baines et al., 2015; Lark et al., 2018; Sim et al., 2022). In the Netherlands, a decrease of 30% in preventable errors was found in the period 2008-2012, but this result was not statistically significant (Baines et al., 2015). Other studies conclude that interventions in

the field of specific and individualized practices show improvements, yet other more systemic areas like coordinated oversight of patient safety have had less success (Lark et al., 2018).

PSC is a specific form of organizational culture. Organizational culture is interpreted differently by scholars and has many definitions, but it is associated with the dynamic set of norms, attitudes and behaviors that influence actions of members of the organizations (Jung et al., 2009; Schein, 2010). A common framework to identify organizational culture is Schein's model of organizational, which analyzes organizational culture on three levels based on the degree of 'visibility' (Baumgartner, 2009).

The first level of organizational culture is referred to as 'artifacts' and describes the observable level of culture (Schein, 2010). In PSC, safety systems in organizations can be seen as an artefact (Kohn et al., 2000). The design of these systems is based on human factor theory, which states that errors are often attributable to characteristics and limitations of human cognition. Safety systems are focused on reducing complexity, simplification and standardized processes to avoid reliance on vigilance and memory. An example of this are time-outs during surgeries and the use of checklists (Kohn et al., 2000; Nolan, 2000). The second level is referred to as espoused values and includes the declared set of values and norms by the organization, which is in PSC formed by the focus on a 'just culture' in which individuals are not blamed. The third level is the 'heart' of an organizational culture and is referred to as underlying assumptions, comprised of unconscious shared assumptions, thoughts, beliefs and perceptions (Schein, 1990). This level of organizational culture is the hardest to measure and identify and requires rich interpretative methods (Churruca et al., 2021).

Investigating and 'capturing' organizational culture on all levels requires rich interpretative methods, which typically involves a combination of qualitative and quantitative

methods. Healthcare differs in this sense from other industries because of its almost-exclusive use of surveys. 95,5% of studies on patient safety culture exclusively used self-report surveys to assess safety culture (Churruca et al., 2021). In both practice and research, surveys are mostly used to identify areas of improvement (Mannion & Davies, 2018). Surveys have multiple advantages, like cost-effectiveness, ease of administration and the ability to assess the effect of a certain intervention and compare PSC over time and between different units (Jung et al., 2009). Studies that solely use surveys to assess PSC are based on the assumption that PSC can act as a 'remedy' to improve quality and patient safety outcomes (Mannion & Davies, 2018). Yet, viewing and assessing PSC solely as a 'managing tool' does not assess all levels of organizational culture (Schein, 2010). Strictly speaking, surveys only measure (patient) safety climate, which can be seen as the 'surface level' of culture (Ehrhart & Schneider, 2016; McLean, 2005). Surveys capture the first and second level of organizational culture, although they tend to focus on the espoused values, as artefacts are more context specific because of the uniqueness of healthcare organizations (Churruca et al., 2021; Hoffmann et al., 2014). Because of the lack of qualitative in-depth methods in PSC research, little is known about the basic underlying assumptions. Yet, basic underlying assumptions are considered to be the essence of organizational culture and determine the other levels. This level of culture can be seen as the ultimate source of values and actions and changing these basic assumptions is extremely hard (Linnenluecke & Griffiths, 2010; Schein, 2010). Not understanding the basic underlying assumption may lead to a misinterpretation of the first and second level (Gartshore et al., 2017). A study by Feng et al. (2008) identified 'patient safety as the first priority' as an example of a basic underlying assumption of PSC. Yet, few studies have explicitly focused on the basic underlying assumptions of PSC. A study by Hoffman et al. (2014) about PSC simply classified basic underlying assumptions as 'not measurable' and did not consider it further in their analysis.

Potential effects of PSC on EGB

As PSC is embedded through an organization on different levels, it could affect EGB in many ways, both positively and negatively. Predicting *how* PSC exactly affects EGB is complex. This is because PSC itself is (partly) context dependent and cannot be pre-specified. Furthermore, as described not all dimensions of PSC are properly understood because of the lack of qualitative and mixed-methods in this field of study. Furthermore, little is known about EGB in the context of healthcare. However, based on the antecedents of EGB and what is generally known about PSC, some potential effects can be identified. Firstly, perceptions of PSC (espoused values level of organizational culture) could affect EGB positively because of the person-organization fit (Mi et al., 2020). The aim of PSC is maximizing patient safety, based on values like fairness and respecting human limits. This can be seen as universal moral values as these are values that are perceived as inherently positive and important and for (almost) all people (Schwartz, 2005). In other words: (almost) everyone would agree on the notion that patients should be able to trust healthcare organizations in doing everything in their power to ensure their safety and prevent errors. This can be seen as a 'values fit' and following the results of the study by Mi et al (2020), this alignment of values can lead to positive attitudes and behaviors towards the organization and specifically to EGB.

Nevertheless, PSC could also affect EGB negatively, based on aspects of the theory of planned behavior. As indicated by the narrative review on sustainability in healthcare by Sherman et al (2020), a common viewpoint in healthcare regarding patient safety in the form of infection prevention is that there is "no limit to the cost or material required to avoid any risk of healthcare acquired infection" (Sherman et al., 2020, p. 7). This has amongst other things led to infection prevention standards and behaviors that lead to pollution, while these measures are often not evidence-based (Gordon, 2020; Seifert & Guenther, 2019). As there seems to be a norm that 'safety *always* comes first, no matter what', employees may feel that

sustainability is not important - or at least not as important as safety - which in turn can negatively affect EGB.

Furthermore, perceived behavioral control on proactive EGB might be negatively affected by the high standardization of protocols and tasks in PSC (Ajen, 2002). Standardization and established protocols lead to less room for change, which thus may lead to lower perceived behavioral control to execute proactive EGB as there are few possibilities to perform such behavior. This would not be the case for task-related EGB, as this behavior does not require changes to the environment as it involves adhering to set organizational goals.

Methodology

Research design

This research was conducted using a mixed-methods case study design. A case study was suitable in our study as it is appropriate for research that aims to answer *why/how* questions (1), takes place in an environment in which the researcher has little control over events (2) and covers a present-day phenomenon in (some sort of) a real-life context (3) (Phelan, 2011).

Mixed-methods provides for integrating both breadth (quantitative) and depth (qualitative) of knowledge. This is especially relevant in the context of researching PSC as assessing all its dimensions requires qualitative methods to capture contextual nuances and deeper components (Churruca et al., 2021; Taras et al., 2009). For the quantitative part of the research, a descriptive, cross-sectional online survey was used. The quantitative part of the research focused on the '*what*': it aimed to describe the general perceptions of patient safety culture, EGB and perceptions of a green organizational climate. The latter was included to get a sense of to what extent the employees currently perceive the organizational climate as 'green', which has been proven to affect EGB (Norton et al., 2014). Furthermore, the survey allowed for the examination of possible relationships between these variables. The qualitative part of the research focused on the *why/how* as it allows for examining underlying dynamics (Eisenhardt, 1989). These methods included semi-structured interviews and observations. Semi-structured interviews are conducted using a set of pre-defined questions that assure the topics of the research questions are included (Kallio et al., 2016). The researcher is however flexible in using these questions and is flexible in diving deeper into a topic that pops up during the interview by using probes. This allows for more detailed and rich information by letting participants express their opinions freely. Observations allowed for insights into the physical environment of the hospital and the behavior of employees. This gave insights into

the current organizational culture (especially on the level of artefacts) and employee green behavior, especially task-related EGB as this behavior (e.g. separating waste, turning off lights) is more observable than proactive EGB.

This study was part of a greater research project by the LDE (Leiden, Delft, Erasmus collaboration) center for sustainability about sustainability in healthcare (LDE Centre for Sustainability, 2022). The case organization was the LUMC, a university hospital in Leiden, the Netherlands. The LUMC has around 8800 employees and about 880 hospital beds. This hospital combines patient care with research and education (LUMC, 2020). In the field of sustainability, the hospital has some actions in the form of company-wide energy and waste targets and green teams embedded through different departments in the organization. Furthermore, the LUMC signed the Green Deal on Sustainable Healthcare (LUMC, 2020).

Data collection

Quantitative: survey

The online survey was set up in Qualtrics. It was distributed through nonprobability sampling, in the form of convenience and snowball sampling. Contact details of department managers, secretaries and heads of green teams were collected through the intranet. They were contacted via mail in which they were informed about the purpose of the study and asked if they could distribute the survey in their department, using the URL or alternatively, via a poster with a QR code that linked to the survey (that was sent along in the mail). As organizational culture is formed throughout the whole organization (Ehrhart & Schneider, 2016), a variety of departments were approached (clinical and non-clinical) and it was emphasized that any staff member was welcome to fill in the survey. Initially, 21 departments were contacted, but some employees responded that they would also send it to other colleagues. The total sample consisted of 130 participants ($N = 130$).

Survey procedure

The quantitative data was gathered through a survey built via the Qualtrics platform.

Participants were informed that the study was about the role of employees in the transition to

a more sustainable hospital. Confidentiality and animosity were ensured and participants

were informed that they could leave at any time during the survey. Then, the participants

subsequently answered four sets of questions on patient safety culture, EGB, Green

organizational climate, Pro-environmental attitude and demographic variables. Afterwards,

the participants were debriefed, thanked and given the opportunity to leave any comments or

remarks through a text box. The survey was set up in English and then translated in Dutch as

most employees in the LUMC are Dutch. Only for the items measuring patient safety a

validated Dutch translation was available. The other items were translated in Dutch.

Reliability was determined using Cronbach's α, and a score of > 0.6 is considered reliable.

All Dutch translated items had adequate reliability, which was comparable to the original

English construct and were thus considered reliable.

Survey measures

All items were 5-point Likert scale items (1=Strongly disagree, 5= Strongly agree).

Patient safety culture

PSC was measured using 10 items of the Hospital Survey on Patient Safety Culture (HSPSC),

the most frequently used survey to measure patient safety culture (Waterson et al., 2019). The

validated Dutch translation of the HSPSC was used (Smits et al., 2007). The total HSPSC

consists of 12 dimensions and a total of 42 items. To avoid an unnecessary long survey that

could lead to survey dropout (Hoerger, 2010) *and* as we only want to get a sense of overall

perceptions of PSC, the dimensions organizational learning-continuous improvement

(Cronbach's α = .722), management support for patient safety (Cronbach's α = .798) and

overall perceptions of patient safety (Cronbach's α = .707) The scale proved reliable

(Cronbach's α= .766) so the three dimensions were averaged into one total score.

EGB

Both task-related and proactive EGB were measured. Task-related EGB was measured

through 4 items on the employee task performance scale (Cronbach's α = .905) (Bissing-

Olson et al., 2013; Mi et al., 2020). Proactive EGB was measured through 10 items in total

that belong to the three categories of proactive EGB as proposed by Boiral & Paillé (2012):

eco-initiatives (3 items, Cronbach's α = .881), eco-civic engagement (4 items, Cronbach's

α = .837) and eco-helping (3 items, Cronbach's α = .884). The three types of proactive EGB

were averaged into one total score (Cronbach's α = .905).

Green work climate perceptions

Three dimensions of green work climate perceptions were assessed. Items to assess

employee's perceptions of the organizational (4 items, Cronbach's α = .870) and co-workers

(4 items, Cronbach's α = .820) orientations regarding sustainability were derived from

Norton et al. (2014). Furthermore, perceptions of organizational environmental support (3

items, Cronbach's α = .724) were assessed on the scale suggested by Kim et al. (2020). The

three dimensions of green work climate perceptions proved reliable (Cronbach's α = .831)

and were averaged into one total score.

Pro-environmental attitude

The New Ecological Paradigm was used to measure pro-environmental attitude, which is the most widely used measure to do so since its publication in 1978 (Bissing-Olson et al., 2013). In our survey, the shortened 6-item NEP scale was used (Cronbach's α = .707) (Dunlap et al., 2000; Kim et al., 2020).

Job characteristics

The participant was asked whether he/she a direct interaction with patients in his/her job (0 = no, 1 = yes), as we were interested in whether this affected EGB. Furthermore, the participant was asked whether his/her department had a green team (0 = no, 1 = yes, do not know, recoded to = 0) to see if this had any effects on EGB or perceptions of a green work climate.

Demographics

The demographic characteristics age in intervals [18-24], [25-34], [35-44], [45-54], [55-64], [65 and over] [prefer not to say] as asking age through a categorical (closed) question generally leads to higher response rates (Gendall & Healey, 2008; Griffith et al., 1999). Staff position questions were derived from the HSPSC (Waterson et al., 2019).

Qualitative: semi-structured interviews

For the qualitative part of the research, a diverse sample of interviewees (n=6) was gathered through convenience and snowball sampling (table 1). The overarching research project by the LDE (that this study was part of) involved two-weekly in-depth sessions, lectures and workshops about different areas of sustainability within healthcare. Through these sessions, potential interviewees (I2 & I3) were identified and contacted. Two of these interviewees were already involved with sustainability in some way; I2 in the form of taking

initiative in 'greening' the operating room and I3 in the field of medical instruments, like looking for possibilities in the refurbishment of depreciated devices. Through snowball sampling, the remaining interviewees were recruited. The interview guide can be found in appendix A.

Table 1

Overview of interviewees

Interviewee code	Staff function	Direct interaction with patients	'Involved' with sustainability in job
I1	Radiology technician	Yes	No
I2	Medical specialist (Gynecologist)	Yes	Yes
I3	Medical technology employee	No	Yes
I4	Section head/purchaser	No	No
I5	Medical specialist (Radiologist)	Yes	No
I6	Head of safety directorate / Anesthetist	Yes	No

Data analysis

Quantitative

The statistical software SPSS was used for data analytics. Before analysis, the gathered data was prepared. The dataset was checked and corrected for missing data. To summarize the data, frequencies, means, standard deviations and Pearson's Correlations were calculated. Multiple regression analyses were used to examine the relationship between the means of task-related EGB, proactive EGB and the independent variables PSC, Green work climate and pro-environmental attitude. As an exploratory procedure, stepwise regression was used for variable evaluation, in the way that it could indicate which variables had the highest predictive power in both task-related and proactive EGB. These variables were afterwards tested in another multiple regression model. Finally, ANOVA tests were used to assess

whether there were any effects of the job characteristics 'direct interaction with patients' and 'department has a green team' affected PSC, EGB and perceptions of a green work climate.

Qualitative

The qualitative data was analyzed using thematic analysis methods which allow for the identification and analysis of themes (patterns) within data (Braun & Clarke, 2006). The semi-structured interviews were recorded and subsequently transcribed. Then, Atlas.ti (version 22) was used for open and selective coding. Open coding led to an initial number of 213 codes, which was reduced to 109 codes by merging comparable themes. In the axial coding process, these first-order codes were clustered into eleven more abstract themes. Lastly, these themes were ordered into three aggregate dimensions. The coding process was iterative and involved comparing, merging and re-aggregating themes and second-order codes. All of the first-order themes and aggregate dimensions were summarized in a coding tree.

Results

Quantitative results

Data screening and preparation

The initial number of respondents was 130 ($N = 130$), yet 53.8% of this were non-respondents (respondents who did not fill in any questions). These were filtered out by applying a progress filter of >5% (as a progress of 5% was equal to 0 responses), which led to a cleaned sample of 80 ($N=80$). This sample had 57 (71,25%) full respondents and 23 (28,75%) partial respondents. The missing value pattern indicated that the missing data increased as the survey progressed as shown in figure 2. This indicates survey dropout, which can be caused by a variety of factors like survey fatigue, no interest in the topic or lack of time (Hoerger, 2010).
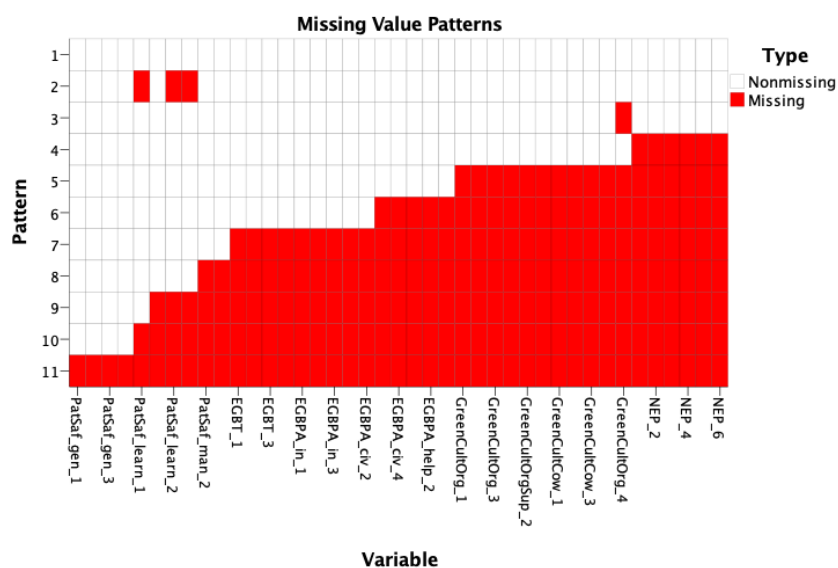
Figure 2: missing value pattern

As missing data can lead to biased parameter estimates and inaccurate standard errors in statistical analyses, multiple imputation (MI) techniques were used to correct for this missing data. Multiple imputation is based on missing data that is Missing Completely at Random or Missing at Random. A missing value analysis indicated that Little's (1988) test of Missing

Completely at Random (MCAR) test was not significant, = 25.429, DF = 65, *p*= 0.311. A significant Little's test indicates that the missing data is not MCAR, which allowed for using multiple imputation to correct for the missing data.

Furthermore, outliers were removed if the absolute standardized value was greater or smaller than 3 ($|z|$>3). Task-related EGB and pro-environmental attitude contained 2 outliers and green working culture 1, so these cases were removed.

Participants

After filtering out non-respondents, the sample was comprised of 80 respondents. Table 2 shows the participants' characteristics of the sample. However, the percentage missing data in the demographics questions was high (around 28%), so it gives a limited picture of the actual sample. As shown, the sample is quite diverse in terms of age and staff position. Furthermore, 70.7% of the participants indicated that they had direct interaction with patients and 63.8% of participants indicated that their department had a green team. 19% indicated that they did not know if their department had a green team.

Table 2

Participant characteristics

Profile of respondents	%	Valid %		%	Valid %
Age			**Staff position**		
25-34	22,5	31,0	Physician	11,3	15,8
35-44	15	20,7	Nurse	13.8	19,3
45-54	16,3	22,4	Technician (e.g. Lab, Radiology)	8.8	12,3
55-64	15	20,7	Administrative	1.3	1,8
65 and over	3,8	5,2	Management	7.5	10,5
Missing	27,5		Facility employee	1.3	1,8
Direction interaction with patients			Researcher	2.5	3,5
Yes	51,2	70,7	Surgery assistant	3.8	5,3
No	21,3	29,3	Student / co-assistant	2.5	3,5
Missing	27,5		Anesthetist nurse	5.0	7,0
			Other	10.0	14,0
Department has a green team			Prefer not to say	3.8	5,3
Yes	46,3	63,8	*Missing*	28,7	
No	12,5	17,2			
Do not know	13,8	19,0			
Missing	27,5				

Descriptive statistics

Frequencies

In table 3, the average frequencies of all variables corrected for missing data can be found. The full frequency table can be found in appendix B, in which all items are included. In total, 56,1% of responses on items measuring PSC were positive. Management support for PSC was the dimension with the lowest positive score (39,1%), whereas the dimension learning-continuous improvement was highest (67,7%). Furthermore, a majority (53,5%) of responses on task-related EGB were positive. Answers on proactive EGB were more divided and negative and positive responses were about equally divided (40,5% / 42,4%). Out of the dimensions of proactive EGB, eco-civic engagement showed the highest frequency of

negative responses (47,4%). Dimensions on green work climate show a relatively high percentage of 'neither' responses (30,4%) compared to other constructs, although the majority of further responses were positive (55,7%). Lastly, pro-environmental attitude showed a high positive frequency (75,5%).

Table 3

Responses (frequencies) to survey measures

	(Strongly) Disagree	Neither	(Strongly) Agree
		Valid %	
General perceptions PSC	14.5	24.0	61.5
Learning-continuous improvement	9.7	22.6	67.7
Management support PSC	20.7	40.1	39.1
Total PSC	15.0	28.9	56.1
Task-related EGB	28.8	17.7	53.5
Eco-initiatives	32.3	17.4	50.3
Eco-civic engagement	47.4	19.0	33.6
Eco-helping	41.7	15.1	43.2
Proactive EGB	40.5	17.2	42.4
Organ. environmental orientation	13.0	25.9	61.2
Organizational environmental support	18.4	33.3	48.3
Co-workers environmental orientation	10.4	32.1	57.7
Green work climate	13.9	30.4	55.7
Pro-environmental attitude	5.7	18.7	75.5

Correlations

Table 4 shows the Pearson Correlations between all variables, as well as the means and standard deviations (SD). Generally, the analysis shows that proactive EGB was weakly positively related with PSC $r = .22$, $p < .01$, Green work climate $r = .29$, $p < .01$ and all underlying dimensions of these variables, although correlation were considered weak as all correlation coefficients were below $r < 0.3$. Furthermore, task-related EGB showed no

significant correlation with PSC $r = .02$, $p > .05$ and GWC $r = .05$, $p > .05$. Pro-environmental attitude was significantly positively correlated with proactive EGB $r = .22$, $p < .01$. There was a non-significant correlation of $r = -.02$, $p > .05$ between task-related EGB and pro-environmental attitude. PSC was weakly positively correlated with GWC $r = .21$, $p < .01$. Furthermore, age was weakly positively correlated with PSC $r = .29$, $p < .01$, and proactive EGB $r = .33$, $p < .01$. Having a green team was positively correlated with Proactive EGB $r = .21$, $p < .01$, but not with task-related EGB $r = -.03$, $p > .05$. Lastly, interaction with patients showed negative correlation with task-related EGB $r = -.33$, $p < .01$, proactive EGB $r = -.15$, $p < .01$ and positive correlation with general perceptions of PSC $r = .3$, $p < .01$.

Table 4

Pearson's correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. PSC: Overall perception	3,49	1.29	--															
2. PSC: Org. learning	3.58	1.51	.48**	--														
3. PSC: Man. support	2.85	1.33	.42**	.58**	--													
4. Patient safety culture	3.31	1.12	.76**	.86**	.82**	--												
5. Task-related EGB	3.24	1.25	-.003	.00	.05	.02	--											
6. Eco-initiatives	3.35	1.67	.15**	.06	.07	.11*	.26**	--										
7. Eco-civic engagement	2.66	1.17	.25**	.25**	.15**	.27**	.068	.47**	--									
8. Eco-helping	2.93	1.25	.13**	.17**	.16**	.19**	.17**	.42**	.70**	--								
9. Proactive EGB	2.98	1.12	.21**	.18**	.15**	.22**	.21**	.81**	.84**	.82**	--							
10. GWC: Org. attitude	3.39	1.26	.01*	.07	.29**	.19**	.35**	.22**	.14**	.26**	.25**	--						
11. GWC: Org. support	2.96	1.48	.12*	.10*	.23**	.18**	.05	.20**	.20**	.19**	.24**	.68**	--					
12. GWC: Co-workers	3.39	0.78	.10*	.12*	.19**	.17**	.04	.15**	.25**	.25**	.26**	.36**	.37**	--				
13. Green work climate	3.17	0.96	.14**	.12*	.26**	.21**	.06	.22**	.26**	.25**	.29**	.67**	.93**	.69**	--			
14. Pro-environmental attitude	3.85	1.18	.24**	.30**	-.02	.22**	-.02	.36**	.28**	.30**	.39**	.05	-.06	.22**	.04	--		
15. Age	-	-	.18**	.26**	.27**	.29**	-.09	.25**	.31**	.35**	.33**	.01	.16**	.03	.13*	.21**	--	
16. Green team	-	-	.02	.08	.05	.06	-.03	.16**	.17**	.23**	.21**	.05	.13*	-.03	.08	.05	-.01	--
17. Interaction patients	-	-	.30**	.06	-.08	.11*	-.33**	-.10	-.14**	-.15**	-.15**	-.22**	-.08	-.14**	-.12*	-.16**	-.04	.19**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Statistical analysis

To examine relationships between both types of EGB and the remaining variables, multiple linear regression was used. Firstly, a 'general' model was tested using only the main (consolidated) variables PSC, GWC and pre-environmental attitude (NEP) independent variables. The second model used stepwise regression to identify possible predictors of task-related and proactive EGB, using all constructs of PSC, GWC and the demographic variables age, green team and interaction with patients. The aim of this second model was to explore relationships in more detail. In order for analysis to be reliable and valid, for each significant model the assumptions linearity, multicollinearity, homoscedasticity and normality of residuals were assessed. This can be found in appendix C.

General multiple linear regression models

For the general regression models, task-related EGB and proactive EGB were inserted as the independent variables, PSC, GWC and NEP as dependent variables. For task-related EGB, the model was not a significant predictor of task-related EGB, $F(3,423) = 0.579$, $p = 0.629$. For proactive EGB, the model was statistically significant $F(3,423) = 42.416$, p=0.000 and explained 23,1% of the variance in proactive EGB. All assumptions for multiple regression were met (see appendix C). The perceptions of patient safety culture ($\beta = 0.089$, $p = 0.047$), green work climate perceptions ($\beta = 0.257$, $p = 0.00$) and pro-environmental attitude ($\beta = 0.355$, $p = 0.000$) predicted proactive EGB significantly at the $\alpha = 0.05$ level.

Table 5

Multiple regression proactive EGB

Variable	Proactive EGB			
	β	SE	t	p
PSC	0.089	0.045	1.992	0.047
GWC	0.257	0.051	5.893	0.000
NEP	0.355	0.041	8.141	0.000
	R^2=0.231			
	F(3,423) = 42.416, p=0.000			

Regression using stepwise selected variables

In stepwise regression, multiple regressions are executed in which for each regression the weakest correlated variable is removed. Stepwise regression can be used as an exploratory approach in finding appropriate predictors. The stepwise regression model itself is not reliable as stepwise regression causes bias (Hwang & Hu, 2015). For stepwise regression, the variables general perceptions of PSC (PatSaf_gentot), organizational learning (PatSaf_learntot), management support for patient safety (PatSaf_mantot), organizational orientations regarding sustainability (GreenCultOrg_tot), co-workers orientations regarding sustainability (GreenCultCow_tot), perceptions of organizational environmental support (GreenCultOrgSup_tot), age (Age), green team (GreenTeam) and direct interaction with patients (Directinteraction) were included as independent variables. Task-related and proactive EGB were included as dependent variables.

A stepwise regression with task-related EGB as outcome variable led to a model with 6 statistically significant output variables: GWC: Org. attitude, GWC: Org. support, Direct interaction with patients, pro-environmental attitude, general perceptions of patient safety and management support for patient safety. These variables were included in a multiple regression model, which was statistically significant F (6,333) = 18.508, p = 0.000 and explained 25% of the variance in task-related EGB. However, overall perceptions of patient

safety (β = 0.08, p = 0.176) and management support for patient safety (β = 0.05, p = 0.107) were insignificant and removed. The final model with the four remaining variables was statistically significant $F(4,335)$ = 28.574, p = 0.000 and explained 25.4% of the variance in task-related EGB. The perceptions of the organizational orientation regarding sustainability (β = 0.530, p = 0.00), perceived organizational environmental support (β = -0.333, p = 0.00), pro-environmental attitude (β = -0.104, p = 0.031) and whether someone has direction interaction with patients (β = -0.253, p = 0.00) predicted task-related EGB significantly at the α = 0.05 level.

Table 6

Multiple regression proactive task-related EGB, variables selected by using stepwise regression

| Variable | Task-related EGB | | | |
	β	SE	t	p
GWC: Org. attitude	0.530	0.065	8.006	0.000
GWC: Org. support	-0.333	0.055	-5.128	0.000
NEP	-0.104	0.051	-2.172	0.031
Direct interaction patients	-0.253	0.136	-5.166	0.000
	R^2=0.254			
	$F(4,335)$ = 28.574, p = 0.000			

The stepwise regression with proactive EGB as outcome variable indicated six predictors: pro-environmental attitude, green work climate, age, green team, direction interaction with patients and overall perception of PSC. These variables were included in a multiple regression model, which was statistically significant $F(1,333)$ = 26.835, p = 0.000 and explained 32.5% of the variance in proactive EGB. Pro-environmental attitude (β = 0.269, p = 0.046), perceptions of a green work climate (β = 0.202, p = 0.00), age (β = 0.226, p = 0.000) green team (β = 0.204, p = 0.00), direction interaction with patients (β = -0.145, p =

0.005) and overall perceptions of PSC $\beta = 0.118$, $p = 0.021$) predicted task-related EGB

significantly at the $\alpha = 0.05$ level.

Table 7

Multiple regression proactive EGB, variables selected by using stepwise regression

Variable	Proactive EGB			
	β	SE	t	p
NEP	0.269	0.046	5.521	.0.000
Green work climate	0.202	0.055	4.34	.0.000
Age	0.226	0.041	4.835	.0.000
Green team	0.204	0.109	4.395	0.000
Direct interaction patients	-0.145	0.127	-2.835	0.005
PSC: Overall perception	0.118	0.044	2.317	0.021
	$R^2 = 0.325$			
	$F(1,333) = 26.835, p = 0.000$			

Effects of job characteristics

One-way ANOVA tests were performed to compare the effect of direct interaction with

patients (1) and working in a department with a green team (2) on EGB (task-related EGB,

eco-civic, eco-helping, eco-initiatives, proactive EGB) and the constructs of green working

climate. To gain more insights on this, ANOVA tests were used. Three assumptions about the

data must be met in order to conduct ANOVA: independent observations, normality and

homogeneity. The first two assumptions are met, as observations are independent and the

sample has a reasonable size (n > 30), for which normality is not required. Homogeneity was

tested using Levene's test, in which a significant result indicates that the population variances

are equal and that the assumption of homogeneity is not met.

A one-way ANOVA indicated that there was a statistically significant difference

between employees with direct patient interaction and employees without direct patient

interaction on perceptions of green organizational orientations $F(1, 344) = 17.029$, $p < 0.01$.

Employees with direct patient interaction ($M = 3.205$, $SD = 1.23$) reported statistically lower perceptions of organizational orientations regarding sustainability than employees without direct patient interactions ($M = 3.793$, $SD = 1.03$). The homogeneity assumption was met as Levene's test indicated equality of variances $F(1,344) = 0.92$, $p > 0.05$.

Employees that worked in a department with a green team ($M = 2.92$, $SD = 1.18$) reported statistically significantly higher eco-civic engagement than employees with no green team ($M = 2.49$, $SD = 1.12$) $F(1, 346) = 10.430$, $p < 0.01$. The homogeneity assumption was met as Levene's test indicated equality of variances $F(1,346) = 3.42$, $p > 0.05$. Besides, average perceived organizational environmental support was statistically significantly higher in employees that had a green team ($M = 3.136$, $SD = 1.31$) than employees that did not have a green team ($M = 2.783$, $SD = 1.35$), $F(1, 345) = 0.075$, $p < 0.05$. The homogeneity assumption was met as Levene's test indicated equality of variances $F(1,345) = 0.075$, $p > 0.05$.

Qualitative results

Figure 4 displays the coding tree in which the first-order codes, second-order themes and aggregate dimensions. The three labels were labelled as follows: 'fearful of consequences of changes '(1), 'rigid environment' (2) and 'patient safety is actively managed, sustainability is not' (3). The findings are discussed in detail using relevant quotes and are structured along the three main thematic dimensions.
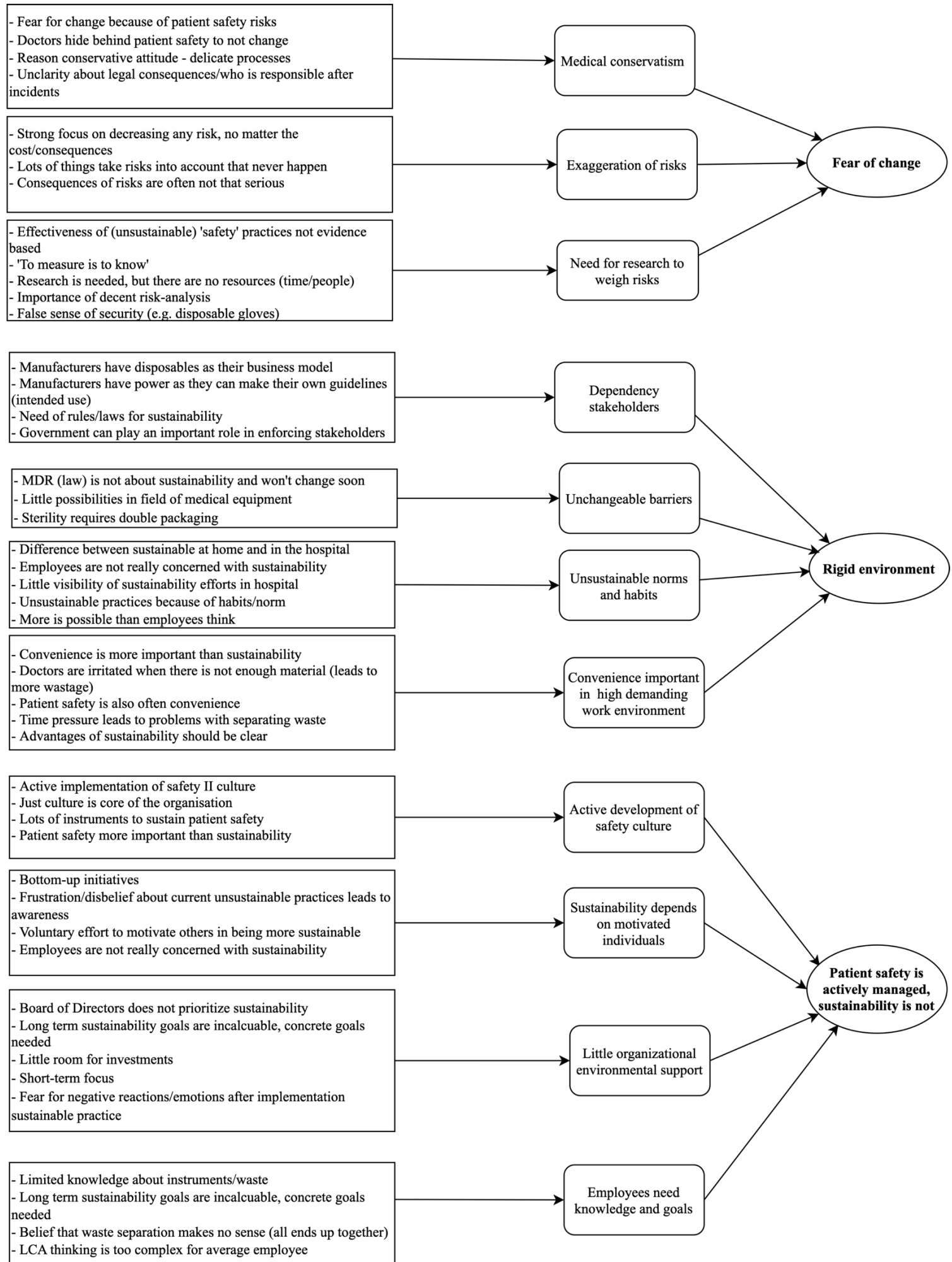
- Fear for change because of patient safety risks
- Doctors hide behind patient safety to not change
- Reason conservative attitude - delicate processes
- Unclarity about legal consequences/who is responsible after incidents

→ Medical conservatism

- Strong focus on decreasing any risk, no matter the cost/consequences
- Lots of things take risks into account that never happen
- Consequences of risks are often not that serious

→ Exaggeration of risks

- Effectiveness of (unsustainable) 'safety' practices not evidence based
- 'To measure is to know'
- Research is needed, but there are no resources (time/people)
- Importance of decent risk-analysis
- False sense of security (e.g. disposable gloves)

→ Need for research to weigh risks

Fear of change

- Manufacturers have disposables as their business model
- Manufacturers have power as they can make their own guidelines (intended use)
- Need of rules/laws for sustainability
- Government can play an important role in enforcing stakeholders

→ Dependency stakeholders

- MDR (law) is not about sustainability and won't change soon
- Little possibilities in field of medical equipment
- Sterility requires double packaging

→ Unchangeable barriers

- Difference between sustainable at home and in the hospital
- Employees are not really concerned with sustainability
- Little visibility of sustainability efforts in hospital
- Unsustainable practices because of habits/norm
- More is possible than employees think

→ Unsustainable norms and habits

- Convenience is more important than sustainability
- Doctors are irritated when there is not enough material (leads to more wastage)
- Patient safety is also often convenience
- Time pressure leads to problems with separating waste
- Advantages of sustainability should be clear

→ Convenience important in high demanding work environment

Rigid environment

- Active implementation of safety II culture
- Just culture is core of the organisation
- Lots of instruments to sustain patient safety
- Patient safety more important than sustainability

→ Active development of safety culture

- Bottom-up initiatives
- Frustration/disbelief about current unsustainable practices leads to awareness
- Voluntary effort to motivate others in being more sustainable
- Employees are not really concerned with sustainability

→ Sustainability depends on motivated individuals

- Board of Directors does not prioritize sustainability
- Long term sustainability goals are incalcuable, concrete goals needed
- Little room for investments
- Short-term focus
- Fear for negative reactions/emotions after implementation sustainable practice

→ Little organizational environmental support

- Limited knowledge about instruments/waste
- Long term sustainability goals are incalcuable, concrete goals needed
- Belief that waste separation makes no sense (all ends up together)
- LCA thinking is too complex for average employee

→ Employees need knowledge and goals

Patient safety is actively managed, sustainability is not

Figure 4: : coding tree, showing the first order codes, second order themes and aggregate themes

Fear of change

Generally, there seems to be a culture in which there is reluctance towards implementing change because of potential negative consequences, mostly in the field of patient safety risks. This conservative attitude is deeply rooted within healthcare, and hesitance to change is not limited to sustainability: doctors are generally conservative to any change (I6). This attitude is taught within education: "That conservative attitude that we talked about earlier, that's doctor-specific, as in that's how you're also trained. Better safe than sorry." (I2) Furthermore, doctors tend to be cautionary because often processes are very delicate, in which a small change can have big consequences (I6). A doctor can have years of experience with a certain method and thus knows exactly what the outcomes are. Changing this may lead to patient safety risks, which are to be avoided. Yet, doctors also sometimes tend to 'hide' behind patient safety to prevent changes, often out of a personal preference:

> I also think the doctor hides behind patient safety as the only weapon against changes.
> And that also has to do with costs. If a doctor can get a cheaper tong, but he likes the
> other tong more, or if it's better and easier, he will always say: patient safety is at
> stake. So, he uses the word safety as a blow back, in the context of costs,
> sustainability, changes, that is always on our lips. (I2)

Besides a fear of patient safety risks, there is a fear of being held (legally) accountable if something goes wrong after implementing a change. Patients can file complaints about a doctor at the medical disciplinary tribunal, which can have serious consequences (I3). At the moment, it is not clear whether an individual employee carries such a responsibility, or whether the hospital itself takes on this responsibility.

Furthermore, hesitance to change is enhanced by the way risks are treated within hospitals. Risks involve two aspects: frequency and the severity of this consequence (I3).

Currently, in the hospital there seems to be both an overestimation of frequency as well as the severity of the consequences:

> We actually live in a time in which nothing can go wrong. So, if something occurs in 0,1% of cases and it is possible to decrease this to 0,09%, we think it is even better. While you can rightfully ask if that is necessary, in the light of sustainability. Then every patient would say: yes, but then I am just that one patient who gets an infection. However, an infection is treatable. (I2)

Currently, any decrease of the frequency of a risk is seen as better, even if the chance of it happening was already very small. Sometimes risks are very serious as they can lead to deaths, but often it is about something less serious, like a treatable infection (I2). Currently, little distinction is made between these high and lower types of risks and potential negative sustainability consequences are not considered when preventing risks. Often, big measures are taken to prevent risks that have questionable chances of happening and severity, while these practices often lead to unsustainable consequences:

> In the hospital, all fluorescent lamps are replaced once a year. So, I saw that and I asked why that was, and it was because if it breaks it's dark in here, so we better do it ahead of time. Then you think: well, isn't that a weird train of thought? But yes, I also understand their thinking, because if you have to walk around in the dark, that doesn't work of course. But then the question is: how big is the problem if it goes wrong? And then I come to patient safety, when we look at those lamps that can break, well if it happens we'll walk around with a flashlight. And then you have to look at how often it occurs, and suppose it is 0.01%, then you have to ask yourself whether you have to set up an entire company to replace those lamps in the hospital. (I2)

Making proper considerations about certain practices and their risks requires research in the form of risk-analyses. However, currently there is no department or team that is responsible

for doing these kinds of analyses. The medical technology department is capable of doing these kinds of analyses in the field of medical equipment, but they do not get time to do this (I3). Currently, there seems to be a 'no harm, no foul' attitude, as there are numerous practices and guidelines that are meant to lead to more safety have mixed evidence. However, these practices often cause an environmental burden which is not taken into consideration. Another example can be found in the use of disposable gloves, which leads to high amounts of waste. It is not clear whether gloves should be changed after each contact with a patient, whether they can be used for longer periods of time or whether washing hands thoroughly is equally safe (I2). Yet changing this can lead to fear, partly caused by the fact that the use has been so ingrained for many years (since the AIDS era) (I2):

> Still, that [disposable gloves] gives a kind of false safety, because you have the idea that you are well protected by it, but if we read the rules carefully we don't always have to wear those gloves. (I2)

Rigid environment

The environment in which healthcare workers operate is rigid and hard to change. A variety of factors contribute to this. Firstly, unchangeable barriers are important contributors to this rigidity. Unchangeable barriers can be found in two forms: legal and technical barriers (I3, I5). There are certain rules that ensure safety, but hinder sustainability. A large part of hospital waste comes from packaging, but sterile products must be double wrapped according to the law (I3). Employees often have ideas about making certain instruments more sustainable, and they can approach the manufacturer to do this, with the help of the medical technology department (I3). However, any change to a product must apply to the Medical Device Regulation (MDR). The MDR is an EU regulation regarding the safety and effectivity of medical instruments. A conformity assessment takes a lot of time and is costly, which is a

barrier to making instruments more sustainable. The MDR is not about sustainability, and this is not likely to change soon as the MDR is fairly new (I3). Besides, developing entirely new ideas requires thorough testing and experimentation, which leads to the old and proven technology being cheaper. However, I3 noted that regulations and law also offer more room than people think: "I think that people are always very scared of legislation. It offers plenty of possibilities, provided you have considered the risks, controlled them. And that you are not just doing something." (I3) Sustainability can also be hindered by technical barriers. Some types of equipment, like MRIs, simply cannot be put off because they need permanent cooling (I3, I1).

Furthermore, in terms of making materials and equipment more sustainable, hospitals are dependent on manufacturers, which do not always seem to be a frontrunner in this field. A substantial part of the environmental burden of healthcare is caused by the use of single-use instruments, which were pushed into the market by manufacturers selling them as cheaper, safer and more convenient (I4). Yet, single-use instruments cause a lot of waste, not only from the instrument itself, but also by its packaging. However, it is not easy to change to reusables, simply because for many instruments manufacturers do not produce a reusable option (I5). The business model of manufacturers is built around single-use materials, which makes them hesitant in changing their business models as single-use materials are more profitable (I2). Furthermore, manufacturers possess power in the way they can compose the 'intended use' by themselves, which describes how the healthcare professional should use the instrument (I3). Because of this, medical professionals are obliged to throw away a single-use material, even if it is technically possible to sterilize and reuse it. Not following the intended use can (theoretically) be done, but the consequence is that the responsibility if something goes wrong moves to the medical professional or the hospital, and there could be legal consequences, which was also touched upon in the first aggregate theme. Single-use materials

are often 'simple' instruments, like scissors or tweezers, but also much more expensive and advanced devices, which can lead to frustration:

A scope is a fully medical electrical device. They are not necessarily very cheap – a few thousand euros – but you throw them away. Yes, I do have my doubts about that.

And there are still a number of things that are disposable but should not be. (I3)

Another example of an intended use practice is the expiration date of medical equipment. After the expiration date, the product should be thrown away, even if it is still in proper technical condition. This power of manufacturers can lead to frustration: "We sometimes have discussions with the manufacturer about appliances, if it is beyond its expiration date we say 'why?', it is still working fine." (I3). The government could play an important role in enforcing rules on this or by making single-use instruments more expensive, but currently the government seems rather passive (I2).

An often-mentioned experience was a perception of general unsustainable behavior amongst colleagues, mostly in 'smaller' sustainability practices (task-related EGB) like putting off lights and separating waste properly. In principle, computers and lights are to be put off when the working day is over, but in practice they are often still on (I3, I5, I1). Furthermore, most employees seem not to be too concerned with sustainability (I5, I6). Several interviewees (I1, I4, I6) mentioned a difference between sustainable behavior at home and at the hospital and that people seem to care less at their workplace: *"I sometimes say very cynically that if people could take the energy to save home with them, they would do it."* (I1). Yet, even the employees that are in fact concerned with sustainability do not always act if they think something could be done more sustainable, simply because it is 'just the way things go here':

"I don't think they [colleagues] care that much about it. Neither do I when I'm at work. You're in a certain flow and with certain things, but I'm not going to call the

pharmaceutical company to ask if they could put a layer [packaging material] less around it." (I5)

Furthermore, employees often perceive that little change is possible because current practices arise from regulations and protocols, whereas actually these are habits ('just the way things go') and are not formally established. An example can be found in shutting down medical imaging equipment (CT scanners) at night. Currently, medical imaging equipment is not turned off at night, because of safety concerns (taking the startup time and potential technical problems in consideration). When asked whether (a portion of) equipment could be shut down if no one was there (e.g. at night), I1 believed it could not be changed. Yet, employees from the medical technology department indicated that there was no official regulation to leave devices on, it was merely done from a 'better safe than sorry' perspective and turning the devices off was never thoroughly researched (I3).

Another factor that contributes to the perception of an unsustainable organization lies in little visibility of current sustainability practices, which leads to people believing that far less is happening than actually is (I4, I1, I6). The hospital has a variety of sustainability practices, most prominently in the organization of green teams in several departments. Yet, these green teams are hardly visible and what kind of things they do is even more hidden (I4). There is a general sense that sustainability is something a few enthusiastic individuals do, while in practice more happens than people think. An example of this is on-site composting of organic waste, which is distributed to local schools and allotments (I3).

Lastly, hospital workers are generally very busy and time pressure is often high, so working procedures are as efficient as possible and people are generally very hesitant to changes that lead to lower efficiency and convenience (I4, I5, I3). People often perceive that working more sustainably leads to lower convenience, which in turn leads to hesitance and experiencing it as a hassle: "we [doctors] are always irritated when there are too few things

on the table, but that does imply that there is always too much and that we have to throw things away." (I5); "A lot of people also think it [separating packaging waste] is a hassle, which is also partly true because we want them to hand over things quickly, and then they have to unpack it quickly and then throw it away somewhere else" (I5). Convenience is also often linked to patient safety: the example of always having enough (or actually too much) instruments on the operation table can be 'sold' as patient safety as there is sufficient material if something unexpected happens, yet it is also just more convenient to have too much material around in case something drops on the ground (I2, I5). Employees do not like lower convenience, yet they might be more willing to accept changes if the advantages or reasons for sustainable products are clear, which currently often does not seem to be the case (I2). Furthermore, employees already have a lot of administrative tasks and lots of rules and procedures they have to comply to. Adding more (sustainable) tasks may make them feel overwhelmed:

> People already have so much on their minds and then additional rules are added, they already feel they have so much to do, write down and register. Then they have six bins in front of them and then they also have to think about where to put it. (I3)

Patient safety is actively managed, sustainability is not

The final aggregate dimension is about the general notion that patient safety is a core element of the organization and that it is managed actively, whereas sustainability is merely seen as a 'side' project and depends on motivated individuals. Regarding patient safety culture, the 'just' culture is perceived to be truly embedded in the organization (I3, I6), which entails that there is a system to report incidents and calamities without being blamed, with a strong focus on learning from these incidents. The development of this culture has been going on for a long time and is still being actively managed today (I6). There is a broad variety of

tools available to do this, like auditing, e-learning, setting up safety programs with specific and concrete targets and quality dashboards (I6). Besides, there are about 30-40 functions that are involved with safety, which shows its diversity. Since a few years, the implementation of Safety II has started (I3, I6), which goes further than examining just one incident as it is prospective and it analyses the entire system. The involved studies are much broader-scale and are supposed to lead to more systemic changes (I6) In the development of patient safety culture, a variety of employees (e.g. doctors, nurses, researchers) get training and are involved in doing the studies that are part of the Safety II culture, so it is embedded throughout the whole organization (I3).

While the patient safety culture is managed top-down and lots of tools are available to manage this culture, sustainability is currently mostly a bottom-up, intrinsic activity that relies on motivated individuals. Generally, it seems that awareness of sustainability is growing, but it is not considered a core element of the organization in the way patient safety is:

> "It is a hobby project of a few people. I see at the facility company that they do quite a lot about it, they also feel a bit like the leaders in this theme, of course it also deals with major themes such as energy and things like that. I think that the facility management company does play a leading role in this, but that does mean that you do not yet get to the core of the care, but that it is all around it." (I6)

Despite the growing awareness of sustainability, the majority of doctors do not feel that it is their responsibility: "I really notice that we are in the awareness phase: the doctors you approach say: 'Oh nice, but not for my patients'." (I2). The dependency on intrinsically motivated employees that take initiative in sustainability efforts leads to differences between departments regarding sustainability in the hospital (I4, I3). Furthermore, department managers cause differences in the level of sustainability efforts in departments:

"One pays attention to a duster, the other to a sticker. Every department has its own culture, but the management decides. They have a lot of influence, because they can name such things more often. (I1)

Motivation for sustainability is often triggered by frustration or disbelief about current unsustainable practices, like seeing the amount of waste that is produced every day and by noticing differences between behavior at home and in the hospital:

Well, you notice that employees sometimes think: at home I separate the waste, and at home I don't immediately grab a new piece of paper. In the hospital I do that from a medical point of view, while I sometimes think to myself: instruments that cost 350 euros, for example, I do 3 snips with it and then I throw it away. And that doesn't feel right to me. (I2)

Besides, motivation comes from a general awareness that humans use too much resources and things must change (I1).

Multiple interviewees mentioned that top management should take a more proactive approach as currently "everyone is just doing something" (I2). Furthermore, employees experience little support by top management in setting up a green team: *"They started years ago with that and it wasn't supported at all by the management. There are also other things that need your attention, that made it water down"* (I1). A lack of support can be found in needed money for sustainability practices. In general, hospitals have small margins:

In my view, what also plays a role for a hospital is that our margins are so small. In a company you can easily have a 7-10% margin on your production. In a hospital it is about 1.5% margin. So, the investment decision - to do things differently or to deploy people differently - disrupts the economic process very quickly. (I6)

Often, sustainability practices require a higher initial investment, but save money in the longer term, for example in washable coats that are paid back in 2-3 years (I3). However,

there seems to be a short-term focus which leads to not investing in such practices because of the higher initial cost. This can lead to frustration in employees: "Just like they have golden ideas that cost money, and then they are terribly disappointed if the hospital says 'don't do it' because it costs so much more." (I6).

Furthermore, a reason for the restraint of higher management in sustainability could lie in a fear of negative reactions after implementing a sustainable practice (I2). One interviewee proposed to the board cutting all meat from the hospital, from a sustainability perspective. Yet, they responded to not do that because it would lead to negative (public) commotion. Negative reactions could also arise amongst the staff: implementing changes often leads to a need to adapt to lower comfort (e.g. a lower temperature, computer is always on and ready to use), which could lead to responses along the lines of 'not treating your employees decently'. Measures can be hard to take, because "they are surrounded by so much emotion" (I2).

Lastly, employees seem to lack relevant knowledge to execute EGB. This is especially the case for task-related EGB. The hospital has some sustainability-related targets, but these are hospital wide and mainly relevant for the facility department as they focus on 'large' goals like energy and waste total (I6). There is a lack of specific sustainability goals for departments, which decreases the 'need' to execute EGB. An example of a lack of knowledge to execute task-related EGB properly lies in the field of materials and waste. The hospital is already making efforts to sustainability and employees are expected to segregate different types of waste, like paper and plastics. Yet, employees often lack proper knowledge about what waste belongs in which bin (I1). They also do not receive any formal training about this (I1, I5). Furthermore, the benefits of sorting waste are not clear, and among some employees there is a persistent belief that it does not make sense to sort waste, as it all ends up on the same heap anyway (I1, I4). Proper sorting of waste is further complicated by the

fact that both reusables and single-use instruments are used in the same procedures, as some single-use instruments are replaced by reusable versions:

> (…) currently we have an enormous problem with the mix disposable non-disposable. People do not know anymore what they can throw away and what not, so we throw away everything now. And that leads to very high costs. But vice versa too: you don't want disposable things to end up in your autoclave. (I3)

Furthermore, the inherent complex nature of sustainability further complicates employees' understanding of how they can contribute. Changes in procedures can lead to unexpected outcomes and it is not always easy to evaluate what is more sustainable. Analyzing and comparing practices to see which one is more sustainable is often more complex than it seems at first sight and requires LCA (life-cycle analysis) thinking, that assesses the entire lifecycle of a product or process. An example can be found in a surgery in which a heart valve is replaced. The 'traditional' way of doing this is by cutting open the entire thorax. A much more sustainable way is by placing it through an inguinal vein. The latter surgery itself is more sustainable, yet it cannot be said that the whole process is more sustainable, as the valve placed in the new method lasts 5 years, while the valve in the 'traditional' way of operating lasts 20 years (I2). LCA thinking is complex and cannot be left to individuals in the workplace (I3).

Discussion

This study aimed to explore the effects of patient safety culture on employee green behavior in a healthcare organization using a mixed methods approach. The main finding of this study is that there are multiple elements related to patient safety culture that hinder EGB. Quantitative results indicated that perceptions of patient safety (espoused values of PSC) showed small positive effects on proactive EGB only. Qualitative results indicated that the other dimensions of patient safety culture (basic underlying assumptions and artefacts) did affect both types of EGB in numerous ways. The main findings were that patient safety culture (1) involves a presumable underlying assumption of a pursuit to avoid *any* patient safety risk and (2) has led to the formation of a rigid environment in which there is little room for (sustainable) change, which is disadvantageous for EGB. The effects can be explained using the theory of planned behavior, which states that the main antecedent of a behavior is someone's intention to do the behavior, which is shaped through attitudes, norms and perceived behavioral control (Ajen, 2002).

Before we explain the results in more detail, firstly the sometimes seemingly contradictory findings of the findings of the qualitative and quantitative studies require attention. Qualitative results indicated only a small positive relationship between PSC and proactive EGB, whereas qualitative results identified several factors related to PSC that hinder EGB. This difference can be explained by going back to what both studies actually measure. As mentioned in the literature review, surveys are only able to capture the 'surface' level of organizational culture (Churruca et al., 2021; Taras et al., 2009). So, our results suggest that the 'surface' level of PSC has little effects on EGB. The quantitative study did however uncover interesting and sometimes unexpected effects, which will be discussed in more detail below. In turn, the qualitative methods assessed the PSC in more detail on all three organizational culture levels (Schein, 2010), which revealed that the other levels of

organizational culture (artefacts and basic underlying assumptions) affect EGB and perceptions of a green working climate in multiple ways. Furthermore, quantitative results indicated a seemingly more 'optimistic' view on EGB and green work climate perceptions than qualitative results did. Sampling bias in the quantitative part of the study should be taken into consideration. Sampling bias is suggested by the relatively high percentage of employees with a green team (63,8% compared to about 25% in the total organization) in the sample and by the fact that many participants dropped out of the survey during the sustainability-related questions, which suggests less interest in the topic and survey fatigue (Porter et al., 2004). Social desirability bias might also play a role, as this should always be considered in self-reported surveys that include 'morally' relevant questions (EGB). Social desirability entails over-reporting of 'good' behavior (EGB) to achieve a better social impression of oneself (Nederhof, 1985). Yet, research has found that the effect of social desirability bias in environmental psychology research seems to be small (Vesely & Klöckner, 2020). Furthermore, our research design included several factors that counteract social desirability bias, like ensuring anonymity and confidentiality and using neutral wording (Vesely & Klöckner, 2020). Lastly, the applied mixed methods approach allowed for triangulation of the data, which mitigate the social desirability bias of the study as a whole. Triangulation increases external validity and has the potential for more robust interpretations regarding social desirability (Ried et al., 2022). The overall findings of the study are discussed in more detail below, following the dimensions of theory planned behavior.

Attitude

In the theory of planned behavior, attitude refers to the subjective evaluation of the behavior and whether the outcome is perceived as desirable (Ajen, 2002; Katz et al., 2022). Both quantitative and qualitative results indicated that pro-environmental attitude is high and that

attitudes regarding EGB were positive, in the way that it was seen as beneficial and desirable. Furthermore, people indicated that seeing the high amounts of waste produced and the discrepancy between sustainable behavior at home and at work motivated them to engage in EGB. However, qualitative results also indicated that a small part of their co-workers did not care much for separating waste, as they believed it all ends up in the stream eventually so it makes no sense. There was little available information or knowledge about waste (e.g. no trainings), while access to information and increasing knowledge about waste may improve and increase EGB as indicated by previous research (Johansson, 2016; Liobikiene & Poškus, 2019). Thus, this shortage of knowledge may not help in overcoming environmental skepticism in the organization (Sabbir et al., 2021).

An unexpected result related to attitude was found in multiple regression in task-related EGB, namely that pro-environmental attitude was negatively related to task-related EGB. This was contrary to previous studies (Dahiya, 2020; Norton et al., 2015). A possible explanation might lie in how people with higher pro-environmental attitudes interpret 'environmentally friendly' ways differently (stricter) than people with lower pro-environmental attitudes as suggested by previous studies in the field of sustainable consumption (Gleim et al., 2013; Johnstone & Tan, 2015; Matthes & Wonneberger, 2014). Research in this field on the attitude-behavior gap indicated that people with a higher pro-environmental attitudes are found to be more skeptical about the perceived effectiveness of sustainable practices, in the way that they believe a practice will actually make a difference to the environment (Gleim et al., 2013). Qualitative results indicated that task-related EGB was quite 'basic' in the hospital and included common things like putting off lights and separating waste, but that sustainability was not yet embedded in the 'core' of the organization. Because of the potential higher skepticism in people with higher pro-environmental attitude, they might perceive that these basic practices do not qualify as executing their work in

environmentally friendly ways. Pro-environmental attitude did show a positive effect on

proactive EGB, which was in line with previous research (Katz et al., 2022; Sabbir et al.,

2021).

Furthermore, quantitative results indicate that perceptions of patient safety culture had

a (small) positive effect on proactive EGB. This could be explained by our hypothesis on

potential positive effects of PSC on EGB because of the person-organization fit (Mi et al.,

2020). As it is likely that people agree with the values PSC is based on as they can be seen as

moral values (e.g. patient safety, fairness) (Schwartz, 2005), according to person-organization

fit this alignment of values can lead to positive attitudes and behaviors towards the

organization and thus in this context to proactive EGB.

Norms

Perceived norms are the experienced social pressure to conduct the behavior in theory of

planned behavior (Ajen, 2002). Perceived norms that affect proactive and task-related EGB

seem to differ, however generally results indicated that employees experienced little social

pressure to perform EGB. What stands out here is that (qualitative) results indicate that

patient safety and sustainability are managed and treated entirely differently. Patient safety is

top priority, which has translated to specific goals and an embeddedness of patient safety

culture through the whole organization. In turn, this does not seem to be the case for

sustainability, as it appears to be more of a voluntary option to do. This difference in

priorities might be explained by the 'mere urgency effect', which entails that urgency is

prioritized over importance (Zhu et al., 2018). Patient safety tasks can be perceived as more

urgent than sustainability tasks as effects of patient safety are more observable in the short-

term and can have direct negative effects on patients. Sustainability can be classified as

'important' as it also involves safety effects (because of the detrimental health effects of

climate change), yet these effects are less observable and obvious and thus perceived as less urgent. Besides, institutional effects may also play a role. In the Netherlands, the Dutch Healthcare Authority and the Health and Youth Care Inspectorate actively supervise healthcare organizations to ensure quality of healthcare for citizens (Dutch Healthcare Authority, 2019). Not adhering to certain standards or rules can lead to negative consequences like the imposition of a fine. Yet, for sustainability, there are agreements set in the 'Green Deal Sustainable healthcare', a project in which the government is involved as well (*Green Deal Duurzame Zorg | RIVM*, n.d.). However, there does not seem to be hard targets or control on involved organizations contributing to these targets, which shows resemblance to our findings in the way that sustainability in healthcare is currently voluntary and relies on taking personal initiative.

Comparing the findings of the quantitative and qualitative study, social pressure to execute task-related EGB seems to be low. Quantitative results indicated that the majority of respondents felt they were able to execute task-related EGB. Yet, qualitative results indicated that employees experienced that co-workers generally did not execute task-related EGB properly, in the form of wrongly segregated waste and leaving computers and lights on after they left. The low social pressure could be caused by the fact that there are no formals goals and little control on task-related EGB (Haffar & Searcy, 2018). For the quantitative results, social desirability bias should also be kept in mind when interpreting these results as this may illustrate a more positive view.

Furthermore, multiple regression on task-related EGB indicated that the perceptions of organizational orientation regarding sustainability was the strongest predictor of task-related EGB, which is in line with previous research (Norton et al., 2014). This translates to higher expression of task-related EGB in individuals that believe the organization thinks environmental sustainability is important. However, multiple regression also yielded an

unexpected result in the form of a negative effect of perceived organizational environmental support on task-related EGB, which was contradictory to previous research (Norton et al., 2014). A recent study by Zhang, Zhang & Jia (2021) might explain this unexpected result. Their study found that perceived organizational support affects EGB negatively when it is incongruent with perceived supervisory environmental support, in the way that employees receive inconsistent signals of environmental support which arouses corporate hypocrisy and inhibits EGB. In our study, supervisory behaviors were not examined in detail. Yet, qualitative results did indicate that there could be differences between departments in perceived supervisory support as there are large differences on sustainability efforts between departments within the hospital, partly caused by the intrinsic motivation of managers in these departments. In conclusion, social norms for executing task-related EGB seem to be low because of (1) a perception that sustainability is not prioritized, which is translated to a lack of department-level goals and little control on task-related EGB, and (2) inconsistencies in the organizational attitude regarding sustainability.

Perceived norms related to proactive EGB seem to be mostly affected by the basic underlying assumptions of patient safety culture. Literature on PSC has shown little attention to these basic assumptions, mainly caused by the lack of rich interpretative (qualitative) methods in this field of research that are required to identify these basic underlying assumptions (Churruca et al., 2021). One basic assumption described in literature was 'patient safety as the first priority', which also emerged in our thematic analysis (Feng et al., 2008). However, the thematic analysis also found an expansion to this assumption in the field of how risks are treated. Namely, an assumption seemed to lie in the view that a decrease of *any* patient safety risk must be pursued. Often, the frequency and severity of the risk seems to be overestimated, whereas at the same time prevention of the risks lead to high environmental impacts. Interestingly, the risks related to these environmental impacts are not considered,

whereas these risks also involve health effects, but in the longer term and less observable. Besides, there seems to be a 'no harm, no foul'/'better be safe than sorry' approach, in the way that practices that are not proven to be safer still are being executed, just to take no risks and because 'it's just the way we do it'. An interesting paradox can be found here. In patient safety culture, there is a generally strong focus on evidence-based practice, which means that health outcomes are optimized by selecting the method with the best available and useful evidence (Ulrich et al., 2008). However, this principle is not applied consequently, as practices that are assumed to lead to higher safety often have mixed evidence, but are still in place 'just to be sure'. In our study, the most often mentioned example was the use of medical gloves, which is also a theme in research. Literature points out that in most clinical situations, decontaminating hands by washing or using a decontamination gel is the appropriate method and as safe as using gloves (Lee, 2013; Singh et al., 2021). Yet, there is an overuse of gloves and an underuse of gels, caused by habits and a 'just in case' mindset (Lee, 2013), which was also found in our study.

The approach to handling risks was a topic that emerged during our thematic analysis. This topic receives surprisingly little attention in literature on PSC, whereas our study indicates that this seems to have a prominent impact on the basic underlying assumptions of PSC. Additional investigation of literature on risk assessment indicates that our findings show resemblance to the *strong precautionary principle* (Fischer & Ghelardi, 2016). This is a strategy for preventing potential risks to the public or environment, even when supporting scientific evidence is questionable and costs are high (Hansson, 2020). This principle is often critiqued for being unscientific and an obstacle to innovation. Hansson (2020) identified three conditions that should be met in order to allow for application of the precautionary principle: there should be no competing top priorities (1), precautionary actions should be based on the current state of science (2) and potential harms should be plausible (e.g. more than "mere

possibilities") (3). Our results indicate that in healthcare currently the precautionary principle is applied in situations in which these three conditions are not met. Another critique of the precautionary principle is that it ignores negative consequences of precautionary measures themselves, which is also in line with our results (Rushton, 2007). Additional research could investigate the role of the precautionary principle in healthcare more in-depth. More specifically, it can focus on whether it is applied appropriately, as it may play a role in sustainability in healthcare.

Lastly, our study suggested that an underlying assumption lies in treating patient safety as something that is incontestable in a way, which makes it a somewhat sensitive topic. This is in line with studies of organizational culture, in the way that basic underlying assumptions are considered to be nondebatable and are thus extremely hard to change (Schein, 2010, p. 28). It should be noted that in healthcare, it is not illogical that patient safety is the most important thing as it is healthcare's duty to maintain public health and as there is still a high number of preventable deaths despite the focus on PSC and attempts to improve healthcare quality (Naoum et al., 2021). Yet, what seems to be overlooked is that while patient safety should be maintained, the view should be expanded to the associated costs and consequences, as these in turn can harm patient safety as well (Rushton, 2007; Sherman et al., 2020; Warburton, 2005). A potential negative consequence of the nondebatable nature of patient safety is that it can be used to counteract change for whatever reason, as no one would dare to even question the importance of patient safety. In the qualitative findings, examples of this were found in medical manufacturers framing disposables as safer than reusables to not having to change their business model or doctors using patient safety arguments in not wanting to change to a cheaper instrument. This potential negative aspect of patient safety was not found in previous studies, which may be caused by literature on patient safety culture staying on the level of 'espoused values' (Schein, 2010), and not diving deeper into its

underlying concepts. In fact, almost all literature on patient safety culture seems to treat the concept as something that has merely positive outcomes. The only study we were able to find was about the notion that safety precautions are often not cost effective (Warburton, 2005).

These findings translate to a subjective norm characterized by a conservative attitude to change, which hinders proactive EGB. Results suggest that the precautionary principle plays a role in this. Furthermore, proactive EGB seems to be hindered by the low willingness to invest in longer-term projects that have higher investment costs in the short term. Besides, higher management was sometimes hesitant to incorporate sustainable practices out of a fear of negative reactions. As a result, social norms affecting proactive EGB are (1) a general restraint on changes in order to not harm patient safety, (2) a short-term focus and (3) a focus on avoiding negative commotion.

Perceived behavioral control

Perceived behavioral control is someone's belief of how hard it is to execute the associated behavior. For task-related EGB, efficiency played an important role in this. Qualitative results indicated that work pressure is high, which leads to a high need for efficiency and convenience as work processes should not be disrupted. This was especially the case in situations in which patients are directly involved, as otherwise it may pose patient safety risks. This is in line with the quantitative finding that having direct interaction with patients was negatively related to task-related EGB. An interesting finding from the thematic analysis was that patient safety practices also are accompanied by higher convenience (e.g. if you drop something, you just take a new one) and that people often perceived task-related EGB to lead to lower efficiency and convenience. This was especially the case in separating waste, which was complicated a large mix of different materials. This is a hindering factor for task-related EGB, which is in line with previous research that indicated that pro-

environmental behavior is more likely to happen if it is accompanied by little inconvenience for individuals (Wyss et al., 2022).

In proactive EGB, perceived behavioral control seems to be mostly lowered by the rigid environment in which healthcare workers operate. The rigidity is often caused by measures that are focused on increasing patient safety, like strict regulations and guidelines on the use of materials, packaging and intended use regulations (Altayyar, 2020). This leads to an environment in which maximum safety is ensured, but in creating this environment, sustainability was not considered. This has led to an inherently unsustainable environment in which employees possess little power to change it and thus limits taking initiatives that characterize pro-environmental behavior. In the literature on contextual factors affecting EGB, this aspect of the 'literal' physical environment has been overlooked. Literature tends to focus on green HRM practices to form a green organizational culture and seems to reason about business environments in which change is (fairly) easily possible.

Another factor affecting perceived behavioral control in proactive EGB may lie in liability when something goes wrong. This means that if a healthcare employee changes a procedure to make it more sustainable and an incident happens afterwards, the individual employee may be held accountable and face legal consequences. Interestingly, this is not in line with the philosophy of the patient safety culture, which is about not blaming mistakes on individuals. However, currently the hospital management does not seem to take a proactive role in taking over this responsibility, which hinders proactive EGB as it is accompanied by a potentially high personal cost (Wyss et al., 2022).

Contributions to literature

Firstly, our study contributed to patient safety culture literature by examining PSC qualitatively and specifically by examining the basic underlying assumptions more in-depth

(Churruca et al., 2021; Schein, 2010). Our results suggested that the precautionary principle seemed to have a prominent influence on the formation of these basic underlying assumptions. Besides, we expanded the field of Patient Safety Culture by identifying potential negative aspects of PSC. Research on PSC seems to treat the concept as something that is inherently positive (Warburton, 2005). However, our research suggests that it can hinder EGB in multiple ways.

Furthermore, we expand the field of research on sustainability in healthcare by examining the role of healthcare employees in the transition to higher environmental sustainability in healthcare (Sherman et al., 2020). Current research in this field tends to focus on (practical) alternatives in decreasing environmental impact or on the systemic level of the healthcare industry as a whole. Yet, employees are considered to be crucial for achieving organizational sustainability (Davis et al., 2012; Mi et al., 2020; Yeşiltaş et al., 2022). Furthermore, proactive EGB can provide as an important source for innovation (Weigt-Rohrbeck & Linneberg, 2019), which is needed as the transition to a sustainable healthcare sector requires "rethinking all aspects of healthcare delivery" (Sherman et al., 2020, p. 8). Our study however shows that proactive EGB, and change in general, seems to be hindered by the rigid environment that (partly) originated from PSC.

Lastly, as Katz et al. (2022) suggested, a future area of research in the field of EGB in examining the effect of different work context that may involve certain constraints. We contributed to the research field on EGB by placing it in a context of a high reliability organization, a specific organizational type that indeed shows multiple constraints on EGB. As discussed, current research on EGB seems to assume a 'conventional' work environment in which employees have more room to behave on their own accord (Katz et al., 2022)

Contributions to practice

There are multiple contributions to practice. For task-related EGB, our study indicates that hospitals should be aware that task-related EGB should not hinder efficiency and convenience, as employees work in a high-pressure environment. Furthermore, organizational support and supervisor support should be aligned, as inconsistencies may lead to perceptions of organizational hypocrisy and hinder EGB. Proactive EGB, and sustainability in general, can be hindered by the short-term focus that seems to be present in hospitals. Furthermore, our research makes clear that in order to implement sustainable practices, risk-analyses are essential in which patient safety risks are considered, but also environmental risks. Besides, healthcare managers may want to have a critical look at whether current safety practices and habits are based on the current state of science and thus actually lead to higher safety (Hansson, 2020). Although research may indicate that some current habits do not lead to higher safety, managers should keep in mind that changing these practices may lead to fear and opposition in employees (Lee, 2013). Furthermore, managers should be aware that in order to become more sustainable, there seems to be a large dependency on stakeholders like medical manufacturers and the government, which can impose rules. Thus, engagement with these stakeholders is needed for more radical changes (Sherman et al., 2020).

Limitations and directions for future research

There are several limitations to our study. Firstly, the study focused on just one academic hospital in the Netherlands, which may limit external validity. Findings might not be applicable in other countries because of cultural differences. The fact that the hospital of our case study is an academic hospital may complicate generalizing results to a 'conventional' hospital, as academic hospitals have a purpose of research and development of new technologies and methods. Secondly, patient safety culture is something that is not

consistent throughout healthcare organizations and differs per department (Mannion & Davies, 2018). Our study did not zoom in on different departments, yet this may be an interesting approach to compare the effects of different 'levels' of PSC on EGB. Furthermore, internal validity might be violated by the indications of sampling bias and potential social desirability bias due to the self-report nature of the survey. Yet, this bias was counteracted by triangulation made possible by the mixed method approach, which increases internal validity (Modell, 2005). Lastly, to explain our results, we used the theory of planned behavior, based on previous research on EGB that showed that the constructs of the theory of planned behavior are related to EGB intentions and EGB. However, results to what extent pro-environmental intentions actually lead to EGB are variable and not always clear (Greaves et al., 2013; Katz et al., 2022).

Several directions for future research can be identified. Firstly, an interesting notion lies in the fact that patient safety culture is essentially focused on preventing preventable incidents in healthcare. Yet, diseases and adverse health effects caused by climate change can also be classified as 'preventable', as becoming sustainable would prevent them. This raises the question of how environmental effects could be considered when assessing patient safety risks and thus could become embedded in patient safety culture. Furthermore, an interesting field of research could lie in how medical conservatism could be counteracted to make room for sustainability, without compromising on patient safety. This requires quite a big paradigm shift, which may be acquired through incorporating sustainability in education and clinical training, which is a field that is in its early stages (Walpole et al., 2019). Furthermore, our research indicates that a top-down approach is needed to allow for more room for change. This includes involving stakeholders like medical manufacturers, the government and healthcare regulators, like the Dutch Healthcare Authority. Future research should assess their perspective and potential role in this. There is especially little knowledge of the role of

medical manufacturers, whereas they have a large influence on the waste that is produced in healthcare.

Bibliography

Ajen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal of Applied Social Psychology*, *32*(4), 665–683.

Altayyar, S. S. (2020). The Essential Principles of Safety and Effectiveness for Medical Devices and the Role of Standards. *Medical Devices (Auckland, N.Z.)*, *13*, 49. https://doi.org/10.2147/MDER.S235467

Anåker, A., Nilsson, M., Holmner, Å., & Elf, M. (2015). Nurses' perceptions of climate and environmental issues: A qualitative study. *Journal of Advanced Nursing*, *71*(8), 1883–1891. https://doi.org/10.1111/jan.12655

Baines, R., Langelaan, M., De Bruijne, M., Spreeuwenberg, P., & Wagner, C. (2015). How effective are patient safety initiatives? A retrospective patient record review study of changes to patient safety over time. *BMJ Quality and Safety*, *24*(9), 561–571. https://doi.org/10.1136/bmjqs-2014-003702

Bamdad, T. (2019). Pro-environmental Attitude-Behavior; A Spillover or a Gap? In *Advances in Science, Technology and Innovation* (pp. 169–183). Springer Nature. https://doi.org/10.1007/978-3-030-10804-5_17

Baumgartner, R. J. (2009). Organizational culture and leadership: Preconditions for the development of sustainable corporation. *Sustainable Development*, *17*(2), 102–113. https://doi.org/10.1002/sd.405

Bissing-Olson, M. J., Iyer, A., Fielding, K. S., & Zacher, H. (2013). Relationships between daily affect and pro-environmental behavior at work: The moderating role of pro-environmental attitude. *Journal of Organizational Behavior*, *34*(2), 156–175. https://doi.org/10.1002/job.1788

Blazejewski, S., Gräf, A., Buhl, A., & Dittmer, F. (2018). Enabling green spillover : How firms can benefit from employees' private green activism. *Contemporary Developments*

in Green Human Resource Management Research, 73–94.

https://doi.org/10.4324/9781315768953-5

Boiral, O., & Paillé, P. (2012). Organizational Citizenship Behaviour for the Environment:

Measurement and Validation. *Journal of Business Ethics*, *109*(4), 431–445.

https://doi.org/10.1007/s10551-011-1138-9

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research

in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brundtland, G. H. (1987). Our common future - Call for action. *Environmental Conservation*,

14(4), 291–294. https://doi.org/10.1017/s0376892900016805

Cantor, D. E., Morrow, P. C., & Montabon, F. (2012). Engagement in Environmental

Behaviors Among Supply Chain Management Employees: An Organizational Support

Theoretical Perspective. *Journal of Supply Chain Management*, *48*(3), 33–51.

https://doi.org/10.1111/j.1745-493X.2011.03257.x

Churruca, K., Ellis, L. A., Pomare, C., Hogden, A., Bierbaum, M., Long, J. C., Olekalns, A.,

& Braithwaite, J. (2021). Dimensions of safety culture: A systematic review of

quantitative, qualitative and mixed methods for assessing safety culture in hospitals.

BMJ Open, *11*(7), 43982. https://doi.org/10.1136/bmjopen-2020-043982

Clements, W., Chow, J., Corish, C., Tang, V. D., & Houlihan, C. (2020). Assessing the

Burden of Packaging and Recyclability of Single-Use Products in Interventional

Radiology. *CardioVascular and Interventional Radiology*, *43*(6), 910–915.

https://doi.org/10.1007/s00270-020-02427-3

Dahiya, R. (2020). Does organisational sustainability policies affect environmental attitude of

employees? The missing link of green work climate perceptions. *Business Strategy and

Development*, *3*(3), 395–403. https://doi.org/10.1002/bsd2.110

Davis, M. C., Leach, D. J., & Clegg, C. W. (2012). The Physical Environment of the Office:

Contemporary and Emerging Issues. In *International Review of Industrial and Organizational Psychology 2011* (pp. 193–237). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118311141.ch6

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, *56*(3), 425–442. https://doi.org/10.1111/0022-4537.00176

Dunphy, J. L. (2014). Healthcare professionals' perspectives on environmental sustainability. *Nursing Ethics*, *21*(4), 414–425. https://doi.org/10.1177/0969733013502802

Dutch Healthcare Authority. (2019). *NZa Role and Duties*. https://puc.overheid.nl/nza/doc/PUC_276485_22/1/

Ehrhart, M. G., & Schneider, B. (2016). Organizational Climate and Culture. *Oxford Research Encyclopedia of Psychology*. https://doi.org/10.1093/ACREFORE/9780190236557.013.3

Eisenhardt, K. M. (1989). Building Theories from Case Study Research Published by : Academy of Management Stable. *The Academy of Management Review*, *14*(4), 532–550.

Eizenberg, E., & Jabareen, Y. (2017). Social Sustainability: A New Conceptual Framework. *Sustainability 2017, Vol. 9, Page 68*, *9*(1), 68. https://doi.org/10.3390/SU9010068

Feng, X., Bobay, K., & Weiss, M. (2008). Patient safety culture in nursing: A dimensional concept analysis. *Journal of Advanced Nursing*, *63*(3), 310–319. https://doi.org/10.1111/j.1365-2648.2008.04728.x

Fischer, A. J., & Ghelardi, G. (2016). The Precautionary Principle, Evidence-Based Medicine, and Decision Theory in Public Health Evaluation. *Frontiers in Public Health*, *4*, 107. https://doi.org/10.3389/FPUBH.2016.00107/BIBTEX

Gartshore, E., Waring, J., & Timmons, S. (2017). Patient safety culture in care homes for older people: A scoping review. *BMC Health Services Research*, *17*(1), 1–11.

https://doi.org/10.1186/s12913-017-2713-2

Gendall, P., & Healey, B. (2008). Asking the age question in mail and online surveys. *International Journal of Market Research*, *50*(3), 309–318. https://doi.org/10.1177/147078530805000303

Gleim, M. R., Smith, J. S., Andrews, D., & Cronin, J. J. (2013). Against the Green: A Multi-method Examination of the Barriers to Green Consumption. *Journal of Retailing*, *89*(1), 44–61. https://doi.org/10.1016/j.jretai.2012.10.001

Goncalo, J. A., & Katz, J. H. (2020). Your Soul Spills Out: The Creative Act Feels Self-Disclosing. *Personality and Social Psychology Bulletin*, *46*(5), 679–692. https://doi.org/10.1177/0146167219873480

Gordon, D. (2020). Sustainability in the Operating Room: Reducing Our Impact on the Planet. *Anesthesiology Clinics*, *38*(3), 679–692. https://doi.org/10.1016/j.anclin.2020.06.006

Granel-Giménez, N., Palmieri, P. A., Watson-Badia, C. E., Gómez-Ibáñez, R., Leyva-Moral, J. M., & Bernabeu-Tamayo, M. D. (2022). Patient Safety Culture in European Hospitals: A Comparative Mixed Methods Study. *International Journal of Environmental Research and Public Health*, *19*(2), 939. https://doi.org/10.3390/ijerph19020939

Graves, L. M., Sarkis, J., & Zhu, Q. (2013). How transformational leadership and employee motivation combine to predict employee proenvironmental behaviors in China. *Journal of Environmental Psychology*, *35*, 81–91. https://doi.org/10.1016/j.jenvp.2013.05.002

Greaves, M., Zibarras, L. D., & Stride, C. (2013). Using the theory of planned behavior to explore environmental behavioral intentions in the workplace. *Journal of Environmental Psychology*, *34*, 109–120. https://doi.org/10.1016/j.jenvp.2013.02.003

Green Deal Duurzame Zorg | RIVM. (n.d.). Retrieved December 21, 2021, from https://www.rivm.nl/green-deal-duurzame-zorg

Griffith, L. E., Cook, D. J., Guyatt, G. H., & Charles, C. A. (1999). Comparison of open and closed questionnaire formats in obtaining demographic information from Canadian general internists. *Journal of Clinical Epidemiology*, *52*(10), 997–1005. https://doi.org/10.1016/S0895-4356(99)00106-7

Haffar, M., & Searcy, C. (2018). Target-setting for ecological resilience: Are companies setting environmental sustainability targets in line with planetary thresholds? *Business Strategy and the Environment*, *27*(7), 1079–1092. https://doi.org/10.1002/bse.2053

Hahn, T., Pinkse, J., Preuss, L., & Figge, F. (2015). Tensions in Corporate Sustainability: Towards an Integrative Framework. *Journal of Business Ethics*, *127*(2), 297–316. https://doi.org/10.1007/s10551-014-2047-5

Haines, A., & Patz, J. A. (2004). Health Effects of Climate Change. In *Journal of the American Medical Association* (Vol. 291, Issue 1, pp. 99–103). https://doi.org/10.1001/jama.291.1.99

Hansson, S. O. (2020). How Extreme Is the Precautionary Principle? *NanoEthics*, *14*(3), 245–257. https://doi.org/10.1007/S11569-020-00373-5/FIGURES/2

Hoerger, M. (2010). Participant Dropout as a Function of Survey Length in Internet-Mediated University Studies: Implications for Study Design and Voluntary Participation in Psychological Research. *Cyberpsychology, Behavior and Social Networking*, *13*(6), 697. https://doi.org/10.1089/CYBER.2009.0445

Hoffmann, B., Müller, V., Rochon, J., Gondan, M., Müller, B., Albay, Z., Weppler, K., Leifermann, M., Mießner, C., Güthlin, C., Parker, D., Hofinger, G., & Gerlach, F. M. (2014). Effects of a team-based assessment and intervention on patient safety culture in general practice: An open randomised controlled trial. *BMJ Quality and Safety*, *23*(1), 35–46. https://doi.org/10.1136/bmjqs-2013-001899

Hwang, J. S., & Hu, T. H. (2015). A stepwise regression algorithm for high-dimensional

variable selection. *Journal of Statistical Computation and Simulation*, *85*(9), 1793–1806. https://doi.org/10.1080/00949655.2014.902460

Johansson, K. (2016). Understanding recycling behavior: a study of motivational factors behind waste recycling. *Waste Management and The Environment VIII*, *1*(Wm), 401–414. https://doi.org/10.2495/wm160361

Johnstone, M. L., & Tan, L. P. (2015). Exploring the Gap Between Consumers' Green Rhetoric and Purchasing Behaviour. *Journal of Business Ethics*, *132*(2), 311–328. https://doi.org/10.1007/s10551-014-2316-3

Jung, T., Scott, T., Davies, H. T. O., Bower, P., Whalley, D., McNally, R., & Mannion, R. (2009). Instruments for exploring organizational culture: A review of the literature. *Public Administration Review*, *69*(6), 1087–1096. https://doi.org/10.1111/j.1540-6210.2009.02066.x

Kaiser, F. G., & Gutscher, H. (2003). The proposition of a general version of the theory of planned behavior: Predicting ecological behavior. *Journal of Applied Social Psychology*, *33*(3), 586–603. https://doi.org/10.1111/j.1559-1816.2003.tb01914.x

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, *72*(12), 2954–2965. https://doi.org/10.1111/JAN.13031

Kaplan, S. B., & Forst, L. (2017). Linking environmental sustainability, health, and safety data in health care: A research roadmap. *New Solutions*, *27*(2), 189–209. https://doi.org/10.1177/1048291117710784

Katz, I. M., Rauvola, R. S., Rudolph, C. W., & Zacher, H. (2022). Employee green behavior: A meta-analysis. *Corporate Social Responsibility and Environmental Management*, *January*, 1–12. https://doi.org/10.1002/csr.2260

Keller, R. L., Muir, K., Roth, F., Jattke, M., & Stucki, M. (2021). From bandages to buildings: Identifying the environmental hotspots of hospitals. *Journal of Cleaner Production*, *319*(September 2020), 128479. https://doi.org/10.1016/j.jclepro.2021.128479

Kim, W. G., McGinley, S., Choi, H. M., & Agmapisarn, C. (2020). Hotels' environmental leadership and employees' organizational citizenship behavior. *International Journal of Hospitality Management*, *87*(September 2019), 102375. https://doi.org/10.1016/j.ijhm.2019.102375

Kirwan, B., Reader, T., & Parand, A. (2019). The safety culture stack – the next evolution of safety culture? *Https://Doi.Org/10.1080/09617353.2018.1556505*, *38*(3), 200–217. https://doi.org/10.1080/09617353.2018.1556505

Klöckner, C. A., & Oppedal, I. O. (2011). General vs. domain specific recycling behaviour - Applying a multilevel comprehensive action determination model to recycling in Norwegian student homes. *Resources, Conservation and Recycling*, *55*(4), 463–471. https://doi.org/10.1016/j.resconrec.2010.12.009

Kohn, L., Corrigan, J., & Donaldson, M. (2000). *To Err Is Human*. National Academies Press. https://doi.org/10.17226/9728

Kwak, S. G., & Kim, J. H. (2017). Central limit theorem: the cornerstone of modern statistics. *Korean Journal of Anesthesiology*, *70*(2), 144. https://doi.org/10.4097/KJAE.2017.70.2.144

Langstaff, K., & Brzozowski, V. (2017). Managing environmental sustainability in a healthcare setting. *Healthcare Management Forum*, *30*(2), 84–88. https://doi.org/10.1177/0840470416675178

Lark, M. E., Kirkpatrick, K., & Chung, K. C. (2018). Patient Safety Movement: History and Future Directions. *Journal of Hand Surgery*, *43*(2), 174–178.

https://doi.org/10.1016/j.jhsa.2017.11.006

LDE Centre for Sustainability. (2022). *Interdisciplinary Thesis Lab: Sustainable Hospitals by Medical Delta | Centre for Sustainability*. https://www.centre-for-sustainability.nl/for-students/interdisciplinary-thesis-labs/interdisciplinary-thesis-lab-sustainable-hospitals-by

Lee, K. (2013). Student and infection prevention and control nurses' hand hygiene decision making in simulated clinical scenarios: A qualitative research study of hand washing, gel and glove use choices. *Journal of Infection Prevention*, *14*(3), 96–103. https://doi.org/10.1177/1757177413484784

Lenzen, M., Malik, A., Li, M., Fry, J., Weisz, H., Pichler, P.-P., Chaves, L. S. M., Capon, A., & Pencheon, D. (2020). The environmental footprint of health care: a global assessment. *The Lancet Planetary Health*, *4*(7), e271–e279. https://doi.org/10.1016/S2542-5196(20)30121-2

Linnenluecke, M. K., & Griffiths, A. (2010). Corporate sustainability and organizational culture. *Journal of World Business*, *45*(4), 357–366. https://doi.org/10.1016/j.jwb.2009.08.006

Liobikiene, G., & Poškus, M. S. (2019). The importance of environmental knowledge for private and public sphere pro-environmental behavior: Modifying the Value-Belief-Norm theory. *Sustainability (Switzerland)*, *11*(12). https://doi.org/10.3390/su10023324

LUMC. (2020). *LUMC Jaarverslag 2020*.

Mannion, R., & Davies, H. (2018). Understanding organisational culture for healthcare quality improvement. *BMJ (Online)*, *363*(November), 1–4. https://doi.org/10.1136/bmj.k4907

Matthes, J., & Wonneberger, A. (2014). The skeptical green consumer revisited: Testing the relationship between green consumerism and skepticism toward advertising. *Journal of*

Advertising, *43*(2), 115–127. https://doi.org/10.1080/00913367.2013.834804

McLean, L. D. (2005). Organizational Culture's Influence on Creativity and Innovation: A
Review of the Literature and Implications for Human Resource Development. *Advances
in Developing Human Resources*, *7*(2), 226–246.
https://doi.org/10.1177/1523422305274528

Mi, L., Sun, Y., Gan, X., Yang, H., Lv, T., Shang, K., Qiao, Y., & Jiang, Z. (2020).
Promoting Employee Green Behavior Through the Person-Organization Fit: The
Moderating Effect of Psychological Distance. *Frontiers in Psychology*, *11*(October), 1–
16. https://doi.org/10.3389/fpsyg.2020.568385

Modell, S. (2005). Triangulation between case study and survey methods in management
accounting research: An assessment of validity implications. *Management Accounting
Research*, *16*(2), 231–254. https://doi.org/10.1016/j.mar.2005.03.001

Myers, K. F., Doran, P. T., Cook, J., Kotcher, J. E., & Myers, T. A. (2021). Consensus
revisited: Quantifying scientific agreement on climate change and climate expertise
among Earth scientists 10 years later. *Environmental Research Letters*, *16*(10).
https://doi.org/10.1088/1748-9326/ac2774

Naoum, P., Palioura, S., Naoum, V., Nomikos, N., Bachtalia, K., Zisis, K., Athanasakis, K.,
& Kyriopoulos, J. (2021). Cost–benefit analysis of single versus repeated use of single-
use devices in cataract surgery. *Clinical Ophthalmology*, *15*, 1491–1501.
https://doi.org/10.2147/OPTH.S292849

Nederhof, A. J. (1985). Methods of coping with social desirability bias: A review. *European
Journal of Social Psychology*, *15*(3), 263–280.
https://doi.org/10.1002/EJSP.2420150303

Nolan, T. W. (2000). System changes to improve patient safety. *BMJ*, *320*(7237), 771–773.
https://doi.org/10.1136/bmj.320.7237.771

Norton, T. A., Parker, S. L., Zacher, H., & Ashkanasy, N. M. (2015). Employee Green

Behavior: A Theoretical Framework, Multilevel Review, and Future Research Agenda.

Organization and Environment, *28*(1), 103–125.

https://doi.org/10.1177/1086026615575773

Norton, T. A., Zacher, H., & Ashkanasy, N. M. (2012). On the importance of pro-

environmental organizational climate for employee green behavior. *Industrial and

Organizational Psychology*, *5*(4), 497–500. https://doi.org/10.1111/j.1754-

9434.2012.01487.x

Norton, T. A., Zacher, H., & Ashkanasy, N. M. (2014). Organisational sustainability policies

and employee green behaviour: The mediating role of work climate perceptions. *Journal

of Environmental Psychology*, *38*, 49–54. https://doi.org/10.1016/j.jenvp.2013.12.008

Ones, D. S., & Dilchert, S. (2012). Employee Green Behaviors. *Managing HR for

Environmental Sustainability*, 85–116.

Phelan, S. (2011). Case study research: design and methods. *Evaluation & Research in

Education*, *24*(3), 221–222. https://doi.org/10.1080/09500790.2011.582317

Pinzone, M., Lettieri, E., & Masella, C. (2012). Sustainability in healthcare: Combining

organizational and architectural levers. *International Journal of Engineering Business

Management*, *4*(1), 1–9. https://doi.org/10.5772/54841

Porter, S. R., Whitcomb, M. E., & Weitzer, W. H. (2004). Multiple surveys of students and

survey fatigue. *New Directions for Institutional Research*, *2004*(121), 63–73.

https://doi.org/10.1002/ir.101

Pronovost, P. J., Weast, B., Holzmueller, C. G., Rosenstein, B. J., Kidwell, R. P., Haller, K.

B., Feroli, E. R., Sexton, J. B., & Rubin, H. R. (2003). Evaluation of the culture of

safety: Survey of clinicians and managers in an academic medical center. *Quality and

Safety in Health Care*, *12*(6), 405–410. https://doi.org/10.1136/qhc.12.6.405

Ramus, C. A., & Killmer, A. B. C. (2007). Corporate greening through prosocial extrarole behaviours - A conceptual framework for employee motivation. *Business Strategy and the Environment*, *16*(8), 554–570. https://doi.org/10.1002/bse.504

Ried, L., Eckerd, S., & Kaufmann, L. (2022). Social desirability bias in PSM surveys and behavioral experiments: Considerations for design development and data collection. *Journal of Purchasing and Supply Management*, *28*(1), 100743. https://doi.org/10.1016/J.PURSUP.2021.100743

Rodriguez, R., Svensson, G., & Wood, G. (2020). Sustainability trends in public hospitals: Efforts and priorities. *Evaluation and Program Planning*, *78*(October 2019). https://doi.org/10.1016/j.evalprogplan.2019.101742

Rushton, L. (2007). The precautionary principle in the context of multiple risks. *Occupational and Environmental Medicine*, *64*(9), 574. https://doi.org/10.1136/OEM.2006.031856

Sabbir, M. M., Khan, |, Taufique, R., Md, K., & Brookes, O. (2021). *Sustainable employee green behavior in the workplace: Integrating cognitive and non-cognitive factors in corporate environmental policy*. *22*. https://doi.org/10.1002/bse.2877

Sammer, C. E., Lykens, K., Singh, K. P., Mains, D. A., & Lackan, N. A. (2010). What is patient safety culture? A review of the literature. *Journal of Nursing Scholarship*, *42*(2), 156–165. https://doi.org/10.1111/j.1547-5069.2009.01330.x

Schein. (2010). *Organizational culture and leadership* (Vol. 31). https://doi.org/978-0-470-18586-5

Schein, E. H. (1990). Organizational culture. *American Psychologist*, *45*(2), 109–119. https://doi.org/10.1037/0003-066X.45.2.109

Schwartz, M. S. (2005). Universal moral values for corporate codes of ethics. *Journal of Business Ethics*, *59*(1), 27–44. https://doi.org/10.1007/s10551-005-3403-2

Seifert, C., & Guenther, E. (2019). Prevention is better than cure—Environmental management measures in hospitals. *Corporate Social Responsibility and Environmental Management*, *26*(4), 781–790. https://doi.org/10.1002/csr.1720

Shani, A. B. R., & Mohrman, S. A. (2012). Learning to organize for sustainable health care: Rigor, reflection and relevance. *Organizing for Sustainable Effectiveness*, *2*(2012), 227–249. https://doi.org/10.1108/S2045-0605(2012)0000002012

Sherman, J. D., Thiel, C., MacNeill, A., Eckelman, M. J., Dubrow, R., Hopf, H., Lagasse, R., Bialowitz, J., Costello, A., Forbes, M., Stancliffe, R., Anastas, P., Anderko, L., Baratz, M., Barna, S., Bhatnagar, U., Burnham, J., Cai, Y., Cassels-Brown, A., … Bilec, M. M. (2020). The Green Print: Advancement of Environmental Sustainability in Healthcare. *Resources, Conservation and Recycling*, *161*. https://doi.org/10.1016/j.resconrec.2020.104882

Sim, M. A., Ti, L. K., Mujumdar, S., Chew, S. T. H., Penanueva, D. J. B., Kumar, B. M., & Ang, S. B. L. (2022). Sustaining the Gains: A 7-Year Follow-Through of a Hospital-Wide Patient Safety Improvement Project on Hospital-Wide Adverse Event Outcomes and Patient Safety Culture. *Journal of Patient Safety*, *18*(1), E189–E195. https://doi.org/10.1097/PTS.0000000000000725

Singh, D., Parsa, A., & Parsa, F. D. (2021). Do Gloves Provide Adequate Protection Against Infection? *Aesthetic Plastic Surgery*, *45*(6), 3045–3047. https://doi.org/10.1007/s00266-021-02553-4

Smits, M., Christiaans-Dingelhoff, I., Wagner, C., van der Wal, G., & Groenewegen, P. (2007). De validiteit van COMPaZ. *Tsg*, *85*(2), 105–114. https://doi.org/10.1007/bf03078622

Sonğur, C., Özer, Ö., Gün, Ç., & Top, M. (2018). Patient Safety Culture, Evidence-Based Practice and Performance in Nursing. *Systemic Practice and Action Research*, *31*(4),

359–374. https://doi.org/10.1007/S11213-017-9430-Y

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., De Vries, W., De Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, *347*(6223), 50–51. https://doi.org/10.1126/science.1259855

Strauss, K., Lepoutre, J., & Wood, G. (2017). Fifty shades of green: How microfoundations of sustainability dynamic capabilities vary across organizational contexts. *Journal of Organizational Behavior*, *38*(9), 1338–1355. https://doi.org/10.1002/job.2186

Tahir, R., Athar, M. R., Faisal, F., Shahani, N. un N., & Solangi, B. (2019). Green Organizational Culture: A Review of Literature and Future Research Agenda. *Annals of Contemporary Developments in Management & HR*, *1*(1), 23–38. https://doi.org/10.33166/acdmhr.2019.01.004

Taras, V., Rowney, J., & Steel, P. (2009). Half a century of measuring culture: Review of approaches, challenges, and limitations based on the analysis of 121 instruments for quantifying culture. *Journal of International Management*, *15*(4), 357–373. https://doi.org/10.1016/j.intman.2008.08.005

Thiel, C. L., Woods, N. C., & Bilec, M. M. (2018). Strategies to Reduce Greenhouse Gas Emissions from Laparoscopic Surgery. *American Journal of Public Health*, *108*(S2), S158–S164. https://doi.org/10.2105/AJPH.2018.304397

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H. B., Choi, Y. S., Quan, X., & Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *Herd*, *1*(3), 61–125. https://doi.org/10.1177/193758670800100306

Vesely, S., & Klöckner, C. A. (2020). Social Desirability in Environmental Psychology Research: Three Meta-Analyses. *Frontiers in Psychology*, *11*, 1395.

https://doi.org/10.3389/FPSYG.2020.01395/BIBTEX

Walpole, S. C., Barna, S., Richardson, J., & Rother, H. A. (2019). Sustainable healthcare education: integrating planetary health into clinical education. In *The Lancet Planetary Health* (Vol. 3, Issue 1, pp. e6–e7). Elsevier. https://doi.org/10.1016/S2542-5196(18)30246-8

Warburton, R. N. (2005). Patient safety - How much is enough? *Health Policy*, *71*(2), 223–232. https://doi.org/10.1016/j.healthpol.2004.08.009

Waterson, P., Carman, E. M., Manser, T., & Hammer, A. (2019). Hospital Survey on Patient Safety Culture (HSPSC): A systematic review of the psychometric properties of 62 international studies. *BMJ Open*, *9*(9). https://doi.org/10.1136/bmjopen-2018-026896

Weigt-Rohrbeck, J., & Linneberg, M. S. (2019). Democratizing innovation processes: personal initiative in bottom-up eco-innovation. *European Journal of Innovation Management*, *22*(5), 821–844. https://doi.org/10.1108/EJIM-12-2018-0278

Wesselink, R., Blok, V., & Ringersma, J. (2017). Pro-environmental behaviour in the workplace and the role of managers and organisation. *Journal of Cleaner Production*, *168*, 1679–1687. https://doi.org/10.1016/j.jclepro.2017.08.214

Wood, L. C., Wang, C., Abdul-Rahman, H., & Jamal Abdul-Nasir, N. S. (2016). Green hospital design: Integrating quality function deployment and end-user demands. *Journal of Cleaner Production*, *112*, 903–913. https://doi.org/10.1016/j.jclepro.2015.08.101

Wyss, A. M., Knoch, D., & Berger, S. (2022). When and how pro-environmental attitudes turn into behavior: The role of costs, benefits, and self-control. *Journal of Environmental Psychology*, *79*(February 2021), 101748. https://doi.org/10.1016/j.jenvp.2021.101748

Yeşiltaş, M., Gürlek, M., & Kenar, G. (2022). Organizational green culture and green employee behavior: Differences between green and non-green hotels. *Journal of*

Cleaner Production, *343*(July 2021), 131051.

https://doi.org/10.1016/j.jclepro.2022.131051

Zhang, Y., Zhang, Z., & Jia, M. (2021). When and Why Perceived Organizational

Environmental Support Fails to Work: From a Congruence Perspective. *Management*

and Organization Review. https://doi.org/10.1017/mor.2021.11

Zhu, J., Tang, W., Wang, H., & Chen, Y. (2021). The influence of green human resource

management on employee green behavior—a study on the mediating effect of

environmental belief and green organizational identity. *Sustainability (Switzerland)*,

13(8). https://doi.org/10.3390/su13084544

Zhu, Yang, & Hsee. (2018). The Mere Urgency Effect. *Journal of Consumer Research*, *45*,

673–690. https://doi.org/10.1093/jcr/ucy008

Zijp, M., Velders, G., & Waaijers-van der Loop, S. (2021). *The win-win effect of sustainable*

health care: measures and their health effects. https://www.rivm.nl/documenten/win-

win-effect-of-sustainable-health-care-measures-and-their-health-effects

Appendix A: interview guide

Interview guide/questions

Introduction:

Ask if it's okay to record interview

Short explanation of research: little is known about role employees in making hospital more sustainable

1. What is your job in the hospital?

[1: Patient Safety culture]

1. What does patient safety culture mean to you?

2. How does it appear in your job/department?

3. Has it changed much over recent years?

4. How is it 'taught' to people?

-> If yes: how?

-> If unknown -> For example by trainings?

[2: Sustainability/EGB]

5. How do you interpret sustainability?

 -> Is it important in your own life?

6. And how do you experience it in your job?

7. Are there initiatives in your department?

-> If yes: what is going well and what is going not so well?

8. Do you have the idea that co-workers have it on their mind?

9. Do you experience a culture in which sustainable initiatives are being supported?

10. Do people take initiatives by themselves?

[3. Potential links PSC/EGB]

11. Do you feel like the focus on safety in the hospital hinders sustainability?

-> If yes: do you have any examples of this?

-> If answer is about fear for consequences/restraint: Do you have any idea how to manage this conservative attitude?

12. How would you ideally envision it?

Appendix B: Frequency table

	(Strongly) Disagree		Neither		(Strongly) Agree		Missing	
	n	%	n	%	n	%	n	%
Patient safety culture								
Patient safety is never sacrificed to get more work done.	21	26.3%	14	17.5%	41	51.2%	4	5.0%
Our procedures and systems are good at preventing errors from happening.	6	7.5%	19	23.8%	51	63.7%	4	5.0%
It is just by chance that more serious mistakes don't happen around here. [later recoded]	48	60,0%	21	26.3%	7	8.8%	4	5.0%
We have patient safety problems in this unit. [later recoded]	47	58.8%	19	23.8%	10	12.5%	4	5.0%
We are actively doing things to improve patient safety.	5	6.3%	14	17.5%	54	67.5%	7	8.8%
Mistakes have led to positive changes here.	4	5.0%	10	12.5%	58	72.5%	8	10.0%
After we make changes to improve patient safety, we evaluate their effectiveness.	12	15.0%	25	31.3%	35	43.8%	8	10.0%
Hospital management provides a work climate that promotes patient safety.	15	18.8%	19	23.8%	39	48.8%	7	8.8%
The actions of hospital management show that patient safety is a top priority.	17	21.3%	32	40.0%	23	28.7%	8	10.0%
Hospital management seems interested in patient safety only after an adverse event happens. [later recoded]	23	28.7%	36	45.0%	13	16.3%	8	10.0%
Task-related EGB								
I can adequately complete assigned duties in environmentally friendly ways.	19	23,8%	12	15,0%	34	42,5%	15	18,8%
I can fulfill responsibilities specified in my job description in environmentally friendly ways.	18	22,5%	14	17,5%	33	41,3%	15	18,8%
I can perform tasks that are expected of me in environmentally friendly ways.	22	27,5%	11	13,8%	32	40,0%	15	18,8%
I can accomplish the environmental protection tasks within my duties competently.	16	20,0%	9	11,3%	40	50,0%	15	18,8%
Proactive EGB								
In my work, I weigh the consequences of my actions before doing something that could affect the environment.	16	20,0%	15	18,8%	34	42,5%	15	18,8%

	(Strongly) Disagree		Neither		(Strongly) Agree		Missing	
	n	%	n	%	n	%	n	%
I voluntarily carry out environmental actions and initiatives in my daily work activities.	24	30,0%	9	11,3%	32	40,0%	15	18,8%
I make suggestions to my colleagues about ways to protect the environment more effectively, even when it is not my direct responsibility.	23	28,7%	10	12,5%	32	40,0%	15	18,8%
I actively participate in environmental events organized in and/or by my company.	33	41,3%	13	16,3%	19	23,8%	15	18,8%
I undertake environmental actions that contribute positively to the image of my organization.	28	35,0%	21	26,3%	15	18,8%	16	20,0%
I volunteer for projects, endeavours or events that address environmental issues in my organization.	44	55,0%	8	10,0%	12	15,0%	16	20,0%
I spontaneously give my time to help my colleagues take the environment into account in everything they do at work.	38	47,5%	13	16,3%	13	16,3%	16	20,0%
I encourage my colleagues to adopt more environmentally conscious behavior.	19	23,8%	8	10,0%	37	46,3%	16	20,0%
I encourage my colleagues to express their ideas and opinions on environmental issues.	23	28,7%	8	10,0%	33	41,3%	16	20,0%
Green work climate perceptions								
Our hospital is worried about its environmental impact.	10	12,5%	18	22,5%	32	40,0%	20	25,0%
Our hospital is interested in supporting environmental causes.	10	12,5%	19	23,8%	31	38,8%	20	25,0%
Our hospital believes it is important to project the environment.	9	11,3%	14	17,5%	37	46,3%	20	25,0%
Our hospital is concerned with becoming more environmentally friendly.	2	2,5%	11	13,8%	46	57,5%	21	26,3%
Our hospital is willing to assist employees in solving environmental problems.	12	15,0%	17	21,3%	31	38,8%	20	25,0%
Help is available at our hospital when environmental problems arise.	11	13,8%	24	30,0%	25	31,3%	20	25,0%
Our hospital is willing to extend itself to solve an environmental problem.	10	12,5%	19	23,8%	31	38,8%	20	25,0%
In our hospital, employees pay attention to environmental issues.	6	7,5%	13	16,3%	41	51,2%	20	25,0%

	(Strongly) Disagree		Neither		(Strongly) Agree		Missing	
	n	%	n	%	n	%	n	%
In our hospital, employees are concerned about acting in environmentally friendly ways.	6	7,5%	15	18,8%	39	48,8%	20	25,0%
In our hospital, employees try to minimise harm to the environment.	11	13,8%	20	25,0%	29	36,3%	20	25,0%
In our hospital, employees care about the environment.	2	2,5%	29	36,3%	29	36,3%	20	25,0%
Pro-environmental attitude								
We are approaching the limit of the number of people the Earth can support.	7	8,8%	16	20,0%	35	43,8%	22	27,5%
Humans interfering with nature produces disastrous consequences.	4	5,0%	9	11,3%	45	56,3%	22	27,5%
Humans are seriously abusing the environment.	0	0,0%	7	8,8%	51	63,7%	22	27,5%
The Earth is like a spaceship with very limited room and resources.	6	7,5%	15	18,8%	37	46,3%	22	27,5%
The balance of nature is very delicate and easily breakable.	2	2,5%	8	10,0%	48	60,0%	22	27,5%
If things continue on their present course, we will soon experience a major ecological catastrophe.	1	1,3%	10	12,5%	47	58,8%	22	27,5%

Appendix C: Normality assumptions checks

Model 1: PEGB + main variables

| Variable | *Proactive EGB* | | | |
	β	SE	t	p
PSC	0.089	0.045	1.992	0.047
GWC	0.257	0.051	5.893	0.000
NEP	0.355	0.041	8.141	0.000
	$R^2=0.231$			
	$F(3,423) = 42.416$, p=0.000			

Assumption 1: Relationship is linear: ✓
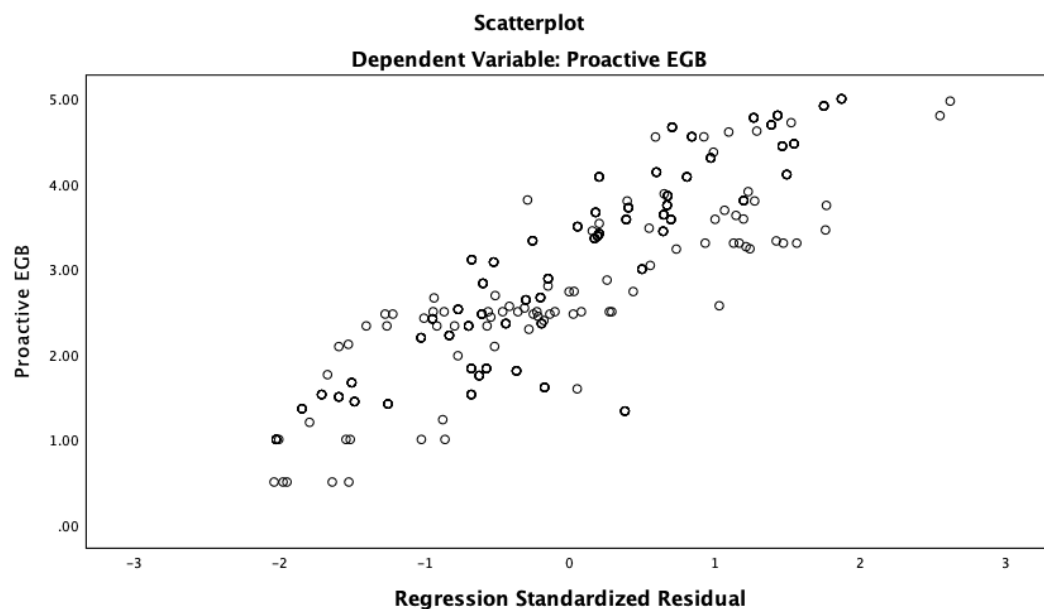
Assumption 2: Multicollinearity: ✓

All VIF scores were well below 10 (maximum VIF = 1.970) and tolerance scores were all above 0.2 (minimum tolerance = 0.527), which indicates that the assumption for multicollinearity was met.

#3: Values of residuals are independent: ✓

The Durbin-Watson statistic was 1.809, which lies in the acceptable range of 1.5-3, so the third assumption has been met.
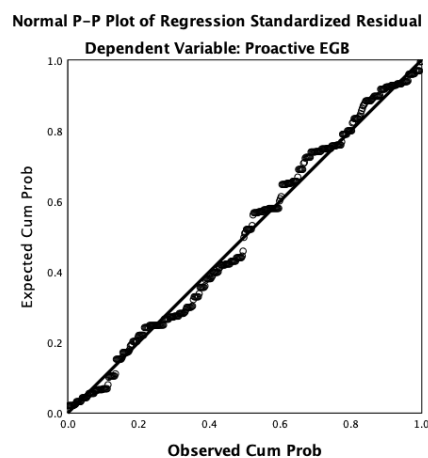
#4 Variance of residuals is constant (homoscedasticity): ✓

Plot: Y=ZRESID, X=ZPRED -> looks random
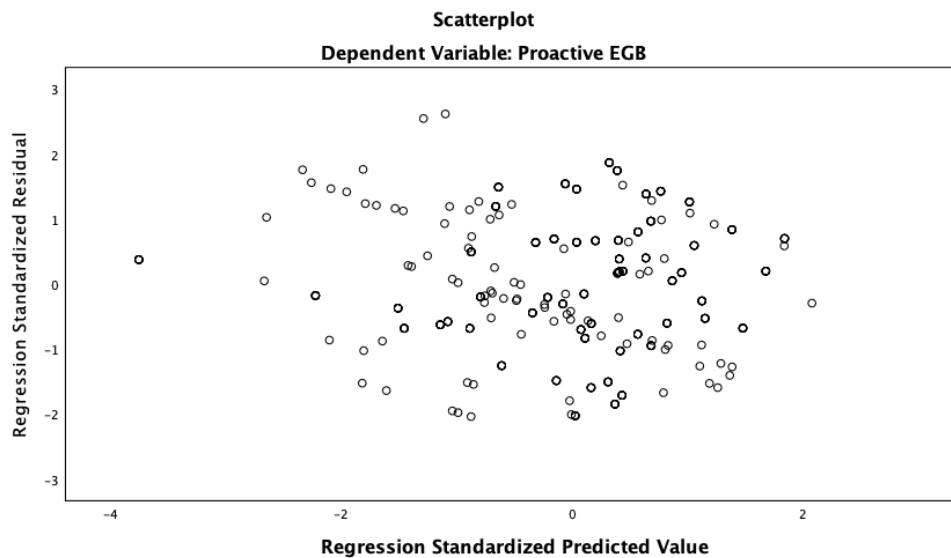
#5: Values of the residuals are normally distributed: ✓

The P-P plot for the model suggested that the assumption of normality of the residuals is met.

#6: No influential cases biasing model: ✓

Cook's distance values were all under 1 (maximum = 0.082), suggesting individual cases were not unduly influencing the model.

Model 2: TEGB (selection variables based on stepwise regression)

Variable	*Task-related EGB*			
	β	SE	t	*p*
GWC: Org. attitude	0.530	0.065	8.006	0.000
GWC: Org. support	-0.333	0.055	-5.128	0.000
NEP	-0.104	0.051	-2.172	0.031
Direct interaction patients	-0.253	0.136	-5.166	0.000
			$R^2 = 0.254$	
			$F(4,335) = 28.574, p = 0.000$	

Assumption 1: Relationship is linear: ✓
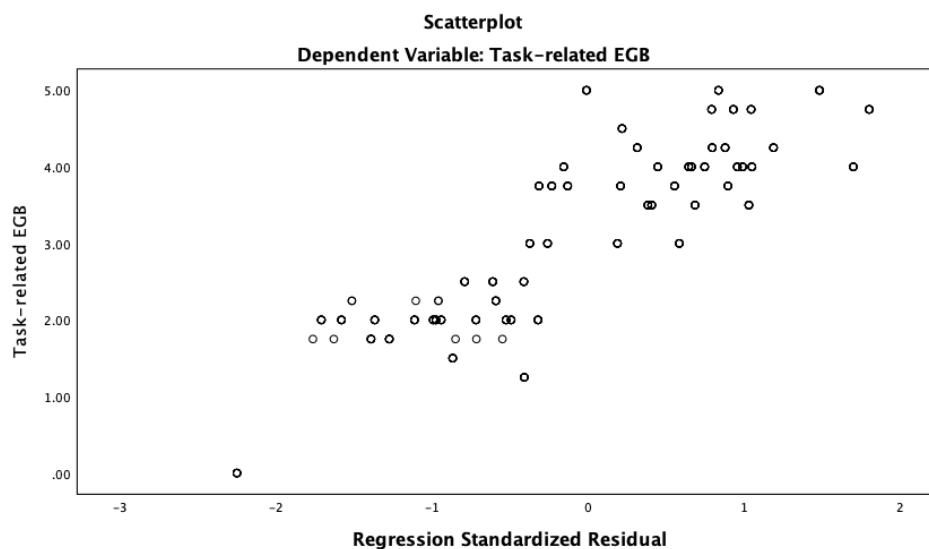
**Assumption 2: Multicollinearity:** ✓

All VIF scores were well below 10 (maximum VIF = 1.970) and tolerance scores were all

above 0.2 (minimum tolerance = 0.527), which indicates that the assumption for

multicollinearity was met.

#3: values of residuals are independent: ✓

The Durbin-Watson statistic was 2.276, which lies in the acceptable range of 1.5-3, so
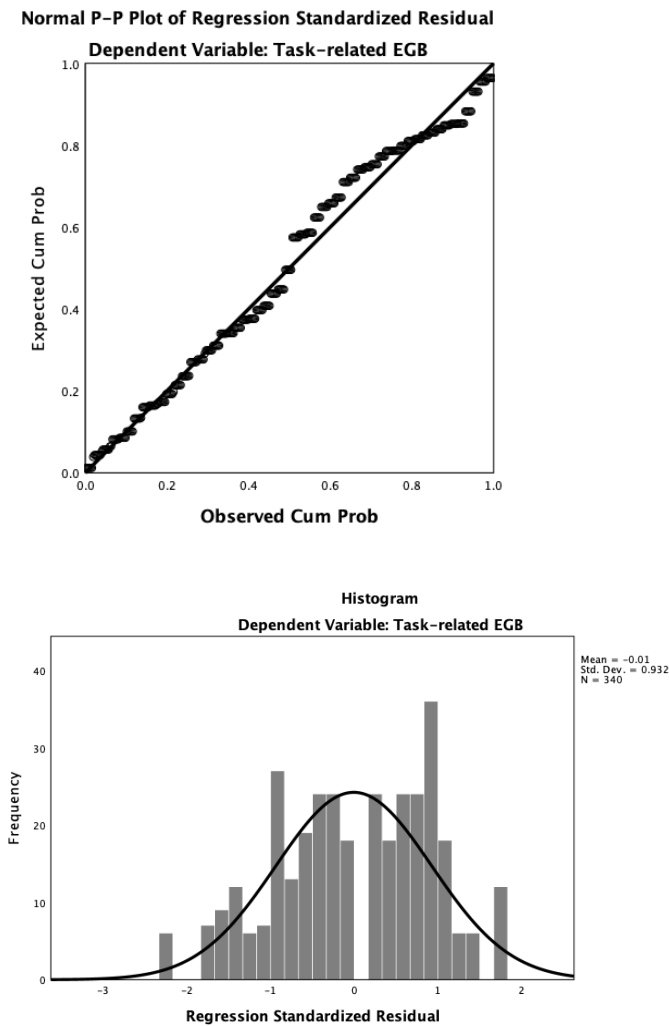
the third assumption has been met.

#4 Variance of residuals is constant (homoscedasticity) : ✓

Plot: Y=ZRESID, X=ZPRED -> looks random

Scatterplot
Dependent Variable: Task-related EGB
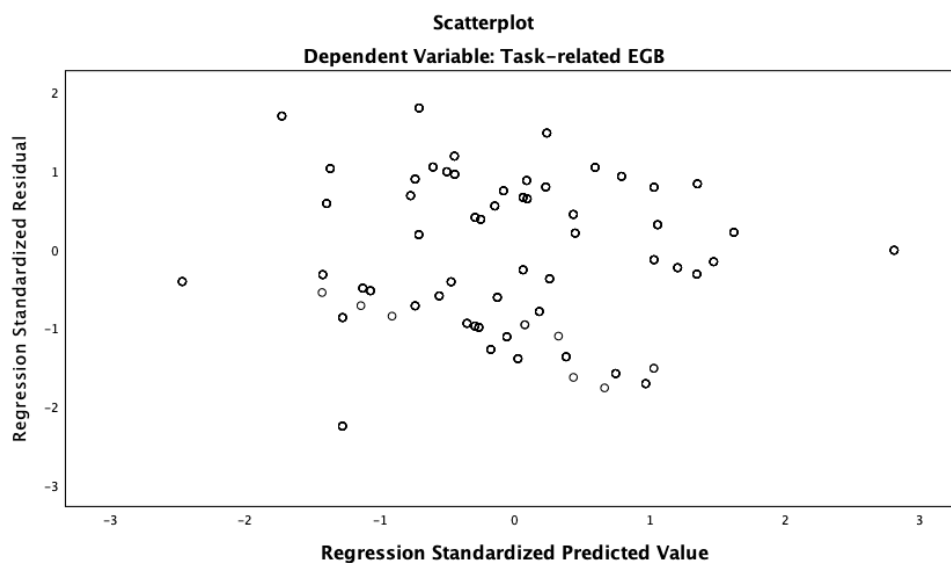
#5: Values of the residuals are normally distributed: ✗

The P-P plot for the model and histogram of the standardized residuals suggested that the

assumption of normality of the residuals was not met. However, violation of assumption is

not likely to have a significant impact on the findings as according to the Central Limit

Theorem, since n>30, the distribution of the sample means is fairly normally distributed and only extreme deviations from normality are likely to have a significant impact on the findings (Kwak & Kim, 2017).


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Task-related EGB

Histogram
Dependent Variable: Task-related EGB

#6: No influential cases biasing model: ✓

Cook's distance values were all under 1 (maximum = 0.011), suggesting individual cases were not unduly influencing the model.

Model 3: Proactive EGB - variables selected by stepwise regression

	Proactive EGB			
Variable	β	SE	t	*p*
NEP	0.269	0.046	5.521	.0.000
Green work climate	0.202	0.055	4.34	.0.000
Age	0.226	0.041	4.835	.0.000
Green team	0.204	0.109	4.395	0.000
Direct interaction patients	-0.145	0.127	-2.835	0.005
PS: Overall perception	0.118	0.044	2.317	0.021

$R^2=0.325$

$F(1,333) = 26.835, p = 0.000$

Assumption 1: Relationship is linear: ✓

Scatterplot
Dependent Variable: Proactive EGB
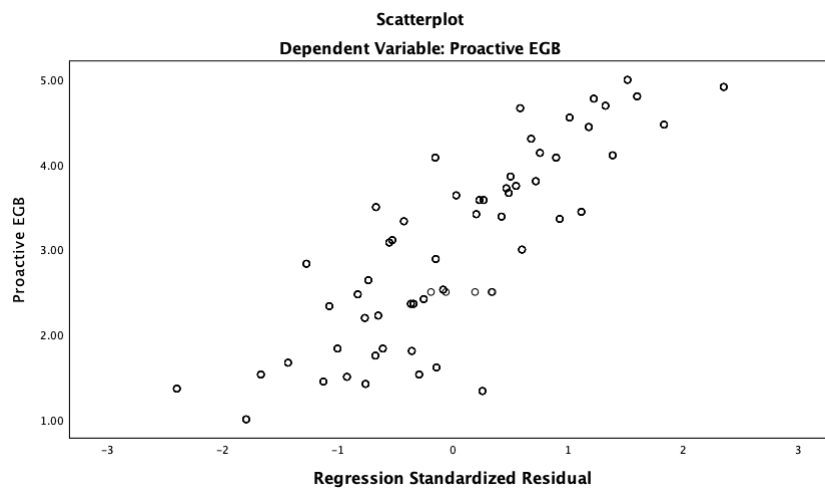
Assumption 2: Multicollinearity: ✓

VIF scores well below 10, tolerance score above 0.2 (statistics = max VIF = 1.282, min

tolerance = 0.784 respectively)

#3: values of residuals are independent: ✓

The Durbin-Watson statistic showed that this assumption had been met, as the obtained value

was 1.694, which lies in the acceptable range of 1.5-3.

#4 Variance of residuals is constant (homoscedasticity): ✓

    Plot: Y=ZRESID, X=ZPRED -> looks random

The standardized residuals vs standardized predicted values showed a random pattern and no

obvious signs of funneling, which suggests that the assumption of homoscedasticity has been

met.
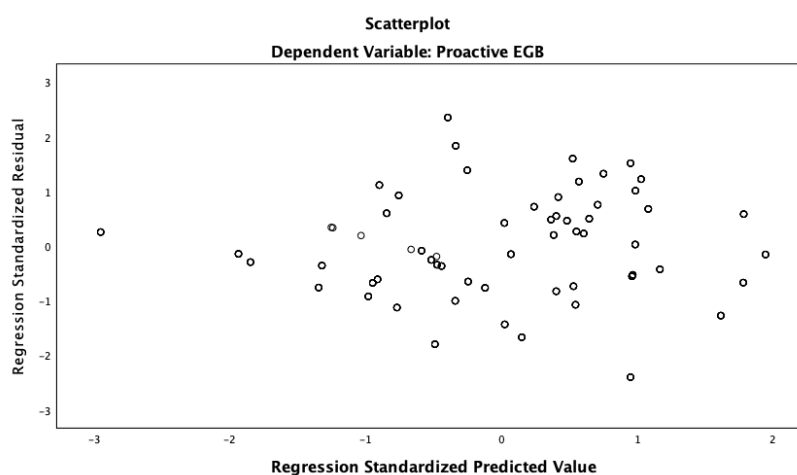
Scatterplot
Dependent Variable: Proactive EGB

#5: Values of the residuals are normally distributed: ✓

The P-P plot for the model suggested that the assumption of normality of the residuals is met.

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Proactive EGB
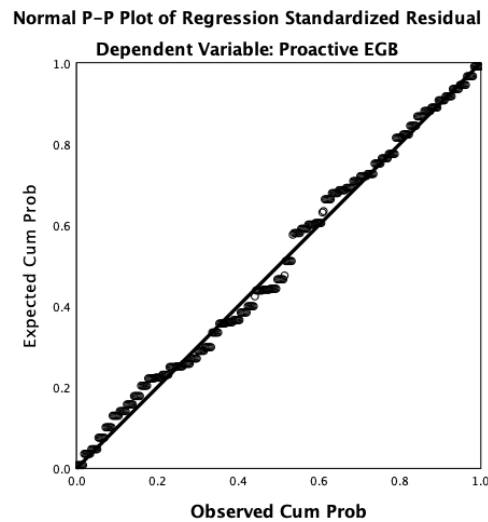
#6: No influential cases biasing model: ✓

Cook's distance values were all under 1 (maximum = 0.033), suggesting individual cases were not unduly influencing the model.