

CONNECTION WITH NATURE AS A KEY FACTOR IN THE FORMATION OF CHILDHOOD IDENTITIES: A SYSTEMATIC REVIEW¹

La conexión con la naturaleza como factor clave en la formación de las identidades infantiles: una revisión sistemática

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ABSTRACT

Rapid urban and technological development has driven humans towards social and cultural dynamics marked by a nature deficit in their habits and routines. Previous research has analysed the effects of separating humans from natural spaces from a variety of perspectives, highlighting the benefits and importance of establishing a stronger connection between people and nature. The aim of this study was to establish the impact of nature on particular internal attributes such as values, behaviours, emotions and social skills that shape the identity construction of the individual, especially during childhood. To do so, a systematic literature review was carried out following the SALSA framework based on a bibliographic search in the Web of Science and Scopus databases. The literature selection was limited to studies published between 2012 and 2022. After applying pre-established criteria, a total of 10 articles were selected for analysis. Most of the results showed that interaction with nature has positive effects on children's emotional, behavioural, and social development, offering greater self-knowledge, positive bonds with peers, a deeper connection with the environment and, ultimately, a process of personal development that generates a healthy identity construction through connection with nature. In conclusion, it is important to increase research into the impact of natural environments on identity construction from an early age, from pedagogical and humanist perspectives.

Keywords: childhood; natural environment; identity; human development; literature review.

RESUMEN

El acelerado desarrollo urbanístico y tecnológico ha impulsado al ser humano hacia dinámicas sociales y culturales marcadas por el déficit de naturaleza en sus hábitos y rutinas. Los efectos producidos por la separación del sujeto de los espacios naturales han sido estudiados desde diferentes perspectivas en investigaciones previas, destacando desde diferentes perspectivas los beneficios y la importancia de establecer una mayor conexión entre las personas y estos espacios. El objetivo del presente estudio consistió en conocer las implicaciones que la naturaleza tiene sobre determinados atributos internos como valores, comportamientos, emociones y competencias sociales que configuran la construcción identitaria del individuo, especialmente durante la infancia. Para ello, a partir de una búsqueda bibliográfica en las bases de datos *Web of Science* y Scopus, se llevó a cabo una Revisión Sistemática de Literatura mediante el marco SALSA. La selección de la literatura se limitó a los estudios publicados entre 2012 y 2022, tras la aplicación de criterios preestablecidos, se seleccionaron un total de 10 artículos para su análisis. La mayoría de los resultados encontrados indicaron que la interacción con la naturaleza genera efectos positivos en el desarrollo emocional, comportamental y social de niños y niñas, ofreciendo un mayor conocimiento de sí mismos, vínculos positivos con sus iguales, una conexión más profunda con el entorno y, en definitiva, un proceso de desarrollo personal que genera una construcción identitaria saludable a través de la conexión con la naturaleza. Como conclusión, se constata la importancia de aumentar las investigaciones

respecto a la influencia de los entornos naturales en el desarrollo identitario desde edades tempranas, abordando perspectivas pedagógicas y humanistas.

Palabras clave: infancia; medio ambiente natural; identidad; desarrollo humano; estudio bibliográfico.

1. INTRODUCTION

Recent development in contemporary societies has been characterised by expansive urban construction that has involved the shrinking and degradation of natural spaces, resulting in increasingly built-up environments where the relationship with nature becomes ever more complex and distant (Puig & Casas, 2017). In addition to this hyper-urban model of cities, there is the presence of the virtual space, the expansion of which has caused significant changes to how we relate to our environment (Ibáñez Ayuso *et al.* 2023) The convergence of both phenomena, that is to say, expansive urban construction and the abundance of digital technology, reinforces what Louv (2005) calls “nature deficit”, sustained by social dynamics that are increasingly mediated by technologies and which overwhelmingly happen in urban environments. As a result, people’s experiences, routines and habits are affected by a significant exposure to virtual and artificial environments, with significant implications for their behaviour and, consequently, for the basic educational processes that comprise their “being”.

The reality of this denatured situation differs from the results of studies carried out by different authors (Barrera-Hernández *et al.*, 2020; Rosa & Collado, 2019), which hold that natural environments are not just a factor that determines the well-being of the subject, but that in addition human beings’ dependence on and interaction with their ecosystem is fundamental for an integral education and to comprehend human identity and its role in society (Puig *et al.*, 2014). For example, it can be seen that nature is a stimulus for improving physical well-being (Nyarku *et al.*, 2019; Squillaciotti *et al.*, 2022) and psychological well-being (Holt *et al.*, 2019; Xia Dong, 2023). Likewise, for Cudworth and Lumber (2021), Dopko *et al.* (2019) and Muñoz (2009), direct connection with green spaces helps reduce emotional and behavioural problems and provides the subject with an ideal context to develop independence, autonomy and confidence. Likewise, the social focus notes that nature provides people with spaces for socialisation and for establishing bonds among peers and with the environment that surrounds them, emphasising the development of ecological values and conscience (Evans *et al.*, 2018; Humphreys & Blenkinsop, 2018). Ultimately, habits and bonds with nature influence different areas of people’s learning and, as a result, the construction of different conceptions in their identity, such as the individual, the social and the ecological. Consequently, for authors such as Green (2018), Pelo (2018) and Muñoz-Rodríguez (2022), the connection between human beings and nature has a meaningful effect on the redefinition of the identity of the individual.

1.1. *Identity construction and nature*

The construction of human identity construction has been studied from a range of perspectives and theoretical dimensions (Quiroga *et al.*, 2021; Sepúlveda, 2020) owing to its conceptual complexity. The different approaches used in the literature agree that this process of identity construction is neither static nor homogeneous, but rather occurs during the different stages of people's lives. However, the process of construction of the sense of the "self" has its most critical period during early childhood (Ergün, 2020; Vega Granda *et al.*, 2022).

Based on an integrated approach, and taking into account the multidimensionality attributed to the identity of the person (Quiroga *et al.*, 2021), the sense of identity is shaped through the convergence and organisation of individual or personal identity and its integration in the subject itself and with others (Sánchez Calleja & García Jiménez, 2020; Vignoles *et al.*, 2012). So, individual identity corresponds to identity content that pertains to the person, on the one hand, centring on the individual processes of discovery and differentiation of the subject's own identity and, on the other, referring to internal attributes of the subject such as goals, values, behavioural norms, desires, emotions and beliefs (Camelo, 2023; Waterman, 2012). On the other hand, identity integration corresponds to relational identity, which involves accommodating the subject's past, present and future experiences, establishing the continuity of its "self" (Erikson, 1994; Quiroga *et al.*, 2021). Similarly, this integration occurs through processes of assimilation and adoption of the roles that the subject carries out within society, thus expanding the person's experiential possibilities by doing different actions and behaviours (Sepúlveda, 2020). Finally, integration with others refers to collective identity, in other words, to the identification of the subject with other groups and to the sense of belonging to them. From this perspective, identity construction is understood to be linked to social and collective processes, encompassing internal attributes such as feelings, beliefs and behaviours that are produced through identification with others (Flórez Varón & Cárdenas-Támara, 2022; Subero Tomás & Esteban-Guitart, 2020).

In view of these dimensions, other authors (Cheung & Hui, 2018; Vignoles *et al.*, 2012) establish that identity construction is also linked to material identity and identity of place, shaped through feelings of belonging to environments that are meaningful for the subjects. To that effect, and taking into account the continuity of the meaning of the "self", natural environments are a potential field for personal and collective experiences. The results of these experiences are reflected in the development of values, beliefs, socialisation and behaviour (Dewey, 2021; Green, 2017). The effects of these factors on the individual's identity development are evidenced in the coincidence between these factors that are influenced by natural spaces and the internal attributes of the person that comprise the identity of the subject.

Although the influence of natural spaces on the well-being and development of the subject is theoretically and empirically based on various studies, the number of

studies that aim to analyse the effect of these spaces on the attributes that comprise the subject's identity is currently limited. Consequently, based on the NATEC-ID and NATUR-TEC Kids LivingLab projects, this study seeks to provide an overview of the effects of natural spaces on the subject's identity construction during a critical period of development, centring the research on the child population. Specifically, it seeks to identify how and to what extent nature influences children's acquisition of values, feelings, socialisation processes and behaviour, which will subsequently influence their meaning of the "self". To this end, to achieve the objective set, we present a systematic literature review, selecting studies published in the last 10 years that make it possible to answer the following key questions: What research objectives are proposed in the literature analysed? How does nature influence the internal attributes of the child considered in this research? And, what are the principal results obtained regarding the influence of the natural environment on the development of these attributes?

2. METHODOLOGY

To ensure the quality and scientific validity of this research, we used the SALSA (Search, Appraisal, Synthesis and Analysis) framework. This comprises four sequential phases: literature searching; source evaluation; synthesising information; and content analysis (Grant & Booth, 2009).

2.1. *Databases, algorithms and search strategies*

We used the Web of Science (WoS) and Scopus databases the first phase owing to the multidisciplinary character and impact factor of both repositories in the different areas of knowledge.

Based on the previously reviewed literature, we identified a series of keywords or descriptors and included them in the following 3 algorithms: a) Algorithm 1: *child** AND *natur** AND *environment* AND (*deficit* OR *exposure* OR *relatedness*); b) Algorithm 2: *child** AND *school* AND (*gardens* OR *green space**); and c) Algorithm 3: *child** AND *green space** AND (*urban* OR *cit**). These algorithms include the study sample delimited in this research as well as generic concepts or concepts related to the term "nature". Therefore, considering this latter concept, for this research we accepted wild spaces, blue areas (rivers, beaches, lakes, etc.) and green spaces located in urban areas (gardens, vegetable gardens, parks with trees and areas in the open air with vegetation) as natural environments. Regarding the identity factor, we established a series of variables or internal attributes that influence children's identity construction: experiences, emotional component, beliefs, behaviours, sociability, establishing bonds, and values. In order to include a large number of pieces of research, these attributes were not included in the search algorithms. However, the presence of these variables was used as an eligibility criterion in the literature evaluation phase.

In WoS, we searched the *Education and Educational Research* category, applying the algorithms to the Title and Abstract fields (TI-AB), while in Scopus, the algorithms were applied to field tags corresponding to Title, Abstract and Keywords (TITLE-ABS-KEY), executing the search in all of the categories. These searches took place during January 2023.

2.2. Literature evaluation and inclusion and exclusion criteria

We evaluated the sources by establishing inclusion and exclusion criteria from two perspectives: the first encompassed a series of criteria relating to the filters applied during the database search process and the second centred on eligibility criteria applied following an in-depth review of the preselected research works. Figure 1 shows the criteria set in both perspectives.

FIGURE 1
INCLUSION AND EXCLUSION CRITERIA

Search filter criteria	Inclusion criteria	(a) Open-access publications
		(b) Publications from between 2012 and 2022
		(c) Publications as journal articles
		(d) Publications in English or Spanish
	Exclusion criteria	(a) Restricted-access publications
		(b) Publications from outside the established range
		(c) Publications as books, book chapters, reviews, conference proceedings, theses
		(d) Publications in languages other than English or Spanish
Eligibility criteria	Inclusion criteria	(a) Publications that analyse green spaces as a variable
		(b) Publications that analyse internal attributes that influence participants' identity construction
		(c) Research with samples comprising participants aged up to 16 years
	Exclusion criteria	(a) Publications that analyse green spaces as a contextual factor or a medium
		(b) Publications that analyse attributes or variables that do not influence participants' identity construction
		(c) Research with samples comprising participants aged over 16 years

2.3. Literature selection and information synthesis process

After applying the search filter criteria, a total *N* of 409 articles were preselected using the first algorithm (WoS *n* = 179; Scopus *n* = 230), 271 articles were found with the second (WoS *n* = 4; Scopus *n* = 267) and 188 were identified by the third (WoS *n* = 11; Scopus *n* = 177). An in-depth review of the preselected studies was then performed, applying the eligibility criteria. Following this exhaustive evaluation, 2 studies from the first search algorithm were selected, 7 from the second algorithm and 1 from the third. A check for duplicated articles was then performed to ensure that the participating researchers had applied the same evaluation criteria. This showed that no identical articles had been selected from the different databases. A total of 10 articles were ultimately selected for analysis in this research (Figure 2).

FIGURE 2
 LITERATURE SELECTION PROCESS

IDENTIFICATION (Fields TI-AB and TITLE-ABS-KEY)		
Algorithm 1 WOS <i>n</i> = 636 Scopus <i>n</i> = 1,075	Algorithm 2 WOS <i>n</i> = 23 Scopus <i>n</i> = 894	Algorithm 3 WOS <i>n</i> = 19 Scopus <i>n</i> = 444
SEARCH FLITER CRITERIA		
Inclusion/exclusion criteria (a)		
Algorithm 1 WOS <i>n</i> = 222 Scopus <i>n</i> = 324	Algorithm 2 WOS <i>n</i> = 5 Scopus <i>n</i> = 365	Algorithm 3 WOS <i>n</i> = 12 Scopus <i>n</i> = 224
Inclusion/exclusion criteria (b)		
Algorithm 1 WOS <i>n</i> = 193 Scopus <i>n</i> = 278	Algorithm 2 WOS <i>n</i> = 5 Scopus <i>n</i> = 304	Algorithm 3 WOS <i>n</i> = 12 Scopus <i>n</i> = 209
Inclusion/exclusion criteria (c)		
Algorithm 1 WOS <i>n</i> = 180 Scopus <i>n</i> = 231	Algorithm 2 WOS <i>n</i> = 4 Scopus <i>n</i> = 272	Algorithm 3 WOS <i>n</i> = 11 Scopus <i>n</i> = 177
Inclusion/exclusion criteria (d)		
Algorithm 1 WOS <i>n</i> = 179 Scopus <i>n</i> = 230	Algorithm 2 WOS <i>n</i> = 4 Scopus <i>n</i> = 267	Algorithm 3 WOS <i>n</i> = 11 Scopus <i>n</i> = 177
ELIGIBILITY CRITERIA (a), (b) and (c)		
Algorithm 1 WOS <i>n</i> = 0 Scopus <i>n</i> = 2	Algorithm 2 WOS <i>n</i> = 0 Scopus <i>n</i> = 7	Algorithm 3 WOS <i>n</i> = 0 Scopus <i>n</i> = 1
Total <i>N</i> of articles selected = 10		

A data table was designed as a method for documenting the information synthesis process. This table records the following variables: a) author(s), b) year of publication, c) research design, d) type of research, e) research method, f) sample, g) research aim, h) variables analysed and i) relevant results of the research. The results obtained from the variables relating to research designs (design, type and method) were evaluated quantitatively, while for the last three variables, a quantitative focus was applied through a narrative analysis of the units of content provided in the pieces of research.

3. RESULTS

3.1. Description of the selected studies

Table 1 synthesises the principal data about the research subjected to analysis with regard to year of publication, method, research design and type, as well as the sample participating and the context of the research.

These data indicate that research on the influence of nature on the development of internal attributes in children has been done on an occasional and transversal basis over a number of years. However, there was a gradual increase in

TABLE 1
STUDIES SELECTED FOR ANALYSIS

Author(s)	Year	Method	Design	Type	Sample	Context
Adams & Beauchamp	2021	Qualitative	Observational	Transversal	91	Wales
Amoly <i>et al.</i>	2014	Qualitative	Observational	Transversal	2111	Spain
Askerlund & Almers	2016	Mixed	Observational	Transversal	27	Sweden
Chiumento <i>et al.</i>	2018	Mixed	Quasi-experimental	Longitudinal	36	England
González <i>et al.</i>	2022	Qualitative	Observational	Transversal	10	Chile
Huynh <i>et al.</i>	2013	Quantitative	Observational	Transversal	17249	Canada
Jarvis <i>et al.</i>	2022	Quantitative	Observational	Longitudinal	27539	Canada
Luís <i>et al.</i>	2020	Quantitative	Observational	Transversal	132	Portugal
Mycock	2018	Qualitative	Observational	Longitudinal	75	England
Pollin & Retzlaff-Fürst	2021	Mixed	Quasi-experimental	Longitudinal	53	-

publications focussing on this line of research in the most recent two-year period (2021 and 2022). When examining the methodological characteristics of the 10 studies selected, it is apparent that qualitative research is more common (see Adams & Beauchamp, 2021; Amoly *et al.*, 2014; González *et al.*, 2022; Mycock, 2018). Similarly, it is notable that many of the studies adopt an observational analytical focus (for example, Adams & Beauchamp, 2021; González *et al.*, 2022; Mycock, 2018, among others). Finally, a predominance of transversal research is apparent (for example Adams & Beauchamp, 2021; Askerlund & Almers, 2016; Huynh *et al.*, 2013, among others).

There is a notable disparity in the number of participants in the samples of the studies selected. The study with the smallest sample featured 10 children (González *et al.*, 2022), while the research with the largest sample included a total of 27,539 children (Jarvis *et al.*, 2022). Participants' ages ranged from 3 to 16, covering everything from early childhood to adolescence. Three of the studies selected had the same minimum age of participants: Askerlund and Almers (2016) had a sample aged between 7 and 8, Amoly *et al.* (2014) worked with children aged from 7 to 10 and Adams and Beauchamp (2021) included children aged from 7 to 11 in their study. Furthermore, two studies shared maximum ages in their samples. González *et al.* (2022) carried out their research with a sample aged between 6 and 12, while Pollin & Retzlaff-Fürst (2021) worked with children aged between 11 and 12. Similarly, the studies by Chiumento *et al.* (2018) and Luís *et al.* (2020) featured samples with a maximum age of 14, specifically, with a range of 9 to 14 in the former and 8 to 14 in the latter. Finally, Huynh *et al.* (2013) worked with the oldest sample, covering a range of 10 to 16 years.

Jarvis *et al.* (2022) did not specify the age range of their study sample, although they did note that the mean age was 5.6 years. Regarding the gender of the sample, it was striking that four works did not provide this information (Adams & Beauchamp, 2021; Amoly *et al.*, 2014; Askerlund & Almers, 2016; González *et al.*, 2022). Most of the works that did provide this information maintained parity between genders, with the exception of Mycock (2018) where there were more girls.

3.2. *The influence of nature on children's emotional and social development*

Adams and Beauchamp (2021) underline the necessary interaction between human beings and nature. These researchers implemented a series of experiential activities in their study that were carried out in nature reserves with the objective of understanding the perceptions, feelings and sensations produced by direct contact between children and these environments. Their findings indicate that the children experienced feelings of calm, plenitude, freedom and relaxation, underlining the opportunity natural spaces provide to carry out reflexive exercises of introspection. These perceptions also influenced their temporal conscience, demonstrating the

liberating aspect of nature. Ultimately, the children's biophilic experiences resulted in an improved perception of nature, a greater connection with these environments and a better sense of self and self knowledge.

On this line, Chiumento *et al.* (2018) present the results of a pilot Social and Therapeutic Horticulture (STH) intervention called *Haven of Green Space*. The authors draw on the research by Sempik *et al.* (2014) to define STH, conceptualising it as therapeutic interventions based in green spaces to improve participants' well-being. Similarly, Chiumento *et al.* (2018) start from the framework of the "Five Ways to Well-Being", an approach that seeks to promote behavioural change in subjects towards the development of positive relations, autonomy, competence and security. Consequently, Chiumento *et al.* (2018) transfer these approaches to therapeutic practice with children through the following five actions: a) connecting with others and with nature, b) doing physical activity, c) perceiving the environment and one's own feelings, d) generating self-confidence, and e) establishing reciprocal relations with other people. The findings extracted indicate that the interventions using STH benefited the mental health and well-being of children with behavioural, emotional and social difficulties who participated in the project. These results endorse nature's capacity to influence internal attributes such as emotional well-being, self-esteem, the sense of belonging and the creation of social and relational networks.

Meanwhile, González *et al.* (2022) define the connection with nature as an affective and experiential sense of belonging to the natural world that relates to pro-environmental and prosocial behaviour, positive levels of happiness, satisfaction and resilience. In this study, González *et al.* (2022) set the objective of analysing the experiences and perceptions of relationship between subject and nature that influence the well-being of children who live close to natural environments and that of children who live far from them. The researchers start from an interpretation of well-being constructed using three dimensions: physical; psychological, encompassing cognitive and emotional well-being; and social. The positive perceptions that children report of nature's influence on their well-being stand out in regard to the findings linked to the internal attributes that comprise their identities. In particular, these findings show that the children's relationship with nature generated feelings of happiness and self-satisfaction, as well as creating social bonds without any significant difference being presented according to the distance between the natural environment and where they live. Nonetheless, differences in participants' perceptions relating to how nature influences their well-being were identified. Accordingly, children who live close to natural environments perceived an improvement in their physical well-being, while those who live further away perceived an improvement in their psychological well-being (cognitive and emotional).

Jarvis *et al.* (2022) investigate the association between early exposure to vegetation and childhood development. They evaluated it using the "Early Development

Instrument” (EDI). This is intended to measure children’s capacity to meet the developmental milestones for their age, including the following domains: physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and knowledge. Regarding exposure to nature, three different environments are established, with the type and volume of vegetation varying in each of them: total vegetation, tree cover and grass cover. The findings not only indicate that green spaces had a positive influence on the five dimensions of childhood development, but they also demonstrated that these effects increase or decrease depending on the type and volume of natural cover. For example, tree-covered areas had a stronger positive influence on children’s development than grass-covered ones. However, these results, which link well-being with the type and volume of vegetation do not match the results of other studies.

Huynh *et al.* (2013) set out to evaluate the relationship between emotional well-being and the exposure to nature of children and adolescents. Their findings indicate that, while nature’s positive effects on people’s well-being are already well-founded, they were not significant in the context of their research. Huynh *et al.* (2013) determine that the possible causes of the weak effect of nature on children and adolescents’ well-being could be: contextual and personal variables; the composition or type of natural space; the variation of the perception, use and interaction with the natural space; the taking of decisions regarding the type of contact with nature, as well as the variations in the geography of and access to these environments.

For their part, Luís *et al.* (2020) refer to how children’s growing disconnect with nature can be combated by the potential for schools to recover this bond through their playgrounds. The fact is that if school is somewhere where children spend much of their time, their environments can be enhanced through ever greener designs of spaces that reinforce the bond between students and natural environments. Consequently, Luís *et al.* (2020) suggest examining and comparing the effects of green playgrounds in three educational centres where the presence of natural elements varies (paved playground with little vegetation, playground with green areas and an earth playground with a vegetable garden). In particular, the authors on the one hand focus on the immediate effects of these environments on the restorative experience and, on the other hand, on the long-term effects on attitudes towards and connections with nature, as well as on social competences. Their findings indicate that contact with green playgrounds made a positive contribution to students’ restorative experiences, with them displaying more positive attitudes towards natural settings and a greater connection with nature.

However, the findings of these three authors regarding the influence of nature on social competences were not significant, matching the results obtained by Huynh *et al.* (2013). In particular, Luís *et al.* (2020) establish that the weak relationship

between nature and social competences might be because of the instrument used to evaluate social competences or the effect of a range of variables at play in social interaction in educational centres: number of children, heterogeneous interests, motivations and personality among others. In view of these results, Luís *et al.* (2020) argue for this line of study to be expanded and tackled in greater depth, something later done in the work by Pollin and Retzlaff-Fürst (2021). For these authors, school vegetable gardens stand out as green spaces that have a positive influence on the children's integral development.

To that effect, Pollin and Retzlaff-Fürst (2021) carried out an exploratory study to examine how much educational interventions implemented in a school vegetable garden influence the development of children's social and emotional behaviour. The results show that lessons supported by natural environments increased the manifestation of positive emotions, in particular happiness and wonder, promoting the creation of positive bonds with experiences that occurred in direct contact with nature. Unlike Huynh *et al.* (2013) and Luís *et al.* (2020), these authors emphasise in their research how social competences and opportunities are benefited, something that is reflected in cooperative behaviour between the children. Ultimately, interactions with natural environments while carrying out educational activities can be of value for emotional and social development and the development of other internal attributes such as self-esteem.

3.3. *The influence of nature on the formation of values and the behaviour of young children*

The research by Amoly *et al.* (2014) is part of the BREATHE Project (*BRain dEvelopment and Air polluTion ultrafine particles in scHool childrEn*). Among the variables analysed, the authors evaluated the influence on emotional, behavioural, relational and prosocial attributes in children of: a) time spent playing in green spaces; b) how green the children's home environments are; c) the proximity of their homes to significant green spaces; and d) contact with blue spaces (beaches). The results Amoly *et al.* (2014) obtained underlined how playing in green spaces, as well as contact and time spent in them and in blue environments had a positive effect on the development of children's behaviour. These effects were also reflected in emotional and prosocial attributes, allowing children to establish positive bonds with their peers and with the environment around them.

On this line, Askerlund and Almers (2016) present their research linked to the BÄRFIS project. In this framework, educational centres are offered access to and participation in a model forest garden. The importance of these natural settings is determined by their potentiality to generate and develop moral values, beliefs and perspectives in children. For this study, the authors propose as their objective, on the one hand, investigating children's reasoning ds to the dependence and

relations established between different organisms, including them, and on the other, analysing how to describe their relations with the setting, also identifying which values of nature they express. Regarding the dependence and relations between the different organisms, it is established that, after direct contact with nature, the children identified the existence of certain relationships created in the setting, for example, unidirectional relationships with the animals based on caring behaviour, that foster their interest in ecological well-being. However, the child-vegetation relationship was bidirectional, with mutual dependence between the subject and the natural setting standing out, as did the development of ecological conscience in the participants. With regard to the values that might be fostered in nature, Askerlund and Almers (2016) carried out a study based on the values presented by Kellert (2002): aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic, scientific, symbolic and utilitarian. The results of this research show that the values most commonly expressed by the children are scientific or ecological, humanistic, aesthetic and naturalistic. So, the development of the former favours cognitive and intellectual capacities, problem solving, critical thinking, respect and appreciation for nature. Humanistic ones promote the capacity to receive and provide affection, forming bonds of attachment with the environment and cooperative behaviour. According to Askerlund and Almers (2016), promote curiosity, imagination, creativity, self-confidence and self-esteem. And finally, naturalistic ones generate feelings of respect for nature in children, as well as recognition of the intrinsic value of the environment surrounding them. These moral approaches agree with people's identity construction, specifically ecological identity.

Finally, a study by Mycock (2018) investigates how play in direct contact with nature, specifically mud, can influence the perception and management of students' gender identity in two forest schools and a school garden. This research starts from the approaches of open air schools and children's search for a connection with natural settings. As well as building neutral spaces in relation to gender roles (Änggård, 2016), these environments also foster open-ended and spontaneous play while at the same time children creatively and imaginatively explore their most immediate environment. These determinants are used by Mycock (2018), who for her research redesigned a space that she called a "mud kitchen", designed from a neutral perspective, without gender connotations, but with familiar utensils for the children. The configuration of this space offered the opportunity to relate through free and spontaneous interactions within the natural environment, in turn enabling children to renegotiate stereotyped gender limits, practising more flexible identities and developing values linked to respect, tolerance and empathy. Moreover, the author underlines the reconceptualisation of "cleanliness", mitigating the idealised perspective of this state, alluding to the fact a free, healthy and happy child gets dirty while playing in natural environments, enabling it to reconnect with itself, with its own nature and with what surrounds it. Ultimately, connection with nature and

playing freely in open areas in childhood foster the social competences that will influence the construction of children's identity from a multifaceted perspective, making them more responsible adults with solid social and affective bonds with their environment (Pyle, 1993).

Although the selected studies do not specifically aim to analyse the construction of childhood identities, they all examine attributes that are directly related to diverse conceptions of identity. It is apparent that the influence of the connection with nature on the construction of individual identity is analysed through the children's introspection, their self-knowledge, personal satisfaction, perceptions, adoption of values, and learning of behaviour, as proposed in the studies by Adams and Beauchamp (2021), Amoly *et al.* (2014), Askerlund and Almers (2016), González *et al.* (2022) and Mycock (2018). Likewise, the emotional attribute at play in the formation of identity stands out in most of the studies selected (for example, Adams & Beauchamp, 2021; Amoly *et al.*, 2014; Askerlund & Almers, 2016; Chiumento *et al.*, 2018, González *et al.*, 2022; Jarvis *et al.*, 2022; and Pollin & Retzlaff-Fürst, 2021). Many of these works also study the interactive and relational aspects and socialisation, something that, on the one hand, coincides with the collective conception of identity, particularly in terms of identification with others, and, on the other hand, with the sense of belonging both to a social group and to the surrounding natural environment (Amoly *et al.*, 2014; Askerlund & Almers, 2016; Chiumento *et al.*, 2018; González *et al.*, 2022; Jarvis *et al.*, 2022; Mycock, 2018; Pollin & Retzlaff-Fürst, 2021). As for relational identity, this is most notably analysed in the research by Mycock (2018), who studies the adoption of different roles by children in the experiences done in natural environments. Finally, the 10 studies selected analyse the conception of identity of place transversally by promoting and analysing the creation of bonds, connections and relationships with the non-human natural environment that surrounds the children. In essence, these findings reflect the multidimensional character of human identity and the continuity both of its construction at early ages and in the redefinition of the meaning of the "self".

The connection between children and nature has been approached in a variety of ways in the studies selected. For example, the studies by González *et al.* (2022), Huynh *et al.* (2013) and Jarvis *et al.* (2022) drew on children's prior experiences in relation to their contact with nature. On the other hand, Amoly *et al.* (2014), Luís *et al.* (2020) and Mycock (2018) centred on the children's interactional activities and spontaneous games. Adams and Beauchamp (2021) also analysed the connection with nature through spontaneous play, planned play and sensory relaxation experiences done by children in nature reserves. The findings of the other studies were obtained through experiences mediated by different learning situations in direct contact with nature (Askerlund & Almers, 2016; Chiumento *et al.*, 2018; Pollin & Retzlaff-Fürst, 2021). Another notable aspect is the role played

by educational centres in the research. Luís *et al.* (2020) explored green school playgrounds as a way of fostering a connection with nature, while Pollin and Retzlaff-Fürst (2021) researched the effects of educational interventions based on a school garden. For her part, Mycock (2018) did her study in two forest schools and a green school, where the connection with nature was inherent in the educational setting. Finally, Amoly *et al.* (2014) and Askerlund and Almers (2016) underlined schools' capacity to bring students closer to natural settings, whether through time for playing in natural spaces close to the educational centre, as observed in the first study, or through participation in a project that allowed access to a forest garden, as shown in the second.

Most pieces of research found a positive effect in the attributes analysed. Children's connection to natural settings creates benefits in their emotional and social development and well-being (Chiumento *et al.*, 2018; González *et al.*, 2022; Pollin & Retzlaff-Fürst, 2021), as well as in their development of values and the appropriateness of behaviour (Amoly *et al.*, 2014; Askerlund & Almers, 2016; Mycock, 2018). Nonetheless, we also found that studies such as those of Huynh *et al.* (2013) and Luís *et al.* (2020) do not agree with some of these results. The first of these studies found the improvement in the emotional well-being of young children to be weak, while in the second, this non-significant influence is reflected in the development of social competences. In both cases, the authors underline the small number of earlier studies that explain these results, and so they refer to what they regard as possible causes for their findings, agreeing that these could be due to the heterogeneity of interpersonal, intrapersonal and contextual variables; to the variability of the children's perceptions or valuations of nature, as well as the habits and routines of contact and connection with it or, as Huynh *et al.* (2013) state, the geographical or accessibility characteristics of these settings, which are sometimes some distance from where the children live.

4. DISCUSSION AND CONCLUSIONS

The main aim of this study centred on identifying how nature influences the development of attributes involved in the construction of identity during early childhood. To do so, we performed a systematic review of the last 10 years, analysing a total of 10 articles. This research has allowed us to conclude that identity construction is a complex and non-homogeneous process (Bernal, 2005; Quiroga *et al.*, 2021), characterised by its continuous, diverse and distributed nature. This is the result of the situations experienced by subjects in a relational context with their environment and with others (Trianes Torres & Amezcua Membrilla, 2012; Vera & Valenzuela, 2012).

Intrapersonal and interpersonal factors are at play in the formation of the different identity constructs. The former relate to self-discovery, self-confirmation

of the individual “self”, emotional development, values and perceptions, among others, while the latter are linked to social interaction, the sense of belonging to a group or to social and cultural influences. In other words, the identity feeling is built through the lived experiences of each person and her interaction with others (Camelo, 2023). Moreover, and from a relational and identitarian concept of place, the environment provides a space for learning behaviour, creating ideas and beliefs, and adopting roles aimed at connecting with and caring for this environment (Flórez Varón & Cárdenas-Támara, 2022).

The findings of this study make it possible to establish that different internal factors or attributes involved in the identity construction of children are positively influenced by the connections established between the children and natural spaces. These results agree with other studies that have also shown a series of benefits relating to these attributes and contact with natural settings. Bikomeye *et al.* (2021) and Mygind *et al.* (2021) found that nature has a positive effect on the socio-emotional development of boys and girls. In addition, Fretwell and Greig (2019) underline the benefit of contact with nature on the personal well-being of this age group. Furthermore, Liao *et al.* (2020) have shown behavioural improvements, while Dewey (2021) specifically emphasised environmental improvement and the construction of ecological conscience and identity. In contrast, while the majority of the studies selected have shown positive effects on the connection between nature and identity, the works by Huynh *et al.* (2013) and Luís *et al.* (2020) did not align with this positive trend. The first of these studies found a weak effect of nature on children’s emotional well-being, while the second did not find a significant influence on the development of social competences. These findings can be attributed to what Wang *et al.* (2020) call “objective nature deficit” and “subjective nature deficit”. Objective nature deficit relates to a lack of knowledge of and contact with nature, while subjective nature deficit relates to aspects such as a lack of empathy for the environment, limited identification with natural living beings and a lack of satisfaction with the attributes of nature. Specifically, the work of Huynh *et al.* (2013) considers a lack of access to natural settings as one of the reasons for their weak influence on study participants’ internal attributes, something that is in agreement with objective nature deficit. This position is also analysed in other research (for example, Addas, 2022; Martori *et al.*, 2020; Pérez-del-Pulgar *et al.*, 2021) where the lack of accessibility of natural settings, whether these be wild areas or urban green spaces, was identified as one of the causes of the disconnection with nature. Therefore, considering the positive effects of interaction with natural spaces on the construction of identity during early childhood, it is important to direct educational processes towards reducing nature deficit, both objective and subjective (Louv, 2005, Wang *et al.*, 2020) and, by extension, promoting the formation of a healthy identity in children, starting from processes of humanisation and reconnection with the natural environment.

In short, the present work highlights how research aimed at analysing the influence of nature on the internal attributes that influence and determine the identity of children is limited, and how more depth in this line of study is needed. This conclusion is based on the importance of attending to, promoting and studying the child's relationship with nature from an experiential, situational, social and cultural perspective, taking into account that identity construction is the fruit of the subject's interaction with its surroundings (Erikson, 1994; Muñoz-Rodríguez, 2022; Sepúlveda, 2020). Nonetheless, based on current social trends, there is one situation that cannot be ignored, namely that technology is a significant and decisive factor in society's habits and routines. Consequently, it is not only necessary to identify the point at which technology and nature converge and complement one another, but also to analyse the effects of the interrelation of natural and virtual spaces on the development of subjects and, consequently, on their identity development. To this end, while accepting that nature and technology cannot be disassociated from the development of the human being, pedagogy must work in favour of an education that interlinks these spaces, taking advantage of the inherent potentialities of both contexts in the development of the person, without losing sight of critical periods in development, such as childhood.

4.1. *Limitations and future research*

Although this research is based on a methodology that ensures its results have rigour and scientific quality, the limited number of studies available and selected for analysis is a limitation when generalising the findings. Furthermore, although clear and explicit inclusion criteria were set, evaluation bias by the researchers when selecting the studies is a variable that cannot be ignored. The findings of the systematic review made it possible to identify and contextualise particular variables that the literature links to the children's development of identity and which are influenced by this age group's relationship with nature. These variables can contribute to establishing the theoretical starting points that make it possible to broaden knowledge regarding identity construction in connection with nature and through experiences developed within these environments using technology as a factor involved in the development of attachment to these spaces. With the aim of considering this field in greater depth, starting from the previously cited research projects, one suggested future line of research would be to explore and analyse the ways in which children construct their identity through their connection and bond with natural environments, carrying out social and cultural experiences based on studies contextualised in the current social and cultural dynamics that make it possible to respond to new educational challenges.

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