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SEÇÃO: ARTIGO

Connection with Nature and professional performance

Conexão com a Natureza e atuação profissional

Conexión con la Naturaleza y desempeño profesional

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Abstract: Contact with natural environments is essential for establishing the Connection with Nature (NC), a subjective attachment to nature, which in turn is a source of benefits for the integral health of humans. The type and frequency of contact with natural environments can vary for a variety of reasons. In the labor field, the choice of professional training can be an indicator of Connection with Nature (NC). To understand the possible association between academic training and CN levels, this study involved forest engineers and professionals from other backgrounds. Two complementary studies are reported here, in study 1 a face-to-face questionnaire was applied, and in study 2 an online questionnaire. All the 295 participants answered a socio-demographic questions and CN scales. In the two studies conducted, it is confirmed that the area of graduation and post-graduation levels are factors that affect the CN of adults, along with a history of positive interaction with nature had in childhood. The results also confirm that professionals in environmental sciences have higher CN levels than professionals in the humanities.

Keywords: workplace, welfare, affection, environment

Resumo: O contato com os ambientes naturais é essencial para a constituição da Conexão com a Natureza (CN), um apego subjetivo à natureza, que por sua vez é fonte de benefícios para a saúde integral dos humanos. O tipo e a frequência de contato com ambientes naturais podem variar por diversos motivos. No âmbito laboral, a escolha da formação profissional pode se constituir em um indicativo de Conexão com a Natureza (CN). Para compreender a possível associação da formação acadêmica e níveis de CN, este estudo envolveu profissionais de várias áreas. Os 295 participantes responderam a um questionário virtual com dados sociodemográficos e escalas de CN. Nos dois estudos conduzidos confirma-se que a área de graduação e de pós-graduação dos profissionais são fatores que afetam a CN dos adultos, juntamente com um histórico de convívio positivo com a natureza tido na infância. Os resultados confirmam ainda que profissionais das áreas ambientais possuem níveis de CN maiores do que os de humanidades.

Palavras-chave: ambiente de trabalho, bem-estar, afeto, ambiente

Resumen: El contacto con los entornos naturales es fundamental para establecer la Conexión con la Naturaleza (CN), un apego subjetivo a la naturaleza, que a su vez es fuente de beneficios para la salud integral del ser humano. El tipo y la frecuencia del contacto con los entornos naturales pueden variar por varias razones. En el campo laboral, la elección de la formación profesional puede ser un indicio de Conexión con la Naturaleza (CN). Para comprender la posible asociación de antecedentes académicos y niveles de NC, este estudio involucró a profesionales de la ingeniería forestal y profesionales de otras áreas. Los 295 participantes respondieron un cuestionario virtual con datos sociodemográficos y escalas CN. En los dos estudios realizados, se confirma que el área de formación y niveles de posgrado de los profesionales son factores que inciden en la CN de los adultos, junto con una historia de interacción positiva

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con la naturaleza que tuvo en la infancia. Los resultados también confirman que los profesionales de las ciencias ambientales tienen niveles más altos de CN que los profesionales de las humanidades.
Palabras clave: ambiente de trabajo, bienestar, afecto, medio ambiente

Natural environments have restorative capacity for humans in different ways. For instance, reduce stress and attention (Bezold et al., 2018; Kaplan, 1995; Whitburn et al. 2019); increase the sense of relaxation and well-being (Cox & Gaston, 2016) and contribute to the improvement in learning and integral development of children and young people (Hodson & Sander, 2017; Ulset et al., 2017). Natural environments can also mitigate the impact of noise and air pollution (Gascon et al., 2016); regulate air humidity and temperature, and improve the urban microclimate (Gomes & Soares, 2003; Pereira et al., 2018) which influence in one way or another the health and well-being of people. However, getting in touch with natural environments becomes every day a greater challenge for people living in cities, whose exponential growth has reduced and threatened the green areas in their surroundings. In this process, the person-nature relationship has been undergoing changes, which can bring serious compromise, not only to the integral health of people, but also in the care and protection of nature including all professional performances.

Despite the circumstances of urbanization, industrialization, and development of technologies, which have altered the way we interact with environments, the genetic code of humans has not been altered enough to eliminate from people the need to be in touch with nature (Laird, 2019). This need is pointed out as a biological factor present in humans that refers to a search for contact with nature. According to the biophilia hypothesis, humans have an innate need to relate to natural environments that is rooted in formation (Wilson, 1984).

These biological aspects that drive proximity to the natural world to enjoy the various benefits, in turn, feedback the type of relationship that is distinctive in each person's formation. Having contact with natural environments is essential for the constitution of the Connection with Nature (CN), a subjective attachment to natural environments that contains cognitive, affective, and behavioral aspects (Nisbet & Zelenski, 2013; Zylstra et al., 2014). High levels of CN translate a sense of unity between person-environment, such that this strong relationship contributes to both the health-promoting aspects of the person itself and the protection of that environment. A meaningful relationship with nature, therefore, is essential to mobilize people around environmental protection. In this sense, CN is a construct considered to be a strong predictor of pro-environmental behaviors and attitudes (Schneider & Schaal, 2018), which is associated with environmental care and protection actions at different scales (Mazzarino & Assis, 2016; Restall & Conrad, 2015).

People with higher levels of CN have some prominent characteristics, such as a tendency to pay full attention, to be open to new experiences, to self-reflection (Richardson & Sheffield, 2015), and to seek contact with nature more often (Chew, 2019). These practices further foster the ability to perceive the restorative benefits of the environment (Berto et al., 2018). Thus, a cycle begins: by identifying and feeling part of nature people are filled with positive affectivity with nature and therefore seek to care for it by promoting the well-being of the biotic community, which strengthens CN (Leopold, 1970). Conversely, the absence of contact with the natural world can contribute to creating problems for people's physical and psychological health (Louv, 2016). By being in opposition to the biophilic necessity and increasing experiences in built environments, people move away from natural environments. Thus, the cycle of disconnection with nature is created, affecting human beings at a non-conscious level, generating uneasiness and lack of motivation to take care of it, and, ultimately, contributing to create more human problems (Joly & Queiroz, 2020; Norton, 2009).

In view of the few opportunities for contact with nature offered in cities, several initiatives have already been carried out aimed at promoting or strengthening CN, especially in childhood, a

period when positive experiences with natural environments are indicative of strong CN (Cheng & Monroe, 2012; Collado et al., 2013, 2017; Corraliza & Collado, 2019). It is necessary, though, to consider that direct experiences with nature can have a great diversity of interests and distinct ways of experiencing this contact.

The strong relationship with nature also occurs as a professional training activity, either through the disciplines of basic training or courses with immersion in natural environments with college students (Karisman & Supriadi, 2020; Shellman & Hill, 2017). Paz et al. (2020), showed that academic training in natural sciences of schoolteachers is a variable that advocates a greater relationship with nature, even if they have little contact with the field in their work activity. Nevertheless, few studies have been concerned with verifying the implications of frequent contact with nature in the promotion of CN when the interest is directed towards a professional performance.

It is appropriate to believe that professionals in environmental sciences and forestry, chose to follow this occupation with a minimum of identification and attraction for nature in its different forms, and that, throughout their basic training, they began to live more often in green environments. And, consequently, the relationship with nature would be strengthening not only in derived knowledge, but also in their lived experience and affectivity, to distinguish their levels of CN. Based on the theoretical arguments presented, this study sought to investigate the relationship of the area of training and professional performance on the levels of CN. To this end, two studies were conducted with higher education professionals working in Brazil, with different academic backgrounds and levels of contact with nature in their work routine.

Method

This research was developed in two studies designated here as Study 1 and Study 2. A face-to-face questionnaire and a virtual survey were used for the study 1. The face-to-face questionnaire was applied to professionals with different higher education training, all residing in the city of Manaus-AM. This data collection occurred in March 2017 and the participants were chosen by convenience. The virtual survey was applied to forestry engineers from several regions of Brazil. The participants were chosen from a list of former students of an immersion course in the Amazon rainforest developed by a research institution. They were contacted via email and data collection occurred in March 2021, using the Google Forms platform.

The time lapse between the studies is since they are data from two studies carried out independently by the same research group, as part of a master and doctorate degrees. One of the research project was approved by the ethics committee of CAAE nº. 63687616.9.0000.0006, under number 1.900.249 and the other by CAAE 20296619.10000.0006, under number 3.605.807.

The two questionnaires contained questions about their professional profile, their contact with natural environments, and two social scales: (1) Scale of Inclusion of Nature in the Self (INS) (Schultz, 2002) and (2) Reduced Nature Connection Scale - NR-6 (Nisbet & Zelenski, 2013). The INS consists of 7 figures composed of pairs of circles, one represented as "self" and the other as "nature", in 7 different degrees of overlap, so that the respondent must indicate among the figures, the one that best defines their relationship. The conceptual model present in the INS recognizes the inclusion of these entities that represent a sense of cognitive connection and affection associated with a concrete action of responsibility directed toward nature. The NR-6 consists of 6 items to understand affective and cognitive aspects and physical contact of people with the natural world. It assesses the internalization of identification with nature and worldviews related to nature (Tam, 2013). The scales underwent factor analysis, calculation of the mean of responses to the items of each scale, and analysis of variance. Despite measuring different aspects of the CN construct, the two scales used (INS and ERN-6) showed strong association and satisfactory rates for the sample in question. These two scales are

widely used in research on CN worldwide, including with Brazilian samples (Mikołajczak, 2019).

Study 1 consisted of 86 professionals with higher education degrees and working in their respective areas of training participated (F=40, M=46), 43 from Forest Engineering and 43 from other areas, such as Law, Pedagogy, Biochemistry, Administration, Biology and Psychology. The Forest Engineering professionals were from several states of the country and the other professionals were all residents of Manaus-AM. Their ages ranged from 25 to 49 years (mode = 34 years). Study 2 used data from three different groups of higher education professionals, part of whom also participated in study 1. The sample consisted of a total of 295 professionals with higher education degrees (F=151; M= 144), all working directly in various regions of the country. The participants were classified according to their academic background: 102 from the forest sciences, 27 from the exact sciences, 123 from the humanities, and 43 from the biological sciences.

Results

Results of study 1

The NR-6 as a single-factor scale was confirmed by factor analysis with a KMO index of 0.758, with Bartlett's test of sphericity significant with $p<0.01$. The reliability analysis indicated a Cronbach's α equal to 0.749. All indices, therefore, demonstrate the reliability of using this scale. From this, the scores of the participants on the Nature Connection construct assessed by the NR-6 scale were calculated. The results obtained on the NR-6 scale show that forestry engineers have higher levels than other professionals. This difference was also observed on the INS scale. Pearson's correlation analysis showed that the NR-6 and INS scales, even though they measure different aspects of CN, present a strong correlation $r= 0.736$ with $p<0.01$. When compared to the gender variable, no significant differences were found in the two measures of CN. Participants with greater contact with nature also show stronger connection with nature on both scales (Table 1).

Table 1 – Nature Connection averages according to the participants' profile information

	Average INS	dp	Average ERN	dp
Female	5,1	1,15	4,2	0,43
Male	4,8	1,52	4,0	0,64
Forest engineers	**5,5****	1,18	**4,2***	0,48
Other Professionals	**4,4****	1,32	**3,9***	0,60
Contact Childhood - Always	**5,1***	1,13	**4,2***	0,46
Childhood Contact - Sometimes	**4,2***	1,61	**3,8***	0,65
Childhood Contact - Rarely	4,5	1,94	3,8	0,74

*p<0,05 **p<0,01

Source: Prepared by the authors

Forest engineers, however, reported going to natural environments more often during childhood than professionals from other fields of knowledge (Table 2).

Table 2 – Frequency of contact with nature during childhood

	Contact with Nature during childhood			
	Ever	**Sometimes**	**Rarely**	**Total**
Forest Engineers	83,7%	11,6%	4,7%	100%
Other Professionals	58,1%	25,6%	16,3%	100%

Source: Prepared by the authors

Results of study 2

Here we analyze the responses obtained in the INS (Schultz, 2002) and the association of these levels of CN with external variables, such as area of training and professional activity, post-graduation, and gender.

Although all have university education, those who have taken some post-graduation show higher levels of INS than those who have not. The variable gender, however, was not a determining characteristic to differentiate the levels of INS when education is a dependent variable. Professionals in forest sciences, biological sciences, and exact sciences have higher INS levels than professionals in the humanities (Table 3).

Table 3 – INS levels according to the characteristics of professionals

	INS	**dp**
Humanities	**4,69****	1,77
Exact Sciences	5,25	1,43
Biological Sciences	5,27	1,48
Forest Sciences	**5,54****	1,19
Post-Graduated	**5,27***	1,51
Did not attend graduate school	**4,88***	1,0
Female	5,02	1,59
Male	5,22	1,51
Visit green areas - Always	**5,59****	1,31
Visit green areas - Something	**4,61****	1,47
Visit green areas - Rarely	**4,22****	1,86

*p<0,05 **p<0,01

Source: Prepared by the authors

Contact with green areas is another characteristic associated with differences in INS. Those who have more frequent contact with natural environments also have higher levels of INS when compared to those who attend these types of environments occasionally or rarely. Among the areas of training there was a significant difference ($p<0.05$) between the means of frequency of contact with nature. Professionals in the forest sciences usually go to natural environments much more often than those of exact and biological sciences. Professionals in the humanities, on the other hand, are the ones who least access natural environments in their daily lives (Table 4).

Table 4 – Percentage distribution of contact with nature in the different areas of professional training

	Always	Something	Rarely	Total
Humanities	66,7	18,5	14,8	100%
Exact Sc.	39	35	26	100%
Biological Sc.	46,5	34,9	18,6	100%
Forest Sc.	85,3	9,8	4,9	100%

Source: Prepared by the authors

Discussion

Both studies point out that the area of academic training and professional performance can be predictors of the relationship with nature, producing different degrees of contact and different levels of connection with it. The area of knowledge and the level of academic training congregate an important association in the way these professionals relate to nature. Professionals in forest sciences, biological sciences, and exact sciences show a greater relationship of proximity with nature than professionals in the humanities. However, even among those professionals in the biological sciences, contact with nature is lower compared to professionals in the forest sciences, whose work routines require different types of contact with nature. The routine of professionals working in the urban area allows little contact with nature. Several factors may limit the access to natural environments, such as lack of time, distance to nature areas, lack of transportation and mobility to urban green parks, lack of security and the scarcity of structured spaces for leisure nature-based (Fernandes & Higuchi, 2017; Zacarias, 2018). However, even with such obstacles, this study points out that professionals with training areas related to environmental sciences (forest and biological sciences) seem to recognize more the importance of nature and to seek more intense contacts with it.

Associated with the area of knowledge of their respective training, there is the role of graduate courses as significant in the relationship with nature, as those who had attended post-graduate courses showed stronger levels of CN than those who had only an undergraduate degree. Thus, specialized education may be associated with higher levels of CN. Such a result corroborates with studies that claim that a greater amount of formal education is associated with valuing nature and its biophilic capabilities (Ahmetoglu, 2019; Gifford & Nilsson, 2014). It is possible that some aspects of these professionals' further education contribute to their valuing nature and seeking to get closer to it. When considering the field of work, forest engineers stand out with even higher levels of NC than professionals in other areas, and with greater frequency of contact with nature. One must consider, however, that for forest engineers, nature is an important part of their lives, since their work requires direct involvement with the forest.

It is important to remember that the CN construct is composed of information about nature, experiences with nature, emotional bonds, and a concrete attitude of responsibility towards it. However, Zylstra et al., (2014) warn that the type of experience in nature is crucial in (re)connecting with nature, which can be simple initially, but can sensitize people and thus resort to more intense and complex activities in their relationship. In addition, the authors point out that disciplines in university education reveal this evolution (nature-based education) since they do not only include contact with nature per se, but a series of activities with reflections, affections, and knowledge. These activities, which promote authentic (re)connection with nature, can be spontaneous or semi-structured, such as immersion courses/experiences, either individually or in groups. When high levels are established, CN becomes a spontaneous and revealing activity for oneself and for others. It is noteworthy here that these forest engineers, at

the time of their graduation, participated in a 30 to 40-day total immersion experience in the Amazon Forest that they considered of great value to their personal and professional identity.

The institutional effort, whether from schools or universities, has an important support from the family context of closeness with nature. This study highlights the role of frequent contact with nature since childhood, which was also found in other studies (Braun & Dierkes, 2017; Cleary et al., 2020; Lumber et al., 2017). Besides, children with more interest in knowledge about environmental dynamics start to consider pursuing professional careers in environmental fields when they reach adulthood (Gray & Pigott, 2018; Reese et al., 2018; San Jose & Nelson, 2017). This fact may have even corroborated the choice of university field of study that these participants pursued.

The results obtained in this study are therefore, in line with other studies on contact with nature in children, which highlight those positive experiences with the natural world from an early age exert an influence that remains throughout a person's life (Hughes et al., 2018; Rosa et al., 2018). Children who have more contact with nature and who participate in nature-based education have greater awareness of environmental problems and their responsibilities as citizens (San Jose & Nelson, 2017); enjoy all the health benefits that green areas offer humans and have a good contribution to their physical, psychological and emotional development (Hodson & Sander, 2017; Mustapa et al., 2015; Ulset et al., 2017).

The results of the INS scale and the ERN-6 show that most professionals who believe they have a strong connection, or feel part of nature, also have a relationship of intense proximity to natural environments, not only for their professional activities, but also personal ones, including in time of the covid-19 pandemic. As stated by Zylstra et al. (2014), this contact through work routes that requires an effective and meaningful immersion, feedback and acts as a major element of the CN construct itself. A worrying piece of data that emerges in this study is of the levels of CN and contact with nature of professionals in the humanities. When compared to the other groups, they have lower NC and less frequent contact with nature. It is important to think that even though the focus of training in the human sciences lies in the interaction between humans, everyone is inserted in a place, in a biological ecosystem that serves as a stage for social events. Therefore, including the environmental dimension in the curriculum, promotes broader possibilities of professional performance that can reverberate in integral health and transformation capabilities of the social world (Zylstra et al., 2014).

Thinking about mandatory curricular internship with activities that prioritize direct contact with nature, is important for people who do not have significant experiences in nature. This experience can provide subsidies to reconnect people with nature. After all, one is unlikely to develop a concern for nature without directly experiencing it (Balmford; Cowling, 2006). Students can more effectively achieve this deep commitment that CN constitutes through a strategically guided educational process (Zylstra et al., 2014). Nature outreach interventions in higher education seems to be crucial in promoting and encouraging students to approach and value natural environments. Moreover, environmental education activities inside and outside universities can be important means for repositioning CN in adults (Frantz & Mayer, 2014), as well as encouraging pro-environmental attitudes and behaviors that problematize detachment and so-called nature deficit disorder (Fletcher, 2017; Louv, 2016).

Final Considerations

Establishing a relationship of appreciation and closeness with natural environments is of utmost importance, both for encouraging pro-environmental behaviors and for promoting human health. Therefore, contact with nature should be encouraged, not only for children, but also for adults. Considering that few studies have been developed to verify the implication of CN levels in professional practice, this research open doors to such questions, since person-nature relationships is relevant to the person's overall health and work performance.

The study has some limitations that can provide a basis for further research on the identification of contextual factors that facilitate or hinder participants from being in contact with nature. It was not possible to understand if the type of relationship with nature is somehow associated with the types of understanding they have of nature and even their ability to perceive the health and well-being benefits produced from this contact. In addition, it is worthy to understand what the main motivations are linked to going to green environments among professionals from these different areas of knowledge.

Finally, it is to note that, as part of this data was held in person before the COVID-19 pandemic and part virtually, considering that the pandemic was ongoing, some of the results may have been indirectly implicated. Therefore, it is necessary to consider such methodological implications, and further studies on the subject are recommended.

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