A Systematic Review of Design and Wellbeing

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ABSTRACT

An increasing number of researches has been focusing on how design can contribute to happiness by trying to increase wellbeing. The focus is providing solutions through design to improve people's lives, thus increasing the appreciation of their lives. The Ebscohost database was systematically searched for relevant publications about design and wellbeing until 2019. A total of 17 journal articles, published between 2010 and 2018, were included in the research. Data was extracted on macro-theme and category of research, by application area, design, methods, instruments, and focus. Studies on design and wellbeing were explored in the last decade mostly by European researchers. Physical environment, product design, sustainability, and technology are the most common application areas, and most of them have references related to the psychological literature. The main method adopted is experimental and qualitative in nature. The association between design and wellbeing is one that most often targets variables and projects to increase wellbeing instead of discussing how the results will improve positive affect and decrease negative affect to improve people's lives. The area of research has been growing at a slow steady pace since 2010.

Keywords: Wellbeing, Design for Wellbeing, Positive Design, Subjective Wellbeing, Positive Psychology.

INTRODUCTION

Wellbeing is an important component of people's everyday lives and interactions. Traditional approaches to wellbeing appear to be in the field of psychology, for which the sense of psychological wellbeing can be best described as happiness (Bradburn, 1969). Bradburn studied the structure of psychological wellbeing, gathering data that would differentiate between positive and negative affect, by learning how macro-level social changes would affect people's lives. According to the author, positive and negative affect are both parts of a range of wellbeing, which goes beyond happiness.

Johnson, Robertson, and Cooper (2018) also point out that wellbeing is more stable than people's mood in a certain moment, but still more volatile than their personalities. The authors refer to the two components that constitute psychological wellbeing: "hedonic" and "eudaimonic." The "hedonic" approach is a more subjective view of happiness in terms of the search for more pleasure (positive affect) and less pain [b] (negative affect). The "eudaimonic" approach dates back to Aristotle's (1947) as it relates to the purposeful aspects of wellbeing

that can be achieved by action. Aristotle suggested that people do not rate their "eudaimonia" in the same way, but that achieving it will bring self-realization (see also Ryan & Deci, 2001, for a review). Ryff (1995) takes a step further to describe dimensions of wellbeing beyond affect in terms of self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth.

The study of wellbeing has recently spread to the field of design by manipulating design variables to influence wellbeing. When designing for wellbeing, it is possible to develop products, services, technologies, built environments and sustainability. Thus, there are different approaches to it. On the one hand, researchers such as Desmet and Pohlmeyer (2013) actively try to influence wellbeing through their design. According to Pohlmeyer (2013), while positive psychology focuses on the individual characteristics and contingencies related to wellbeing to achieve a fulfilling life, positive design is concerned with providing "actionable design solutions" (p.543) to improve people's lives. In other words, the area of positive design, as defined by Desmet and Pohlmeyer (2013), is concerned with how design can contribute to happiness by trying to increase subjective wellbeing, increasing "enduring appreciation of their lives" (p.7).

Pohlmeyer (2013) proposes that designers should create the necessary means for people to flourish. The researcher states that the design field must not only be looking to diminish displeasure but proactively targeting how to promote subjective wellbeing through experiences. In this way, design would be able to address a wide range of components related to wellbeing. The author also states that professionals should try to design for lasting wellbeing by dealing with eudaimonic elements, through the lenses of positive design.

On the other hand, some academics develop research on the relationships between design and wellbeing but do not specifically target the second one as the intended result of their work. They focus on variables and projects that are supposed to increase wellbeing. An example is the study carried out by Ozkaramanli & Desmet (2012), in which conflicting concerns were explored in the context of sustainable eating habits. They are concerns that are challenging to satisfy simultaneously. Therefore, their conciliation might help to improve the user's wellbeing.

Even though a set of authors is concerned with the theme and that research through a diversity of approaches has been growing in the past few years, a study on the relationship between psychology, wellbeing and design is needed. Therefore, a systematic review of journal publications was developed to identify direct connections (not reviews) of the topic. The aim of this paper was to analyze what had been produced by researchers to date in peer-reviewed journal papers regarding the connections between design and wellbeing. A secondary aim is to verify in which extension psychology has influenced the field of design for wellbeing until now. Furthermore, we verified in which journals and when they were published, authors' countries of residence, keywords, application areas (e.g., product, environments), and methodological approaches employed by them.

1. METHOD

The aim research questions addressed in this study is: How can the design field apply psychological concepts, such as wellbeing, to its projects? In light of this question, we developed searches on Ebscohost's database, the largest academic multi-disciplinary

database, which also searches through other databases, such as PsychInfo, MEDLINE and EconLit.

The keywords used to search for relevant papers were "design*" AND "wellbeing OR well-being OR well being" until July 2019. The inclusion criteria were: (a) linked full text, (b) published in English, (c) published on academic journals, (d) peer-reviewed, and (e) address wellbeing in design research or projects.

Our initial search yielded over 21,000 manuscripts from which we wouldn't be able to filter and get to clear findings, which suggested a need for a narrower approach. We conducted a preliminary screening of the papers and concluded that this result was due to the word design being frequently involved in the description of the research design and is not necessarily related to the design field. Thus, we conducted the search of keywords found on paper's titles, which resulted in 148 papers. Abstracts were then screened to ensure that they address wellbeing in research or projects. All of the studies that did not present a connection between design and wellbeing were excluded, resulting in a total of 24 papers.

Once identified, the 24 relevant papers were downloaded and categorized in an excel spreadsheet. Two researchers conducted the original screening of the manuscript and whenever there was a question two other researchers helped solve it. The following information was extracted: name of the journal, year of publication, volume, issue number, authors' names, country of origin of the first and second authors, paper title, abstract, keywords and the application area (physical environment, technology, product, service, and sustainability). The analysis included descriptive statistics for all quantitative variables and the areas of application.

From the general search, we gathered 24 papers, being one of them a call for papers and two special issue editions. One of the special issues, an editorial by Michel, O'Shea and Hoppe (2015), was included in the analysis since we considered that it had original content, instead of only presenting the issue. All 24 articles were read so that it would be possible to identify whether they dealt with the connection between design and wellbeing. We then started a new spreadsheet, in which only filed papers that were directly related to our study. After careful consideration of the inclusion criteria, we limited our review to a total of 17 journal articles, published between 2010 and 2018, with none from 2019 fitting the criteria. The seven articles that were excluded from this systematic review did not fit the criteria because two of them were a call for papers and a special issue and the other five mentioned the word design without referring to the design field, being: individual task design; designing democracy; design for system performance; study design and methods; evidence from a clustered research design.

2. RESULTS

In Table 1 we report the number of papers found in each year. Up to 2010, we have not found any journal papers that matched our criteria. The amount of papers in the area has been gradually enhancing, with the most publications in 2013 (three papers), which declined from 2014 to 2018, with only two publications per year. When we considered only the last five years, results included 10 out of the 17 papers. This suggests that researchers are gradually starting to address the importance of improving people's wellbeing through design in their studies at a steady pace.

Table 1. Papers Identified in the Past Five Years Divided by Year and Journal of Publication

Year	Journal	Amount of publications	
		Per journal	Per year
2018	Journal of Biomedical Informatics	1	2
	Journal of Cleaner Production	1	
2017	Architectural Design	1	2
	Cities	1	
2016	Design Issues	1	2
	Applied Ergonomics	1	
2015	Journal of Occupational and Organizational Psychology	1	2
	Environmental Modelling & Software	1	
2014	Design Issues	1	2
	Applied Ergonomics	1	
2013	International Journal of Design	3	3
2012	International Journal of Design	1	1
2011	Design Issues	1	1
2010	Journal of Architectural and Planning Research	1	2
	Building and Environment	1	

To verify in which extension psychology has influenced the field of design for wellbeing, it is important to visualize the global presence of the subject. Thus, we analyzed the first author's country of residency and the journals where the studies were published. This helps build a panorama of the current body of work regarding the subject.

The journals in which these papers were published, and the number of studies found in each one of them can be observed in Figure 1. We found relevant papers in 11 different Journals. The International Journal of Design was the one that most published these papers in the field (23%), followed by Design Issues (17%), and Applied Ergonomics (12%). All the other published only one paper.
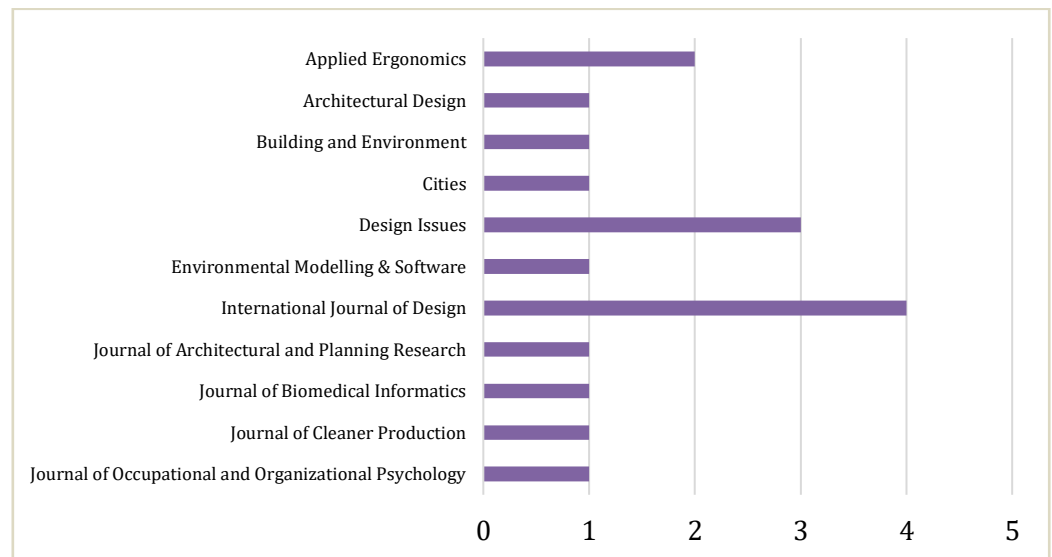
Figure 1. Journals in alphabetical order and number of publications

Considering that these journals focus in different areas of design and have different editorial policies, we can observe that wellbeing is being researched in a variety of areas related to design. Most of the research was conducted in European countries based on first author's country of residence (11 authors, 70.5%)—primarily Netherlands (4) and England (3)—followed by the United States (4 researchers, 23.5%) as can be seen in Figure 2.
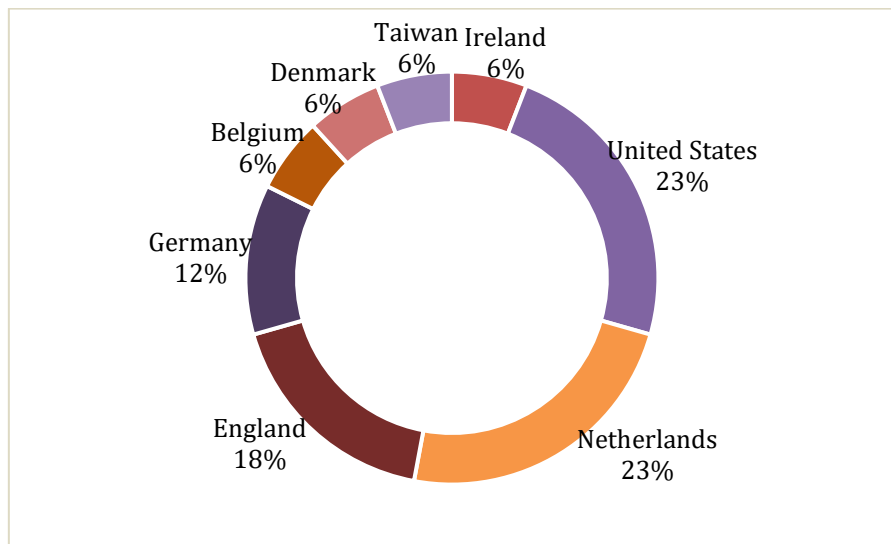
Figure 2. First author's country of residence

The 17 papers represent a range of application areas (Figure 3), including sustainability (3 papers), physical environment (5), product design (5), technology (3), and services (1). To have a clearer view of the applications and approaches employed in these studies, we have also identified their keywords. Out of the 17 articles, only 10 had keywords, adding up 54 words. They were grouped by similarity of content in macro-themes and categories observed in Table 2. The amount of citations is indicated between parentheses after each word when it is more than one, but outputs are not organized by frequency. The order follows a logic based on thematic organization. The keywords reveal emphasis in wellbeing itself; relationships between wellbeing, health and its physical and psychological triggers; and design processes, approaches and applications. Other fields and themes are also approached, especially data and systems analysis and modeling.

Table 2. Keywords Grouped by Macro-Themes and Categories

| Macro-theme	Category	Keywords
Wellbeing and experience (in and out of the design field) (16)	Wellbeing and related words (8)	Well-being (4); Happiness; Flourishing; Comfort; Motivation;
	Topics related to design and experience (4)	Design for Emotion; Flow; User-influencing Technology; Utopian Design
	Design for wellbeing (4)	Design for Subjective; Design for Subjective Well-being; Design for well-being; Positive Design
Health, and physical and psychological variables related to health and wellbeing (23)	Health, psychological and medical conditions (7)	Health and wellbeing; Health (2); Behavior change; Assistive Technology; Concern Conflict; Resilience;
	Life satisfaction, social inclusion and freedom (3)	Freedom; Nudge; Satisfaction;
	Life stages and situations (2)	Ageing; Pivotal Moments;
Design processes, approaches and applications (27)	Games (2)	Game-based learning; Serious game;
	Participatory Processes (2)	Participatory Prototyping; Co-experience Driven Design;
	Environmental design and public spaces (4)	Spatial Explicit Model; Environmental education; Urban Coherence; Dynamic Model;
	Technology (2)	SLM; Persuasive technologies;
	Sustainability and environment (4)	Energy; CO2 Emissions; Sustainability; Vertical greening
	Intervention and design framework (3)	Design Framework; Design; Design Practice;
	Ergonomics (2)	Construction ergonomics; Participatory ergonomics
Other fields (9)	Data and systems analysis and modeling (3)	System Dynamics; Systems thinking; Production system design
	Management (2)	Complexity management; Stakeholder perspective
Others (5)	Others (2)	'Double loop' Learning; Ethics;
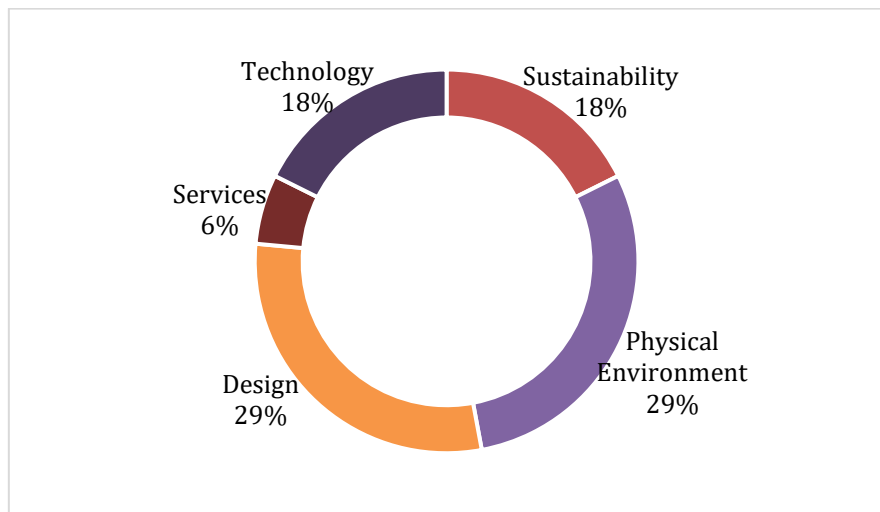
Figure 3. Application areas of the papers

As expected, most of the publications have references and/or quotes to the psychological literature (76.5%), not only keywords. From the four studies that did not include psychological citations, the one by Schulze et al (2015) focused on creating a game to show options of sustainable land management, the study by Eaves, Gyi and Gibb (2016) showed how improvements of the physical environment would enhance people's quality of life (e.g., less muscular pain or that people would walk to work), the one by Edwards and Jensen (2014) focused on designing a production system for productivity and wellbeing, and the study by Burton and Sheehan (2010) focused on how the care-home environments may influence older resident's wellbeing.

In summary, results up to this point indicate that the relationships between design and wellbeing are being explored in a growing number of journal papers. The main journal that has been used as a vehicle to publish research on the topic is the International Journal of Design, and European academics are leading the ranking as the main authors, followed by American researchers. It was also noteworthy that physical environment and product design are the most common application areas, and that psychological variables and references were identified in most studies. To understand in-depth how these studies are being developed, the papers in each application area are reviewed in the following session to provide an overview of the methods employed in each application area.

2.1. METHODOLOGICAL PERSPECTIVES BY APPLICATION AREAS

A summary of the 17 papers included in the revision was presented in Table 2, including research aims, sample sizes, methods, and main results. The papers were categorized following the five application areas from Figure 3, providing an overview of how wellbeing is being addressed in design research.

Physical Environment

Studies on physical environment referred to housing, workspace interventions and green spaces and exposure to nature. Regarding housing, Burton and Sheehan (2010) studied how individual design features may influence the quality of life and wellbeing of elderly people in care homes. The researchers used an explorative study of care home residents' perceptions based on qualitative, semi-structured interviews with more than 80 residents in 20 care homes in the United Kingdom. Their findings show that residents were very positive about

their homes and the design of it, stating that the environment made them feel happy and satisfied with it. Additionally, they also pointed out that the design of the care homes is important, with 63% of them saying that it was very or fairly important. Findings also suggest that seeing nature and the presence of greenery are important, and so is having open-plan layouts and practical, easily accessible designs.

Research on workspace focused on its different effects on people's wellbeing. Eaves, Gyi, and Gibb (2016) studied the degree to which construction workers could contribute to changes in their workplace, providing them with an improvement of health and wellbeing. Their idea was to give attention to "their health at work and ways of making their jobs easier, safer or more comfortable" (p.10). Through purposive sampling, they interviewed in-depth 80 workers in the UK, using the Nordic Musculoskeletal Questionnaire and Work Ability Index to discover the worker's aches and pains and reducing strain on the body. They concluded that there was a high prevalence of symptoms, with different trades reporting distinct complaints. Even so, ratings of workability were high, not being influenced by the aches and pains. The participants were aware of the possible physical demands that come with their jobs, their health and even took some of the responsibility for their issues. The workers came up with more than 250 ideas on health and wellbeing, showing that the involvement with the workforce in the development of solutions can be very positive. Examples of the types of changes suggested by the workers are improving the working environment, making it more comfortable and even reducing risks.

The editorial by Michel, O'Shea and Hoppe (2015) presents a special issue focused on resource-oriented interventions in the workplace, focusing on two types of resources: personal and job resources (including social support). According to the authors, resource-oriented intervention research is promising for all stakeholders. The papers presented by them serve as examples of how to conduct high-quality intervention studies and draw attention to what still needs to be studied to further develop the research field.

In the fields of green spaces and exposure to nature, the links among health, wellbeing and green space were reviewed by Douglas, Lennon, and Scott, (2017). They intended to make evidence more accessible and useful for those planning and designing urban green spaces. The method used by the authors was a literature review. After, they used a life-course approach to examine their findings regarding the benefits for health and wellbeing generated through the engagement with green spaces through different life stages. They defined cohort-specific and cross-cutting design interventions and proposed a general integrated green space framework for health and wellbeing. By doing this, they provided guidelines for the provision of an increase in the number of green spaces that would meet people's needs at all life-course stages.

Gallagher, Martin, and Ma (2011) discussed the relationship between rhetoric and design, arguing that rhetoric and visual design are strongly connected in terms of goals, functions and values. They also analyze similarities related to skill, art and practice. The authors understand rhetoric as having three operational functions (to instruct, to move and to please) and through the definition that it is a process that is part of all discursive practices and that affects social consciousness at all levels (Leff, 1997).

Gallagher, Martin, and Ma's (2011) goal was to show that this intersection would create opportunities for invention while generating analytic strength to understand meanings and analyze visual phenomenon. They described the development of an overarching critical framework, named as visual wellbeing, applying it to different types of visual design projects

as a way of demonstrating the critical and practical potential of the framework. The authors came to the conclusions that enargeia and eudaimonia could "provide distinct criteria for analyzing and assessing artifacts and design objects" (p. 39), as they demonstrate through figures of examples. Another conclusion was that the use of their visual wellbeing framework indicated that artists and designers could be "rhetorically successful by providing objects that employ the constituent concepts of visual wellbeing" (p. 40). By presenting case studies of the use of art in nature (e.g., sculptures), the authors found that through them it is possible to address the "defective nature of the environment by communicating ideas and ideals to the community" (p.40). They conclude that the application of this framework to the design process could lead to other possibilities.

Product Design

Studies on product design investigated design frameworks and tools, and the development of products to allow dealing with spatial and community issues. They are explored as follows. Design frameworks and tools to design for wellbeing were the most common studies in this application area. Ozenc (2014), for example, identified that transitions in life stages and situations can threaten people's wellbeing and create wicked challenges for designers. With this in mind, a design framework called modes of transitions was developed, focusing on how design can help in the pursuit of wellbeing. Modes of transitions were created through the interplay between the design process and theoretical investigation, giving designers sensitizing lenses that lead to ways of understanding and acting on a transition situation. The author discussed ways in which people struggle with changes and the status quo, potential impacts that product design has on their emotional state, and types of stages that constitute the modes of transitions framework (the understanding stage, the conceiving and refining stage and the assessing stage). Modes of transitions help to address how these stages can be used by designers to comprehend and help people to move along through transitions.

Desmet and Pohlmeyer (2013) aimed at understanding how design can enhance people's happiness and subjective wellbeing. Based on positive psychology, the authors developed a positive design framework. It is based on three elements to design for subjective wellbeing: pleasure, personal significance and virtue. They also presented examples of products that were developed with the intent to make people happier and enhance their subjective wellbeing.

Ozkaramanli and Desmet (2012), based on the premise that people must deal with internal conflicts on a daily basis, introduced conflicting concerns to emotion-driven design. The authors realized that product emotions can help resolve concern conflicts through motivating users to pursue long-term goals instead of immediate concerns. Through a design approach, they researched how to explore and design with conflicting concerns when focusing on sustainable eating habits. They have used a sample of 23 people that volunteered to be part of the study. The authors used focus groups, interviews and a generative session to explore the participants' emotions, underlying concerns and contradictory concerns. They after created a user profile, from which they identified conflicting pairs of concerns that guided the other stages of the design process. The findings were summarized in six concern cards that were shown to a group of designers during idea-generation workshops. The 26 designers participating in the study were introduced to the cards, that was a first attempt to develop a tool focused on introducing conflicting concerns to their creative process. The initial findings were used to improve the tool, allowing designers to make different combinations of concern

statements. Conclusions indicate that products designed by using conflicting concerns could contribute to the user's wellbeing.

Products to allow dealing with spatial and community issues to increase wellbeing were also identified among product design studies. Schulze's et al (2015) indicated the need to have more understanding of the feedbacks between the decisions made on land use and human resource appropriation. There are complex and nonlinear feedbacks happening between management, productivity, environmental quality, and human wellbeing in land systems. Therefore, the authors designed an educational game to illustrate choices of sustainable land management to the interested public, students and stakeholders. The game allows users to rule a country by the exploration of "how contrasting dimensions of sustainability (economy, environment and social conditions), can be harmonized regionally, while continuously being threatened by global trade fluctuations" (p.58). It was tested with students from high schools and universities. Participants engaged in discussions while being introduced to topics related to sustainable land management and resource appropriation, indicating that it would enrich classes on geography, mathematics, physics, biology and economics.

Another research focus is the development of products to enhance health and wellbeing. De Couvreur et al (2013) developed a study of inclusive participatory design to design for occupational experiences based on community-based practices. The authors have used an open design process, in which industrial designers, patients, and occupational therapists interacted within their local product ecology. The goal was to stimulate disabled people and their caregivers to become more active in the provision of "collaborative maintenance of their own physical, mental and social well-being" (p.57). The authors spent five years setting up participatory design cases in real-life contexts, with each process lasting 12 weeks. Each team had a (disabled) client, a caregiver, a design student, an occupational therapy student and other stakeholders from the context. The study consisted of a threefold interaction, within occupational therapists' local product ecology. Results indicate that collaborative designing, such as the making and use of artifacts could increase someone's subjective well-being. These joint activities of prototyping may lead to more engagement, new challenges, rich relationships and sense of accomplishment, enhancing people's wellbeing.

Technology

Studies on this application area referred to technology focused on health care; improvement of free and fair behaviors and relationships through technology; and optimization of artifacts and consumption processes. In the field of technology focused on health care, Bhattacharya et al (2018) studied how to help people feel motivated to change their habits toward better health. To do so, they conducted surveys and interviews with adults who have already accomplished (or are working toward) behavior change. By doing this, the authors identified four pivotal experiences for change to happen: prolonged dissatisfaction and desire to change, significant changes that increase fear or hope of future, increased understanding of one's behavior and personal data, and social accountability. Furthermore, they describe a design space where to design technology-based interventions focused on encouraging individuals to make changes that will improve their health. The design space comes with five recommendations from the authors, which address the framing, pivotal and/or supportive features.

Regarding how to improve free and fair behaviors and relationships, Dorrestijn and Verbeek (2013) studied the ethical issue when finding the proper balance between determination and

freedom in a context of user-influencing design for the improvement of wellbeing. The authors showed in their paper two approaches for user-influencing design, persuasive technology and nudge, using the context of social engagement in the history of design. They also brought to attention utopian aspirations in arts and crafts, new objectivity, gute form and postmodernism and provided examples of it. The authors, after going through these themes, concluded that user-influencing design methods would "help to prolong a tradition of socially engaged design" (p.54) providing better understanding and more effective tools related to how technology mediates the human existence. In this way, they proposed that a more moderate social program for design, focusing on the quality of how mundane technologies integrate into people's lives.

Regarding the optimization of artifacts and consumption processes, Edwards and Jensen (2014) studied how professionals from the ergonomic field ensure that the design or redesign of production systems consider productivity and employees' wellbeing. Four main issues that the person responsible for facilitating the design process may face were identified: (1) determination of limits and scope of the system; (2) identification of stakeholders and their roles in the design process; (3) management of different knowledges involved in the process; and (4) emphasize and give attention to leadership roles in the system design, performance management systems, and key performance indicators. They presented a conceptual framework that could be used by the people responsible for the system design process. The framework shows what should be taken into consideration when designing or redesigning a system as well as outlining the importance of distinguishing the role of designing a system design process and of being part of the design team. In this way, they concluded by the examples they presented, that it is possible to help system design facilitators when dealing with the four issues presented by the authors.

Service Design

One of the identified papers is a study in the field of service experience. Steen (2016) proposes that Design for wellbeing projects create co-design opportunities, "for people to engage in meaningful and fulfilling activities so that they can flourish" (p.04). The author proposes that the Capability Approach should be used since it focuses on creating the necessary conditions for human flourishing. The goal of the study is to help design practitioners to use this approach in their projects, with it promoting the development of freedom. These projects should promote participation and empowerment of users through a process that "is meaningful, fulfilling, and empowering" (p.11) and will create results to empower individuals. The author proposes the use of 24 Capability Cards in workshops, presenting the example of three partners that collaborate in developing a service aimed at empowering disadvantaged people. If the three of them have different goals, the cards can help them discuss and align their ambitions and develop a common vision, perceiving their ambitions as complementary. Thus, his study presents the cards and workshop instructions aimed at supporting project team members, users and stakeholders, facilitating discussions and selecting human capabilities to focus on in the projects.

Sustainability

Three of the studies focused on sustainability. Two of them studied sustainable building designs, while another study focused on the ecological footprint of urban planning and workplace design. The study conducted by Steemers and Manchanda (2010) focused on the relationships between sustainable building design and occupant wellbeing. Through the use

of 12 case studies of office buildings in the United Kingdom and India, their study explores if energy use and CO_2 emissions are correlated to the occupant's satisfaction and comfort. Their findings suggest that increased energy is associated with increased mechanization and therefore reduced occupant control, which leads to reduced comfort and satisfaction by the occupants. The authors also suggest that occupant's health conditions are correlated with their levels of satisfaction. Therefore, more energy use does not lead to an enhancement of wellbeing. The study's conclusions also show that occupants affect the energy performance of the buildings where they live but are equally affected by the environmental conditions created. Thus, occupant's wellbeing should be one of the goals of sustainable design, creating environments perceived as more comfortable, with perceptions of control, contact with nature and general pleasantness impacting the overall wellbeing of occupants.

In another study, Ling and Chiang (2018) used swift restorative actions (incorporating 'greening' elements) to amend ecology damages. These are environmentally sensitive, innovative practices used as a means to connect the fields of ecology, horticulture, architecture and environmental tools used in the natural restoration of urban damages. Through an exploratory study, which consisted of a literature review and a case study, the authors found that the vertical green is a more sustainable option when dealing with indoor air quality and disposal of hazardous waste. Furthermore, the use of it can help enhance user's wellbeing and reduce their stress, while leading to economic benefits such as the minimization of the use of traditional indoor air filter.

Focused on the ecological footprint of urban planning and workplace design, McGregor, Aguilar and Lockhart (2017) presented, through case studies in New York and London, cases where build environments were created and serve as an encouragement for healthy behaviors (e.g., cycling and strolling). The authors point out that environmentally smart design can help not only contributing to climate change but improving economic outcomes for companies and countries. For the researchers, carbon reduction strategies may benefit the user's wellbeing and productivity, which will lead to financial implications. Their findings suggest that while old urban planning and workplace design tended to promote a sedentary lifestyle, which leads to health problems, now is a time to reconfigure the built environment to promote health and improve wellbeing.

By summarizing the main aspects of each paper, some data can be extracted from them. They can be seen in Table 3. The most common type of study was experimental (47.05%), followed by case study (29.41%). The evaluated papers address the topic through environmental variables related to wellbeing (64.70%) and other psychological variables related to wellbeing (35.30%). It was observed that the main methods were qualitative (64.70%), qualitative and quantitative (17.64%), and document analysis (11.76%).

Table 3. Methodological Perspectives on Wellbeing

Application Area	Reference	Type of study	Aim focus	Methods	Instruments
Physical Environment (5 papers)	Burton and Sheehan (2010)	Explorative study	Environmental variable related to wellbeing	Qualitative	Interviews
	Gallagher, Martin, and Ma (2011)	Case study			Theoretical implications
	Douglas, Lennon, and Scott (2017)	Literature review		Document analysis	Qualitative synthesis of evidence
	Michel, O'Shea and Hoppe (2015)	Special issue		Multiple	Multiple
	Eaves, Gyi, and Gibb (2016)	Experimental research		Quantitative and Qualitative	Interviews
Technology (3 papers)	Bhattacharya et al (2018)	Experimental research	Other psychological variables related to wellbeing	Quantitative and Qualitative	Surveys and interviews
	Dorrestijn and Verbeek (2013)			Qualitative	Narrative review
	Edwards and Jensen (2014)		Environmental variable related to wellbeing		
Product Design (5 papers)	Schulze et al (2015)	Experimental research	Environmental variable related to wellbeing	Quantitative and Qualitative	Experiment via survey
	Ozenc (2014)			Qualitative	Interviews; Surveys; Diaries; Narratives
	Ozkaramanli and Desmet (2012)		Other psychological variables related to wellbeing		Focus groups; Interviews
	De Couvreur et al (2013)	Case study			Self-reporting; User-prototype interactions; Observations were filmed
	Desmet and Pohlmeyer (2013)	Historical research		Document analysis	Theoretical approach
Service Design (1 paper)	Steen (2016)	Case study	Other psychological variables related to wellbeing	Qualitative	Workshops
Sustainability (3 papers)	Steemers and Manchanda (2010)	Case study	Environmental variable related to wellbeing	Qualitative	On-site surveys, drawings, reports and interviews
	McGregor, Aguilar and Lockhart (2017)				Qualitative synthesis of evidence
	Ling and Chiang (2018)	Experimental research			Literature review and case study

3. SUMMARY AND CONCLUSIONS

The evidence summarized in this review contributes to further the discussion of the role of design in wellbeing research. The area of research has been growing at a slow steady pace since 2010 mostly in European institutions, followed by American ones. The International Journal of Design was the one with the highest amount of publications on the topic up to this moment, which is consistent with a multi-country interest. Only English language journals were included in this revision, suggesting these results should be considered carefully. Nevertheless, by systematically reviewing journal article publications in English, we show the first attempt to organize the existing research by international academic researchers.

The association between design and wellbeing is one that most often targets variables and projects to increase wellbeing instead of discussing how the results will improve positive affect and decrease negative affect in order to improve people's lives. Nevertheless, Gallagher et al. (2011) present a discussion of criteria to analyze new projects and Desmet and Pohlmeyer (2013) proposes a new framework of research on wellbeing.

We also found a consistent relationship between Design and Psychology in the study of wellbeing, as expected. Psychological research is one of the main foundations of theories of wellbeing, but the observed research works were not limited to psychological theories and variables. The most common application areas of these studies were the physical environment and product design, followed by technology, service design, and sustainability, suggesting that design for wellbeing is developing as a five-track research area within the field of Design, which are often interconnected. Both qualitative and quantitative approaches have been used by researches, which shows a scientific development of the area, pursuing comprehension and theoretical advances. There is a predominance of qualitative studies, and this could indicate opportunities to develop quantitative research, especially measuring the effects of design on wellbeing.

Future research may help grow the body of work on how designers can use psychological concepts such as wellbeing in their projects. For example, regarding the physical environment, research on housing, workspace, and green spaces evaluating the wellbeing of both healthy and unhealthy subjects may be a line of work. Furthermore, studies focused on how design projects can help enhance wellbeing of individuals would serve as a bridge between the fields (design, wellbeing and psychology), welcoming the intersection among them.

The potential limitation of only one database searched is circumvented by the relevance of Ebscohost as the most used interdisciplinary database, which is the core of research about design and wellbeing, an area of study originally attributed to Psychology. Nevertheless, the review needs to be both expanded and the research further explored. Another limitation is the fact that the search was conducted only through the keywords of the articles. Therefore, articles that studied the connections between psychology, design and wellbeing, but did not present the specific words in their keywords, were not included in this research.

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