Article

Connectedness to Nature, Well-Being and Presence of Birds

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ABSTRACT

Connectedness to Nature represents a growing area of interest in the latest years because it could have implications in human behavior. In addition, another type of implications studied in people have been the sounds of birds. The aim of this literature review was to analyze the state of knowledge about Connectedness to Nature and birds, as well as its link with variables related to well-being to identify gaps and directions for further research. We reviewed 41 papers published between 2011 and 2021. Papers were found in 29 journals with studies from 16 countries. Eighty-five percent of the papers used an experimental design and there is a trend of increasing publications over time. Our results show that Connectedness to Nature is linked to variables related to well-being, and the presence of birds (or their perception) contributes to explain the relationship. Therefore, more research on the subject is needed because there is evidence that contradicts some findings. Also, research is needed in different bird species, sounds, different cultures and local contexts, thus, it is necessary to study rural and urban areas. In addition, research is needed in children and teenagers who have been very little represented. Finally, it is necessary to have more information from Latin American countries as they represent the most diverse in bird species and to be able to compare with more studied regions like Europe and North America.
Keywords: connectedness to nature, well-being, birds, nature´s contribution to people, literature review.

RESUMO

A conexão com a natureza representa uma área de interesse crescente nos últimos anos, pois poderia ter implicações no comportamento humano. Além disso, outro tipo de implicações estudadas nas pessoas têm sido os sons das aves. O objetivo desta revisão da literatura foi analisar o estado do conhecimento sobre a Conectividade com a Natureza e as aves, bem como sua ligação com variáveis relacionadas ao bem-estar para identificar lacunas e direções para pesquisas posteriores. Revisamos 41 artigos publicados entre 2011 e 2021. Foram encontrados artigos em 29 periódicos com estudos de 16 países. Oitenta e cinco por cento dos artigos utilizaram um desenho experimental e há uma tendência de aumento das publicações ao longo do tempo. Nossos resultados mostram que a conexão com a natureza está ligada a variáveis relacionadas ao bem-estar, e a presença de aves (ou sua percepção) contribui para explicar a relação. Portanto, mais pesquisas sobre o assunto são necessárias porque há evidências que contradizem algumas descobertas. Além disso, a pesquisa é necessária em diferentes espécies de aves, sons, diferentes culturas e contextos locais, portanto, é necessário estudar as áreas rurais e urbanas. Além disso, a pesquisa é necessária em crianças e adolescentes que têm sido muito pouco representados. Finalmente, é necessário ter mais informações dos países latino-americanos, pois eles representam as mais diversas espécies de aves e poder comparar com regiões mais estudadas como a Europa e a América do Norte.
Palavras-chave: conexão com a natureza, bem-estar, aves, contribuição da natureza às pessoas, revisão literária.

1. Introduction

It is well known that people derive various benefits from nature (ecosystem services), which are directly related to well-being (Díaz et al. 2015). In addition, conceptual frameworks have been proposed to understand the interactions between different variables and explain these benefits (Tzoulas et al. 2007; Remme et al. 2021). In 2017, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) used the ecosystem services concept towards Nature's Contributions to People (NCP), leaving three major groups:

Material NCP, Non-material NCP and Regulating NCP (Díaz et al. 2018). However, a decline is reported in 14 of the 18 NCP since 1970, in which human activities have had a worldwide impact, influencing the loss of terrestrial, freshwater and marine ecosystems (IPBES 2019). Furthermore, it is known that urbanization processes are related to the deterioration of people's quality of life (Lecic-Tosevski 2019). This is worrying on a global scale, given that 55% of the world's population currently lives in urban areas and is expected to grow to 68% by 2050 (Naciones Unidas México 2020).

Physical and psychological experiences are Non-material NCP that recognize the importance of spending time outdoors in nature, as well as wildlife (birds) watching (Díaz et al. 2018). These can help increase the Connectedness to Nature (CTN; Zayas 2019), which is a trait that is defined as the way in which people feel emotionally connected with nature (Mayer & Frantz 2004). It has been found that CTN has repercussions on people's health, well-being and behavior (Colléony et al. 2020). For example, a research conducted by Dushkova et al. (2021) reported negative mental health impacts from the COVID-19 pandemic (depression, insomnia, panic attacks, increased stress levels, etc.) in a study conducted in Russia (n = 216, women = 72.7%, 20-40 years old) and Australia (n = 110, female = 61%, 40-45 and 65 years old), at the same time it even concluded that people perceived benefits towards mental well-being as one of the very important aspects of contact with nature greater than physical well-being. With respect to well-being, it is considered to be a multidimensional concept (OECD 2017), which includes biological, sociological, economical, environmental, cultural and political aspects (Tzoulas et al. 2007) and can be understood as "a state of the human being that arises when good health is maintained (physical and mental), social relationships of trust and cooperation are established, and individuals and groups can act to pursue their goals so that they are satisfied with their lives" (Ayala-Azcárraga et al. 2019, p.28).

A study in Canada (n = 100, female = 58, male = 41, unspecified = 1; M_{Age} = 19.58, *SD*= 3.29) by Nisbet et al. (2019) reported that some aspects that promote a negative mood like traffic, noise and pollution can at the same time inhibit CTN and that mindfulness meditation in nature can increase CTN and at the same time reduce negative moods. Likewise, Nisbet et al. (2020) reported in an investigation in Canada (n = 102, M_{Age} = 61.56, *SD* = 9.71) that CTN is related to more positive moods and that people who live near trees perceive better mental health as well as a higher CTN.

Additionally, to the mentioned afore several studies have shown that a higher CTN is associated with greater pro-environmental behavior (Häyrinen & Pynnönen 2020). Rosa et al. (2018) conducted a study in Brazil (n = 224, 140 female, 84 male, M_{Age} = 23.64, *SD* = 5.96) where they related in a positive way CTN and some behaviors that people identify as beneficial for the environment. Other studies have identified those experiences in nature during childhood influence the development of CTN (Theimer & Ernst 2012; Mustapa et al. 2019; Colléony et al. 2020).

In the same way, the presence of birds has been related to an improvement in people's well-being (Ferraro et al. 2020). Methorst et al. (2020) found that the greater the richness of bird species present at a site the higher life satisfaction is reported by people in a study in 26 countries in Europe (n = 26 000). Likewise, Hepburn et al. (2021) found that bird diversity can help increase people's satisfaction where they live in a study in Canada (n = 1035). In a study in England (n = 266, 56% female, 44% male) Jorgensen et al. (2007) reported resident's satisfaction of nearby nature that can be observed in their streets where birds and wildlife were the most valued response by people. In another study in Australia (n = 447, 65.7% female, 14-81 years, M_{Age} = 52), Schebella et al. (2017) found that the word birds had the highest frequency of mention as one of the top loved elements of favorite outdoor sites.

On the other hand, the relationship of birds with CTN has been reported. Cox and Gaston (2016) found in a study in England (n = 331, 60% female, 40% male, adults) that people feel a higher CTN when they feed birds in the green areas of their homes as they feel more relaxed when they can observe birds in their gardens. Similarly, Cox and Gaston (2015) found in a study in England (n = 336, 60% female, 40% male, adults) that people reported higher CTN when they could see and identify more bird species. Hammond (2020) found in a study in the United States that Bird Feeders are effective in increasing CTN in adults/parents (n = 234) but observed no effect in children (n = 200, 11-12 years). Regarding pro-environmental behavior, Larson et al. (2018) found in a study in the United States (n = 646) that Birdwatching contributed to pro-environmental behavior as it was observed to influence the meaning people assigned to places.

Studies explaining the relation between connection to nature and birds show different approaches, from bird species richness (Methorst et al. 2020; Hepburn et al. 2021), motivations to wild birds feeding (Cox & Gaston 2016; Clark et al. 2019), reducing stress (Ratcliffe et al. 2013; Bitterman & Simonov 2017), perceived restorativeness (Ratcliffe et al. 2016; Zhao et al. 2018; Fang et al. 2020; Zhu et al. 2020), human health (Depledge et al. 2011; Buxton et al. 2021) and CTN (Darryl 2011; Cox & Gaston 2015).

The aim of this literature review was to analyze the state of knowledge about CTN and birds, as well as its link with variables related to well-being to identify directions for further research.

2. Methods

Literature review was carried out using principles of Systematic Literature Review (SLR) (Mengist et al. 2020; Page et al. 2021). SLR uses methods with ordered procedures to collect and synthesize information to answer a research topic (Page et al. 2021), it follows four basic steps: search strategy, inclusion and exclusion criteria, synthesis and analysis (Mengist et al. 2020).

2.1 Data source and search strategy

We included studies with participants in any age and gender as well as interventions related with birds and any kind of measurement tool for CTN or well-being. We searched for documents in English and Spanish. All outcomes were included.

An electronic literature search was conducted following the databases SCOPUS, PubMed, SciELO and other sources like google scholar and reference section.

Scientific papers were selected from a 10-year period. To get the most recent information, literature published between 2011 until March 26th, 2021, was included.

We reviewed whole documents to search relationships between birds and CTN or well-being, which was the main criterion. Papers without this relationship were not included. We included into the analysis qualitative or quantitative approaches. We excluded gray literature, book chapters and presentations.

2.2 Inclusion and exclusion criteria

Inclusion criteria were keywords used for CTN and its main synonyms: nature connectedness, nature relatedness and connection to nature (Häyrinen & Pynnönen 2020); birds, songbird, birdsong; and well-being, pro-environmental behavior, environmental behavior, environmental education, relational values, biospheric values, nature experience. We selected papers with these words in title, abstract or similar keywords. In addition, we reviewed the reference section in each document to identify other relevant papers. We got 119 scientific papers. We removed duplicate records and then excluded others for not meeting the eligibility criteria (Figure 1).

2.3 Data collection

From the review of the identified records we selected the following variables: year of publication, authors, measurement scale, measurement tool, study population, journal, country and approach. We used a frequency analysis to know the number of papers related with the variables. All information was analyzed in an Excel spreadsheet. Articles were screened first by title and abstract and then at the full-text level to ensure that they met the eligibility criteria.

3. Results

Our systematic literature review identified 41 papers for analysis (Figure 1).

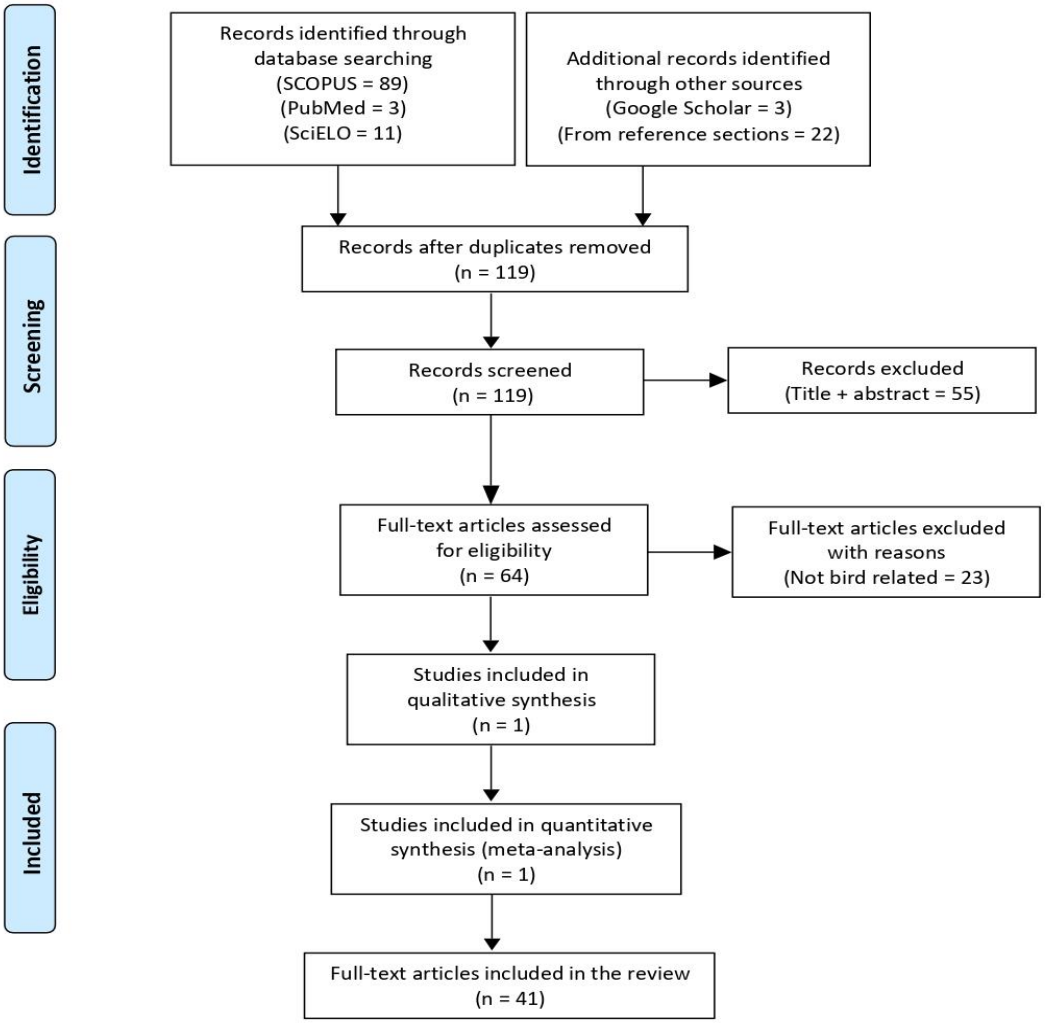

Figure 1. Own elaboration based on Moher et al. 2009.

Three categories were established in which papers addressed the following approaches: (1) well-being including subthemes like mental health, stress, (2) CTN and (3) environmental behavior. Of the total number of papers, 32% have a focus on well-being, 31% on CTN, 15% on mental health, 14% on pro-environmental behavior and 8% on stress, and it is necessary to consider that several papers fall into more than one classification.

3.1 Journals

Publications were found in 29 journals, of which 18 (62%) are part of the Journal Citation Report Index (JCR). From the total, 45% of the publications were written in 6 journals: "Journal of Environmental Psychology" (10%), "Frontiers in psychology", "Applied Environmental Education & Communication", "PLOS ONE", "International Journal of Environmental Research and Public Health" and "Ecological economics" (7% each).

3.2 Country interest

Countries in which the research on the subject has been carried out were identified to analyze in which contexts the information is focused. All studies have been published in 16 countries apart from one that used a continental scale in Europe (Methorst et al. 2020). Seventy-six percent of the information is concentrated in six countries: United States (24%), England (19%), Australia (12%), China (9%), New Zealand (7%) and Japan (5%).

3.3 Measurement methodology

Eighty-five percent of the papers used an experimental design, while 15% used a non-experimental design. The most used methodology to measure CTN (Table 1) was The Nature Relatedness Scale (Nisbet et al. 2009). In the same way, the most used methodology to measure well-being was qualitative, self-reported method (Table 1). Some of the instruments for measuring well-being variables that papers report are: "subjective happiness and life satisfaction as components of subjective well-being" (Hepburn et al. 2021; p. 7), "self-reported well-being was measured as perceived psychological restoration" (Ferraro et al. 2020; p. 3), "assessment of people's self-reported life-satisfaction as a measure of subjective well-being" (Methorst et al. 2020; p. 2), well-being measured three items "whether participants felt (i) energized and full of life, (ii) relaxed and restored, and (iii) good about life" (Massingham et al. 2019; p. 832), etc.

3.4 Year of publication and population study

There is a trend of increasing publications over time on the subject. In the last three years (2018-2020), 56% of the information is concentrated. On the other hand, the adult population is the most studied in the reported papers (Table 1). Of the total number of reviewed papers, 83% addressed an adult population, while only 7% addressed an adolescent population and 10% addressed a child population.

Table 1. Measurements of Connectedness to Nature and Well-Being

#	Date	Authors	Measurement scale		Measurement tool		Country	Population of study		
			CTN	WB related measurements	CTN	WB		Participants	Age	Gender
1	2021	Hepburn et al.	Nature Relatedness Scale (Adapted from Nisbet et al. 2009)	Subjective happiness, life satisfaction	2 items, 5-point scale	3 items, 7-point scale	Canada	1035	Adults	-
2	2020	Ferraro et al.	-	Perceived Restorativeness Soundscape Scale (Payne 2013)	-	19 items, 7-point scale	United States	665	Adults	-
3	2020	Hammond	CTN (Stern et al. 2008); Nature Relatedness Scale (Nisbet et al. 2009)	-	21 items, 9-point scale;7 items, 5-point scale	-	United States	234 200	Adults Children (11-12 years)	-
4	2020	Leong et al.	Nature Relatedness Scale (Nisbet et al. 2009)	Spiritual well-being, mental and emotional well-being	21 items, 5 point scale	2 items, 5-point scale	Singapore	879	Adults	-
5	2020	Methorst et al.	-	Life-satisfaction: Quality of Life Survey (EQLS)	-	1 item, 10-point scale	Europe (26 countries)	43,636	Adults	-
6	2019	Colléony et al.	Nature Relatedness Scale (Nisbet & Zelenski 2013)	-	6 items, 5-point scale	-	France Israel UK	258 174 309	Adults	-
7	2019	Freeman et al.	Nature Relatedness Scale (Nisbet et al. 2009)	-	21 items,5 point scale	-	New Zealand	72	Older adults (65-69 years)	-

#	Date	Authors	Measurement scale		Measurement tool		Country	Population of study		
			CTN	WB related measurements	CTN	WB		Participants	Age	Gender
8	2019	Massingham et al.	Nature Relatedness Scale (Nisbet & Zelenski 2013)	Personal well-being (energized and full of life, relaxed and restored, good about life)	3 items, 5-point scale	3 items, 5-point scale	Australia	427	Adults	-
9	2019	Mustapa et al.	Adapted from previous instruments of CTN	-	26 items, 4-point scale	-	Malaysia	760	Children (10-11 years)	-
10	2018	Rosa et al.	Connectedness to Nature Scale	-	13 items, 5-point scale	-	Brazil	224	Young adults (*M*=23.64 years, *SD*=5.96)	140 female, 84 male
11	2018	van Heezik et al.	Nature Relatedness Scale (Nisbet et al. 2009)	-	21 items, 5 point scale	-	New Zealand	72	Older adults (65-90 years)	-
12	2017	Zhang et al.	Enjoyment of Nature Scale (Milfont & Duckitt 2010)	-	10 items, 5-point scale	-	China	340	Adolescents (11-17 years, *M*=13.63)	200 female, 136 male
13	2016	Cox & Gaston	Questionnaire	-	2 items, 5-point scale	-	England	331	Adults	60% female, 40% male

#	Date	Authors	Measurement scale		Measurement tool		Country	Population of study		
			CTN	WB related measurements	CTN	WB		Participants	Age	Gender
14	2016	Soga et al.	Nature Relatedness Scale (Nisbet et al. 2009)	-	21 items, 5-point scale	-	Japan	255	Adults (18-26 years, *M*=20.1, *SD*=1.4)	127 female, 120 male, 8 blank
15	2015	Cox & Gaston	Questionnaire	-	1 item, 5-point scale	-	England	331	Adults	60% female, 40% male
16	2014	Arendt & Matthes	Inclusion of Nature in Self Scale (Schultz 2002)	-	1 item, series of overlapping circles	-	Austria, Alemania	175	Adults (19-46 years, *M*=22.25, *SD*=3.06)	86% female
17	2013	Goddard et al.	-	Quality of life or emotional well-being	-	1 item, open question	United Kingdom	533	Adults	
18	2012	Theimer & Ernst	Children's Connection to Nature Index (Cheng & Monroe 2010)	-	-	-	United States	38	Students (4th and 5th grade, high school)	-

#	Date	Authors	Measurement scale		Measurement tool		Country	Population of study		
			CTN	WB related measurements	CTN	WB		Participants	Age	Gender
19	2011	Luck et al.	Adapted from Connectedness to Nature Scale (Mayer & Frantz 2004)	International Well- being Index (level of satisfaction with living)	14 items, 11 point-scale	8 items, 11-point scale	Australia	1078	Adults	-

CTN = Connectedness to Nature, WB = Well-Being, *M* = Mean, *SD* = Standar Deviation

4. Discussion

It was possible to identify that CTN is linked to variables related to well-being. This is consistent with Hepburn et al. (2021) where a relationship was observed between neighborhood satisfaction and the number of nearby bird species, even when people rarely mentioned birds in their responses. Likewise, Luck et al. (2011) reported a relationship between CTN and well-being.

The presence of birds (or their perception) contributes to explain the relationship between CTN and variables related to well-being. This coincides with that reported by Ferraro et al. (2020) where bird diversity perception influenced people's responses in such a way that the greatest restorative effects were related to perceptions of bird diversity. Likewise, Leong et al. (2020) report that CTN influences the way people perceives bird services/disservices. Similarly, it coincides with that reported by Methorst et al. (2020) in a study at larger spatial scale, where they mention that bird species richness is associated with life satisfaction across 26 countries in Europe.

However, there is also evidence that contradicts some findings. Hammond (2020) used bird feeders as an instrument to increase CTN in people and found that with adults there was a response but not in children. On the other hand, Hedblom et al. (2019) found no evidence that bird sounds help stress recovery. Therefore, more research on the subject is needed.

4.1Journals and country interest

Regarding the journals that have addressed the research topic, the issue of CTN and its relationship with well-being and presence of birds has been approached mainly from the area of psychology, since researchers who are interested in the interrelationships between people and their surroundings publish in the Journal of Environmental Psychology and people who are interested in psychological sciences also publish in Frontiers in Psychology. The research topic has also been approached from the environmental education and health areas. On the other hand, this also implies that the analysis of this topic has been limited in other areas of study. Leaving as a need and opportunity to address issues such as the identification and strengthening of these topics to contribute to better management and use of ecosystems, their biodiversity and their contributions to people, in contexts of sustainability. Even more importantly, research is still pending to help integrate these kinds of results into public policies for decision-making.

Countries of high-income economies (World Bank 2021) are represented in research about CTN, well-being and birds. It coincides with the three major regions worldwide for spending on research and development that countries allocate to science (Rivas-Castillo et al. 2020). America with the United States, Europe with England and Southeast Asia with Japan and China. Once again, it remains to be understood these relationships in underdeveloped countries such as Latin America, where about 60% of the terrestrial life of the planet is present and its importance in avifauna is recognized (UNEP-WCMC 2016).

Possibly these links between well-being and connectivity with nature are greater in these environments, given the prevailing biotic, cultural and ancestral diversity, however, their appreciation and recognition may be less. In recent years, these countries have begun to recognize and evaluate NCP, nevertheless, it is reported that cultural elements such as those addressed in this study still lack clear methodologies for their study.It is important to analyze in which places and contexts the research in CTN and its relationship with presence of birds is focused, since the generalizations about the results may be questionable because there is no representation of different cultures, ages, genders, as well as socioeconomic contexts.

4.2 Measurement methodology

Of the papers that used experimental design, 46% report measurements of CTN and/or WB. (Table 1). Regarding the measurements of CTN, of the total number of papers that report them, 50% used The Nature Relatedness Scale (Nisbet et al. 2009) or some adaptation of it. This is one of the scales considered the most complete as it evaluates three aspects of the relationship with nature: cognitive, affective and physical. However, the use of scales should be considered according to the target population, for the case of children (a very little studied population) the use of other scales should be considered, for example the Inclusion of Nature in Self Scale (Schultz 2002), which is a single-item graphic scale, which may be easier to understand and shorter to apply. With respect to the methodologies to measure well-being, no study carried out a measurement of all the aspects included in the concept (Ayala-Azcárraga et al. 2019), some variables related to it were used, where most are self-reported. Some studies have used a physiological level of analysis, but it contradicts the evidence since Hedblom et al. (2019) mentioned that there is no evidence that birds participate in recovery from stress. Therefore, it is necessary to complement different measurements since the majority are self-reported.

The increase in these topic publications (56% in the last three years), can be related to the recent creation of the NCP concept that emphasizes that culture is central to all of the links between people and nature, and recognizes other knowledge systems, like those of local communities and indigenous peoples (Díaz et al. 2018). Also considering that Nature underpins every person's well-being and ambitions – from health and happiness to prosperity and security (Díaz et al. 2018).

4.3 Directions for future research

Although avifauna provide important direct and indirect benefits to people (Mahendiran & Azeez 2018), in North America a decline in bird species has been observed since 1970 (Rosenberg et al. 2019), which coincides with bird declines in other parts of the world (Şekercioğlu et al. 2004; Hallmann et al. 2014; Inger et al. 2014). In addition, the loss in bird species at the same time is changing the acoustic properties of soundscapes, suggesting that one of the primary ways people maintain their connection to nature is also being lost and carries implications for health and well-being (Morrison et al. 2021).

Therefore, it is necessary to have information from other regions like Latin American countries, which are not being studied on this topic, at least not reported in this research with the keywords and the method used. It is necessary to do and publish research in Latin American countries to be able to compare the results with other countries and to be able to make generalizations of the results. In addition, further research is needed to compare rural and urban areas to contrast different local contexts. Besides to the above, is required to complement different types of measurements, self-reported and physiological, within the same study to have a point of comparison between them, as well as comparing subjective with objective measures. Finally, it is important to carry out this kind of research in children and teenagers, since it has been very little represented in the studies.

Adults are the most studied group in the reported papers. It is required to be able to do more research in this regard and replicate studies done in other populations (Soga et al. 2016). In addition, it is necessary to pay attention to the decrease in the time that children (Soga et al. 2016) and adolescents (Zhang et al. 2017) are spending in contact with nature as it may have repercussions in their CTN and the relationships it presents with well-being and pro-environmental behavior, as well as it has been shown that experiences in nature at early ages act as a trigger for time spent in nature during adulthood (Rosa et al. 2018). Also, this could have a significant positive impact in the future, reflected in trained people to implement a better use and conservation of nature.

Furthermore, research is needed on different bird species and sounds (Leong et al. 2020, Zhu et al. 2020), population and cultures as it has been observed that the meanings people associate with each bird species may change in relation to cultural context (Ratcliffe et al. 2016). Furthermore, in some cases, people have reported negative associations (aggressive behavior, fear, stressful sound) to certain bird sounds and have not been considered to support stress recovery (Ratcliffe et al. 2013). Therefore, the cultural context should be considered in the research, since based on this, there could be a difference in the responses.

At the same time, there is a need to incorporate gender differences of individuals in research as there is contrasting evidence that birdsongs can support recovery from stress and gender difference could have an influence on outcomes (Hedblom et al. 2019).

4.4 Limitations

Other literature may have been excluded because we used specific databases. We analyze English and Spanish documents; thus, other language literature could be excluded.

5. Conclusions

It was possible to identify in the literature that CTN is linked to variables related to well-being and this relationship can be explained (to some degree) by the presence of birds. There is also evidence that contradicts some findings, so there is a need to continue studies and incorporate other populations in different cultures, contexts and ages (children and adolescents), in addition to incorporating objective measures to complement and contrast existing findings. Finally, to implementing studies with a more integral and multidisciplinary approach (ecological, social/psychological and economic), that help to merge the information into proposals that effectively contribute to decision-making aimed at the best use, management and conservation of NCP.

Disclosure statement

The authors report there are no competing interests to declare.

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