Effects of forest therapy on salivary biomarkers (cortisol, amylase and IGA) in pediatric cáncer survivors: an experimental study

Efectos de la terapia de bosque sobre biomarcadores salivales (cortisol, amilasa e IGA) en supervivientes de cáncer pediátrico: estudio experimental

Dear Editor:

Childhood and adolescent cancer survivors (CACSs) are at increased risk of chronic disease associated with environmental factors throughout their lifespan. There is growing evidence that contact with nature (CWN) may have beneficial effects on health and its application in CACSs could contribute to improving their health and wellbeing. Spending time in natural spaces has an impact on health through effects on the cardiovascular, renal, respiratory, endocrine, immune and nervous systems.[1] Several hypotheses have been proposed to attempt to explain the mechanisms underlying the nature-health interaction. Neuroinflammation, which affects immunosurveillance, is among the most studied.[2] This is due to the use of saliva biomarkers of meta-inflammation, such as cortisol, α-amylase and immunoglobulin A, whose success stems from the ease and non-invasiveness of sample collection. Few studies have been conducted on CACSs, but an improvement on health-related quality of life has been described in association with CWN.[3] Chronic inflammation can have an impact on immunosurveillance by causing persistent alterations in the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system, which in turn have an impact on the health of CACSs.[4] Therefore, interventions in nature in the context of cancer treatment/recovery can be an adjuvant environmental health and lifestyle measure aimed at strengthening the immune system and mitigate delayed adverse effects of treatment.

We present a quasi-experimental, controlled pre-post intervention pilot study on the use of CWN in CACS. Participants engaged in an ''Educaventura'' (an experience in nature) (Fig. 1) lasting 2.5 h in the Valle-Carrascoy Regional Park in Murcia, Spain. Before the intervention, we collected data on anthropometric and sociodemographic variables, the level of nature connectedness and scores on health-related quality of life (Pediatric Quality of Life Inventory [PedsQL]) and the stress and difficulties questionnaire. On the day of the intervention, we collected samples of saliva before and after to measure the levels of cortisol, amylase and immunoglobulin A by enzyme immunoassay. We conducted a descriptive statistical analysis with the software package SPSS (version 16), using the Shapiro-Wilk test to assess normality, the Wilcoxon signed-rank test for paired samples, the χ^2 test and the Mann–Whitney *U* test.

The participants were 9 childhood and adolescent cancer survivors (cases), recruited from the environmental and community health programme for the long-term follow-up of paediatric cancer survivors (known as PLASESCAP, the acronym of the programme's name in Spanish) and 7 of their siblings (controls). We observed a decrease in cortisol of 11% in cases and 37% in controls (cases: $P = .260$; controls: $P = .028$), a decrease in α-amylase of 75.93% in cases and 51.73% in controls (cases: $P = .008$; controls: $P = .612$) (Fig. 2). The differences were statistically significant ($P < .05$) for the levels of cortisol in controls and the levels of α-amylase in cases. These differences corresponded to decreases in the levels of cortisol and α-amylase during exposure to forest environments, consistent with the findings of Hunter et al. (2019) who estimated reductions of 21.3% in cortisol levels and 28.1% in α-amylase levels in a log-transformed model that varied as a function of the duration and quality of the exposure to nature.[5] The levels of immunoglobulin A increased by 59% in both groups (cases: $P = .859$; controls: $P = .237$). This humoral immunity barrier is known to protect against viral infection and other diseases and is very important for CACS. Changes in innate and cell-mediated immunity have been described in association to nature exposure.[6]

This is the first published study on CWN in CACSs with an experimental approach. Our findings suggest that short interventions in nature could decrease neuroinflammation and improve mucosal immunity in CACSs. This are encouraging results that justify further research in larger samples, controlling for confounders and with a more thorough assessment of the effects of CWN on CACS and other chronically ill patients.

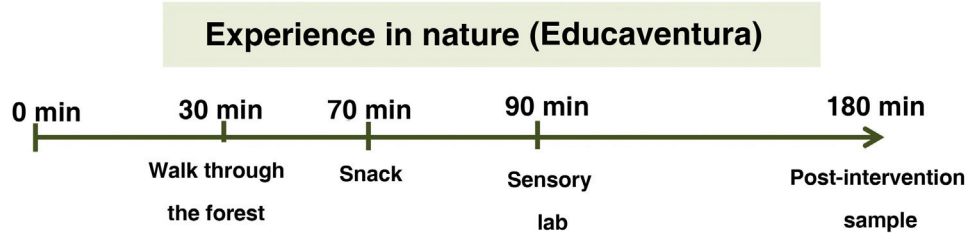

Figure 1 Timeline of the Ëducaventura¨*in the Woods* educational experience in nature.

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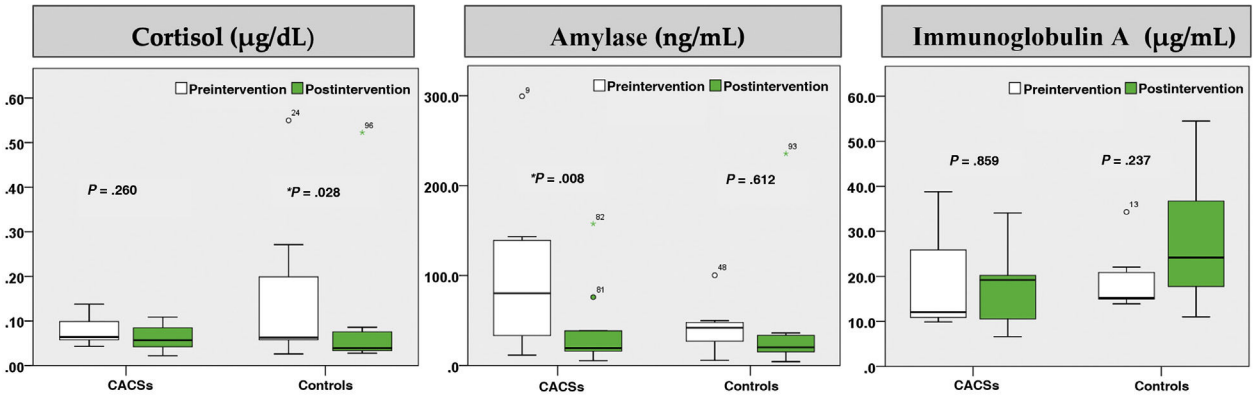

Figure 2 Changes (pre vs post) in the analysed salivary biomarkers in cases and controls. The boxes (percentiles 25th–75th) show the median concentrations of the biomarkers, and the whiskers the minimum (5th percentile) and maximum (95th percentile) values.
CACS, childhood and adolescent cancer survivor.
*Statistically significant ($P < .05$).

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Conflicts of interest

The authors have no conflicts of interest to declare.

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