UNIVERSIDAD Ð CÓRDOBA

CONEXIÓN CON LA NATURALEZA Y OTROS FACTORES PSICOSOCIALES DETERMINANTES DEL COMPORTAMIENTO PROAMBIENTAL

LUIS HUMBERTO MACIAS-ZAMBRANO

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TITULO: *Conexión con la naturaleza y otros factores psicosociales determinantes del comportamiento proambiental*

AUTOR: *Luis Humberto Macias Zambrano*

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Campus de Rabanales
Ctra. Nacional IV, Km. 396 A
14071 Córdoba

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Título de la tesis: **Conexión con la naturaleza y otros factores psicosociales determinantes del comportamiento proambiental / Connectedness with nature and other psychosocial factors determining pro-environmental behavior.**

Autor: **Luis Humberto Macias Zambrano**

Directores: **Esther Cuadrado** y **Antonio J. Carpio Camargo**

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TÍTULO DE LA TESIS:

Conexión con la naturaleza y otros factores psicosociales determinantes del comportamiento proambiental

DOCTORANDO: Luis Humberto Macías Zambrano

INFORME MOTIVADO:

La tesis doctoral realizada por Luis Humberto Macías Zambrano se ha desarrollado siguiendo un progreso sobresaliente en cada una de sus fases. El doctorando ha mostrado desde los inicios un grado de interés y motivación muy altos, y una gran capacidad de trabajo y autonomía. El resultado es una Tesis Doctoral cuidada en todos sus aspectos y detalle, con una más que aceptable calidad investigadora, diseños y análisis complejos y variados, resultados pertinentes y conclusiones relevantes a nivel tanto teórico como práctico. En su conjunto, la tesis presenta un total de cuatro artículos científicos en el ámbito de la psicología ambiental, tres de ellos ya publicados en revistas de alto impacto científico y otra en avanzada fase de revisión. El primero de ellos se refiere al diseño y validación de una escala de conexión con la naturaleza, un constructo que despierta cada vez más interés el momento actual de crisis medioambiental global y en el que se habla cada vez más del concepto “Onehealth”, dado su intrínseca relación tanto con los comportamientos sostenibles como con la salud psicológica de las personas. En el segundo, se analizan las relaciones establecidas entre variables de nivel individual y colectivo en la explicación del comportamiento sostenible, perspectiva cada vez más necesaria para comprender de una manera más holística y compleja los comportamientos individuales y sociales. El tercero se centra en el análisis de las variables sociodemográficas determinantes de la conexión con la naturaleza. Y es un estudio experimental en el que se manipularon las teorías implícitas de los participantes acerca de la reversibilidad del cambio climático para explorar si adoptaban un rol moderador en la relación establecida entre la responsabilidad y el comportamiento sostenible. Todos estos trabajos han sido presentados en diferentes foros tanto nacionales como internacionales, y han sido sometidos para su publicación a

diferentes revistas de reconocido prestigio como *Environment, Development and Sustainability*, *Environmental Education Reseearch* y *Plos One*.

Por todo ello, se autoriza la presentación de la tesis doctoral.

En Córdoba, a 18 de marzo de 2024.

Firma de los directores:

Esther Cuadrado

Antonio Carpio Camargo

INFORME SOBRE APORTACIONES DERIVADAS DE LA TESIS DOCTORAL Y FACTOR DE IMPACTO DE LAS REVISTAS CIENTÍFICAS (JOURNAL CITATION REPORTS).

Artículos científicos publicados:

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Cuadrado, E., Macias-Zambrano, L., J. Carpio, A., & Tabernero, C. (2023). The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioural, and cognitive aspects. *Environmental Education Research*, *29(2),* 308-329. https://doi.org/10.1080/13504622.2022.2111407 JCR Q2, JIF 3.2.

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Córdoba, 1 de marzo 2022.

Srs. De la Comisión Evaluadora de Becas y Ayudas destinadas a miembros de Universidades del Grupo La Rábida.

A todos los efectos, se hace constar que el profesor Luis Humberto Macias Zambrano (con pasaporte 1311117723), de la Universidad Laica Eloy Alfaro de Manabí, realizó una estancia y colaboró durante un período de tres meses (diciembre a febrero de 2021/2022) con el Departamento de Psicología de la Universidad de Córdoba. Durante esta estancia ha desarrollo actividades de investigación correspondientes a su tesis doctoral "Conexión con la naturaleza y otros factores psicosociales determinantes del comportamiento proambiental" en las facilidades de la Facultad de Educación. La estancia inició el día 2 de diciembre 2021 y finalizó el 1 de marzo 2022.

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Tutor responsable
Esther Cuadrado

Directora del Departamento
Amalia Reina Giménez

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Dedicado a quien se pueda conmover con la belleza de lo natural.

“To the degree that we come to understand other organisms, we will place a greater value on them, and on ourselves.”

Edward Wilson

“Every time we learn one of their names [non-human species], we conserve a habitat for it within our imagination.”

Es Devlin

Contenidos

Índice de figuras

Índice de tablas

RESUMEN

La relación que mantiene el ser humano con la naturaleza es un punto clave dentro de los problemas ambientales que se han presentado a través de la historia, y que han incrementado de forma alarmante en décadas recientes. Dentro de esta relación, nuestros comportamientos definen los impactos que se generan en la naturaleza, de tal forma que un cambio de perspectiva hacia comportamientos proambientales puede ayudar a encaminarnos hacia una existencia sostenible y así mejorar la situación actual del planeta. Así, el análisis del comportamiento proambiental y los factores que lo determinan resulta de gran importancia en el contexto ambiental actual.

La presente tesis tiene como objetivo principal analizar el rol predictor y los procesos de interacción de distintas variables psicosociales determinantes del comportamiento ambiental. Lo anterior, a través de la resolución de cuatro estudios que conforman la tesis. El primer estudio, *The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioural, and cognitive aspects,* desarrolla una nueva escala multidimensional (ABC-CNS) que permite medir los factores afectivo, comportamental y cognitivo de la conexión con la naturaleza. El segundo estudio, *The moderating effect of collective efficacy on the relationship between environmental values and ecological behaviors*, analiza la interacción entre las variables individuales y colectivas dentro del comportamiento ambiental. El tercer estudio, *Factors that determine the connectedness with nature in rural and urban contexts,* analiza las variables que tienen influencia en los niveles de conexión con la naturaleza y sus dimensiones. El cuarto estudio, *The role of implicit theories about climate change malleability in the prediction of pro-environmental* behavioral intentions evalúa a través de un experimento cómo las teorías implícitas y el sentido de responsabilidad acerca del cambio climático interactúan en el comportamiento proambiental.

Los resultados confirman y revelan variables clave que influyen en el comportamiento proambiental, destacando la importancia de la conexión con la naturaleza, el lugar de residencia, valores ambientales, eficacia colectiva, teorías implícitas y sentido de responsabilidad, entre otros factores. De esta forma, la presente tesis contribuye a la comprensión integral del comportamiento proambiental

y las vías para promover este comportamiento en la ciudadanía, proporcionando herramientas para el diagnóstico y diseño de estrategias efectivas para el desarrollo y ejecución de comportamientos proambientales. Además, se destaca la necesidad de abordar la complejidad del comportamiento proambiental desde una perspectiva multidisciplinar para desarrollar soluciones eficaces y sostenibles para los desafíos ambientales actuales y futuros.

ABSTACT

The relationship that human beings maintain with nature is a key point within the environmental problems that have arisen throughout history, and that have increased alarmingly in recent decades. Within this relationship, our behaviors define the impacts generated on nature, in such a way that a change of perspective towards pro-environmental behaviors can help guide us towards a sustainable existence and thus improve the current situation of the planet. Thus, the analysis of pro-environmental behavior and the factors that determine it is of great importance in the current environmental context.

The main objective of this thesis is to analyze the predictive role and the interaction processes of different psychosocial variables that determine environmental behavior. The above, through the resolution of four studies that constitute the thesis. The first study, *The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioral, and cognitive aspects*, develops a new multidimensional scale (ABC-CNS) that allows measuring the affective, behavioral, and cognitive factors of the connectedness with nature. The second study, *The moderating effect of collective efficacy on the relationship between environmental values and ecological behaviors*, analyzes the interaction between individual and collective variables within environmental behavior. The third study, *Factors that determine the connectedness with nature in rural and urban contexts*, analyzes the variables that influence the levels of connectedness with nature and its dimensions. The fourth study, *The role of implicit theories about climate change malleability in the prediction of pro environmental behavioral intentions*, evaluates through an experiment how implicit theories and the sense of responsibility about climate change interact in pro-environmental behavior.

The results confirm and reveal key variables that influence pro-environmental behavior, highlighting the importance of the connectedness with nature, place of residence, environmental values, collective efficacy, implicit theories and sense of responsibility, among other factors. In this way, this thesis contributes to the comprehensive understanding of pro-environmental behavior and the ways to promote this behavior in citizens, providing tools for the diagnosis and design of effective strategies for the development and execution of pro-environmental behaviors.

Furthermore, the need to address the complexity of pro-environmental behavior from a multidisciplinary perspective is highlighted to develop effective and sustainable solutions to current and future environmental challenges.

INTRODUCCIÓN

INTRODUCCIÓN

En la actualidad el planeta está sufriendo una de las crisis medioambientales más importantes de la historia, manifestada a través de problemas ambientales como el cambio climático, el agotamiento y la degradación de recursos naturales, la contaminación y generación de residuos, o la pérdida de biodiversidad, entre otros. Estos problemas tienen como punto en común su origen antropogénico. La relación que mantiene el ser humano con el ambiente es determinante en el bienestar del planeta, donde un cambio hacia comportamientos proambientales puede ayudar en la actual crisis ambiental. El presente trabajo pretende brindar herramientas que ayuden a profundizar en la comprensión de la relación ser humano – ambiente. Para ello es necesario encontrar vías para restablecer y mejorar la conexión con la naturaleza, y por ende un cambio en su comportamiento a través de la construcción de políticas y directrices en distintos niveles de acción o intervención relacionados con el ambiente, específicamente en el campo de la educación ambiental, la conservación de áreas naturales y la gestión de recursos naturales.

En este contexto, parece relevante estudiar los elementos que influyen en el comportamiento proambiental, para así poder esbozar propuestas de intervención orientadas a promover en los individuos y colectivos la adopción de comportamientos proambientales que repercutan positivamente en la preservación del medio ambiente. En consecuencia, la presente tesis doctoral pretende analizar las variables que pueden influir en el comportamiento proambiental, así como las interacciones que establecen entre ellas y con dicho comportamiento. Con el objetivo de lograr una comprensión integral de la problemática, nos proponemos investigar cómo diversas variables, tanto personales (como valores ambientales, teorías implícitas y edad) como relacionadas con la autorregulación (actitudes, responsabilidad percibida, eficacia colectiva) y situacionales (medio rural versus medio urbano), interactúan entre sí, tanto a nivel individual como colectivo. Exploraremos cómo estas variables se combinan para explicar el comportamiento proambiental, analizando posibles roles mediadores y/o moderadores. Además, se presenta una nueva propuesta para medir una variable que se ha visto a lo largo de la investigación en psicología y educación ambiental como determinante en el comportamiento proambiental: el constructo de conexión con la naturaleza, a través del diseño y validación de una escala tridimensional que incluye los factores afectivo, comportamental y cognitivo.

Así, el objetivo principal de esta tesis es evaluar cómo determinadas variables interactúan entre sí para explicar los comportamientos proambientales. Daremos respuesta a este objetivo al hilo de esta Tesis Doctoral, cuya estructura se describe a continuación. El primer capítulo consiste en el marco teórico, cuya función es enmarcar la Tesis, fundamentando los objetivos e hipótesis de los diferentes estudios realizados para dar respuesta a su objetivo general. En el citado marco teórico, definiremos primero el concepto central de la Tesis, a saber, el comportamiento proambiental, destacando asimismo la relevancia que tiene dicho comportamiento para el ser humano y la sociedad en general. Además, analizaremos algunos modelos teóricos que han servido para enmarcar y explicar el comportamiento proambiental a lo largo de la literatura científica. Y finalmente, nos centraremos en la relación que establecen con el comportamiento proambiental las diferentes variables que hemos tomado en consideración en los diferentes estudios realizados en esta Tesis Doctoral.

El segundo capítulo consistirá en una descripción más exhaustiva del objetivo principal de esta Tesis Doctoral, esclareciendo a su vez sus objetivos más específicos y las hipótesis de estudio, poniéndolos en relación con cada uno de los cuatro artículos que la componen.

El tercer capítulo está conformado por los cuatro artículos empíricos que forman el cuerpo central de la Tesis Doctoral. Así, se presenta en primer lugar el artículo denominado *The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioural, and cognitive aspects* (Cuadrado, Macias-Zambrano, Carpio, et al., 2022), publicado en el año 2023 en la revista Environmental Education Research (Factor de impacto JCR 2022: 3.200, cuartil 2 en la categoría Education and Educational Research y cuartil 2 en la categoría Environmental Studies). En dicho artículo se describe el proceso de diseño y validación de la escala ABC de Conexión con la Naturaleza, que permite medir los factores afectivo, comportamental y cognitivo de la conexión con la naturaleza. El siguiente artículo publicado en el año 2022 en la revista Environment Development and Sustainability (Factor de impacto JCR 2022: 4.900, cuartil 2 en la categoría Environmental Sciences), se titula *The moderating effect of collective efficacy on the relationship between environmental values and ecological behaviors* (Cuadrado, Macias-Zambrano, Carpio, et al., 2022). Este artículo analiza como las variables individuales y colectivas interactúan para explicar el comportamiento ambiental,

medido a través de dos comportamientos proambientales individuales: el comportamiento de reciclaje y las conductas de ahorro de energía. A continuación, el tercer artículo *Factors that determine the connectedness with nature in rural and urban contexts* (Macias-Zambrano, Cuadrado, Carpio; bajo revisión), analiza las variables que tienen influencia en los niveles de conexión con la naturaleza y sus dimensiones. El último artículo presentado, denominado *The role of implicit theories about climate change malleability in the prediction of pro-environmental behavioral intentions* (Cuadrado, Macias-Zambrano, Guzman, et al., 2023) y publicado en el año 2023 en la revista Environment Development and Sustainability (Factor de impacto JCR 2022: 4.900, cuartil 2 en la categoría Environmental Sciences), evalúa, mediante una metodología experimental, cómo las teorías implícitas y el sentido de responsabilidad que ostentan los individuos acerca del cambio climático interactúan para explicar el comportamiento ambiental.

El cuarto capítulo consiste en la discusión general, en la que se destacan los principales hallazgos derivados de dichos artículos y de la presente Tesis Doctoral, interpretando los resultados principales y destacando las implicaciones prácticas, además de las conclusiones generales.

CAPÍTULO 1.
MARCO TEÓRICO

CAPÍTULO 1. MARCO TEÓRICO

1. Comportamiento proambiental: Conceptualización y relevancia social

A través de la historia el ser humano, al igual que otras especies, ha aprovechado los recursos que el ambiente provee. Con sus acciones ha podido apropiarse y transformar el ambiente directa o indirectamente para utilizar dichos recursos y satisfacer sus necesidades. De esta forma, el comportamiento humano ha sido clave en los procesos de transformación del planeta. Sin embargo, a diferencia de otras especies, el impacto que ocasiona el ser humano en el planeta ha excedido su capacidad de recuperación (Ellis, 2011). Según Kaida y Kaida (2016) este equilibro entre seres humanos y recursos se ha deteriorado debido a causas muy específicas en las sociedades modernas, como son la sobrepoblación y diversas actividades económicas. Es así como muchas de las catástrofes ambientales sucedidas en los últimos años, tienen su origen en el comportamiento del ser humano (IPCC, 2021; Steg y Vlek, 2009a). Robina-Ramírez et al. (2020) señalan que el comportamiento insostenible del ser humano trae consigo una amplia gama de consecuencias adversas para el planeta. Kaida y Kaida (2016) agregan que el impacto negativo del ser humano es evidente en muchas áreas, como ambiente, biodiversidad e incluso la propia salud humana.

En este punto, la responsabilidad que tiene el ser humano en el bienestar del planeta es innegable (IPCC, 2021). Debemos profundizar más en la relación del ser humano con el ambiente. Conocer sus efectos, medirlos y proponer soluciones a dichos efectos una vez que han sucedido, si bien es relevante, no es suficiente. Debemos también explorar cómo influir en que los individuos y las sociedades adopten comportamientos enfocados a la protección activa del medio ambiente, es decir a comportamientos proambientales, como una medida de prevención. El comportamiento proambiental es una práctica que promueve la protección y conservación de recursos, además del uso sostenible del ambiente; al estar al tanto de los impactos del comportamiento ambiental, los individuos serían más propensos a comportarse de forma proambiental (Chakraborty et al., 2017).

Tal como menciona Poškus (2018), para lograr entornos sostenibles primero debe existir un cambio hacia un comportamiento proambiental en el individuo y a nivel colectivo y social. Este cambio se ha visto impulsado en años recientes por la

creciente preocupación por la calidad del ambiente (Mahardika et al., 2020). Dirigir las acciones del ser humano hacia un comportamiento proambiental es un reto que se debe asumir para tener la oportunidad de ralentizar, detener o incluso invertir el progresivo daño ambiental que los ecosistemas están sufriendo.

El comportamiento ambiental puede ser definido tomando en cuenta el impacto que dicho comportamiento provoca en el ambiente, ya sea modificando la disponibilidad de materiales y energía o alterando la estructura y dinámicas de la biosfera, en otras palabras, aquel comportamiento que provoque cambios en el ambiente (Stern, 2000). Continuando con lo anterior, debido a la inclusión de la protección ambiental en la toma de decisiones, Stern (2000) considera que el comportamiento ambiental también se puede definir como aquel comportamiento llevado a cabo con la intención de cambiar el ambiente, usualmente para beneficio de este. Esta definición difiere de la anterior en que, como su autor indica, resalta la intención como causa del comportamiento, así como la posibilidad de que esta intención pueda fallar y resulte en un impacto ambiental.

En la misma línea que lo anterior, para Hehir et al. (2021) las acciones enmarcadas en el comportamiento ambiental, tanto individuales como grupales, están enfocadas a beneficiar el ambiente, y estas pueden ser identificadas tanto por su impacto como por su intención. En este último punto concuerdan con Coen et al. (2019) destacando que impacto e intenciones no siempre pueden coincidir, ya que las buenas intenciones no siempre se traducen en impactos positivos para la naturaleza. Los comportamientos orientados a intención se enfocan en lo que las personas hacen para beneficiar al ambiente, como por ejemplo comprar alimentos no procesados o reciclar; mientras que los comportamientos orientados a impactos se enfocan en impactos ambientales específicos del comportamiento, como por ejemplo ahorrar energía o recursos (Steg y Vlek, 2009a, 2009b). Steg y Vlek (2009a) consideran que enfocarse en las intenciones difiere de pensar en los impactos, en el caso del comportamiento ambiental orientado a la intención este puede revelar mucho sobre las intenciones, motivos y actitudes de las personas hacia el ambiente, pero poco sobre los impactos ambientales reales de su comportamiento, por ejemplo, si bien una persona puede llevar a cabo un conjunto de comportamientos proambientales como parte de su intención de aportar al ambiente, estos no necesariamente

aportarían más, si nos enfocamos en el impacto real que dichos comportamientos representa en el ambiente.

Partiendo de la definición que brindan Siegel et al. (2018) sobre comportamiento: “una serie de pensamientos, interacciones y acciones que ocurren en un contexto sociocultural”, de forma simple también podemos definir el comportamiento proambiental como toda acción del ser humano enfocada a reducir el impacto sobre el ambiente. Lange y Dewitte (2019) consideran que todo comportamiento humano causa impacto, sin embargo, aquellos que causan impactos positivos al ambiente puede considerarse proambiental. Para Kaida y Kaida (2016) el comportamiento proambiental es el comportamiento responsable en la protección del ambiente en distintos niveles de acción. Steg y Vlek (2009a) lo definen como aquel comportamiento que daña el ambiente lo menos posible, incluso llegando a beneficiar a este.

En su análisis más detenido sobre los impactos, Stern (2000) sugiere que los comportamientos proambientales pueden dar lugar a cambios en el ambiente, ya sea de forma directa o indirecta. En el caso de los cambios directos, estos se producen cuando las acciones ocasionan transformaciones inmediatas en el entorno en el que tienen lugar. En otras palabras, el cambio es fácilmente perceptible y suele estar vinculado a actividades específicas; por ejemplo, si una persona decide plantar árboles en su vecindario el impacto directo sería el aumento de la cantidad de árboles en ese lugar, lo que a su vez podría mejorar la calidad del aire.

Por otro lado, los cambios indirectos tienen lugar cuando estas acciones contribuyen a modelar el contexto en el que se pueden producir cambios directos, estos cambios pueden ocurrir en un nivel más amplio y a menudo están relacionados con sistemas o políticas. Siguiendo con el ejemplo anterior, si un grupo de personas se une para plantar árboles en diferentes partes de la ciudad y, como resultado, la ciudad decide invertir más en la plantación de árboles y la gestión del espacio verde, este sería un impacto indirecto

Parece pertinente destacar que existen distintos nombres con los que se ha definido al comportamiento proambiental a través de la literatura, como por ejemplo: comportamiento ambiental, comportamiento ecológico, acciones ambientales, comportamiento ecológicamente responsable, comportamiento ambientalmente

responsable, comportamiento pro-ecológico, comportamiento amigable con el ambiente, comportamiento verde, comportamiento eco-amigable, comportamiento sostenible, entre otros (Tian y Liu, 2022). Sin embargo, continuando con lo anterior, Tian y Liu (2022) agregan que todos los nombres coinciden en muchos aspectos, como por ejemplo la inclusión de los mismos comportamientos, además que se asume que son afectados por los mismos factores y explicados bajo los mismos modelos de comportamiento. Por lo tanto, en esta tesis dichos términos se asumen como sinónimos.

El comportamiento proambiental abarca desde las acciones más simples hasta las más complejas, como por ejemplo apagar las luces al salir de una habitación, un cambio de dieta hacia alimentos que produzcan menos impacto ambiental, o incluso militar activamente en organizaciones ambientales. Dono et al. (2010), recopilando información de distintos autores, han agrupado las acciones en comportamiento proambiental diario, reciclaje, comportamiento de conservación, uso del transporte, consumo en la vivienda, y uso de energía en la vivienda. Kaida y Kaida (2016) señalan que los niveles de acción del comportamiento proambiental incluyen el monitoreo en el consumo de recursos, participación en la conservación natural, reducción del impacto en el cambio climático, y el apoyo a productos amigables con el ambiente, entre otros.

Para Steg y Vlek (2009a) existe una gran diversidad de comportamientos proambientales, cada uno con un diferente impacto, sin embargo, este autor categoriza estos comportamientos bajo las “5 Rs”: reducir, reparar, reusar, reciclar y rediseñar. Estos comportamientos pueden ser adoptados por las personas si están al tanto del impacto ambiental de su comportamiento (Chakraborty et al., 2017) y en todo caso, consideran que los problemas ambientales tienen consecuencias en aspectos egoístas, social-altruistas o biosféricos importantes para ellos (Faletar et al., 2021). Sin embargo, se debe tomar en cuenta que para que este cambio perdure en el tiempo, las personas deben decidir actuar de forma proambiental porque es lo correcto, debido a una motivación intrínseca (Van der Linden, 2015). Winslott Hiselius (2014) agrega que los cambios en el comportamiento pueden conducir a la adopción de otros comportamientos relacionados, e incluso más ambiciosos; por ejemplo, personas que reciclan son propensas a tener actitudes positivas hacia otros comportamientos proambientales. Steg y Vlek (2009a) agregan que promover un

cambio de comportamiento es más efectivo cuando se selecciona el comportamiento a cambiar para mejorar la calidad ambiental, se examina qué factores causan los comportamientos, se aplican intervenciones específicas para cambiar los comportamientos relevantes y sus antecedentes, y, sistemáticamente se evalúa el efecto de las intervenciones en los comportamientos, los antecedentes, y la calidad del ambiente y la calidad de vida de los seres humanos. Facilitando el desarrollo de estrategias de comportamiento amigable con el ambiente, en efecto, podemos formar patrones de comportamiento proambiental en individuos que no poseen dichos comportamientos (Poškus, 2018).

En lo que respecta a los beneficios resultantes de los comportamientos proambientales, estos son el resultado de los impactos positivos que dichos comportamientos ocasionan en el ambiente. Por lo tanto, como ya se ha mencionado previamente, se puede lograr mejorar la calidad del ambiente y los recursos (agua y aire más limpios, espacios óptimos para recreación), lo que genera beneficios a nivel individual (en la salud física y mental), y a nivel social, al crear las condiciones ambientales adecuadas para el buen desarrollo de las sociedades humanas, ralentizando el deterioro ambiental y sus consecuencias (Poškus, 2018; Steg y Vlek, 2009a, 2009b; Yıldırım et al., 2015). Para Ma et al. (2020), los beneficios percibidos del comportamiento proambiental se pueden agrupar en beneficios espirituales, que abarcan beneficios no materiales como salud física, mental y ambiental, y beneficios materiales como regalos o subsidios provenientes del gobierno, como en el caso de las ayudas para el reciclaje o el uso de las placas solares. Estos beneficios varían según los comportamientos llevados a cabo; en este sentido, optar por desplazarse en bicicleta supondría beneficios a nivel social como la reducción de la contaminación, del uso de combustibles fósiles y de la congestión vehicular, y también beneficios individuales como la mejoría de la salud física (Shang et al., 2021). Por otra parte, también la recreación en exteriores abarca beneficios sociopsicológicos a nivel individual como el fomento de la interacción social y del aprendizaje y la reducción de los niveles de estrés (Kil, 2016).

Añadir el beneficio económico como un aspecto de la adopción de comportamientos proambientales es una contribución valiosa para comprender mejor las motivaciones detrás de estos comportamientos. Sin embargo, según Van der Werff y Steg (2018) hacer énfasis en la obtención de beneficios económicos puede llevar al

individuo a perseguir dichos beneficios al momento de optar por un comportamiento proambiental, alejándole así de una motivación más intrínseca, y suponiendo que dicho comportamiento tenga mucha posibilidad de dejar de llevarse a cabo en cuanto el beneficio económico desaparece. Por otro lado, Cheung y To (2019) señalan que se pueden obtener beneficios psicológicos optando por comportamientos proambientales como la compra de productos amigables con el ambiente, ya que el individuo puede percibir una mejora en su estilo de vida prefiriendo un producto que consuma menos recursos naturales.

Se debe tener en consideración que la percepción de los beneficios de los comportamientos proambientales puede variar significativamente entre individuos (Van der Werff y Steg, 2018). Un factor importante es la percepción del costo y beneficio que se pueda tener al momento de llevar a cabo un comportamiento proambiental. Algunos individuos pueden estar motivados a maximizar su beneficio individual mientras minimizan el costo personal al adoptar comportamientos proambientales, lo que significa que el beneficio percibido debe superar el sacrificio requerido (Kesenheimer y Greitemeyer, 2022). Sin embargo, aquellos individuos que presenten actitudes a favor del medio ambiente pueden enfocarse en los beneficios socioambientales de su comportamiento, y por lo tanto optar por comportamientos proambientales; además, si perciben los beneficios de sus decisiones pueden reforzar las actitudes ambientales que generaron el comportamiento en primer lugar, y también crear responsabilidad moral para repetir el comportamiento (Cheung y To, 2019).

De acuerdo con Van der Werff y Steg (2018), es crucial reconocer que los beneficios percibidos tanto a nivel individual como hacia el ambiente también pueden conducir no solo a la repetición del comportamiento, sino a la adopción de nuevos comportamientos proambientales. Por lo tanto, la importancia del beneficio como tal no solo radica en su aporte al individuo o su ambiente, también en el aporte a la continuidad y desarrollo de estos comportamientos a través del refuerzo de la autoidentidad ambiental. Asimismo, se recalca la importancia de hacer énfasis sobre los beneficios de los comportamientos proambientales a través de la promoción de información de dichos beneficios (Cheung y To, 2019).

2. La explicación del comportamiento proambiental: Modelos teóricos

Para Steg y Vlek (2009a) es importante el estudio de las condiciones bajo las cuales se pueden promover y desarrollar comportamientos proambientales, con el objetivo de desarrollar más y mejores estrategias enfocadas al desarrollo de este comportamiento. La comprensión sobre las variables que influyen en el comportamiento proambiental puede ayudar en el diseño de políticas ambientales, pudiéndose además analizar los factores subyacentes en la efectividad y aceptabilidad de estas políticas, y así poder utilizar estos factores para que la política alcance sus objetivos (Steg et al., 2016). A través del tiempo varios modelos han intentado explicar el comportamiento proambiental, desde modelos tempranos usando variables como personalidad, conocimientos y actitudes, hasta modelos más recientes que incluyen actitudes, motivaciones, valores, capacidades personales y hábitos, además de factores contextuales e influencia social (Marks et al., 2016). Steg y Nordlund (2018) consideran de importancia cinco modelos para explicar el comportamiento ambiental, los cuales asumen que las personas toman decisiones razonadas. Entre ellos se encuentran:

a. La teoría de la acción planificada (TAP; Ajzen, 1991, 2020; Fishbein y Ajzen, 2011), que analiza los pros y contras tanto individuales como sociales y la percepción de control conductual para planificar comportamientos.
b. La teoría de motivación a la protección (TMP; Maddux y Rogers, 1983; Rogers, 1975), que asume que las personas consideran los costos y beneficios individuales y colectivos del comportamiento.
c. El modelo de activación de normas (MAN; Schwartz y Howard, 1981), que se centra en la moralidad.
d. La teoría del ambientalismo valor-creencia-norma (VCN; Stern, 2000; Stern et al., 1999), que también se enfoca en los aspectos morales.
e. La teoría del encuadre de objetivos (Lindenberg y Steg, 2007), que proporciona un marco integrado para comprender los factores que influyen en el comportamiento ambiental.

Klöckner (2013) coincide en tres modelos de relevancia fundamentando su decisión en que estos son los más utilizados en psicología ambiental: la TAP (Ajzen, 1991, 2020; Fishbein y Ajzen, 2011), el MAN (Schwartz y Howard, 1981), y la teoría

VCN (Stern, 2000; Stern et al., 1999). A continuación, se detalla brevemente los cinco principales modelos considerados por Steg y Nordlund (2018).

2.1. Teoría de la acción planificada

La TAP (Ajzen, 1991, 2020; Fishbein y Ajzen, 2011) proporciona un marco útil dentro del cual determinar si los predictores de las intenciones de comportamiento de las personas varían dentro del comportamiento proambiental y sus entornos (Maki y Rothman, 2017). Este modelo no solamente es útil, sino que permite entender por qué a menudo las actitudes que tiene un individuo hacia un determinado comportamiento no predicen eficazmente los comportamientos que tendrá el individuo. Según este modelo, si bien la actitud es un elemento que influye en el comportamiento, no es el elemento decisivo o predictivo directo en la puesta en marcha de un comportamiento, sino que lo es la intención conductual, que es la que en última instancia predecirá la probabilidad de que un individuo desarrolle un comportamiento especifico.

La TAP, propuesta por Ajzen (1991, 2020) y Fishbein y Ajzen (2011) establece que la intención conductual viene influenciada a su vez por diferentes elementos clave. Estos elementos son:

a. La **actitud** positiva o negativa que tiene el individuo hacia dicha conducta (y que viene predeterminada por sus creencias conductuales, es decir por la percepción subjetiva de la probabilidad y de la deseabilidad de este comportamiento específico).
b. **Norma social subjetiva**, es decir la percepción que tiene el individuo acerca de lo que su contexto social inmediato, sus grupos de referencia piensan o hacen en relación con este comportamiento específico, lo cual funciona como una presión social del contexto inmediato, y que viene precedida por sus creencias normativas (es decir las expectativas percibidas de las personas que le son importantes).
c. **Control conductual percibido**, es decir la facilidad o dificultad que percibe el individuo para desarrollar la conducta). En otras palabras, se trata de la creencia del individuo en cuanto a su capacidad para realizar la conducta.

En resumen, la TAP sugiere que la intención de llevar a cabo una conducta específica es un predictor importante del comportamiento final. Cuanto más fuerte la

intención, más probable será que el individuo desarrolle de dicho comportamiento (Steg y Nordlund, 2018), de forma que el comportamiento final procederá de la planificación de llevar o no a cabo la conducta en función del análisis de los pros y contra tanto individuales (actitudes) como impuestos por el grupo de referencia (normas sociales), y de la percepción o creencia de que existen ciertos factores que puedan facilitar o dificultar la puesta en marcha de dicho comportamiento.

De esta forma, el hecho de que las personas lleven a cabo un comportamiento proambiental o no puede depender de los siguientes aspectos: en primer lugar, estas personas deben mantener una actitud positiva hacia el comportamiento; en segundo lugar, deben percibir que otras personas esperan que ellos actúen de esa forma y los apoyen, y finalmente, deben tener la convicción de que cuentan con los recursos y la capacidad necesarios para llevar a cabo sus intenciones proambientales (Klöckner, 2013). Según Maki y Rothman (2017) dentro de este modelo las intenciones son el predictor más fuerte de un comportamiento dado, también asume que las actitudes, las normas y la percepción de control predicen mejor las intenciones cuando se especifican al nivel del tipo de comportamiento, y posiblemente también el entorno exacto en el que se lleva a cabo.

2.2. Teoría de la motivación a la protección

De acuerdo con la TMP, propuesta por Maddux y Rogers (1983) y Rogers (1975), cuando los individuos toman decisiones sobre comportamientos proambientales, consideran sus comportamientos actuales y las predicciones de un nuevo comportamiento ambiental en términos de costo y recompensa (Bijani et al., 2022). Este modelo propone que es más probable que las personas actúen de manera proambiental cuando tanto la evaluación de amenazas (percepción de riesgos y beneficios provenientes de acciones dañinas para el ambiente) como la evaluación de afrontamiento (percepción de que las acciones realizadas reducen la amenaza) son altas (Steg y Nordlund, 2018). Bijani et al. (2022) añade que este modelo considera además las estructuras sociales e individuales en la comprensión del proceso cognitivo de toma de decisiones basado en los procesos de evaluación de amenazas y evaluación de afrontamiento.

Para Bockarjova y Steg (2014) este modelo no solo se enfoca en el costo y los beneficios del comportamiento adaptativo que reduce los riesgos ambientales, sino

que también considera los beneficios de los productos o prácticas actuales que aumentan la probabilidad de un comportamiento inadaptado que a su vez aumenta los riesgos ambientales. Continuando con lo anterior, este modelo tiene el potencial para explicar y comprender por qué las personas se involucran o no en acciones proambientales y cómo motivar y facilitar el comportamiento proambiental, ayudando a identificar barreras y motivaciones para aceptar comportamientos amigables con el medio ambiente (Bijani et al., 2022; Bockarjova y Steg, 2014).

2.3. Modelo de activación de normas

El MAN, propuesto por Schwartz y Howard (1981), postula que el comportamiento viene determinado por la asignación que hacen las personas de un cierto grado de responsabilidad por sus acciones (es decir, la atribución de responsabilidad), así como por la comprensión de que sus acciones pueden tener consecuencias para el bienestar de los demás (es decir, la conciencia de las consecuencias) (Milfont et al., 2010).

Bajo este modelo las normas personales se utilizan para predecir el comportamiento individual, experimentándose activamente como una obligación moral, más no como intenciones (Onwezen et al., 2013). Las normas personales son activadas por cuatro factores: conocimiento del problema (o necesidad), atribución de la responsabilidad, resultado de eficacia y autoeficacia. Continuando con lo anterior, las normas personales son más fuertes cuando las personas están conscientes de los problemas ambientales causados por su comportamiento, y cuando se sienten responsables por estos problemas y no los atribuyen a otros (Steg y Nordlund, 2018). Según Rosenthal y Yu (2022) este modelo explica porque los individuos se involucran en comportamientos altruistas, debido a la ya mencionada obligación moral, sin embargo, pueden negar dicha responsabilidad si creen que la solución está más allá de su autoridad o control.

2.4. El modelo de Valor-Creencia-Norma

El Modelo VCN, desarrollado por Stern (2000) y Stern et al. (1999), se deriva del MAN y sostiene que los valores personales pueden influir en las normas personales (Vanderploeg y Lee, 2019). El modelo VCN forma una cadena causal que contiene cinco variables que contribuyen a la generación de conductas proambientales. Estas variables son: valores, nuevo paradigma ambiental, conciencia

de las consecuencias adversas, atribución de responsabilidad y normas personales proambientales. Cada una de estas variables afecta a la siguiente variable en la cadena o puede influir directamente en otras variables dentro del proceso (Tian y Liu, 2022). A su vez, el modelo se basa en las premisas de que el comportamiento surge de la aceptación de ciertos valores personales. Cuando se percibe que algo importante para esos valores está bajo amenaza debido a problemas ambientales, las acciones personales se ven como una forma de aliviar esa amenaza y restaurar el valor (Vanderploeg y Lee, 2019). Además, este enfoque reconoce que las normas personales pueden influir en todo tipo de comportamientos adoptados con intención proambiental. Esto incluye el activismo ambiental (participación en organizaciones o manifestaciones ambientales), los comportamientos no activistas en la esfera pública (la aceptabilidad de las políticas ambientales), el ambientalismo en la esfera privada (compra, uso y disposición de productos con impacto ambiental) y acciones organizacionales (Steg y Nordlund, 2018).

2.5. Modelo de encuadre de objetivos

El modelo de Encuadre de objetivos propuesto por Lindenberg y Steg (2007), es la forma en que las personas procesan la información y actúan en consecuencia, de forma que cuando las personas cambian sus objetivos, también percibirán la situación de manera diferente (Lindenberg y Steg, 2007). El modelo de Encuadre de objetivos (Lindenberg y Steg, 2007) propone que los individuos encuadran sus objetivos y dirigen su comportamiento dentro de este encuadre. El objetivo principal de este modelo es explorar, explicar o enmarcar en qué están involucrados los individuos, a qué información y actitudes pueden acceder, cómo ven las situaciones desde diferentes perspectivas y qué alternativas consideran (Donmez-Turan y Kiliclar, 2021). En esencia, este modelo pone énfasis en cómo los objetivos de una persona influyen en su percepción y toma de decisiones. Cuando una persona tiene un objetivo particular en mente, tiende a enfocarse en la información y las acciones que están alineadas con ese objetivo específico, lo que puede influir en su comportamiento y elecciones.

De acuerdo con el modelo, un objetivo se vuelve focal e influye mayoritariamente en el procesamiento de información, mientras los otros objetivos

actúan en el fondo, incrementando o disminuyendo la fuerza del objetivo focal. Según Steg y Nordlund (2018), estos objetivos pueden ser:

a. **Objetivos hedónicos:** En este caso, el individuo se centra en sentirse mejor en el momento. Los objetivos hedónicos están relacionados con la búsqueda de placer y la satisfacción inmediata.
b. **Objetivos de ganancia:** Estos objetivos se centran en acumular y mejorar los recursos personales. Aquí, el individuo está motivado por la acumulación de beneficios y recursos propios.
c. **Objetivos normativos:** Cuando los objetivos son normativos, el individuo busca actuar de manera apropiada y acorde a las normas sociales y valores personales. Este tipo de objetivo se relaciona con el comportamiento ético y moral.

Do Canto et al. (2023) mencionan que en el caso de comportamientos proambientales las personas pueden tener distintos objetivos, incluso objetivos que se contrapongan, sin embargo, a través de su interacción estos pueden llegar a dominar una situación en particular.

2.6. El Sistema Cognitivo-Afectivo-Personalidad

Otro modelo que, si bien no se incluye en los modelos considerados de especial relevancia por Steg y Nordlund (2018) ni es un modelo específicamente explicativo del comportamiento proambiental, sí es de relevancia en cuanto a su amplitud y a la posibilidad de aplicarlo al comportamiento proambiental, es el Sistema Cognitivo-Afectivo-Personalidad (Mendoza-Denton et al., 2001; Mischel et al., 2002; Mischel y Shoda, 1995). Dicho modelo es un modelo explicativo del comportamiento en general, y como tal puede ser de aplicabilidad a cualquier comportamiento humano, incluido el comportamiento proambiental. Fundamentándose en la interacción individuo-ambiente, dicho modelo incluye como variables predictivas del comportamiento humano tanto variables personales (sociodemográficas, como el género, y psicológicas disposicionales, como las creencias, conocimientos, variables personales, etc.) como situacionales (lugar de residencia, tipo de estudios, etc.), las cuales interactúan directamente con variables autorreguladoras (como por ejemplo la autoeficacia colectiva), las cuales a su vez inciden directamente en el comportamiento humano.

3. Variables de interés en la predicción del comportamiento proambiental.

Para Reid et al. (2009) una mejor comprensión de las variables que facilitan y deshabilitan el comportamiento proambiental es fundamental para alcanzar los objetivos de política de desarrollo sostenible. Esto implica que cualquier esfuerzo para promover el comportamiento proambiental debe basarse en una comprensión sólida de los factores que influyen en dicho comportamiento. Faletar et al. (2021) añaden que para una promoción eficiente del comportamiento proambiental se debe conocer cuáles son las variables que influyen en dicho comportamiento. Independientemente de su naturaleza o resultado final, todas estas acciones pueden estar originadas y motivadas por distintos factores tanto internos (personales o individuales) como externos (sociales, ambientales). Esto subraya la complejidad del comportamiento proambiental y la necesidad de abordar una variedad de influencias y motivaciones para fomentar un cambio positivo en este ámbito.

La interacción de diversas variables con el comportamiento proambiental es un tema central en la investigación relacionada con la sostenibilidad ambiental. Siguiendo el modelo de Sistema Cognitivo-Afectivo-Personalidad (Mendoza-Denton et al., 2001; Mischel et al., 2002; Mischel y Shoda, 1995), se pueden identificar varias categorías de variables que están relacionadas con el comportamiento proambiental y que interactúan entre sí de manera compleja. A continuación, se destacan algunas de estas variables y su relevancia en relación con el comportamiento proambiental:

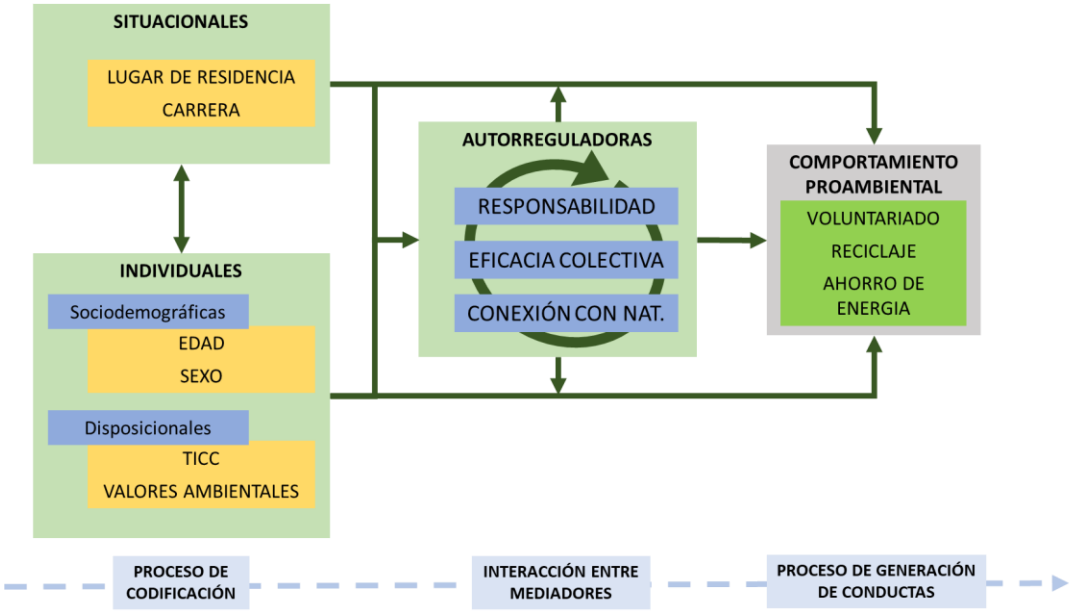
a. **Variables Personales Sociodemográficas:** Estas variables incluyen características como la edad y el sexo. La edad puede influir en la conciencia ambiental y la disposición a participar en comportamientos proambientales. Además, el género también puede desempeñar un papel en la adopción de comportamientos sostenibles, ya que las actitudes y motivaciones pueden variar entre hombres y mujeres.
b. **Variables Psicológicas Personales**: Estas variables se refieren a las creencias, valores y actitudes de una persona. Por ejemplo, las creencias sobre la capacidad de cambiar el clima y los valores ambientales son factores que pueden motivar el comportamiento proambiental. Las teorías implícitas sobre el cambio climático también pueden influir en la disposición de una persona para tomar medidas sostenibles.

c. **Variables Situacionales o Contextuales:** Estas variables incluyen el entorno en el que una persona reside, como áreas urbanas o rurales. El lugar de residencia puede influir en las oportunidades y limitaciones para el comportamiento proambiental. Además, el tipo de estudios cursados también puede tener un impacto, ya que la educación ambiental puede aumentar la conciencia y la comprensión de los problemas ambientales.

d. **Variables Autorreguladoras:** Estas variables están relacionadas con la capacidad de una persona para regular su propio comportamiento en relación con la sostenibilidad ambiental. La conexión con la naturaleza, la percepción de responsabilidad personal en relación con el cambio climático y la eficacia colectiva percibida para actuar proambientalmente son ejemplos de variables autorreguladoras. Estas variables pueden influir en la motivación y la capacidad de una persona para tomar medidas proambientales.

En la figura 1, se ilustran las posibles interacciones entre estas variables, y se refleja la complejidad del comportamiento proambiental y cómo múltiples factores pueden influir en las decisiones y acciones de una persona en relación con la sostenibilidad ambiental. Este enfoque interaccionista reconoce que no existe una única causa para el comportamiento proambiental, sino que es el resultado de una interacción compleja de factores personales, situacionales y autorreguladores.

Figura 1. *Sistema Cognitivo-Afectivo-Personalidad aplicado al comportamiento proambiental incluyendo las variables de estudio y adaptado de Mischel y Shoda (1995).*



Nota. TICC = Teorías implícitas acerca del cambio climático

3.1. Variables situacionales

3.1.1. Lugar de residencia.

El lugar de residencia es un factor relevante que puede influir en la conexión con la naturaleza y el comportamiento proambiental de las personas. Aquí se resumen los principales hallazgos y tendencias relacionadas con el lugar de residencia y su impacto en el comportamiento proambiental:

a. Influencia de las Normas Sociales y la Cultura: El lugar de residencia puede estar vinculado a las normas sociales y la cultura locales. Las comunidades rurales y urbanas pueden tener normas y valores diferentes en relación con la naturaleza y el medio ambiente. Estas normas y valores influyen en las actitudes y el comportamiento proambiental de los residentes. Por lo tanto, el lugar de residencia puede contribuir a la brecha entre las actitudes y el comportamiento proambiental debido a la exposición a diferentes influencias normativas (Mankad y Gardner, 2016).
b. Exposición Diferencial a los Recursos Naturales: El lugar de residencia puede determinar la cantidad y calidad de la exposición personal que las personas tienen a la naturaleza y los recursos naturales. Las personas que viven en áreas rurales a menudo tienen un mayor acceso a entornos naturales y pueden experimentar más interacciones con la naturaleza en comparación con aquellos que viven en áreas urbanas. Esta exposición diferencial puede influir en la percepción de la naturaleza y la disposición a participar en comportamientos proambientales (Neo et al., 2017).
c. Interacciones con la Naturaleza: Las experiencias y las relaciones que las personas mantienen con la naturaleza están relacionadas con su lugar de residencia. Las personas que residen en zonas rurales pueden tener interacciones más frecuentes y significativas con la naturaleza, lo que puede fortalecer su conexión con ella y su disposición a cuidarla. En contraste, en áreas urbanas, estas oportunidades de interacción suelen ser limitadas (Anderson y Krettenauer, 2021).
d. Nivel de Urbanización y Degradación Ambiental: El nivel de urbanización y la degradación ambiental en el lugar de residencia también son factores influyentes. Las áreas urbanas suelen enfrentar desafíos ambientales

específicos, como la contaminación del aire y la falta de áreas verdes, lo que puede influir en las actitudes y el comportamiento proambiental de los residentes (Chen et al., 2011).

En cuanto a las investigaciones previas, se ha observado que las diferencias entre poblaciones rurales y urbanas son inconsistentes en términos de comportamiento proambiental. Algunos estudios han encontrado que las personas en áreas rurales tienden a mostrar un mayor comportamiento proambiental, mientras que otros no han encontrado diferencias significativas o han informado que las personas en áreas urbanas muestran una mayor preocupación por los problemas ambientales, pero pueden ser menos propensas a actuar de acuerdo con esas preocupaciones.

En resumen, el lugar de residencia puede desempeñar un papel importante en la forma en que las personas interactúan con la naturaleza y participan en comportamientos proambientales. Las diferencias en las normas sociales, la exposición a la naturaleza y las experiencias ambientales pueden contribuir a las variaciones en las actitudes y el comportamiento proambiental según el lugar de residencia. Sin embargo, es importante reconocer que las influencias individuales y sociales también desempeñan un papel crucial en la predicción del comportamiento proambiental, y la relación entre el lugar de residencia y el comportamiento proambiental puede variar en diferentes contextos y poblaciones

3.1.2. Carrera

En la presente tesis la variable carrera hace referencia a la profesión estudiada dentro del sistema de educación superior (universidad). Con respecto a la importancia del rol de los estudiantes universitarios, Piyapong (2019) considera que el público en general espera que los estudiantes universitarios hagan contribuciones sustanciales al estado futuro de la sostenibilidad ambiental; esto debido a su grado de educación, conocimientos e información relevante para el medio ambiente. Se considera que la educación formal tiene la capacidad de mejorar el conocimiento ambiental (Wu y Lu, 2013), y este a su vez ayuda a moldear los comportamientos proambientales (Ferreira et al., 2022). Según Janmaimool y Denpaiboon (2016) el desarrollo de comportamientos proambientales está altamente influenciado por el nivel de educación, siendo la educación como tal un importante predictor de estos comportamientos.

Cuanto más alto sea el nivel educativo, más atención las personas tienden a prestar a los problemas ambientales (Wu y Lu, 2013), y a su vez, este nivel está asociado a la adopción de comportamientos proambientales (Ardoin et al., 2016). Continuando con lo anterior, para Wu y Lu (2013), quienes poseen un alto grado académico o entrenamiento universitario en alguna disciplina especifica tienden a un alto grado de preocupación en dicha área específica, siendo la educación sobre problemas ambientales la vía para que las personas sean más conscientes acerca del ambiente, y así lograr comportamientos ambientales que a su vez mejoran la calidad ambiental (Ferreira et al., 2022). Arı y Yılmaz (2017) mencionan que las personas con alto nivel de educación demuestran interés en el reciclaje y otras actividades ecológicas, además de presentar preocupación por su consumo de recursos.

3.2. Variables individuales

3.2.1. Variables sociodemográficas: Sexo y edad

La edad y el sexo son dos variables que han sido estudiadas en relación con el comportamiento proambiental, y ambas parecen influir en la disposición de las personas a participar en acciones que benefician el medio ambiente. Aquí se resumen los puntos clave relacionados con estas dos variables:

Sexo:

a. **Diferencias de Género:** Se han observado diferencias en el comportamiento proambiental entre hombres y mujeres. En general, las mujeres tienden a mostrar un mayor comportamiento proambiental en comparación con los hombres. Sin embargo, estas diferencias pueden variar según la dimensión del comportamiento proambiental (público o privado) y la cultura (Gifford y Nilsson, 2014; Xiao y McCright, 2012).
b. **Socialización de Género:** Estas diferencias de género pueden explicarse en parte a través de la socialización de género. Las expectativas sociales y culturales pueden influir en la formación de comportamientos proambientales. Por ejemplo, las actividades relacionadas con el hogar, como la compra de productos orgánicos o el reciclaje, a menudo se asocian a las mujeres, lo que puede contribuir a las diferencias observadas (Hunter et al., 2004).

Edad:

a. **Correlación Positiva:** En general, existe una correlación positiva entre la edad y el comportamiento proambiental. A medida que las personas envejecen, es más probable que participen en comportamientos proambientales. Esta tendencia se ha observado en diversos estudios y culturas (Saulick et al., 2023; Melo et al., 2018).
b. **Cambios a lo Largo del Ciclo de Vida:** Sin embargo, no siempre se produce una mejora constante con la edad. Algunos estudios han sugerido que los comportamientos proambientales pueden disminuir durante la adolescencia y luego recuperarse en la adultez. Estos cambios pueden estar relacionados con el desarrollo de la personalidad y otros factores propios del ciclo de vida (Anderson y Krettenauer, 2021).
c. **Factores Contextuales:** Además de la edad en sí misma, factores contextuales como la disponibilidad de recursos, la adquisición de información a diferentes edades y la experiencia con problemas ambientales pueden influir en las diferencias observadas en el comportamiento proambiental en diferentes grupos de edad. Por ejemplo, las personas que trabajan en el campo o viven en zonas rurales pueden tener más oportunidades de participar en comportamientos proambientales (Burton, 2014; Gifford y Nilsson, 2014).

En resumen, tanto la edad como el sexo son variables que pueden influir en el comportamiento proambiental, pero su relación con este comportamiento puede variar según el contexto cultural y las dimensiones específicas del comportamiento proambiental que se estudien. La socialización de género y los cambios en el ciclo de vida son factores importantes que pueden explicar las diferencias observadas en estos comportamientos.

3.2.2. Teorías implícitas.

Muchos estudios apoyan la idea de que la inclusión de representaciones sociales es una buena práctica en educación ambiental (Castro, 2006). En particular las representaciones sociales acerca del mundo, como las teorías implícitas (TI) acerca de la realidad. El concepto de teorías implícitas proviene de la teoría social-cognitiva de la motivación (SCTM; Dweck, 2021; Dweck y Leggett, 1988).

Estas TI son explicaciones relativamente estables o creencias que los individuos poseen acerca de la maleabilidad de los atributos personales, tales como la inteligencia (Blackwell et al., 2015) o la capacidad de liderazgo (Lord et al., 2020), o incluso atributos del mundo (por ejemplo, el cambio climático). Las personas pueden tener TI estáticas (pensar que los atributos de una persona o el mundo no pueden cambiar), o TI incremental (pensar que los atributos son modificables). Son llamadas "teorías" debido a que ofrecen un esquema organizado de conocimiento acerca del funcionamiento del mundo físico o social, y son "implícitas" debido a que operan inconscientemente: a pesar de que estén presentes en los individuos, estos usualmente no son capaces de expresarlas verbalmente en un discurso coherente y elaborado, simplemente las aplican (Dweck, 2021; Dweck y Leggett, 1988). Estas TI socialmente internalizadas constituyen un precedente para patrones emocionales, autorreguladores y de comportamiento y como tales tienen interés para el logro de cambios en los comportamientos proambientales.

Las creencias acerca del ambiente están definidas como parte del componente psicológico que explica el comportamiento proambiental (Correa y Rodrigo, 2001). Numerosas investigaciones concluyen que las creencias pueden ser precursores directos del comportamiento ecológico. A pesar de que estas TI son relativamente estables, se ha demostrado que pueden ser influenciadas y por lo tanto se pueden cambiar (Dweck y Grant, 2008).

De acuerdo con la SCTM (Dweck, 2021; Dweck y Leggett, 1988; Dweck y Yeager, 2021), estas dos formas diferentes de ver el mundo, estática o incremental están relacionadas a comportamientos de dominio y éxito (percepción incremental) o, al contrario, comportamientos dirigidos a la evasión y el fracaso (percepción estática). La SCTM (Dweck, 2021; Dweck y Leggett, 1988; Dweck y Yeager, 2021) provee un fuerte marco teórico según el cual los supuestos que los individuos tienen acerca del mundo pueden guiar sus decisiones y finalmente influir en sus comportamientos: TI incrementales y estáticas conducen a diferentes procesos motivacionales y metas, lo cual a su vez conduce a adoptar patrones de comportamiento distintos frente a desafíos. Con TI estáticas los individuos buscan medir y juzgar el mundo inmutable para evaluarlo, conduciendo a estereotipias y sentimientos de impotencia frente a aquellas cosas que no pueden ser modificadas a través de la acción del individuo. Como consecuencia esto conduce a comportamientos inadaptados orientados a la

evasión, ya que los individuos entienden que una posible acción orientada al cambio estará condenada a fallar, y evitarán cualquier juicio negativo sobre su propia capacidad. Por otro lado, con TI incremental se asume que las cosas pueden cambiar, las motivaciones estarán orientadas a entender las dinámicas y desarrollar y mejorar aquello que se pueda, activando emociones de autoeficacia (Tabernero y Wood, 2009), lo cual debería redundar en una mayor adopción de comportamientos de dominio.

Rahnama y Popkowski (2022) consideran que las personas pueden mostrar diferentes teorías acerca de un evento o tarea en particular en diferentes momentos de su vida, y que esta dualidad existe sin importar la educación, habilidades cognitivas, género o etnia, por lo cual todas las personas son una combinación de ambas TI siempre evolucionando con la experiencia. Esta teoría es aplicable al ámbito del comportamiento proambiental. En este sentido, según Schutte y Bhullar (2017) uno podría esperar que las personas que poseen TI incremental relacionado con la sostenibilidad ambiental estén dispuestas a invertir más esfuerzo, y tengan mayor motivación al momento de comportarse de forma proambiental. Teorías implícitas estáticas están relacionadas negativamente a la voluntad de comprometerse con comportamientos proambientales, al contrario, TI incrementales están asociadas de forma positiva a estos comportamientos (Duchi et al., 2020). Las TI también influyen en el comportamiento proambiental al momento de tomar decisiones respecto al consumo de productos ecológicos (Rahnama y Popkowski Leszczyc, 2022). Además, se debe tomar en cuenta que cuando las personas se enfrentan a una incertidumbre ambiental, su comportamiento será mediado como resultado de las TI que posean (Geng et al., 2022).

3.2.3. Valores ambientales.

Es necesario un cambio radical en el paradigma del abordaje de las problemáticas ambientales que involucre a las instituciones y a los individuos, sus comportamientos y valores (Chen, 2015a). Entender los valores que rigen a un individuo o una sociedad es importante para tener un acercamiento práctico hacia la solución de problemáticas ambientales, mediante su priorización (Higde et al., 2017) y cambios en el comportamiento (Mtutu y Thondhlana, 2016). Mtutu y Thondhlana (2016) consideran que los cambios en los valores individuales (formados a lo largo de

la vida) representarían la mayor influencia en el cambio hacia comportamientos proambientales.

Los valores ambientales determinan la forma como nos relacionamos con el ambiente. Schwartz (1994) define los valores como objetivos de transición deseables, de importancia variable, que sirven como principios rectores en la vida de una persona u otra entidad social. Kapeller y Jäger (2020) por su parte los define como principios generales y abstractos por los que se lucha en la vida.

Schultz et al. (2004) definen los valores ambientales como aquellos valores que están específicamente relacionados con la naturaleza, o aquellos en que se ha encontrado correlación con actitudes y preocupaciones ambientales específicas. En el caso de valores ambientales, al ser directrices que rigen nuestra vida, influyen en la forma en que vemos y apreciamos el mundo natural, y la manera en que actuamos dentro de este (Ruepert et al., 2017). Para Higde et al. (2017), los valores ambientales influyen en la forma como percibimos la importancia y el riesgo de las problemáticas ambientales, tanto a nivel individual como social, como por ejemplo el cambio climático. Amérigo et al. (2007) agregan que los valores son motivadores y dinamizadores de las creencias acerca de las consecuencias del deterioro ambiental.

Los valores ambientales se pueden manifestar de distintas maneras; afectan la forma como los individuos evalúan sus opciones de comportamiento según la probabilidad de diferentes consecuencias, además de cómo estas opciones afectan los valores que son más importantes para ellos (Steg et al., 2014). Para varios investigadores, esta variable representa un punto clave en el desarrollo de actitudes y comportamientos ambientales (Evans et al., 2013; Higde et al., 2017; Katz-Gerro et al., 2017; Oliver y Rosen, 2010), preocupación ambiental (Upham, 2009), además de facilitar la adaptación del ser humano en el ambiente (Higde et al., 2017).

Schultz et al. (2004) mencionan que los valores individuales interactúan con percepciones especificas en una situación dada para desarrollar un comportamiento. Para Katz-Gerro et al. (2017) un análisis del efecto de los valores en el comportamiento ambiental capta la base motivacional profunda de tal comportamiento y delinea las condiciones previas para el comportamiento ambiental. Para Oliver et al. (2019) los valores ambientales pueden afectar positivamente la predisposición al reciclaje y las probabilidades de tomar parte de acciones

proambientales. Existe evidencia de la influencia de los valores en las actividades relacionadas con el consumo, como la intención de comprar productos amigables con el ambiente, y la reducción de desechos (Barr y Gilg, 2007). Según Steg y Vlek (2009a) suscribir valores ambientales hace más fácil que los individuos se enrolen en actividades proambientales.

Para Schwartz (1994) los valores son adquiridos tanto a través de la socialización con grupos con valores dominantes, así como experiencias únicas de aprendizaje en los individuos. Los valores ambientales tienen su origen en una compleja interacción de variables, que pueden incluir el contacto con la naturaleza y el conocimiento de esta (Braito et al., 2017; Lankenau, 2018; Schultz, 2002). Sin embargo, los valores no siempre pueden traducirse a comportamientos proambientales (Oliver et al., 2019)

3.3. Variables autorreguladoras

3.3.1. Conexión con la naturaleza.

En la actualidad, el estilo de vida del ser humano hace que cada vez sea más difícil encontrar momentos para entrar en contacto con la naturaleza. Además, el rápido avance de las ciudades sobre ambientes naturales ocasiona que los espacios para esta interacción sean cada vez menos, reduciéndose a naturaleza contenida o áreas construidas que integran elementos naturales, en su mayoría obedeciendo a criterios estéticos o funcionales para la ciudad, pero no para la naturaleza. Este ha sido un problema del ser humano moderno, que ha venido empeorando progresivamente.

Nuestros problemas ambientales actuales están fundamentalmente entrelazados con nuestra relación personal con la naturaleza, la conexión entre las personas y el ambiente natural puede contrarrestar estos problemas (Liefländer et al., 2013). La idea del potencial de la naturaleza para la transformación individual hacia niveles más altos de preocupación ambiental y comportamiento proambiental ha encontrado recientemente cabida en el concepto de conexión ambiental (Beery y Wolf-Watz, 2014). Esta conexión se ha venido estudiando más en detalle en los últimos años (Kroufek y Chytrý, 2015).

Diversos investigadores han tomado el concepto de biofilia como punto de partida para distintos trabajos enfocados en explicar la relación del ser humano con la naturaleza, y poder explicar los distintos aspectos de esta conexión (Lumber et al., 2017). Este concepto nos ayuda a explicar nuestra conexión (o consecuencias de la desconexión) con el mundo natural (Nisbet y Zelenski, 2013). Según la definición de Kellert y Wilson (1995), la biofilia es la afinidad innata de los seres humanos con otros organismos vivos, explicada como un proceso complejo de comportamiento, mediado por reglas de aprendizaje, las cuales han permanecido con el tiempo, pasando de entornos naturales a artificiales, donde aún se manifiestan de forma irregular. Esta afinidad se considera como una clave en el proceso evolutivo del ser humano.

Basado en lo anterior, según Capaldi et al. (2014) para nuestros ancestros el estar conectado con la naturaleza debió ser evolutivamente adaptativo, debido a la necesidad de encontrar los recursos necesarios para sobrevivir y prosperar en el ambiente, así como evitar aquellos peligros que se pudieran presentar. Continuando, estos autores mencionan que aquellos individuos que estuvieran más conectados con la naturaleza tendrían ventaja evolutiva frente a aquellos que no lo estuvieran tanto. Para Lumber et al. (2017) se puede considerar biofilia como el deseo del ser humano de conectarse con la naturaleza. Los aspectos que componen el constructo de biofilia son vías para explicar la conexión que el ser humano tiene con la naturaleza.

Para Schultz (2002) la conexión con la naturaleza describe el nivel según el cual los individuos creen que son parte del mundo natural; en todo caso, incluyen a la naturaleza en la representación cognitiva de su yo. Continuando, esta conexión tiene componentes afectivos, comportamentales y cognitivos. El estudio de la conexión con la naturaleza está enfocado primordialmente a entender cómo las personas se identifican a sí mismos en el ambiente natural, y cómo forman relaciones con la naturaleza (Restall y Conrad, 2015). Para Martyn y Brymer (2016) la conexión con la naturaleza gira en torno al sentimiento de estar inmerso, ser parte de algo más grande, más importante; estar conectado con la naturaleza usualmente se refiere a ser uno con el mundo.

Al involucrar nuestra relación fundamental con el mundo natural, la conexión con la naturaleza es la clave para acciones sostenibles (Martin y Czellar, 2017). Esta conexión provee el fundamento para las actitudes ambientales, la preocupación sobre

problemas del ambiente, y la decisión de comprometerse en comportamientos proambientales (Bruni y Schultz, 2010), independientemente si nos vemos como entes separados de la naturaleza, o cercanamente conectados, esta relación tiene implicaciones en nuestros valores, actitudes y acciones (Lankenau, 2018).

A partir de lo anterior la conexión con la naturaleza trae distintos beneficios tanto para el ser humano como para el ambiente. A nivel individual, el contacto con la naturaleza brinda beneficios para la salud tanto física como psicológica de los individuos, al promover actividades al aire libre, como por ejemplo actividades deportivas, o incluso la reducción de ansiedad o estrés (MacIntyre et al., 2019). La conexión con la naturaleza correlaciona positivamente con el bienestar subjetivo, incluida la satisfacción con la vida (Gould et al., 2018). Se han podido encontrar diferencias significativas a nivel de personalidad, actitudes, comportamiento y bienestar en aquellas personas que se sienten más conectadas con la naturaleza comparado con aquellos que no (Capaldi et al., 2014).

A nivel ambiental, existe evidencia fundamentada que la conexión con la naturaleza puede predecir comportamientos proambientales. Para Perrin y Benassi (2009) la medición de las dimensiones de conexión con la naturaleza puede ser un importante predictor del comportamiento ambiental, además de creencias, actitudes y preocupación ambiental. El contacto con la naturaleza tiene una relación positiva con las intenciones y el comportamiento ecológico, además de que se considera uno de los predictores más fuertes de comportamiento ambiental, superando incluso al conocimiento ambiental (Otto y Pensini, 2017).

Diversas escalas han sido desarrolladas para medir la conexión con la naturaleza (Capaldi et al., 2014; Lankenau, 2018; Navarro et al., 2017; Nisbet y Zelenski, 2013; Sobko et al., 2018). Algunas de estas escalas están orientadas hacia aspectos cognitivos, mientras que otras a aspectos emocionales (Leong et al., 2014; Perrin y Benassi, 2009), pero ninguna se enfoca en el análisis de los componentes afectivo, comportamental y cognitivo conjuntamente.

Algunas escalas incluyen dimensiones como comportamiento y preocupación ambiental (Nisbet y Zelenski, 2013) enfocadas en el concepto del yo y su relación con el ambiente (Navarro et al., 2017) y la sensación de pertinencia al mundo natural (Lee et al., 2015). Sin embargo, el vínculo entre naturaleza y los aspectos cognitivos rara

vez ha sido explorado (Leong et al., 2014), y divergencias entre las dimensiones cognitiva y emocional se han presentado en estudios previos (Sevillano et al., 2017).

Entre las escalas más utilizadas podemos citar las de la Inclusión de la Naturaleza en el Yo (INS; Schultz, 2001), la escala del Amor y Cuidado por la Naturaleza (LCN; Perkins, 2010), la Escala CN (CNS; Mayer y Frantz, 2004), y la Escala de Relación con la Naturaleza (NRS; Nisbet et al., 2009).

La INS consiste en una escala unidimensional que mide la relación percibida entre el yo y la naturaleza, basado en el nivel en que ciertos elementos del ambiente son incluidos en la representación cognitiva del yo individual (Schultz, 2001). La LCN fue diseñada para medir la relación emocional de los individuos con la naturaleza (Perkins, 2010), y ha sido propuesta como una escala complementaria para medidas de orden cognitivo, con tres dimensiones como base de su constructo, sentimientos de amor, sentimientos de asombro y sentimientos de cuidado, todas enfocadas al ambiente natural. La CNS fue diseñada para medir la conexión afectiva de los individuos con la naturaleza, y usualmente se utiliza para probar los efectos de factores situacionales y características de personalidad que puedan influir en la conexión con la naturaleza (Mayer y Frantz, 2004). Finalmente, la NRS (Nisbet et al., 2009) mide la conexión del individuo con el ambiente natural en tres dimensiones, nombradas NR-Yo (la medida en que los individuos se identifican con el mundo natural) NR-Perspectivas (la medida en que las relaciones personales con el mundo natural se manifiestan a través de actitudes y comportamientos) y NR-Experiencias (la medida en que los individuos están físicamente familiarizados y sienten atracción hacia el mundo natural). Sin embargo, como los autores explican, las tres dimensiones incluyen pensamientos, emociones y experiencias de las personas con la naturaleza. La tabla 1 resume los principales aspectos de las escalas previamente mencionadas.

Tabla 1. *Principales escalas utilizadas en la medición del constructo de Conexión con la Naturaleza.*

Escala	Autor	Aplicación	Dimensiones
Inclusión de la Naturaleza en el Yo, INS	Schultz (2001)	Mide la relación percibida entre el yo y la naturaleza.	Unidimensional.
Amor y Cuidado por la Naturaleza, LCN	Perkins (2010)	Diseñada para medir la relación emocional de los individuos con la naturaleza.	Tres dimensiones: sentimientos de amor, sentimientos de asombro y sentimientos de cuidado.
Escala CN, CNS	Mayer y Frantz (2004)	Mide la conexión afectiva de los individuos con la naturaleza.	Unidimensional.
Relación con la Naturaleza, NRS	Nisbet et al. (2009)	Mide la conexión del individuo con el ambiente natural	Tres dimensiones: NR-Yo, NR-Perspectivas, NR-Experiencias.

La medición de la conexión con la naturaleza es complicada (Nisbet et al., 2009). A través del tiempo los investigadores han descubierto limitaciones en las escalas publicadas incluyendo el hallazgo de bajos niveles de correlación con los comportamientos proambientales (Schultz, 2001). Las investigaciones han estado dirigidas más al análisis de aspectos únicos, pero no integrales, lo que podría permitir un mejor entendimiento de la relación con la naturaleza (Perkins, 2010). Por lo anterior, parece relevante el desarrollo de una escala más integral, que incluya las dimensiones afectiva, comportamental y cognitiva (Leong et al., 2014; Sevillano et al., 2017). El nivel en que los individuos se sientan parte del mundo natural incluye no solo emociones, creencias y pensamientos, sino también la tendencia a actuar como parte de la naturaleza.

Así, la presente Tesis Doctoral incluye un artículo cuyo objetivo es el diseño de una escala bajo el modelo ABC de actitudes, que propone los tres componentes: afectivo, comportamental y cognitivo (Jain, 2014; Pratkanis, 2014; Saito, 2009; Spooncer, 1989). En otras palabras, el modelo se enfoca en las interrelaciones entre saber, sentir y hacer (Ho et al., 2019) con respecto a nuestra relación con la naturaleza, y por lo tanto tener una visión más holística e integral sobre el constructo de conexión con la naturaleza.

3.3.2. Eficacia colectiva.

A pesar de que el comportamiento ambiental ha sido estudiado principalmente como un proceso individual de toma de decisiones, perteneciente a las variables personales que lo conducen (Fritsche et al., 2018), los comportamientos personales no solo están afectados por variables individuales (Ferguson y Branscombe, 2010; Jugert et al., 2016).

La psicología social ha demostrado que las condiciones externas (en particular grupos, comunidades o colectivos a los cuales pertenecen los individuos) influyen fuertemente en el comportamiento de las personas (Reicher et al., 2010). Lo que el grupo hace, o incluso lo que uno percibe que el grupo hace, tiene el poder de influenciarnos y cambiar nuestro comportamiento individual. De esta forma, los investigadores deben prestar atención a las variables colectivas que pueden afectar el comportamiento proambiental (Fritsche et al., 2018). La modificación del comportamiento hacia la sostenibilidad no solo requiere atención hacia las variables individuales, sino también a las prácticas colectivas que puedan facilitar (o impedir) el desarrollo de comportamientos proambientales (Bamberg et al., 2015; Peattie y Peattie, 2009; Shove, 2010).

Como explica Bandura (2000, 2010) los individuos son influenciados por las creencias y comportamientos de quienes los rodean, o sea, sus comunidades o grupos. Basado en los conceptos de autoeficacia y eficacia colectiva formulados por Bandura (2006, 2010), la eficacia colectiva para el comportamiento ecológico puede ser entendida como la percepción compartida de las personas acerca de la capacidad de su grupo o colectivo para llevar a cabo comportamientos ecológicos de forma exitosa.

Esta creencia fundamental inevitablemente involucra el comportamiento ecológico de los individuos ya que directamente afecta la motivación y el desempeño (Bandura, 2006, 2010). De acuerdo con Bandura (2006, 2010) aquellos que no creen que son capaces o que su grupo puede comportarse de forma proambiental probablemente no traten de actuar de esta forma o se detendrán tan pronto encuentren alguna dificultad. En este sentido la eficacia colectiva puede predecir el comportamiento proambiental (Chen, 2015b; Jugert et al., 2016; Tabernero y Hernández, 2011), ya que cuanto más los grupos e individuos crean en la capacidad

de la comunidad para comportarse de forma proambiental, ellos se involucrarán más por sí mismos en comportamientos ecológicos.

Como menciona Jugert et al. (2016) cuando los individuos perciben que su grupo tiene la capacidad de comportarse de forma proambiental, ellos ganan sentido de control individual, su autoeficacia incrementa y tienden a actuar en una forma más proambiental. Sin embargo, la eficacia colectiva no solo ha sido percibida como un predictor directo de comportamiento y desempeño, además es considerado un moderador consistente en la relación entre variables personales y comportamiento (Cuadrado y Tabernero, 2015; Tabernero et al., 2015; Tasa et al., 2011). En este sentido, Tabernero et al. (2015) identificaron efectos de interacción entre diferentes variables y la eficacia colectiva en la predicción del comportamiento proambiental.

3.3.3. Responsabilidad percibida hacia el cambio climático

Para Čapienė et al. (2021) la responsabilidad percibida significa el reconocimiento de las consecuencias de las acciones propias sin culpar al resto, pero asumiendo la obligación sobre estas acciones. A lo anterior Patwary et al. (2022) agregan que la responsabilidad ambiental percibida de los individuos se refiere al deber de una persona de proteger el ecosistema y garantizar que sus actividades no tengan un impacto negativo en el ecosistema. Para el caso de la presente tesis, se aborda la responsabilidad percibida sobre aspectos ambientales, de manera específica sobre el cambio climático.

Para Chen y Cheng (2023) la responsabilidad ambiental influye en el desarrollo de una actitud individual más positiva hacia los problemas ambientales, y la creencia en la capacidad de cambiar el estado ambiental. Según Soopramanien et al. (2023) se debe considerar elevar los niveles de responsabilidad ambiental en los individuos para así desarrollar en ellos comportamientos proambientales. Para Liu y Li, (2021) la falta de comportamiento proambiental en ciertas personas puede provenir de no asumir la responsabilidad por determinados problemas ambientales. En este sentido es importante el reconocimiento de las consecuencias del daño ambiental, de tal forma que los individuos se sientan responsables de esas consecuencias, así, las personas que perciben responsabilidad ambiental llevarán a cabo comportamientos ambientales con mayor frecuencia (Wang et al., 2021). Además, la responsabilidad sobre las acciones no solo puede ayudar a desarrollar comportamientos, sino también

a cambiar comportamientos existentes hacia una manera de actuar más prosocial (Soopramanien et al., 2023).

Syme et al. (2002) consideran que incluso si el problema ambiental tiene un alcance global, el individuo puede tomar responsabilidad sobre estos fenómenos y actuar a escala local, como es el caso del cambio climático. La responsabilidad se asigna en base a la evaluación de la propia capacidad para actuar en relación con la capacidad de los demás en el contexto social (Becker et al., 2019), en todo caso, la conciencia en las acciones de los otros puede incrementar el sentido de responsabilidad ambiental (Soopramanien et al., 2023). Cuando se atribuye la responsabilidad al yo, a menudo existe la noción complementaria de otros en la sociedad que son incapaces de asumir tal responsabilidad (Eden, 1993). Por lo tanto, asumir la responsabilidad a una escala mayor que la local dependerá de varios factores como la naturaleza física y social del entorno local del individuo (Syme et al., 2002).

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CAPÍTULO 2. OBJETIVOS E HIPÓTESIS DE ESTUDIO

CAPÍTULO 2. OBJETIVOS E HIPÓTESIS DE ESTUDIO

El comportamiento ambiental juega un rol primordial en la forma en que nos relacionamos con el mundo natural, esto, a través de los impactos que podemos ocasionar. Nuestras acciones definen muchos de los escenarios positivos o negativos que atravesamos en la actualidad, esto incluye los problemas ambientales. A través de un cambio hacia comportamientos más amigables con el ambiente podríamos reducir o incluso evitar muchos daños causados al planeta, sin embargo, para que este cambio suceda debemos conocer los factores que hacen posible dicho comportamiento ambiental.

Tomando en consideración lo anterior, el objetivo principal de la presente tesis doctoral ha sido **analizar el rol predictor y los procesos de interacción de distintas variables psicosociales determinantes del comportamiento ambiental**.

De este objetivo principal se desprenden los siguientes objetivos específicos:

- Diseñar y validar una escala de conexión con la naturaleza que integre los tres factores de las actitudes: cognitivo, afectivo y comportamental, y explorar las relaciones de dicha variable con el comportamiento proambiental (artículo 1).
- Explorar los procesos de interacción de variables individuales y colectivas en la explicación del comportamiento proambiental (artículo 2).
- Analizar la influencia y las interacciones entre los factores que determinan la conexión con la naturaleza y los comportamientos proambientales (artículo 3).
- Analizar los procesos de interacción entre las teorías implícitas sobre el cambio climático y la responsabilidad percibida hacia dicho cambio climático en la predicción de la intención de comportamiento proambiental (artículo 4).

Para poder cumplir con cada objetivo se han diseñado cuatro artículos de investigación que conforman la presente tesis doctoral y de los que se hace un breve recorrido de sus correspondientes hipótesis a continuación.

1. Objetivos de estudio e hipótesis del artículo 1.

El primer artículo que compone la presente tesis doctoral se titula *"The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioural, and cognitive aspects"* y su objetivo principal es: **desarrollar y validad una escala confiable para el constructo de conexión con**

la naturaleza en individuos adultos, que se enfoque en los tres componentes de las actitudes (afectivo, comportamental y cognitivo), la escala ABC Conexión con la Naturaleza (ABC-CNS).

La propuesta para una nueva escala de conexión con la naturaleza nace de la necesidad de crear una escala que pueda integrar los tres aspectos de las actitudes, y, dentro de estos tres aspectos, incluir el comportamiento ambiental. La conexión con la naturaleza es un factor clave en el desarrollo de comportamientos proambientales, por este motivo se considera importante que este comportamiento integre el constructo, y que junto con los factores cognitivo y afectivo ayuden a un estudio más profundo de la conexión con la naturaleza.

A través del tiempo el constructo de conexión con la naturaleza se ha abordado con distintos enfoques, aunque todos ellos haciendo referencia a la relación existente entre el ser humano y la naturaleza (Bruni et al., 2017; Navarro, Olivos, Fleury-Bahi 2017). Esta diversidad trajo consigo el desarrollo de diferentes escalas para medir el constructo (Capaldi, Dopko, y Zelenski 2014; Lankenau 2018; Navarro, Olivos, y Fleury-Bahi 2017; Nisbet, Zelenski, y Murphy 2009; Nisbet y Zelenski 2013; Sobko, Jia, y Brown 2018), sin embargo, a pesar de que estas aborden aspectos afectivos, comportamentales o cognitivos, no suelen hacerlo en conjunto o de forma integral. Además, en muchas ocasiones el aspecto comportamental es relegado en pro de un enfoque afectivo (Perrin y Benassi, 2009). En el presente estudio se considera al constructo de la conexión con la naturaleza como una actitud (Jain 2014; Pratkanis 2014; Schultz 2002; Spooncer 1989). En consonancia con lo anterior, se ha definido desde las tres dimensiones que componen las actitudes, entendiéndose en este sentido la conexión con la naturaleza como el grado en que un individuo se siente emocionalmente conectado con la naturaleza (afectivo); tiende a actuar como parte del mundo natural (comportamental); y cree que es parte del mundo natural (cognitivo). A partir de esto, se origina la primera hipótesis:

Hipótesis 1. La escala ABC-CNS mostrará una estructura tridimensional, de forma que integrará un factor afectivo, otro comportamental y otro cognitivo.

El constructo de conexión con la naturaleza también se ha relacionado con actitudes y valores ambientales. La forma en la que las personas se ven a sí mismas en su relación con el ambiente se considera un factor importante para el desarrollo de

actitudes ambientales. Se considera que algunos de los valores ambientales, como el de apreciación de la naturaleza, son cercanos al constructo de conexión con la naturaleza por definición, además, valores como el de preservación de la naturaleza, también son atribuidos a una fuerte conexión con la naturaleza. A partir de lo anterior se plantea la segunda hipótesis:

Hipótesis 2. Las dimensiones afectiva, comportamental y cognitiva de la escala ABC-CNS correlacionan de forma positiva con (a) la escala NEP (actitudes ambientales) y (b) valores ambientales de preservación y apreciación de la naturaleza.

Además, como se mencionó previamente esta investigación incluye como variable a analizar el comportamiento ambiental, se considera que el constructo de conexión con la naturaleza correlaciona e influye en los comportamientos ambientales (Anderson y Krettenauer 2021; Geng et al. 2015; Mackay y Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, y Abrahamse 2020). Según la teoría, las personas que se sientan más conectadas con el ambiente podrán demostrar comportamientos ambientales (Mackay y Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, y Abrahamse 2020). Por otro lado, si esta conexión es baja, el comportamiento proambiental pudiera no presentarse (Yang et al. 2018). Incluir esta variable también surge como iniciativa para poder saldar la brecha que puede suceder entre actitudes y comportamientos ambientales (Dunlap et al. 2000; Thomas y Sharp 2013) y la baja correlación reportada previamente entre conexión con la naturaleza y comportamientos ambientales (Schultz 2001). La hipótesis 3 se plantea de la siguiente forma:

Hipótesis 3. los tres factores de la escala ABC-CNS, en especial la dimensión comportamental, correlacionaran positivamente con el comportamiento proambiental individual, pero no con el comportamiento proambiental percibido en otros.

2. Objetivos de estudio e hipótesis del artículo 2.

El segundo artículo que forma parte de la tesis se titula *“The moderating effect of collective efficacy on the relationship between environmental values and ecological behaviors”*. Su objetivo principal es: **analizar como las variables individuales y colectivas interactúan para explicar el comportamiento proambiental**.

Dentro del estudio del comportamiento ambiental las variables individuales son frecuentemente utilizadas para explicar este comportamiento. Sin embargo, es necesario prestar atención al contexto en el que se desarrollan estos comportamientos, la conformación socio ambiental de este contexto. Continuando en línea con el artículo anterior, el presente articulo busca explicar el comportamiento ambiental tomando como punto de partida los valores ambientales del individuo, y como estos valores interactúan bajo variables colectivas que son parte de su entorno social. Para esto el artículo se dividió en dos estudios tomando en cuenta los contextos y facilidades para el desarrollo de comportamientos ambientales de las muestras (estudio 1, muestra España; estudio 2, muestra Ecuador).

Los valores ambientales son principios individuales que rigen nuestra percepción y decisiones acerca del uso o preservación de recursos naturales (Dutcher et al., 2007; Schultz et al., 2004; Tadaki et al., 2017). En este articulo estableciéndonos centramos en el estudio de tres valores enfocados al uso de recursos que Bogner (2018) denominan utilización, conservación y apreciación. El valor denominado conservación hace referencia una perspectiva biocéntrica del cuidado y protección del ambiente, mientras que la utilización se refiere a una perspectiva antropocéntrica de uso y consumo de los recursos naturales (Bogner y Wiseman, 2006). Previamente se han reportado correlaciones positivas entre comportamientos proambientales y los valores de apreciación y conservación. Sin embargo, en el caso del valor de utilización se reportan correlaciones negativas, aunque estos resultados no han sido constantes (Boeve-de Pauw y Van Petegem, 2013; Kaiser et al., 2014; Kibbe et al., 2014; Roczen et al., 2014). De acuerdo con lo anterior se establece la siguiente hipótesis:

Hipótesis 1. Individuos con altos niveles en valores de (a) preservación y (b) apreciación se comportarán de forma más proambiental. (estudio 1 y 2)

Sin embargo, además de las variables individuales se requieren variables colectivas para poder explicar el comportamiento proambiental. De esta forma se considera que los individuos están influenciados por las ideas y creencias del grupo o comunidad al cual pertenecen (Bandura, 2006). El individuo debe percibir que el grupo es capaz de llevar con éxito comportamientos proambientales, para así poder ser capaz de replicar dichas acciones en su entorno, esto también es conocido como Eficacia Colectiva para el Comportamiento Ecológico (Bandura, 2006, 2010). La

eficacia colectiva ha sido reportada no solo como un predictor directo del comportamiento proambiental, sino también como un moderador entre este comportamiento y variables individuales (Cuadrado y Tabernero, 2015; Tabernero et al., 2015; Tasa et al., 2011). Esto nos lleva a la segunda hipótesis:

Hipótesis 2. cuando existen altos valores de eficacia colectiva para el comportamiento ecológico, los individuos con altos niveles de (a) preservación y (b) apreciación se comportarán de forma más proambiental (estudio 1 y 2).

El lugar de residencia es otra variable que influye en el comportamiento proambiental, sin embargo, los resultados pueden diferir según los estudios. Se considera que aquellas personas que mantienen mayor contacto con la naturaleza, como en el caso de zonas rurales, pueden reportar mayor nivel de comportamiento proambiental (Berenguer et al., 2005; Gifford y Nilsson, 2014). Por otro lado, también se ha reportado niveles altos de comportamiento proambiental en personas que viven en ciudades (Gifford y Nilsson, 2014; Tabernero et al., 2015). Basado en lo anterior se establece la tercera hipótesis:

Hipótesis 3. El lugar de residencia predecirá el comportamiento ambiental, este será mayor entre las personas en zonas urbanas que las personas en zonas rurales (estudio 2)

Hipótesis 4. Las interacciones en la hipótesis 2 permanecerán en presencia del lugar de residencia como covariable. Significa que el rol moderador de la eficacia colectiva en la relación establecida entre (a) conservación y comportamiento proambiental y (b) apreciación y comportamiento proambiental permanecerán en presencia del lugar de residencia como covariable (estudio 2).

3. Objetivos de estudio e hipótesis del artículo 3.

El tercer articulo (en fase de revisión) que forma parte de la tesis se titula "*Factors that determine the connectedness with nature in rural and urban contexts*". Su objetivo principal es: **analizar la influencia y las interacciones entre los factores que determinan la conexión con la naturaleza y los comportamientos proambientales.**

Ese tercer articulo continua con la idea previa de la influencia del lugar de residencia en los comportamientos y actitudes ambientales, en este caso esta

influencia se analiza desde el constructo de conexión con la naturaleza, ABC-CNS, y las dimensiones que lo componen, incluido el comportamiento proambiental. En este punto se puede asegurar que la conexión con la naturaleza se encuentra influenciada por distintas variables, las cuales se pueden identificar como variables tanto externas como internas al individuo, y determinan esta conexión en mayor o menor medida, en uno u otro sentido. En este artículo se analizan dichas variables en dos muestras, una de España y otra de Ecuador. Los contextos individuales, sociales y ambientales de cada una de estas regiones pueden ayudar a comprender mejor la interacción de estas variables y su impacto en los niveles de conexión ambiental.

Previamente la conexión con la naturaleza se ha definido como un factor clave para el desarrollo de actitudes y comportamientos proambientales, y por ende para la conservación del ambiente (Hughes et al., 2018; Tang et al., 2014). También se ha vinculado con el contacto y exposición a ambientes naturales (Baceviciene y Jankauskiene, 2022). Entre las variables que se han relacionado con la conexión con la naturaleza se encuentra el género y la edad (Mustapa et al., 2021), la educación (Lankenau, 2018), o el lugar de residencia (Anderson y Krettenauer, 2021). Con respecto al lugar de residencia este puede influir debido a la facilidad para el desarrollo de actividades en exteriores que tienen los habitantes rurales (Garza-Terán et al., 2022), sin embargo, no hay un claro consenso de la forma en que los contextos urbano y rural influyen en el desarrollo de la conexión con la naturaleza. Por lo anterior se plantea la siguiente hipótesis:

Hipótesis 1. El lugar de residencia del individuo influye en los niveles de conexión con la naturaleza. Las personas que mantienen mayor contacto con la naturaleza, como en el caso de zonas rurales, pueden reportar mayor nivel de comportamiento proambiental (Berenguer et al., 2005; Gifford y Nilsson, 2014).

Hipótesis 2. Las personas con un nivel de conocimiento sobre la naturaleza mayor presentaran un mayor nivel de conexión con la naturaleza.

Hipótesis 3. Las personas de mayor edad y de género femenino presentaran mayores niveles de conexión con la naturaleza.

4. Objetivos de estudio e hipótesis del artículo 4.

El último artículo que conforma esta tesis se titula *"The role of implicit theories about climate change malleability in the prediction of pro-environmental behavioral intentions"* y tiene como objetivo principal: **analizar como las teorías implícitas acerca del cambio climático (TICC) y el sentido de responsabilidad sobre el cambio climático interactúan para explicar las intenciones de comportamiento proambiental.**

Continuando con el análisis de las variables que influyen el comportamiento ambiental, el presente articulo analiza la interacción establecida entre la percepción de responsabilidad frente al cambio climático y las TICC para explicar el comportamiento proambiental. En este caso se diseñó un experimento en el que se manipularon las teorías implícitas individuales de los individuos acerca del cambio climático, para así analizar su influencia en la predisposición para llevar a cabo actividades proambientales. Este experimento se materializó en un pre-test y post-test con dos grupos experimentales. A un grupo se le presentó información sobre la posibilidad de reversibilidad del cambio climático y a otro sobre la irreversibilidad de este.

Como se mencionó anteriormente el experimento se basa en teorías implícitas (TI) son explicaciones relativamente estables o creencias que los individuos tienen sobre la maleabilidad de atributos personales o atributos del mundo (Dweck y Leggett, 1988; Dweck, Carol y Yeager, 2021). Estas TI pueden ser incrementales o estáticas En el caso de las incrementales, los individuos consideran que estos atributos pueden cambiar. Al contrario, en el caso de las estáticas, los individuos consideran que estos atributos no pueden cambiar. Según lo anterior estas TI pueden influenciar los comportamientos de los individuos, incluyendo los comportamientos ambientales (Correa y Rodrigo, 2001; Duchi et al., 2020; Soliman y Wilson, 2017). En base a lo anterior se establece la siguiente hipótesis:

Hipótesis 1. ITCC Las personas con ITCC incrementales mayor intención de comportamiento proambiental que aquellas con ITCC estáticas.

Otra variable que se tomó en cuenta en este artículo fue el sentido de responsabilidad. El sentido de responsabilidad hace que las personas crean que está en ellos mejorar una determinada situación, en lugar de derivar las acciones a otros

(Bateman y O'Connor, 2016; Gifford et al., 2011). El sentido de responsabilidad ha demostrado claramente ser una variable que influye en el comportamiento ambiental, al punto que la ausencia de esta variable ha sido asociada a la inacción proambiental (Bateman y O'Connor, 2016). Sin embargo, se podría pensar que las TICC pueden llegar a moderar el efecto del sentido de responsabilidad en la intención de comportamiento proambiental, pues por mucho que un individuo se sienta responsable del cambio climático, si percibe que nada puede hacerse ha por cambiar dicha situación al ostentar TICC estáticas, probablemente esto le llevará a no tener la intención de comportarse de manera proambiental Por tal motivo se plantea la siguiente hipótesis:

Hipótesis 2. Las ITCC actúan moderando la relación entre el sentido de responsabilidad sobre el cambio climático y las intenciones de comportamiento proambiental, de forma que, si bien percibir mayor responsabilidad por el cambio climático conduce a tener mayor intención de comportamiento proambiental, el ostentar TICC estáticas reduce la influencia positiva de la responsabilidad en dichas intenciones.

5. Referencias

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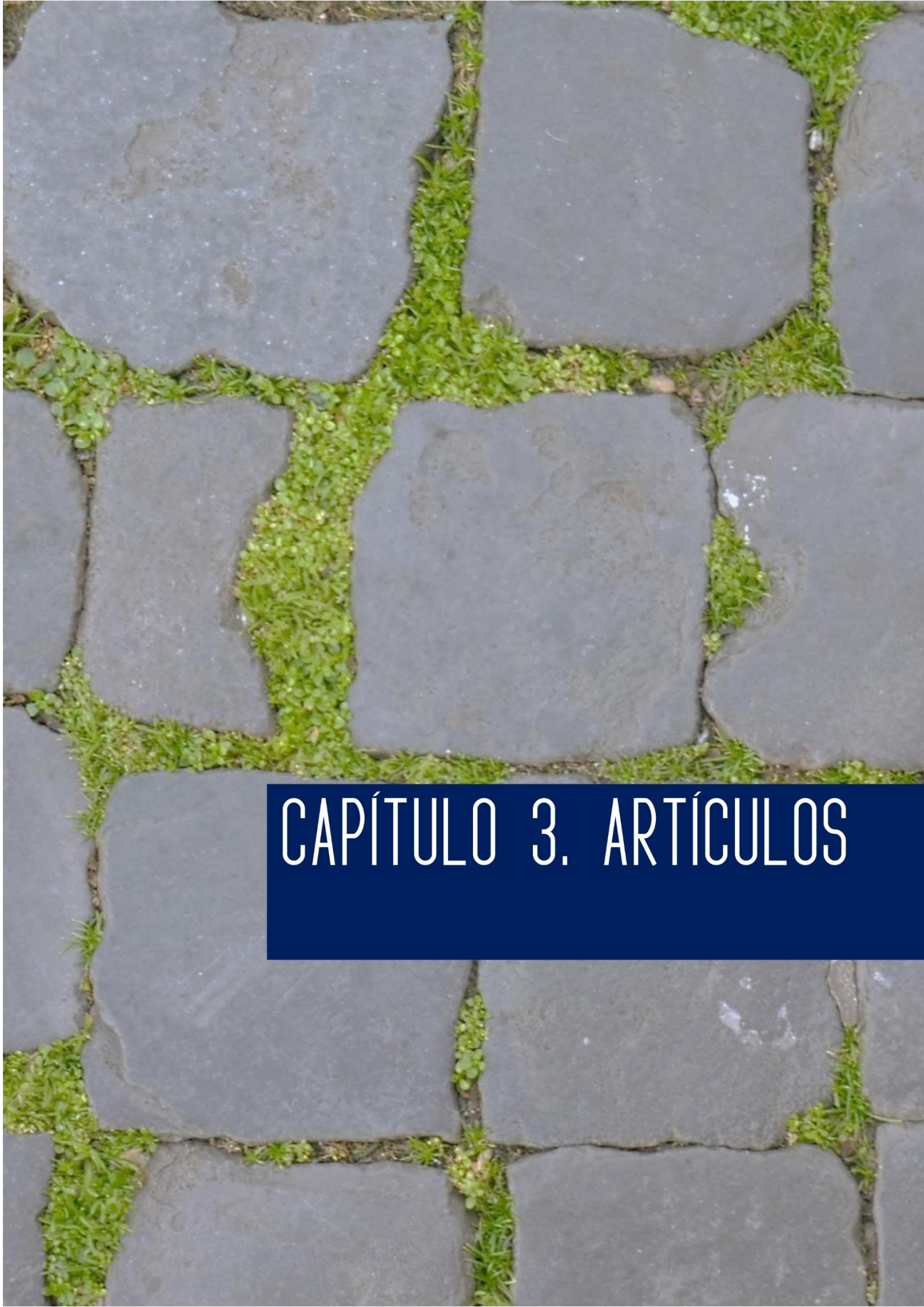

CAPÍTULO 3. ARTÍCULOS

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I. The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioural, and cognitive aspects.

Cuadrado, E., Macias-Zambrano, L., J. Carpio, A., & Tabernero, C. (2023). The ABC connectedness to nature scale: development and validation of a scale with an approach to affective, behavioural, and cognitive aspects. *Environmental Education Research, 29*(2), 308-329. https://doi.org/10.1080/13504622.2022.2111407

Abstract

Connectedness to nature influences the well-being and health of individuals, communities, and the planet. Although many validated scales exist, none includes the three fundamental aspects of any attitude: the affective, behavioural, and cognitive components. The study's main objective was to develop and validate an integral tool, the ABC Connectedness to Nature Scale (ABC-CNS), which would enable the measurement of the affective, behavioural, and cognitive aspects of this construct. The questionnaire was administered to 1,375 students (878 Ecuadorian and 497 Spanish). Exploratory factor analysis retained the three expected factors. Confirmatory factor analyses confirmed a robust adjustment for the tridimensional structure, but cross-cultural invariance was not attained: Although the ABC.CNS is valid for both Ecuador and Spain, the scores cannot be compared in both cultural contexts analysed. The pattern of relations with other psychological variables (proenvironmental values, appreciation and preservation of nature, and individual and classmates' proenvironmental behaviours) provided evidence of the structure and construct validity. The ABC-CNS scale is an integral, reliable, and short tool to measure connectedness to nature through the proposed dimensions. The tool is suitable for environmental professionals and researchers to assess individuals' connectedness to nature, a psychological variable that may affect a person's mental health and proenvironmental behaviour.

Keywords: Connectedness to nature; proenvironmental attitudes; proenvironmental behaviour; scale construction; scale validation

1. Introduction

Connectedness to nature (CN) seems to be of great relevance for individuals and society in general because it has been related to health (Capaldi, Dopko, and Zelenski 2014; Martin et al. 2020; Pritchard et al. 2019; Sobko and Brown 2021) and proenvironmental behaviour (Mackay and Schmitt 2019; Martin et al. 2020; Sobko and Brown 2021; Whitburn, Linklater, and Abrahamse 2020). In this sense, some of the scales used to measure this construct are oriented to the cognitive aspect of connectedness, whereas others are oriented to the emotional aspect (Leong, Fischer, and McClure 2014; Perrin and Benassi 2009), but none focuses on the analysis of affective, behavioural, and cognitive aspects together. Nonetheless, attitude has been defined as a cluster of beliefs, and behavioural tendencies (Baron and Byrne 1987). On this basis, many models have construed their conception of attitudes in this tripartite cluster, such as the ABC Model of Attitudes (Pratkanis 2014), the Tripartite (Spooncer 1989), and the 3D Model (Jain 2014). Thus, the main aim of this study was to develop and validate a reliable CN scale for adults that focuses on the three components of attitudes (the affective, behavioural, and cognitive aspects): the ABC Connectedness to Nature Scale (ABC-CNS).

1.1. Definition and relevance of connectedness to nature

The perceived proximity in the relationship between an individual and nature (Bruni et al. 2017; Navarro, Olivos, and Fleury-Bahi 2017), called *CN*, has been defined with different focuses. For example, Schultz (2002, 67) emphasized a more cognitive aspect in its conception by defining it as “the extent to which an individual includes nature within his/her cognitive representation of self”, and Mayer and Frantz (2004) pointed to both affective and more behavioural aspects by conceiving CN as an individual’s affective and experiential connection to nature.

Because we consider CN to be an attitude as well as the content of one’s relationship and closeness with nature, the construct will present three different dimensions: the affective, behavioural, and cognitive dimensions (Jain 2014; Pratkanis 2014; Schultz 2002; Spooncer 1989). Congruently with the consideration of CN as an attitude, we define CN as the extent to which individuals feel affectively connected with nature (affective component), tend to act as part of the natural world (behavioural component), and believe they are part of the natural world (cognitive component). In

this sense, although Sobko, Jia, and Brown (2018) particularly focused on the affective and cognitive dimensions of CN, the addressed the importance of the affective, behavioural, and cognitive aspects as part of CN. Nevertheless, to our knowledge, no CN scales are specifically oriented to measure the three principal components of attitudes related to CN: affect, behaviours, and cognitions.

Studying the CN concept is of relevance for society, the environment, and individuals. In our era, environmental concerns are highly relevant and prominent due to the environmental crisis to which the planet has been subjected (Dornhoff et al. 2019). In this scenario, to believe, feel, and act positively as part of the natural world and to be highly cognitively, emotionally, and behaviourally connected with nature may be crucial. CN is important for sustainability because it involves our fundamental relationship with the natural world (Lankenau 2018), and it is essential for better coexistence between humans and the biological and nonbiological environment (Pyle 2003). The deeper our connection with nature is, the better our relationship with it (Capaldi, Dopko, and Zelenski 2014; Lee et al. 2015; Sellmann and Bogner 2013) and the higher the level of our environmental concern will be (Navarro, Olivos, and Fleury-Bahi 2017). This can positively contribute to conservation of the environment and addressing sustainability challenges (Ives et al. 2017; Pyle 2003) through the development of proenvironmental attitudes and behaviour (Ives et al. 2018; Sellmann and Bogner 2013).

Moreover, at the individual level, increased contact with elements of the natural environment brings both physical and mental health benefits (Capaldi, Dopko, and Zelenski 2014; Pritchard et al. 2019; Sobko et al. 2020; Sobko and Brown 2021). The greater the degree to which individuals feel connected to nature, the greater their perceived well-being will be (Capaldi, Dopko, and Zelenski 2014; Pritchard et al. 2019; Richardson and McEwan 2018; Sobko and Brown 2021). Contrarily, disconnection from nature can lead to the development of behaviours and attitudes that ultimately damage our physical and mental health and cause irreparable harm to the planet (Pritchard et al. 2019). Thus, a connection with nature seems to have benefits that are both individual and collective.

1.2. Measurement of the connectedness to nature construct

The need to measure and evaluate the CN construct arises from the relevance of the construct for individuals and the planet. Several scales have been developed to measure CN (Capaldi, Dopko, and Zelenski 2014; Lankenau 2018; Navarro, Olivos, and Fleury-Bahi 2017; Nisbet, Zelenski, and Murphy 2009; Nisbet and Zelenski 2013; Sobko, Jia, and Brown 2018) based on both implicit and explicit measurements (Bruni et al. 2017). In some scales, the included dimensions are environmental behaviour and concern (Nisbet and Zelenski 2013) focused on the concept of the self and its relationship with the environment (Navarro, Olivos, and Fleury-Bahi 2017) and the feeling of belonging to the natural world (Lee et al. 2015). However, the link between nature and cognitive aspects has rarely been explored (Leong, Fischer, and McClure 2014), and divergences in the cognitive and emotional aspects have been presented in the past (Sevillano, Corraliza, and Lorenzo 2017).

Among the most used scales, we van cite the Inclusion of Nature in Self (INS; Schultz 2001), the Love and Care for Nature (LCN; Perkins 2010), the CN Scale (CNS; Mayer and Frantz 2004), and the Nature Relatedness Scale (NRS; Nisbet, Zelenski, and Murphy 2009). The INS scale, which consists of a unidimensional scale to measure the perceived relationship between the self and nature, is based on the level at which certain elements of the environment are included in the cognitive representation of an individual's self (Schultz 2001). The LCN scale was designed to measure the emotional relationship that individuals have with nature (Perkins 2010), and it has been proposed as a complementary scale for measures of cognitive order, with three dimensions as a basis for its construct–feelings of love, feelings of awe, and feeling of care–all focused on the natural environment.

The CNS was designed to measure individuals' affective connection with nature, and it is usually used to test the effects of situational factors and personality characteristics that can influence CN (Mayer and Frantz 2004). However, Perrin and Benassi (2009) content analysis of the items of the CNS (2009) led them to argue that the scale measure cognitive beliefs about CN instead of the emotional connection. Finally, the NRS (Nisbet, Zelenski, and Murphy 2009) measures individuals levels of connection with the natural environment with three dimensions: NR-Self (the extent to which individuals identify with the natural world), NR-Perspectives (the extent to which

one's personal relationship with the natural world manifests through attitude and behaviour), and NR-Experiences (the extent to which individuals are physically familiarized with and feel attraction to the natural world). However, as the authors explained, all three dimensions include the thoughts, feelings, and experiences people have of nature, with some overlap between factors and requiring further investigation into the factor structure.

Measuring CN is complicated (Nisbet, Zelenski, and Murphy 2009). Over time, researchers have discovered limitations in published scales, including criticism of the low correlation with proenvironmental behaviours (Schultz 2001). Studies have been oriented more towards the analysis of unique, but not integral, aspects, which can allow a more complete understanding of the relationship with nature (Perkins, 2010). Therefore, the development of a more integral scale for CN, including the affective, behavioural, and cognitive dimensions (Leong, Fischer, and McClure 2014; Sevillano, Corraliza, and Lorenzo 2017), is needed. As Perrin and Benassi (2009) showed, although the cognitive dimension cannot be left aside and must be included, many times the unique dimension evaluated is the emotional one. Moreover, the behavioural dimension is usually unexplored and must be included. The extent to which individuals feel they are part of the natural world includes not only their beliefs, thoughts, and emotions but also their tendency to act as a part of the natural world. The scale designed for the present study was based on the ABC model of attitudes, which proposes three components: affective, behavioural, and cognitive (Jain 2014; Pratkani 2014; Spooncer 1989). In other words, the model focuses on interrelationships between knowing, feeling, and doing (Ho et al. 2019) concerning our relatedness with the natural environment. Therefore, to have a more complete scope of the CN construct, the objective of this work was to develop and validate a CN scale that includes the affective, behavioural, and cognitive aspects.

Hypothesis 1: The ABC-CNS will show a 3D structure, with affective, behavioural, and cognitive factors emerging.

1.3. Connectedness to nature-related variables

1.3.1. Proenvironmental attitudes and values

The connection with nature is considered important for sustainability (Sobko, Jia, and Brown 2018). The way people perceived themselves in nature is important for the development of proenvironmental attitudes (Lankenau 2018). In fact, the close relationship between proenvironmental attitudes and CN has been largely demonstrated, although it has also been demonstrated that they are different constructs (Mayer and Frantz 2004; Nisbet, Zelenski, and Murphy 2009; Nisbet and Zelenski 2013). It has even been suggested that CN is an important construct to shape and adopt proenvironmental attitudes (Lee et al. 2015).

One of the most widely used scales to measure proenvironmental attitudes is the New Environmental Paradigm (NEP; (Gkargkavouzi, Halkos, and Matsiori 2019), related to a wide range of proenvironmental attitudes, which correlates positively with CN (Gkargkavouzi, Halkos, and Matsiori 2019; Navarro, Olivos, and Fleury-Bahi 2017; Nisbet, Zelenski, and Murphy 2009). As Schultz (2002, 71) mentioned, the NEP scale "attempts to measure individual differences in the extent to which people believe that humans are a part of the environment, or whether they are separate from the environment," which, as described previously, is one of the core aspects of CN. Since its early development, the NEP scale has been proposed as an answer to a new worldview of the relationship between people and nature (Schultz 2002). Thus, we expect the NEP scale to be a convergent construct with CN.

Environmental values are also close concepts to that of CN. By using the convention Rokeach (1968) established, which exposed that values are higher-order factors composed by a set of attitudes as first-order factors, Bogner (2018) designed the two major environmental values (2-MEV) and appreciation of nature instrument. In this sense, appreciation and preservation of nature (Bogner 2018; Kibbe, Bogner, and Kaiser 2014) are two constructs that should be intrinsically related to CN. In fact, in their definition of the appreciative use of nature attitude, Kibbe et al. (Kibbe, Bogner, and Kaiser 2014) included the concept of a connection with nature. Thus, appreciation of nature seems to be a construct highly aligned with CN. In addition, Kibbe et al. mentioned that people who preserve the environment have greater CN. In this sense, Sellmann and Bogner (2013) analysed the relationship between the CN construct

(Schultz et al. 2004) and environmental values, measured through 2-MEV, finding that the degree of CN may predict environmental attitudes and values (Bogner 2018; Manoli, Johnson, and Dunlap 2007; Schneller, Johnson, and Bogner 2015).

We expect that the affective, behavioural, and cognitive dimensions of CN would be positively related to the appreciation and preservation of nature and proenvironmental attitudes. The more individuals think, feel, and tend to act in connection with nature, the more they will appreciate and preserve the natural world.

Hypothesis 2: The ABC-CNS affective, behavioural, and cognitive dimensions will correlate positively with (a) the NEP and (b) the preservation and appreciation of nature.

1.3.2. Proenvironmental behaviours

Attitudes do not necessarily lead to acting according to them, but they can influence behaviour (Dunlap et al. 2000; Thomas and Sharp 2013). In this sense, CN strongly correlates with and influences proenvironmental behaviours (Anderson and Krettenauer 2021; Geng et al. 2015; Mackay and Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, and Abrahamse 2020). When an individual includes nature in their life, thereby making it part of themselves, this interconnection can lead to behaviours that seek benefits for nature (Yang et al. 2018). In this sense, various meta-analyses have demonstrated that people who feel more connected to nature are more likely to exhibit proenvironmental behaviours (Mackay and Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, and Abrahamse 2020). On the contrary, a lack of opportunities to have contact with nature can affect behaviours and lead to a loss of support for conservation (Sobko et al. 2020; Soga et al. 2018). If a person does not have a close connection with nature, then proenvironmental behaviours will be difficult to achieve in daily life because they require financial, convenience, and comfort sacrifices (Yang et al. 2018). However, if CN is related to proenvironmental behaviour, it is expected that the behavioural component of CN would probably be the factor more highly correlated to proenvironmental behaviour. Because the behavioural component of CN is conceived as the behavioural tendency to act as part of the natural world, it will be highly related to behaviours oriented towards protecting the natural world.

Naturally, CN is related to an individual's proenvironmental behaviour, but it is not expected that it would be related to the proenvironmental behaviour displayed by other individuals. Although we expect that the extent to which individuals believe they are part of the natural world, feel affectively connected with nature, and tend to act as part of the natural world would be related to the adoption of behaviour that is more proenvironmental, no relationship between the CN of individuals and the proenvironmental behaviour of other individuals is expected. The literature has found that people with high engagement in proenvironmental behaviours have a high degree of connection with nature (Mackay and Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, and Abrahamse 2020), and the relationship between one's attitudes and one's behaviour has been supported (Ajzen 2020), but not between one's attitudes and the behaviour of other individuals. However, the perception of what others do (Ajzen 2020) and the extent to which they act proenvironmentally can affect one's proenvironmental action (Cialdini et al. 2006; Keizer and Schultz 2018) through group pressure (Ajzen 2020; Keizer and Schultz 2018) and can indirectly affect our attitudes related to those actions over time (Ajzen 2020). In this sense, it has been shown that supportive injunctive and descriptive social norms about proenvironmental behaviour influence people's intention to act proenvironmentally: People who perceive that others approve of (supportive injunctive norm) and engage in (supportive description norm) energy conservation showed the highest levels of energy conservation intentions (Smith et al. 2012). Thus, the perception individuals have of the extent to which others behave proenvironmentally (descriptive social norms for proenvironmental behaviour) would be expected to influence attitudes directly related to proenvironmental behaviour, such as nature preservation. Nevertheless, the perception individuals have of the extent to which others behave proenvironmentally (descriptive social norms) would not be expected to influence other attitudes that are not so directly related to proenvironmental behaviour, such as the connection we perceive with nature, which is a more inherent or personal construct that is less influenced by the proenvironmental action we perceive of other people. The literature has shown that the CN we display is related to our proenvironmental behaviour (Anderson and Krettenauer 2021; Geng et al. 2015; Mackay and Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, and Abrahamse 2020) and that the perception of the way others behave proenvironmentally (descriptive social norm) can affect the degree to which individuals have the intention to behave proenvironmentally (Cialdini et al.

2006; Keizer and Schultz 2018; Smith et al. 2012), which could affect directly related attitudes (Ajzen 2020) such as nature preservation; however, no relations have been reported–as far as we know–between the perception of how others behave proenvironmentally and the connection to nature.

> **Hypothesis 3:** The three factors of the ANC-CNS–-particularly the behavioural dimension–-will correlate positively with individual proenvironmental behaviour but not with the proenvironmental behaviour that individuals perceive other people engage in.

2. Method

2.1. Participants

The sample included 1,375 students, of which 878 (63.9%) were Ecuadorian (age range= 18-45, *M*= 21; *SD*= 3.60; 62.9% women) and 497 (36.1%) were Spanish (age range= 18-49, *M*= 21; *SD*= 3.90, 77.3% women). Regarding the place of residence, most of the participants (61.8% for the general sample, 60.4% for the Ecuadorian sample, and 64.4% for the Spanish sample) resided in cities, 24% resided in towns (19.9% for the Ecuadorian sample and 32.8% for the Spanish sample), and 13.2% resided in the countryside (19% and 2.8% for the Ecuadorian and Spanish sample, respectively). The Ecuadorian sample was composed of students from four universities in the province of Manabí, whereas as the Spanish sample was composed of students from the University of Córdoba and the University of Salamanca.

2.2. Procedure

This study, which was previously approved by the Cordoba Research Ethics Committee, through code 4429, was correlational and transversal. University professors disseminated a link to the online questionnaire on the websites of the courses they were teaching and invited their students to participate voluntarily. To answer the questionnaire, the participants first had to give their informed consent.

2.3. Measures

2.3.1. Connectedness to nature

Based on the conception of attitudes as a tridimensional construct, the ABC-CNS was developed to analyse the extent to which individuals are connected to nature in affective, behavioural, and cognitive ways. This means the extent to which they (a) feel affectively connected with nature, (b) tend to act as a part of the natural world, and (c) believe that they are part of the natural world. Congruently, the scale was divided into three dimensions or factors (affective, behavioural, and cognitive) that make up the aspects of an individual's relationship with the natural environment. Each of these factors was made up of five items (see Appendix 1 for the items in both the Spanish and English versions), which were each valued on a 5-point Likert scale (1= *strongly disagree* and 5= *strongly agree*).

Regarding the item construction of the scale, three were directly translated from other scales, six were adapted from previous scales, and the remaining six were created ad hoc. Item 2 was translated from Item 2 of the NRS (Nisbet, Zelenski, and Murphy 2009), Item 5 was translated from Item 5 of the LCN scale (Perkins 2010). Item 1 was adapted from Item 4 of the NRS (Nisbet, Zelenski, and Murphy 2009), Item 3 was adapted from Item 1 of the CNS (Perrin and Benassi 2009), and Items 4, 6, 8, and 9 were adapted from Items 9, 1, 6, and 4 of the LCN scale (Perkins 2010), respectively. Most of the adapted items were shortened just by dropping a few words. In the case of Item 1, it had a major chance and went from "I am not separate from nature but a part of nature" to "I am an integral part of nature", but the core idea remained. In all cases, shortening the items eases comprehension once translated into Spanish.

Items 10 to 15 were completely ad hoc items. Items 10, which belongs to the affective dimension, was designed to describe the feelings of tranquility achieved through contact with nature. The rest of the items belonged to the behavioural dimension, and they were designed to reflect the individual dispositions to display various behaviours that account for CN.

2.3.2. Proenvironmental attitudes

To measure the extent to which individuals had proenvironmental attitudes, Dunlap et al. (2000) revised NEP scale was used. Items 9 (“Despite our special abilities, humans are still subject to the laws of nature”) and 12 (“Humans were meant to rule over the rest of nature”) of the original NEP scale were eliminated to increase the reliability of the scale in our samples. The resulting reliability was acceptable for both samples ($\alpha_{Ecuador} = .70$; $\alpha_{Spain} = .80$).

2.3.3. Nature appreciation and preservation

The extents to which individuals are predisposed to enjoy experiences in natural environments and preserve the resources of the natural world were measured with the appreciation and preservation of nature factors of the 2-MEV scale (Bogner 2018). Acceptable to good reliability was obtained for both samples for both appreciation $\alpha_{Ecuador} = .94$; $\alpha_{Spain} = .87$). and preservation $\alpha_{Ecuador} = .92$; $\alpha_{Spain} = .73$).

2.3.4. Proenvironmental behaviours: recycling and ecological consumption

To measure the extent to which individuals presented proenvironmental behaviour, two frequency scales were used to explore two aspects of proenvironmental behaviour: recycling and consumption. For recycling, the short three-item Individual Recycling Behaviour Scale (Cuadrado et al. 2021) was used. For consumption, a short five-item Individual Sustainable Consumption Scale (see Appendix 2) was developed for the purpose of the study. The scale was developed by using and adapting specific items oriented to ecological consumption from existing ecological behaviour scales and by adding self-created items to measure the degree to which participants had adopted consumption behaviours oriented towards protecting the environment. In general, the items seek to express daily life behaviours related to decisions about responsible consumption. For item construction, Items 1 and 3 were adapted from the Ecological Behaviour Scale (Casey and Scott 2006), Item 4 from the General Measure of Ecological Behaviour (Kaiser 1998), and Items 2 and 5 were newly designed for the purpose of this study, using recommendations from Greenpeace (2020) for sustainable consumption. Item 2 was related to the

consumption of plastic an Item 5 to the consumption of organic and low-environmental-impact products.

Both scales (the Individual Recycling Behaviour Scale and the Individual Sustainable Consumption Scale) measure the frequency at which the different proposed actions regarding recycling and consuming, respectively, are carried out using a 5-point frequency scale, where 1 was *never* and 5 *always*. The reliability of the recycling and consumption dimensions was adequate for the Ecuadorian sample (α= .79 and α= .80, respectively) and acceptable for the Spanish one (α= .70 for both dimensions). As expected, for the ad hoc Individual Sustainable Consumption Scale, exploratory factor analysis (EFA) showed a unique factor that explained 39.67% of the variance.

2.3.5. Perceived ecological behaviour of classmates

To measure the ecological behaviour of other people, we asked participants to give an answer concerning the extent to which they perceived that their classmates performed different and easily observable proenvironmental actions on a three-item, 5-point frequency scale, where 1 was *never* and 5 *always*. The three ad hoc items were related to the nonecological action of littering. The presentation of the scale was as follows: “Next we are going to ask you about the behaviours that you have observed that the members of your class carry out. Please rate the frequency with which you have observed that your class group performs these behaviours.” The three items were “My classmates throw papers on the ground,” “My classmates who smoke throw their cigarette butts on the ground,” and “My classmates throw chewing gum on the ground.” The reliability was correct for the Spanish sample (α= 0.70) and high for the Ecuadorian sample (α= 0.86). As expected, the EFA showed a unique factor that explained 58.14% of the variance.

2.4. Statistical analyses

As Cabrera-Nguyen (2010) showed, rigorous validation of new measures should be performed first through EFA and then, with a different sample, through confirmatory factor analysis (CFA). Thus, the general database was randomly divided into two samples of approximately 50% each. With the first sample (688 participants, of which 62.1% were Ecuadorian and 37.9% Spanish), an EFA using Promax rotation

(an oblique rotation was used because we expected the factors to be correlated) and the maximum likelihood extraction method (Costello and Osborne 2005) was performed. Then, with the second sample (687 participants, of which 34.4% were Spanish and 65.6% Ecuadorian), multigroup CFA with MPLUS was carried out to confirm the factorial structure and its cross-cultural invariance. The goodness-of-fit indices (Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Squared of Approximation (RMSEA)) were assessed by using the rules of thumb recommended by Schermelleh-Engel, Moosbrugger, and Müller (2003), and the culture invariance was assessed by change in CFI ΔCFI in deciding the best-fitting model, assuming that a ΔCFI greater than .01 indicates a reliable difference between the constrained and unconstrained fitting models.

Moreover, the reliability of the scale and its extracted factors for both the Spanish and the Ecuadorian samples were explored through Cronbach analyses and the *H* coefficient termed “maximal reliability *H*” (Bentler 2007). Additionally, the standard error measurement (SEM) was analysed to explore the degree to which the observed scores of the ABC-CNS fluctuated because of measurement errors (Morrow et al. 2015). The criterion of acceptable precision was a result of an SEM different from or equal to the standard deviation of the analysed factor divided by 2 (Wuang, Su, and Huang 2012).

Finally, the relationships between the ABC-CNS and other conceptually related and unrelated variables were explored by performing correlation analyses with SPSS for both the Spanish and the Ecuadorian samples; moreover, we performed a structural equation model by including in the CFA the correlations between the factors of the designed scale and the conceptually related and unrelated constructs. High correlation values (above .40) with a theoretically related construct indicated convergent validity, whereas poor correlation values (under .15) with a theoretically related construct and no correlation with a nontheoretically related construct indicated divergent validity. Moreover, when convergent validity was shown, an EFA was conducted to ensure that the highly correlated constructs were different from the ABC-CNS factors.

3. Results

3.1. Exploratory factorial analyses

When performing the EFA with the first split sample, the Kaiser-Mayer-Olkin index (.943) and Bartlett's test sphericity (x^2= 8931.093; *df*= 105; *p* < .001) supported the use of EFA. The results showed the three expected factors. The three factors explained 69.75% of the variance, and all the items were properly loaded on their proposed dimensions (see Table 2).

3.2. Multigroup confirmatory factorial analyses

The cross-cultural invariance of the tridimensional structure found in the EFA was tested through multigroup CFA analyses. As shown in Table 3, the tridimensional model, which can be observed in Figure 2, was well fitted for both the Spanish and the Ecuadorian samples: As seen in Table 3, the results were acceptable in both countries in almost all the fit indices. In fact, they were excellent in Ecuador, except for the RMSEA (which was acceptable), and very good in Spain, but also with the exception of RMSEA (also acceptable). The multigroup CFA results showed metric invariance but scalar variance between the Ecuadorian and Spanish models (see Table 3), showing that the scale was not invariant regarding culture.

Table 2. *Results of the exploratory factorial analysis of the ABC CN scale: factor loading.*

	Higher loading for each one of the three factors		
Items	Factor 1: Cognitive dimension	Factor 2: Behavioural dimension	Factor 3: Affective dimension
Item 1	.854		
Item 2	.859		
Item 3	.891		
Item 4	.718		
Item 5	.859		
Item 6			.859
Item 7			.763
Item 8			.622
Item 9			.811
Item 10			.903
Item 11		.754	
Item 12		.889	
Item 13		.726	
Item 14		.824	
Item 15		.448	
Cronbach's alpha values	.94	.87	.94
H Coefficient	.93	.90	.92

Table 3. *Goodness-of-fit indexes of the MGCFA.*

	X^2	df	CFI	TLI	RMSEA	RMSEA [90%CI]	SRMR	ΔCFI	Δ_X^2
Baseline Model	455.50***	174	.970	.964	.069	[.061; .076]	.029		
Configurational:									
Spain	214.45***	87	.937	.924	.079	[.066; .092]	.041		
Ecuador	241.05***	87	.979	.975	.063	[.053; .072]	.019		
Metric Invariance	498.66***	186	.967	.963	.070	[.063; .077]	.060	.003	43.16***
Scalar Invariance	773.27***	201	.940	.937	.091	[.084; .098]	.094	.03	317.77***

Note. MGCFA = Multigroup Confirmatory factor analysis; X^2 = Chi-Square test of model fit; df = degree of freedom; CFI = Comparative fit index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; ΔCFI = difference between the Comparative Fit Indexes of two models (the tested model *minus* the baseline model); ΔX^2 = difference of X^2 estimates (the tested model *minus* the baseline model); ****p* < .001.

Figure 2. *Results of the confirmatory factorial analyses for the Spanish and the Ecuadorian samples.*

Figure 2a. Spanish sample

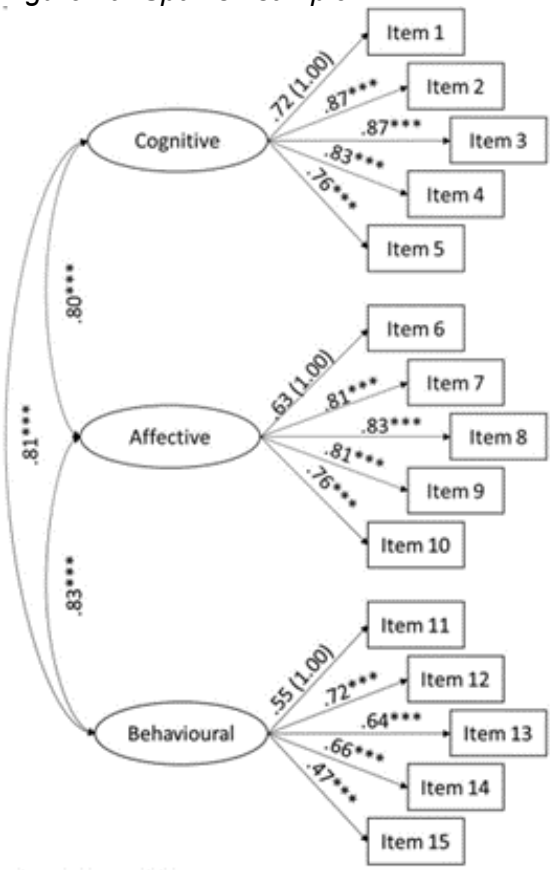
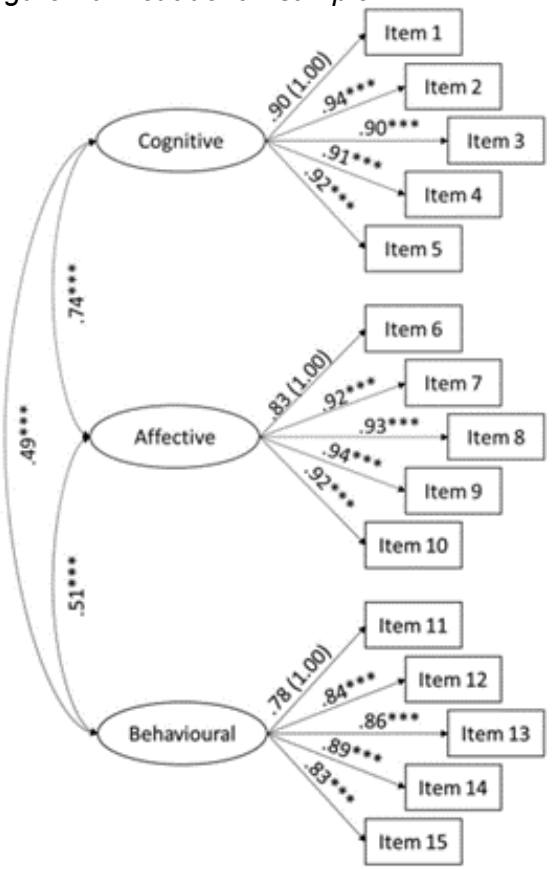


Figure 2b. Ecuadorian sample



Note. *** p < .001.

3.3. Reliability and standard error of measurement

As expected, the SEM values for each of the ABC-CNS factors across the overall, the Spanish, and the Ecuadorian samples all attained the criterion, providing evidence of an acceptable measurement precision for the measure (Table 4). Moreover, as seen in Table 4, reliability was acceptable to high for each of the three factors in all the explored samples, as suggested by the Cronbach's α values, which oscillated between .73 and .96, and the *H* coefficient, which oscillated between .80 and .98.

Table 4. *Standard error measurement (SEM) of the ABC connection to nature scale.*

	Overall sample (Split 2) *N* = 687				Spanish sample (Split 2) *N* = 236				Ecuadorian sample (Split 2) *N* = 451			
	A-CNS	B-CNS	C-CNS	ABC-CNS	A-CNS	B-CNS	C-CNS	ABC-CNS	A-CNS	B-CNS	C-CNS	ABC-CNS
Standard dev.	0.89	0.78	0.95	0.77	0.71	0.66	0.79	0.64	0.97	0.82	1.03	0.82
Reliability coeff. (α)	0.94	0.88	0.95	0.95	0.88	0.74	0.91	0.93	0.96	0.92	0.96	0.96
Reliability coeff. (*H*)	0.94	0.92	0.88	0.97	0.87	0.81	0.80	0.94	0.96	0.94	0.92	0.98
SEM	0.22*	0.27*	0.21*	0.17*	0.25*	0.33*	0.24*	0.17*	0.19*	0.23*	0.21*	0.17*
SD/2	0.45	0.39	0.48	0.39	0.36	0.33	0.40	0.32	0.49	0.41	0.52	0.41

*SEM ≤ SD/2; α = Cronbach's alpha; *H* = Coefficient *H*.

3.4. Convergent and discriminant validity

Correlation analyses with other variables of interest were performed to obtain additional evidence of the instrument's validity. As shown in Table 5, the expected correlations between the ABC-CNS (affective, behavioural, and cognitive dimensions) and appreciation and preservation (2-MEV), environmental attitudes (NEP), and proenvironmental behaviours (both recycling and consumption behaviours) were found, thus providing evidence for convergent validity.

Moreover, higher correlations were displayed between the three factors of the ABC-CNS (in bold in Table 5) and between those three factors and appreciation and preservation (Table 5), the two variables most aligned with the CN construct. The results added more evidence for the convergent validity of the scale. To confirm that this convergence was not due to an overlap of the factors of the ABC-CNS with the appreciation and the preservation variables, we performed an EFA (see Appendix 3)

by entering the items of the ABC-CNS and of the appreciation and the preservation variables. The results showed the five expected components (each of the three dimensions of the ABC-CNS more than both the appreciation and the preservation components), adding evidence for divergent validity. Appreciation and preservation were clearly different variables from the ABC-CNS factors.

In the same way, in the Spanish sample, the two ecological behaviours showed a correlation above .40 with the behavioural factor of the ABC-CNS (and correlation near .40 for the Ecuadorian sample), adding additional evidence of the convergent validity of the scale because the behavioural dimension of the ABC-CNS was expected to be the dimension most correlated with individual proenvironmental behaviour due to its particularly theoretical alignment. Again, to exclude an overlap between ecological behaviour and the behavioural factor of the ABC-CNS, another EFA (see Appendix 4) was performed, this time by entering the items of the behavioural factor of the ABC-CNS and the items of the two ecological behaviour instruments (recycling behaviour scale and the sustainable consumption scale). The results showed the three expected components, thus adding evidence for divergent validity. Recycling behaviour and sustainable consumption behaviour were clearly different from the behavioural factor of the ABC-CNS. Moreover, no correlations (Table 5) were found with the classmates' ecological behaviour variable, adding evidence for divergent validity.

To give more confirmation to the discriminant validity of each of the factors with the other constructs explored, the root square average variance extracted (RSAVE) of each factor of the ABC-CNS was compared with the correlation value of those factors with the other constructs explored. As expected, the RSAVEs of Factors 1 ($\mathrm{RSAVE}_{Spanish} = 0.77;\ \mathrm{RSAVE}_{Ecuadorian} = 0.84$), 2 ($\mathrm{RSAVE}_{Spanish} = 0.69;\ \mathrm{RSAVE}_{Ecuadorian} = 0.80$), and 3 ($\mathrm{RSAVE}_{Spanish} = 0.63;\ \mathrm{RSAVE}_{Ecuadorian} = 0.80$) were higher than the correlations of those factors with the other constructs were (correlations can be seen in Table 5), except for correlation of Factor 3 with the appreciation construct that was slightly higher (0.03) than the RSAVE of Factor 3 was in the Spanish sample. The results add more evidence of the scale's construct divergence with the explored constructs.

Table 5. *Correlations between the ABC connection with nature scale (ABC-CNS) and other scales.*

	1	2	3	4	5	6	7	8	9	Mean	SD
1.ABC-CNS Cognitive Factor	-	**.712*** **	**.65*** **	.51***	0.42***	.34***	.23**	.37***	.11	3.91	0.79
2.ABC-CNS Affective Factor	**.71*** **	-	**.66*** **	.50***	.40***	0.34***	0.22**	.27***	.07	4.10	0.71
3.ABC-CNS Behavioral Factor	**.59*** **	**.66*** **	-	.66***	.41***	.36***	.27***	.38***	.01	3.88	0.66
4. Appreciation	.47***	.54***	.72***	-	.36***	.33***	.17*	.30***	.04	3.57	0.80
5. Preservation	.43***	.50***	.52***	.63***	-	.59***	.20**	.16*	.03	4.24	0.62
6.New Ecological Paradigm	.28***	.31***	.29***	.28***	.48***	-	.20**	.08	.06	3.93	0.57
7. Recycling	.37***	.29***	.44***	.40***	.27***	.12**	-	.27***	-.01	3.87	0.92
8.Sustainable Consumption	.35***	.29***	.40***	.36***	.31***	.12**	.54***	-	.11	3.19	0.75
9.Classmates' ecological behavior	.02	.03	.07	.06	.10*	-.04	-.01	.18***	-	2.80	0.87
Mean	4.03	4.24	4.10	4.13	4.13	3.63	3.27	3.20	2.28	-	-
SD	1.02	0.97	0.82	0.81	0.86	0.52	0.98	0.88	1.12	-	-

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; ABC-CNS = ABC Connectedness to Nature scale. Values displayed in the lower triangle are from the Ecuadorian sample and values displayed in the upper triangle are from the Spanish sample. Values in bold reflect the correlations between the three factors of the ABC-CNS. Values in green reflect correlations above .40 displayed between the factors of the ABC-CNS scale and other constructs that should represent variables convergent with the ABC-CNS. Values in red represent correlations under .20 displayed between the factors of the ABC-CNS scale and other constructs that should represent variables divergent with the ABC-CNS.

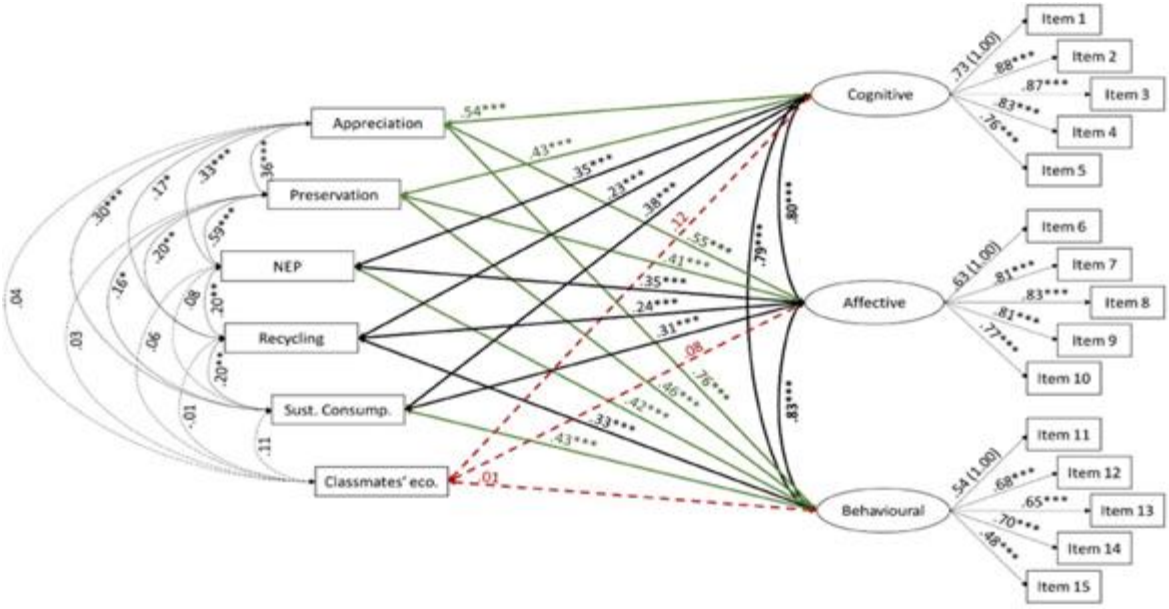
Finally, the structural equation model performed by including the correlations between the three factors of the scale and the other construct used to explore the convergence and divergence of the scale confirmed the expected results as well as the previous correlations found in the correlation analyses performed with SPSS, as shown in Figure 3.

4. Discussion

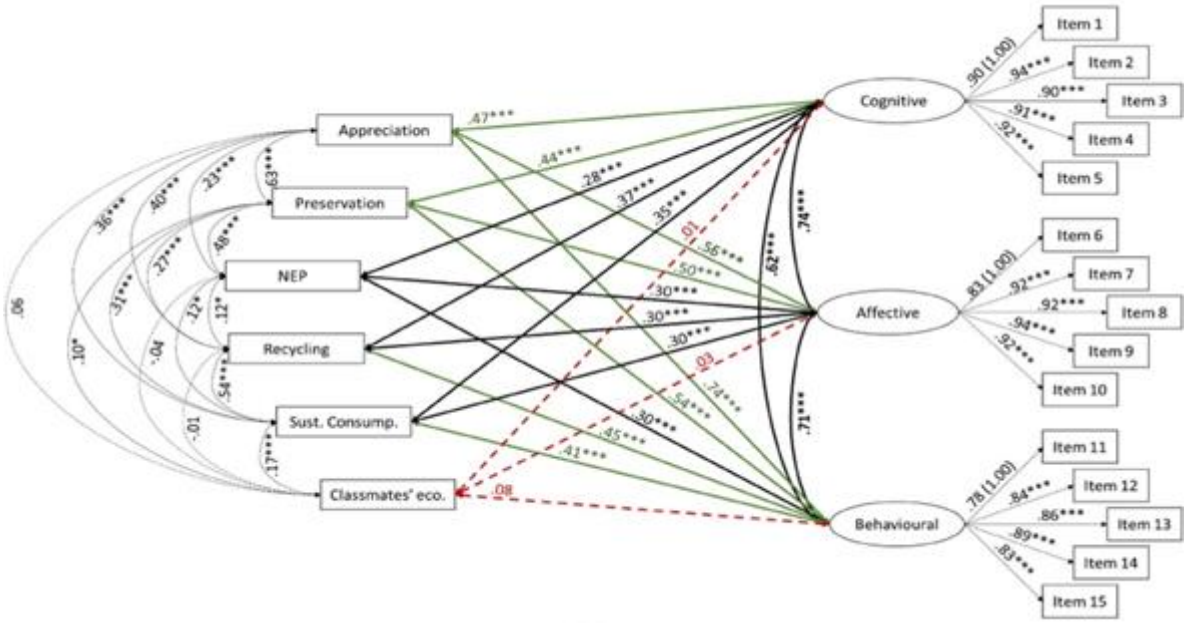
The main aim of this study was to develop and validate a comprehensive and psychometrically sound scale to assess CN in individuals through the ABC model of attitudes, using the ABC-CNS. Although the scales of CN are diverse, none brings together the three fundamental dimensions of any attitude: affective, behavioural, and cognitive. Therefore, the three proposed dimensions of this scale suppose a broader approach to the construct of CN.

Figure 3. *Convergent and divergent validity results.*

a. Results of the convergent and divergent validity in the Spanish context.



a. Results of the convergent and divergent validity in the Ecuadorian context.



Notes. * p < .05; ** p < .01; *** p < .001; Sust. Consump = sustainable consumption; Classmates' eco. = classmates' ecological behaviour. Values in bold reflect the correlations between the three factors of the ABC-CNS. Values in green reflect correlations above .40 displayed between the factors of the ABC-CNS and other constructs that should represent variables convergent with the ABC-CNS. Values in red represent correlations under .20 displayed between the factors of the ABC-CNS and other constructs that should represent variables divergent with the ABC-CNS.

4.1. The ABC-CNS: a reliable and valid multifactorial scale

The results support the tridimensionality of the CN construct. For both the Spanish and Ecuadorian samples, the results of the exploratory and confirmatory factor analyses confirm a robust adjustment for the trifactorial structure, grouping the scale items into the three initially suggested factors. The three dimensions identified correspond to an understanding of the CN construct as an attitude about the relationship with nature, with its affective, behavioural, and cognitive intentions (Jain 2014; Pratkanis 2014; Spooncer 1989). Accordingly, one of the dimensions reported refers to people's beliefs about their inclusion as a part of the natural world, another to their feelings about their connection with nature, and another to their tendency to act as a part of the natural world.

As Restall and Conrad (2015) noted, multidimensional CN scales consistently stand out as showing better results as measurement tools, which justifies the efforts in the research in this field and highlights the results of the present scale and its potential use as an accurate tool for measuring CN, contributing with a multifactorial scale. In this sense, another aspect to highlight that implies the relevance of the scale is that no previous CN scales have focused on the explicit inclusion of the three aspects of attitudes. Some scales have theoretically placed more focus on the cognitive element, such as the INS (Schultz 2001) or the LCN (Perkins 2010); others focus on the affective element, as the CNS supposedly does (Mayer and Frantz 2004); and others include different elements, but not all three, or include all three but do not clearly differentiate between them, such as the Connectedness to Nature Index for Parents of Preschool Children (Sobko, Jia, and Brown 2018) or the NRS (Nisbet, Zelenski, and Murphy 2009). This means, as Perkins (2010) argued, studies have been oriented more to the analysis of unique, but not integral, aspects, which can allow a more complete understanding of the relationship with nature. However, the extent to which individuals feel they are part of the natural world, as an attitude, includes beliefs, emotions, and their tendency to act as a part of the natural world (Jain 2014; Pratkanis 2014; Spooncer 1989). Therefore, the development and validation of the ABC-CNS, as a more integral scale for CN, including the affective, behavioural, and cognitive dimensions (Leong, Fischer, and McClure 2014; Sevillano, Corraliza, and Lorenzo 2017), is relevant.

In this sense, the confirmation of the tridimensionality of the scale for both the Spanish and the Ecuadorian samples supposes the achievement of a complete scale that allows measurement of the three fundamental aspects of the CN construct: affective, behavioural, and cognitive. Moreover, although the scale allows measurement of the three fundamental aspects of CNS, it is at the same time relatively short, with 15 items, five for each of the three dimensions of the scale. This aspect of the scale is particularly relevant because a short scale can be easier to apply for both research and intervention purposes and can facilitate the inclusion of other measures on the same questionnaire. In addition, a short measure reduces demand effects or hypothesis guessing when the measure is used in experiments and surveys (Richins 2004).

The reliability of the ABC-CNS is good, reaching *H* values between .87 and .96 for the affective factor, .81 and .94 for the behavioural factor, and .80 and .92 for the cognitive factor in the different samples (general, Spanish, and Ecuadorian). Although both samples present optimal values in the different tests carried out, differences exist between both results in terms of alpha values. It should be considered that in the context of the results obtained, these differences do not affect the scale in any way. In the case of the NEP, Aguilar-Luzón, Calvo-Salguero, and Salinas (2014) acknowledged that the scale tends to behave differently depending on the nationality of the sample.

In this sense, regarding cross-cultural invariance, the ABC-CNS has demonstrated metric invariance, having shown the loadings to be similar between countries. Then, the ABC-CNS relationships with other variables can be compared across both Ecuador and Spain. This invariance seems relevant because it allows researchers to compare how CN relates to other variables in Spain and Ecuador. Nevertheless, the scalar invariance has not been reached, meaning that although the scale is valid and can be used for both cultural contexts as demonstrated by the metric invariance, the instrument seems to behave in a different way in the two different contexts, which does not allow a mean comparison across the two countries.

Moreover, the pattern of relationships between the external variables and the ABC-CNS and its dimensions supports the good external validity of the scale. As expected in a validation of an instrument oriented to measure different aspects of the

same construct, the three dimensions of the ABC-CNS are highly correlated, which provides evidence for good internal validity of the scale.

Regarding external validity, as we expected and in line with the previous literature, individuals who display higher levels of CN in general and higher levels of each of the three dimensions of the ABC-CNS report higher general proenvironmental attitudes and more often report appreciating and preserving nature. Appreciation and preservation are the variables–among those explored–most aligned with CN, because they represent attitudes intrinsically related to CN (Bogner 2018; Colléony et al. 2017; Kibbe, Bogner, and Kaiser 2014). Thus, the fact that individuals with high scores on the different dimensions of the ABC-CNS also report high levels of appreciation of nature and high levels of preservation of their environment is coherent with previous research (Bogner 2018; Kibbe, Bogner, and Kaiser 2014; Sellmann and Bogner 2013; Thorn and Bogner 2018) and supports the convergent validity of the scale. Moreover, the results also highlight that although preservation and appreciation of nature are concepts highly theoretically related to CN, they are also different constructs, because the EFA showed they are divergent variables. Nonetheless, for the Spanish sample, the divergence between the appreciation value and the behavioural factor of the ABC-CNS was controverted, because the RSAVE of the behavioural component of the ABC-CNS was lower than the correlation observed between this component and the appreciation variable. In this sense, it should be argued that to appreciate nature is a theoretically very near construct to the tendency to act as a part of the natural world. Actually, Kibbe, Bogner, and Kaiser (2014) included the concept of connection with nature in their definition of appreciation of nature.

The patterns of relations of the ABC-CNS with the NEP also support the external validity of the scale. In previous studies, the proenvironmental attitudes measured with the NEP have been shown to correlate positively with the CNS (Gkargkavouzi, Halkos, and Matsiori 2019; Lee et al. 2015) and with the LCN scale (Martin and Czellar 2016; Perrin and Benassi 2009), both designed to measure CN with an affective focus, and with the INS scale (Schultz 2001, 2004; Schultz et al. 2004), a more general measure of CN. In our study, the three factors of the ABC-CNS show high correlation with the NEP, thus adding evidence for the convergence validity of the scale.

Besides the above results, ecological behaviours also show positive correlations with the ABC-CNS. Accumulated evidence has shown that CN is a relevant predictor of proenvironmental behaviours, with scholars having demonstrated that CN can be a relevant variable for interventions to promote proenvironmental behaviours in society (Mackay and Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, and Abrahamse 2020). Congruent with previous studies (Di Fabio and Rosen 2019; Fretwell and Greig 2019; Nisbet and Zelenski 2011; Soga et al. 2016), the more individuals believe, feel, and act as a part of the natural world (higher levels in each of the three dimensions of the ABC-CNS), the more they report proenvironmental behaviours, namely recycling and avoiding the consumption of unsustainable products. Moreover, it is noteworthy that the factor that exhibits the highest correlation values with proenvironmental behaviour is the behavioural dimension of the ABC-CNS, thus giving additional evidence of the convergent validity of the construct and its dimensionality. Moreover, although this high correlation and convergence between the ecological behaviours and the behavioural factor of the ABC-CNS exists, no overlap can be detected, and the EFA allows the divergence of the behavioural factor of the ABC-CNS with the ecological behaviours–clearly shown to be different constructs–to be confirmed.

Finally, as expected, no relations are found between the ecological behaviour observed in the participants' classmates and the different factors of the ABC-CNS. CN has been seen as a highly relevant variable in the prediction of individual ecological behaviours (Mackay and Schmitt 2019; Martin et al. 2020; Whitburn, Linklater, and Abrahamse 2020). Nevertheless, there is no reason to think that the CN of a determined individual should be related to the ecological behaviours of other individuals. Thus, this pattern of relation provides additional evidence for the divergent validity of the scale.

5. Limitations and future research

The university sample selected for the research cannot fully represent the diverse context of the countries studied; however, it can be considered a good starting point to extend research to other stakeholders and groups from the same countries. Cultural differences may exist between the two countries, but the elaboration of the items in the scale was carried out in a way that avoided using regionalisms in the

language to prevent interpretation according to regional context. In future research, it would be convenient to include a population that is more diverse (i.e. not just university students) to corroborate and expand the results. Moreover, the standard approach of multitrait, multimethod correlation matrices that Campbell and Fiske ((Campbell and Fiske 1959) recommended to analyse convergent and divergent validity was not used. Future research with more heterogeneous samples must include this approach.

Finally, Item 15 of the scale presented the lowest loading for both countries, specifically for Spain, although it was suitable to keep in the analyses. Nevertheless, future cross-cultural validation of the scale could explore whether a change in the item construction would allow improvement in the behavioural factor of the ABC-CNS. Perhaps the elimination of the conditional part of the item (i.e. “as if they were human beings,” keeping only “I take care of animals”) or maybe the substitution of the conditional part with “because they are human beings like us” could enhance the item formulation.

6. Conclusion

It can be concluded that the ABC-CNS is a reliable tool to measure the construct of CN through the proposed dimensions and that it is a complete and integral tool. In this sense, a strength of the ABC-CNS, in comparison to other scales, is that it addresses the construct in an integral way by contemplating the three essential components of any attitude, whereas other scales mainly focus on some or one aspect of CN. The EFA and CFA confirmed the scale’s tridimensional character, and the observed correlations with environmental attitudes, appreciation and preservation of nature, and proenvironmental behaviour corroborated its external validity. Therefore, the results suggest the scale’s validity and suitability for use as a tool to measure CN. The brevity of the tool is particularly relevant because it could facilitate the measurement of individuals’ levels of CN for both research and practical purposes. The ABC-CNS can be applied to measure CN in inhabitants of specific regions and then to the construction of environmental plans, interventions, projects, and policies in those regions. Moreover, the ABC-CNS can also support future research as a contribution to the search for a deeper understanding of the relationship between CN and other variables, as well as its contribution to sustainable development.

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6.2. Data availability statement

Data are available at https://doi.org/10.17632/t8v6ncybm6.1.

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8. Appendix

Appendix 1 ABC-CNS scale. Spanish and English versions, and original scale from which the items were taken.

Dimension	Spanish version	English version	Scale of origin
Cognitive (Concerning how I perceive myself in relation to nature…)	1. Soy parte integrante de la naturaleza.	I am an integral part of nature.	Adapted from item 4 of the NRS (Nisbet, Zelenski, and Murphy 2009)
	2. Mi conexión con la naturaleza es una parte importante de quien soy.	My relationship to nature is an important part of who I am.	Translated from item 2 of the NRS (Nisbet, Zelenski, and Murphy 2009)
	3. Percibo un sentido de unidad con el mundo natural que me rodea.	I feel a sense of oneness with the natural world around me.	Adapted from item 1 of the CNS (Mayer and Frantz 2004)
	4. Me siento espiritualmente conectado con la naturaleza.	I feel spiritually bound with nature.	Adapted from item 9 of the LCN scale (Perkins 2010)
	5. Percibo el mundo natural como una comunidad a la que pertenezco.	I think of the natural world as a community to which I belong.	Translated from item 2 of the CNS (Mayer and Frantz 2004)
Affective (Concerning how I feel in relation to nature…)	6. Siento alegría al estar en la naturaleza.	I feel joy just being in nature.	Adapted from item 1 of the LCN scale (Perkins 2010)
	7. Siento un profundo amor por la naturaleza.	I feel deep love for nature.	Translated from item 5 of the LCN scale (Perkins 2010)
	8. Me siento conectado emocionalmente con la naturaleza	I feel emotionally connected to nature,	Adapted from item 6 of the LCN scale (Perkins 2010)
	9. Me siento feliz y como en casa cuando estoy en plena naturaleza	I feel happy and at home when I am in the midst of nature.	Adapted from item 4 of the LCN scale (Perkins 2010)
	10. El contacto con la naturaleza me proporciona un sentimiento de paz y tranquilidad.	Contact with nature gives me a feeling of peace and tranquility.	Ad hoc
Behavioural (Concerning how I behave in relation to nature…)	11. Salgo a menudo al campo o naturaleza.	I often go out to the countryside or nature.	Ad hoc
	12. Cuando estoy en plena naturaleza, me fundo con ella.	When I am in the midst of nature, I merge with it.	Ad hoc
	13. Cuido de la naturaleza como si fuese una parte de mi mismo.	I take care of nature as if it were a part of myself.	Ad hoc
	14. A menudo escucho y observo la naturaleza.	I often listen and watch nature.	Ad hoc
	15. Cuido de los animales como si fuesen seres humanos	I take care of animals as if they were human beings.	Ad hoc

Note. NRS = Nature Relatedness scale; CNS = Connectedness to Nature scale; LCN = Love and Care for Nature scale

Appendix 2 individual sustainable consumption scale (ISC scale).

Item 1	I avoid buying and using aerosol sprays.
Item 2	To avoid the use of plastic bags, I do the shopping with my own bags or cart.
Item 3	When shopping, I try to buy products packaged with as little plastic as possible.
Item 4	I reject plastic bags in stores and shops when they are offered to me.
Item 5	I try to buy products grown using organic farming or those with a low environmental impact.

Appendix 3 results of the exploratory factorial analysis by including the items of the appreciation and preservation scales with the ABC-CNS items.

	Higher loading for each extracted factor				
Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Item 1' ABC CN scale		.773.			
Item 2' ABC CN scale		.830			
Item 3' ABC CN scale		.826			
Item 4' ABC CN scale		.795			
Item 5' ABC CN scale		.805			
Item 6' ABC CN scale				.764	
Item 7' ABC CN scale				.735	
Item 8' ABC CN scale				.664	
Item 9' ABC CN scale				.744	
Item 10' ABC CN scale				.782	
Item 11' ABC CN scale					.625
Item 12' ABC CN scale					.649
Item 13' ABC CN scale					.691
Item 14' ABC CN scale					.640
Item 15' ABC CN scale					.683
Item 1' appreciation scale	.723				
Item 2' appreciation scale	.807				
Item 3' appreciation scale	.764				
Item 4' appreciation scale	.834				
Item 5' appreciation scale	.815				
Item 6' appreciation scale	.726				
Item 7' appreciation scale	.597				
Item 1' preservation scale			.718		
Item 2' preservation scale			.683		
Item 3' preservation scale			.589		
Item 4' preservation scale			.725		
Item 5' preservation scale			.759		
Item 6' preservation scale			.759		
Item 7' preservation scale			.654		
Percentage of explained variance	17.88	15.12	14.75	12.82	10.66

Appendix 4 results of the exploratory factorial analysis by including the items of the individual sustainable consumption and recycling scales with the items of the behavioural factor of the ABC-CNS.

	Higher loading for each extracted factor		
Items	Factor 1	Factor 2	Factor 3
Item 11' ABC CN scale	.767		
Item 12' ABC CN scale	.824		
Item 13' ABC CN scale	.781		
Item 14' ABC CN scale	.840		
Item 15' ABC CN scale	.757		
Item 1' ISC scale		.505	
Item 2' ISC scale		.542	
Item 3' ISC scale		.766	
Item 4' ISC scale		.738	
Item 5' ISC scale		.767	
Item 1' recycling scale			.792
Item 2' recycling scale			.754
Item 3' recycling scale			.817
Percentage of explained variance	26.12	18.73	18.11

II. The moderating effect of collective efficacy on the relationship between environmental values and ecological behaviors

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Abstract

Sustainability implies improvements in responsible behaviors such as recycling and energy saving. Yet, ecological behaviors cannot be improved only by attending to personal variables; focus must also be put on the collective variables. The main aim of this research was to analyze how individual variables (environmental values) and collective variables (collective efficacy for ecological behavior) interact to explain recycling (Study 1; 502 students of Spanish universities) and energy-saving behaviors (Study 2; 544 students of Ecuadorian universities). Participants completed an online questionnaire that reflected all the studied variables. Ecological behaviors were collected through frequency scales. The results of the moderated analyses performed with Process for SPSS confirmed the moderating effect of collective efficacy in the relationship that both preservation and appreciation established with recycling and energy-saving behavior alike. This moderating effect was also confirmed in the relationship that utilization developed with recycling, but not with energy saving. Thus, collective efficacy directly influences pro-environmental behavior, but also interacts with the personal values of individuals. Consequently, the results indicate the need to encourage collective efficacy for ecological behaviors of individuals, groups, collectives, and communities.

Keywords: Recycling · Energy saving · Preservation value · Utilization value · Appreciation of nature value · Collective efficacy

1. Introduction

Whether consciously or unconsciously, the normal functioning of industrialized societies produces environmental changes (Ollinaho, 2016; Rudel et al., 2011). Population, economics, capitalism, and industrial growth are all related to perhaps the greatest challenges faced by humanity today: growing global resource demands and exploitation, environmental degradation, and climate change (Everard et al., 2016; Nasrollahi et al., 2018). Encouraging pro-environmental and ecological behaviors in individuals and society is critical for the planet's sustainability, especially in societies that use natural resources unsustainably until they are despoiled (Jia et al., 2019; Milfont & Duckitt, 2004). To this end, numerous studies have paid special attention to the personal variables that may affect how individuals behave with regard to the environment (Corraliza & Berenguer, 2000; Fritsche et al., 2018). One of the most commonly studied variables is environmental values, referring to individuals' priorities and guiding principles regarding the use of nature and how they view the world and perceive that it might be preserved or exploited, thereby driving their decision making and actions related to the natural environment (Dutcher et al., 2007; Schultz et al., 2004; Tadaki et al., 2017). These values have been conceptualized as a condition to behave pro-environmentally (Kaiser et al., 2005) and have been associated with various pro-environmental behaviors (Corraliza and Berenguer, 2000; Milfont et al., 2010). However, although pro-environmental behavior has been studied primarily as an individual decision-making process, especially pertaining to the personal variables that drive it (Fritsche et al., 2018), personal behaviors are affected not only by individual variables (Ferguson and Branscombe, 2010; Fritsche et al., 2018; Jugert et al., 2016). Social psychology has demonstrated that external conditions--and in particular the group, community, or collectivity to which individuals belong--strongly influence people's behavior (Reicher et al., 2010). What the group does, or what one perceives that the group does, has the power to influence us and change our way of behaving. Therefore, psychologists must pay attention to the collective variables that can affect ecological behavior (Fritsche et al., 2018). In this sense, authors have argued that altering behaviors toward a sustainable society necessitates attention not only to individual variables but also to the collective practices that may facilitate (or, in contrast, impede) pro-environmental actions (Bamberg et al., 2015; Peattie and Peattie, 2009; Shove, 2010).

Consequently, the aim of this investigation is to analyze how individual and collective variables interact to explain ecological behavior. At the individual level, environmental values are considered, which are defined by Corral-Verdugo et al., (2020, p. 7274) as “principles that help people to develop a more sustainable relationship with the environment.” At the group or community level, collective efficacy is considered, which is defined by Bandura (2000) as a group’s shared belief in its conjoint capabilities to successful undertake a specific behavior.

1.1. Environmental values and ecological behavior

Bogner and Wiseman (2006) have reported two Major Environmental Values (2-MEV): *preservation*, which reflects a biocentric perspective regarding the need to care, protect, and preserve the natural environment, and *utilization*, which reflects an anthropocentric view of the need to exploit and alter nature, understood as a source of resources available for human consumption (Wiseman and Bogner, 2003). According to the 2-MEV conception (Bogner and Wiseman, 2006), the two dimensions are not opposed; that is, individuals can simultaneously perceive that natural resources must be preserved and used by humans (Bogner, 2018; Milfont and Duckitt, 2004). Bogner (2018) has recently added a new dimension to the 2-MEV--*appreciation of nature*--reflecting a biocentric view of the benefit and enjoyable use of nature.

Numerous studies have assessed the relationship between environmental values and pro-environmental behaviors, but relatively few studies have analyzed the impact of the preservation and utilization values as orthogonal dimensions, as well as of the appreciation of nature on environmental and ecological behaviors (Bogner, 2018). In the various studies exploring the relationship between the two orthogonal dimensions of the environmental values cited above and environmental behaviors in recent years, preservation has been consistently related to pro-environmental behavior, but not utilization. In this sense, Milfont and Duckitt (2004) and Boeve-de Pauw and Van Petegem (2013b) found that preservation, but not utilization, predicted environmental behavior. Nevertheless, Binngießer and Randler (2015) found both preservation and utilization to be related to pro-animal attitudes (attitudes toward farm and companion animals), a construct they found to be closely related to pro-environmental attitudes. Along the same lines, Boeve-de Pauw and Van Petegem (2013b) noted that preservation consistently predicted pro-environmental behavior in

different cultures, while utilization predicted it in some cultures but not in others. Moreover, to date, few studies have explored the relationship of appreciation of nature with pro-environmental and ecological behaviors.

Nevertheless, Kibbe et al. (2014) discovered that exploitative utilization and appreciative utilization predicted preservation negatively and positively, respectively, and concluded that individuals who appreciate nature will preserve the environment. Moreover, Kaiser et al. (2014) recognized that the more individuals appreciate nature, the more positive their attitudes are toward the protection of environment. It has also been seen that people who engage in appreciative outdoor recreation behave in more pro-environmental ways (Nord et al., 1998). Moreover, individuals with higher levels of appreciation of nature engage in more gardening (Clayton, 2007) and general ecological behaviors (Roczen et al., 2014).

In accordance with the literature cited above, and owing to inconsistencies between the different studies, we will explore the relationship between utilization and pro-environmental behavior. Thus, the *first research question* of this study is this: Does a significant relationship exist between utilization value and pro-environmental behavior?

Also, in congruence with the literature review, we therefore hypothesized that both preservation and appreciation values would predict pro-environmental behaviors.

> **Hypothesis 1** Individuals with higher levels of (a) preservation and (b) appreciation values about nature will behave in a more pro-environmental way.

We will now focus on collective efficacy for ecological behavior as a collective variable determinant of pro-environmental behavior.

1.2. Collective efficacy and ecological behavior

As Bandura (2006) has explained, individuals are influenced by the beliefs of those around them, that is, their community and groups. Based on the self-efficacy and collective efficacy concepts formulated by Bandura (2006, 2010), collective efficacy for ecological behavior can be understood as people's shared perceptions about the ability of their group or collectivity to undertake ecological behaviors successfully. This core belief will inevitably implicate individuals' ecological behavior,

because it affects motivation and performance (Bandura, 2006, 2010). In accordance with Bandura (2006, 2010), those who do not believe that they or their group can behave pro-environmentally will probably not try to act in this manner or will stop as soon as they encounter any difficulty. Therefore, collective efficacy may predict pro-environmental behavior (Chen, 2015; Jugert et al., 2016; Tabernero and Hernández, 2011a): the more individuals and groups believe in the capacity of the community to behave pro-environmentally, the more they will engage in ecological behaviors. When individuals perceive their group as having the capacity to behave pro- environmentally, they gain an individual sense of control, their self-efficacy increases, and they act individually in group terms, that is, in a more pro-environmental way (Jugert et al., 2016).

However, collective efficacy has been perceived not only as a direct predictor of behaviors, but also as a consistent moderator of the relationship between personal variables and behaviors (Cuadrado and Tabernero, 2015; Tabernero et al., 2015; Tasa et al., 2011). Tabernero et al. (2015) have identified interaction effects between different variables and collective efficacy when predicting pro-environmental behavior. They demonstrated in a multilevel study that the relationship between different individual variables and recycling was moderated by collective efficacy in communities: individuals with strong efficacy beliefs and a high satisfaction with service quality recycle more when they belong to a community with greater collective efficacy.

Therefore, it is possible to conceive that collective efficacy for ecological behavior will moderate the relationship established between environmental values and pro-environmental behavior, as it will enhance the positive impact of preservation and appreciation on pro-environmental behavior and reduce the possible negative impact of utilization on pro-environmental behavior.

According to the literature described above, the *second research question* of this study is this: If the utilization value establishes a relationship with pro-environmental behavior, will collective efficacy moderate this relationship by reducing the potential negative impact of utilization on pro-environmental behavior?

Moreover, we expect that collective efficacy will predict pro-environmental behavior and interact with preservation and appreciation to explain pro-environmental

behavior, by moderating the relationship established between environmental values (preservation and appreciation) and pro-environmental behavior.

> **Hypothesis 2** When holding high collective efficacy for ecological behaviors, individuals with high levels of (a) preservation and (b) appreciation will behave in a more pro-environmental way than individuals with lower levels of collective efficacy.

1.3. Sociodemographic variables

Sociodemographic variables (Scannell and Gifford, 2013; Tabernero et al., 2015), and specifically place of residence, have also constituted the focus of interest in pro-environmental studies. Studies that explored the role played by place of residence have revealed inconsistencies, with some finding that people in rural areas, who may be expected to be more in touch with nature, report greater pro-environmental behaviors (Berenguer et al., 2005; Gifford and Nilsson, 2014), whereas others have found that people living in cities with higher numbers of inhabitants are more pro-environmental (Gifford and Nilsson, 2014; Tabernero et al., 2015), perhaps owing to the greater possibilities they are afforded to act in such ways (greater accessibility to containers, greater exposure to campaigns, etc.).

Therefore, we propose the following new hypotheses:

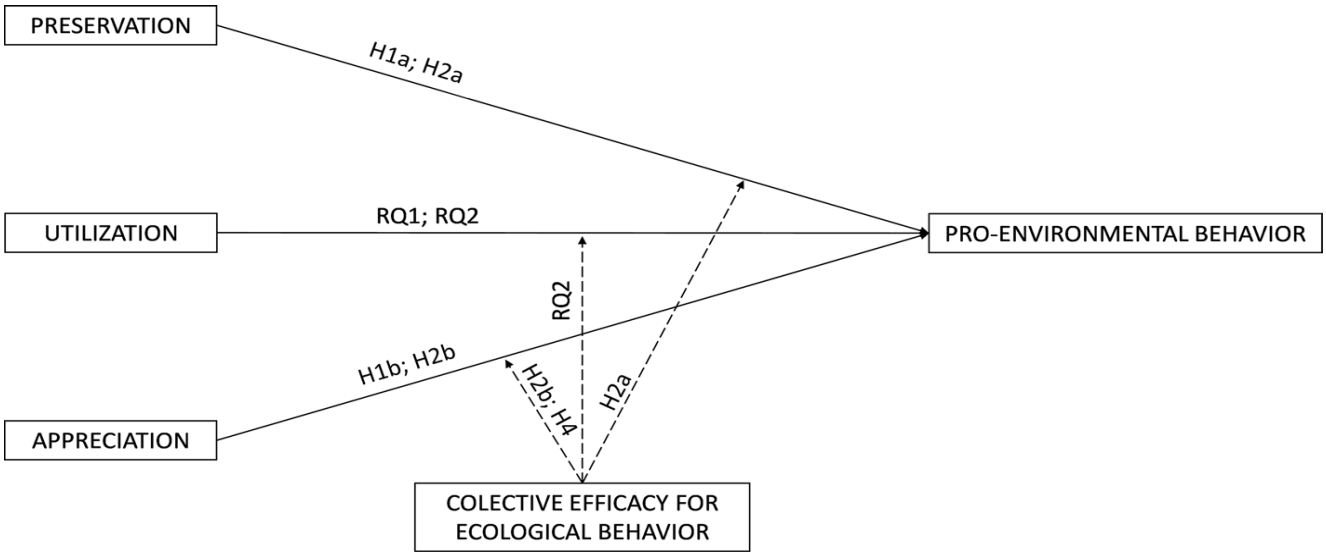
> **Hypothesis 3** Place of residence will predict pro-environmental behavior, this being greater among urban people than rural people.

> **Hypothesis 4** The interactions hypothesized on hypothesis 2 will remain in the presence of place of residence as covariate. It means that the moderating role of collective efficacy in the relationship established between (a) preservation and pro-environmental behavior and (b) appreciation and pro-environmental behavior will remain in the presence of place of residence as covariate.

Moreover, the *third research question* is whether the moderating role of collective efficacy in the relationship established between utilization and pro-environmental behavior will remain in the presence of place of residence as covariate.

In brief, we propose the relationships shown in Figure 4.

Figure 4. Schematic representation of the relationship between hypotheses (H1a; H1b; H2a; H2b and H4) and research questions (RQ1 and RQ2).



Note. H = hypothesis; RQ = research question

1.4. Individual ecological behaviors: recycling and energy saving

Individuals are generating more and more household waste in our consumerist societies. Moreover, the waste produced is of all types: food and water waste, waste from electrical and electronic equipment, packaging waste, and so forth. Consequently, sustainability implies responsible waste management from individuals (United Nations Environment Programme, 2011), including recycling behaviors to reduce pollution and the depletion of natural resources, while saving more energy (Cui and Zhang, 2008; Echegaray and Hansstein, 2017; King et al., 2006; Zeng et al., 2015). As such, studies regarding how best to increase recycling behaviors seem to be growing in relevance. To this end, we will respond to the hypotheses provided by exploring them in relation to recycling behavior as a dependent variable with a Spanish sample.

Moreover, climate change and the depletion of natural resources are two significant problems in our society. Today's society is associated with high levels of demand for energy not only from industries, but also individuals' homes. Indeed, the energy consumption generated at home constitutes a fairly high share of global energy consumption (Zhou and Yang, 2016). Thus, one means of reducing climate change and resource depletion is to stimulate energy-saving behaviors among individuals,

both at home and at work, which renders studies about how to increase individuals' energy-saving behaviors highly relevant. Therefore, we will also respond to the research questions and hypotheses with energy saving as an ecological behavior observed, this time in an Ecuadorian sample instead.

2. Method

Two studies were performed, the first one in a Spanish sample, and the second one in an Ecuadorian sample. In Study1, we respond to all the research questions and to hypotheses 1 and 2, by using recycling behavior as our dependent variables.

In Study 2, we replicate the results found in Study 1, but by using another pro-environmental behavior, namely energy saving, and by considering another cultural sample, Ecuadorian individuals. Moreover, we responded not only to hypotheses 1 and 2, but also to hypotheses 3 and 4.

This research has a cross-cultural approach, and it shares the application of the same instruments for both samples. Gálvez-Ruiz et al. (2018) justify the validity of apply ing instruments in the contexts of Spain and Ecuador, which, although culturally different, share the same language. The economic context is different in both countries, and this aspect could be relevant to explore if the results are maintained in those two different contexts.

2.1. Participants

2.1.1. Study one

The Spanish sample[1] comprised 502 students of different vocational courses at the University of Córdoba (95%) and the University of Salamanca (5%) in Spain. The former is located in a city with a population of over 370,000 inhabitants; the latter is in a smaller city, containing fewer than 160,000 inhabitants. Some of the authors are originally from Spain, and they were granted permission to apply the instruments in

[1] By computing a priori power analysis with G*power software for F tests as tests family and linear multiple regression as statistical test, and by entering three as the number of tested predictors and three as the total number of predictors, while asking for an effect size of small to medium (0.05), the optimal total sample size was 348 participants, with a power of 0.95. Moreover, when computing post-hoc power analysis with G*power software, once more for F tests as tests family and linear multiple regression as statistical test and by entering three as the number of tested predictors, three as the total number of predictors and 502 as the total sample size, the output parameter for power was 0.99. Therefore, our sample size was sufficient.

those universities. Regarding the careers for which the participants were training, 32.7% of the participants were enrolled in teacher training for children's education, 23.5% in teacher training for elementary school, 20.5% in biology, 7.4% in psychology, 7.2% in labor relations and human resources, 5.2% in social education, and 3.6% in sociology. Most of the respondents to the questionnaire were women (77.5%). The average age of the sample was 21.21 years (SD = 3.92, [18, 49]).

2.1.2. Study two

The Ecuadorian sample[2] comprised 544 students at different universities in Ecuador. In this case, one of the authors is originally from Ecuador, and all the authors got access to apply the instruments in those universities. Specifically, 40.8% of the students were enrolled in the Technique University of Manabí, 30.1% in the Laic Eloy Alfaro of Manabí University, 17.6% in the Agricultural Polytechnic Superior School of Manabí, and 11.4% in the South of Manabí State University. Students were pursuing courses in administration (29.8%), teacher training, psychology, and pedagogy (28.7%), environmental, forest, and agricultural engineering (27.1%), marketing engineering (5.4%), veterinary (3.9%), nursing (2.6%), and others (2.5%). More women (62.7%) than men completed the questionnaire. The average age of the sample was 21.23 years (SD ± 3.95, [18, 45]). Most of the participants (61.4%) were living in an urban area, while 38.6% were living in a rural area.

2.2. Procedure

This study, which was previously approved by the Research Ethical Committee of Córdoba, was correlational and transversal. The university professors

[2] As in Study 1, we computed a priori power analysis for F tests family and linear multiple regression analysis as statistical test in G*power software, but this time by entering three as the number of tested predictors and four as the total number of predictors (in each moderation analysis three predictors were entered to respond to our moderating hypotheses, as well as place of residence as covariate to control the effect of third variables). The results were the same as in Study 1. Moreover, when computing a priori power analysis for a one-way ANOVA analysis, entering two as the number of groups and by asking once more for an effect size of small to medium (0.18), the results for an optimal total sample size were 404 participants, with a power of 0.95.

In addition, when computing the same post hoc power analysis for linear multiple regression analysis with G*power software as in Study 1, but by entering three as the number of tested predictors, four as the total number of predictors, and 544 as the total sample size, the output parameter for power was 0.99. Moreover, when conducting the post hoc analysis for the one-way ANOVA statistical test by entering 544 as the total sample size, the output parameter for power was 0.99. Therefore, our sample size was sufficient.

disseminated a link to an online questionnaire with sociodemographic, individual, and collective variables on the website of the courses they were teaching and invited their students to participate voluntarily. Students could participate using either their computer or cellphone.

To answer the questionnaire, the participants had to first give their informed consent. For informed consent, they were advised that participation was voluntary and anonymous, and that they could withdraw whenever they wanted.

2.3. Measures

2.3.1. Sociodemographic data

Information on age, sex, university of enrollment, and career was collected to describe the sample. For study 2, place of residence was added to the sociodemographic variables collected.

2.3.2. Environmental values

Participants' environmental attitudes were measured using the Environmental Values (2-MEV) and Appreciation of Nature Scale (Bogner, 2018). This scale enabled us to assess the preservation (PRE), utilization (UTI), and appreciation of nature (APP) attitudes of participants. Preservation refers to participants' attitudes toward the conservation of the environment, utilization refers to their attitudes toward its exploitation, and appreciation refers to their attitudes toward its enjoyable use. Each of the three dimensions was composed of seven items, to which participants responded using a 5-point Likert scale, on which 1 signified "do not agree at all" and 5 "totally agree." The factorial analysis with oblique rotation using the Promax procedure and with kappa set to the default value of four revealed that the items were loaded in the three expected factors, as in the original scale. Reliabilities for the three dimensions were high for both the Spanish (αPRE = 0.73; αUTI = 0.79; αAPP = 0.88) and the Ecuadorian (αPRE = 0.85; αUTI = 0.78; αAPP = 0.94) samples.

2.3.3. Perceived collective efficacy for ecological behavior

In order to measure the extent to which individuals perceived that their group could undertake ecological behaviors, we created an ad hoc scale of eight brief items (see Appendix 1) by following Bandura's (2006) guide to constructing self-efficacy

scales, and adapting and extending the self-efficacy for recycling behavior scale used by Tabernero and Hernández (2011a, b). The participants responded in a 5-point Likert scale in which 1 was “not at all confident” and 5 was “totally confident.” Reliability was high for both the Spanish (α = 0.90) and the Ecuadorian (α = 0.96) samples, in accordance with the original self-efficacy for recycling behavior scale (α = 0.90) used by Tabernero and Hernández (2011a, b).

2.3.4. Individual ecological behavior

Ecological behaviors were collected through frequency scales. Two different individual ecological behaviors were studied: recycling and energy-saving behaviors.

1. **Recycling behavior** The extent to which individuals recycle was measured for Study 1 through an ad hoc self-created frequency scale comprising three short items (see Appendix 1), to which participants responded using a 5-point Likert scale, on which 1 was “never” and 5 was “always.” Reliability was adequate (α = 0.70). The mean of the three items was calculated, and higher scores of this mean indicated higher individual ecological behavior.
2. **Energy-saving behavior** The extent to which individuals carry out ecological behaviors oriented to saving energy was measured for Study 2 via an ad hoc self-created frequency scale of six items (see Appendix 1). The items were created using the general measure of ecological behavior (Casey and Scott, 2006), as well as the recommendations proposed by Greenpeace to achieve ecological energy-saving behaviors. Reliability was high (α = 0.80). Participants responded to the scale through a 5-point Likert scale, where 1 was “never” and 5 was “always.” The mean of the six items was calculated, and higher scores of this mean indicated higher individual ecological behavior.

2.4. Statistical analyses.

To check the means and standard deviations of the variables as well as the relationship between them, some descriptive correlational analyses were performed.

To confirm the moderation hypotheses, different moderation analyses were performed using model 1 of the Process for SPSS Macro (Hayes and Preacher, 2013), with 10,000 repeated samples of bootstraps and an interval of confidence of 95%.

Model 1 of the Process for SPSS Macro calculates the conditional (or moderated) effect of an independent variable (IV) on a dependent one (DV). Environmental values (in the first moderation analysis, preservation; utilization in the second one; and appreciation in the third one) were introduce as IV. Perceived collective efficacy for ecological behavior was introduced as moderator. The environmental values that were not introduced as IV in each analysis were introduced as covariates in order to control the effects of other variables[3]. Finally, individual ecological behavior (recycling behavior for Study 1 and energy-saving behavior for Study 2) was introduced as a dependent variable. Those moderation analyses were first computed without covariates, and then with the covariates cited. Moreover, for Study 2, and to test Hypotheses 3 and 4, place of residence (coded as -5.00 for individuals living in rural areas and 5.00 for individuals living in urban areas) was included as another covariate.

To confirm the hypothesis regarding the influence of place of residence in the individual ecological behavior, a one-way analysis of variance (ANOVA) was performed in Study 2, with energy-saving behavior as DV and place of residence as IV.

3. Results

3.1. Preliminary analyses

The Pearson's correlation analyses performed showed that all the variables were related as expected for both studies (see Table 6). These results are in line with the expectation for research question 1 and hypothesis 1.

[3] It means, in the first moderation analysis, in which preservation was introduced as IV, both utilization and appreciation were introduced as covariates; in the second moderation analysis, in which utilization was introduced as IV, both preservation and appreciation were introduced as covariates; and in the third moderation analysis, in which appreciation was introduced as IV, preservation and utilization were introduced as covariates.

Table 6. *Means, standard deviation, and correlation between all the study variables for the Spanish and the Ecuadorian samples*

	Preservation	Utilization	Appreciation	CEfEB	ISEB	IRB	Mean	SD
Preservation	-	**-.09***	**46*** **	**.30*** **	**.39*** **	-	**4.24**	**0.77**
Utilization	*-.32*** **	-	**-.08***	**.02**	**-.05**	-	**2.78**	**0.88**
Appreciation	*.31*** **	*-.15*** *	-	**.36*** **	**.34*** **	-	**4.22**	**0.74**
CEfEB	*.18*** **	*.04*	*-.15*** *	-	**.32*** **	-	**3.87**	**0.94**
IRB	*.20*** **	*-.09**	*.20*** **	*.16*** **	-	-	-	-
ISEB	-	-	-	-	-	-	**4.16**	**0.71**
Mean	*4.24*	*2.06*	*3.53*	*3.73*	-	3.88	-	-
SD	*0.60*	*0.75*	*0.80*	*0.77*	-	0.93	-	-

Notes. ***p < .001; **p < .01. Lower triangle, highlighted in italic: data for the Spanish sample; upper triangle, highlighted in bold: data for the Ecuadorian sample. *CEfEB* Collective efficacy for ecological behavior; *IRB* individual recycling behavior; ISEB individual saving energy behavior; *SD* standard deviation.

3.2. Moderation analyses

For Study 1, the moderation analyses confirmed that collective efficacy for ecological behavior moderated the relationship established between environmental values and recycling behavior (Table 7), confirming hypotheses 1 and 2 and research questions1 and 2. The effect of the moderator on the environmental values-recycling behavior link can be observed in Figure 5a.

For Study 2, as stated by the results and in accordance with Study 1, the moderated analyses confirmed that the collective efficacy for ecological behavior moderated the relationships established between environmental values (except for utilization) and energy-saving behavior (Table 8), by confirming hypotheses 1 to 3, and partially hypothesis 4, but not research questions 1 and 2. The effect of the moderator on the environmental values-energy-saving behavior link can be observed in Figure 5b.

Table 7. *Coefficients for the moderation hypotheses: Collective efficacy for ecological behavior as a moderator in the relationship between environmental values and individual recycling behavior (Study 1)*

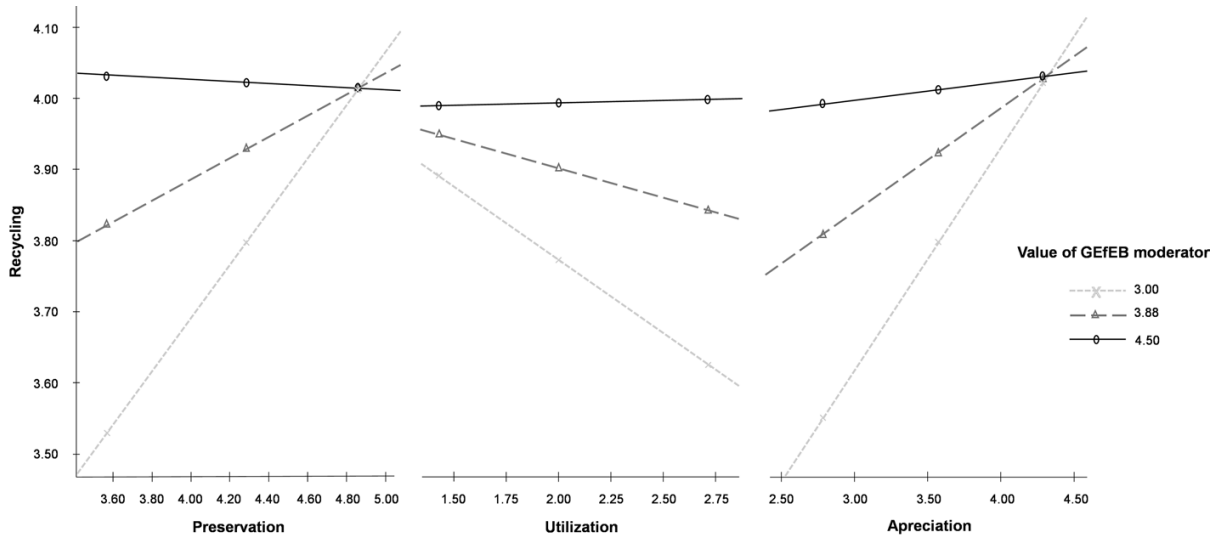
		Coeff	*SE*	*P* [LLCI; ULCI]
Preservation as independent				
Model without covariates				
X (Preservation)	b_1	1.25	.30	<.001 [0.671;
M (CEfEB)	b_2	1.32	.35	<.001 [0.633;
XM (Preservation x CEfEB)	b_3	–0.27	.08	<.001 [–0.429; –
Constant	i_1	–2.03	1.27	.110 [–4.519;
	R^2=.08		ΔR^2 = .02	
	F (3,498) = 14.195, p < .001		F (1,498) = 11.395, p < .001	
Model with covariates				
X (Preservation)	b_1	1.14	.30	<.001 [0.563;
M (CEfEB)	b_2	1.27	.35	<.001 [0.588;
XM (Preservation x CEfEB)	b_3	–0.27	.08	.001 [–0.420; –
Co_1 (Utilization)	b_7	–0.05	.06	.391 [–0.158;
Co_2 (Appreciation)	b_8	0.15	.05	.005 [0.044;
Constant	i_1	–1.95	1.27	.125 [–4.442;
	R^2 = .10		ΔR^2 = .02	
	F (5,496) = 10.421, p < .001		F (1,496) = 10.814, p = .001	
Utilization as independent				
Model without covariates				
X (Utilization)	b_1	–0.85	.27	.002 [–1.381; –
M (CEfEB)	b_2	–0.18	.15	.227 [–0.465;
XM (Utilization x CEfEB)	b_3	0.18	.07	.006 [0.052;
Constant	i_1	4.88	.59	<.001 [3.719;
	R^2 = .05		ΔR^2 = .01	
	F (3,498) = 8.733, p < .001		F (1,498) = 7.574, p = .006	

Table 7 *(continued)*

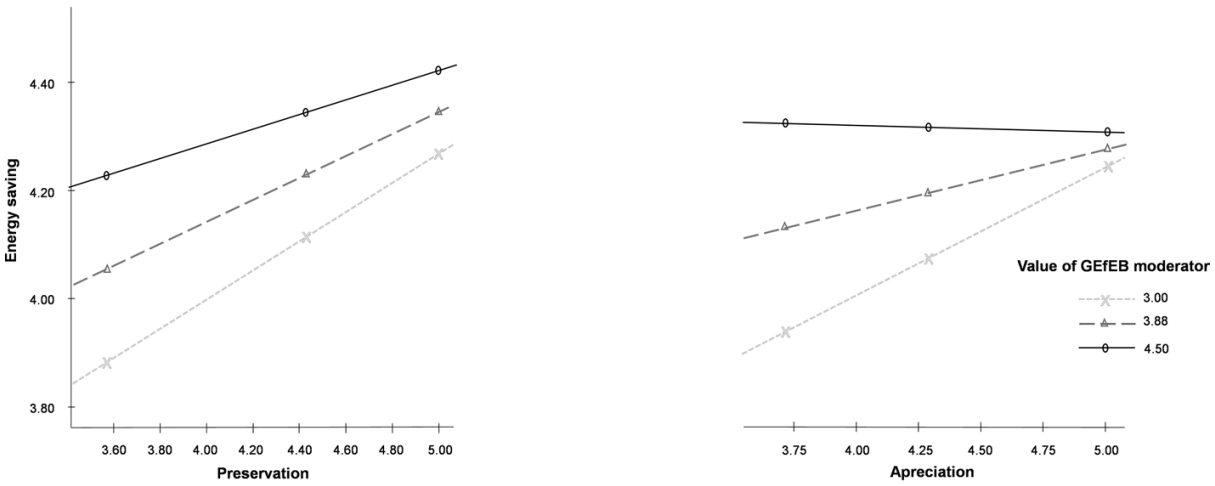
		Coeff	*SE*	*P* [LLCI; ULCI]
Model with covariates				
X (Utilization)	b_1	–0.63	.27	.022 [–1.163; –0.092]
M (CEfEB)	b_2	–0.15	.14	.297 [–0.434; 0.133]
XM (Utilization x CEfEB)	b_3	0.14	.07	.029 [0.015; 0.275]
Co_1 (Preservation)	b_7	0.18	.07	.016 [0.034; 0.328]
Co_2 (Appreciation)	b_8	0.15	.05	.005 [0.047; 0.254]
Constant	i_1	3.32	.70	<.001 [1.935; 4.697]
	R^2=.08		ΔR^2 = .01	
	F (5,496) = 9.123, p < .001		F (1,496) = 4.816, p = .029	
Appreciation as independent variable				
Model without covariates				
X (Appreciation)	b_1	0.90	.23	<.001 [0.443; 1.361]
M (CEfEB)	b_2	0.82	.22	<.001 [0.385; 1.260]
XM (Appreciation x CEfEB)	b_3	–0.19	.06	.002 [–0.309; –0.067]
Constant	i_1	0.11	0.83	.891 [–1.525; 1.754]
	R^2 = .07,		ΔR^2 = .01,	
	F (3,498) = 13.306, p < .001		F (1,498) = 9.320, p = .002	
Model with covariates				
X (Appreciation)	b_1	0.80	.23	<.001 [0.339; 1.262]
M (CEfEB)	b_2	0.75	.22	<.001 [0.316; 1.191]
XM (Appreciation x CEfEB)	b_3	–0.17	.06	.005 [–0.293; –0.052]
Co_1 (Preservation)	b_7	0.18	.07	.014 [0.038; 0.330]
Co_2 (Utilization)	b_8	–0.04	.06	.451 [–0.153; 0.068]
Constant	i_1	–0.16	.87	.855 [–1.860; 1.542]
	R^2 = .08		ΔR^2 = .02	
	F (5,496) = 9.801, p < .001		F (1,496) = 7.949, p = .005	

Note. *X* independent variable; *M* moderator; *Co* covariate; *CEfEB* collective efficacy for ecological behavior. Coefficients are unstandardized

Figure 5. *Moderated effect of collective efficacy for ecological behavior in the relationship established between environmental values and pro-environmental behavior in both studies.*



a *Significant moderated effect of collective efficacy for ecological behavior in the relationship established between environmental values and recycling behavior(Study 1)*



b *Significant moderated effect of collective efficacy for ecological behavior in the relationship established between environmental values and energy-saving behavior (Study 2)*

Note. GEfEB = Collective efficacy for ecological behavior

Table 8. *Coefficients for the moderation hypotheses: Collective efficacy for ecological behavior as a moderator in the relationship between environmental values and individual energy saving (Study 2)*

Models		Coeff	*SE*	*P* [LLCI; ULCI]
Preservation as independent				
Model without covariates				
X (Preservation)	b_1	0.57	.11	<.001 [0.355; 0.793]
M (CEfEB)	b_2	0.50	.13	<.001 [0.250; 0.744]
XM (Preservation x CEfEB)	b_3	–0.08	.03	.008 [–0.139; –0.021]
Constant	i_1	1.13	.45	.013 [0.240; 2.020]
	R^2=.21		ΔR^2 = .01	
	F (3,540) = 46.647, p < .001		F (1,540) = 7.099, p = .008	
Model with covariates				
X (Preservation)	b_1	0.47	.11	<.001 [0.246; 0.698]
M (CEfEB)	b_2	0.41	.13	.001 [0.168; 0.663]
XM (Preservation x CEfEB)	b_3	–0.07	.03	.026 [–0.126; –0.008]
Co_1 (Place of residence)	B_6	0.18	.06	.002 [0.068; 0.289]
Co_2 (Utilization)	b_7	–0.01	.03	.733 [–0.072; 0.051]
Co_3 (Appreciation)	b_8	0.14	.04	.001 [0.052; 0.222]
Constant	i_1	1.02	.46	.026 [0.126; 1.914]
	R^2 = .24		ΔR^2 = .01	
	F (6,532) = 27.493, p < .001		F (1,532) = 4.981, p = .026	
Utilization as independent				
Model with covariates				
X (Utilization)	b_1	–0.09	.13	.488 [–0.345; 0.165].
M (CEfEB)	b_2	0.21	.09	.020 [0.034; 0.393]
XM (Utilization x CEfEB)	b_3	0.01	.03	.724 [–0.052; 0.074]
Constant	i_1	3.46	.37	<.001 [2.737; 4.184]
	R^2 = .11		ΔR^2 = .01	
	F (3,540) = 21.399, p < .001		F (1,540) = 0.125, p = .724	

Table 8 *(continued)*

Models		Coeff	*SE*	*P* [LLCI; ULCI]
Model with covariates				
X (Utilization)	b_1	–0.09	.12	.516 [–0.317; 0.160]
M (CEfEB)	b_2	0.09	.09	.320 [–0.084; 0.257]
XM (Utilization x CEfEB)	b_3	0.02	.03	.537 [–0.040; 0.078]
Co_1 (Place of residence)	b_6	0.18	.06	.002 [0.066; 0.288]
Co_2 (Preservation)	b_7	0.23	.04	< .001 [0.152; 0.310]
Co_3 (Appreciation)	b_8	0.15	.04	< .001 [0.070; 0.238]
Constant	i_1	2.11	.38	< .001 [1.370; 2.848]
	R^2=.23		ΔR^2 = .01	
	F (6,532) = 26.498, p < .001		F (1,532) = 0.382, p = .537	
Appreciation as independent variable				
Model without covariates				
X (Appreciation)	b_1	0.80	.13	< .001 [0.557; 1.053]
M (CEfEB)	b_2	0.81	.14	< .001 [0.531; 1.087]
XM (Appreciation x CEfEB)	b_3	–0.15	.03	< .001 [–0.220; –0.089]
Constant	i_1	0.20	.51	.704 [–0.813; 1.204]
	R^2 = .19		ΔR^2 = .03	
	F (3,540) = 43.430, p < .001		F (1,540) = 21.225, p <.001	
Model with covariates				
X (Appreciation)	b_1	0.61	.13	< .001 [0.351; 0.866]
M (CEfEB)	b_2	0.65	.14	< .001 [0.370; 0.934]
XM (Appreciation x CEfEB)	b_3	–0.12	.03	< .001 [–0.190; –0.058]
Co_1 (Place of residence)	b_6	0.18	.06	.001 [0.075; 0.295]
Co_2 (Preservation)	b_7	0.20	.04	< .001 [0.116; 0.276]
Co_3 (Utilization)	b_8	–0.02	.03	.534 [–0.080; 0.042]
Constant	i_1	0.24	.50	.640 [–0.754; 1.226]

Table 8 *(continued)*

Models		Coeff	*SE*	*P* [LLCI; ULCI]
	R^2=.25		ΔR^2 = .02	
	F (6,532) = 29.341, *p* < .001		*F* (1,532) = 13.524, *p* < .001	

Note X independent variable; *M* moderator; *Co* covariate; *CEfEB* collective efficacy for ecological behavior. Coefficients are unstandardized

3.1. Differences in energy saving depending on the sociodemographic variables

The results of the ANOVA confirmed hypothesis 3 regarding place of residence (M_{rural} = 4.01, SD = 0.80; M_{urban} = 4.26, SD = 0.64; F (1, 538) = 16.069, p < 0.001, η^2= 0.03, OP = 0.98).

The difference in the results of Study 1 and Study 2 for each one of the hypotheses and analyses can be observed on Table 9.

Table 9. *Study 1 and Study 2 results comparison*

	Study 1. Recycling as pro-environmental behavior	Study 2. Energy saving as pro-environmental behavior
Correlation analyses		
RQ1	Confirmation of the relationship between utilization with recycling	The relationship between utilization and energy saving was not confirmed (RQ1)
H1	Confirmation of the relationship between preservation (H1a), appreciation (H1b), and CEfEB with recycling	Confirmation of the relationship between preservation (H1a), and appreciation (H1b), and CEfEB with energy saving
Moderation analyses results		
RQ1	Confirmation of utilization as predictor of recycling	Confirmation of utilization as predictor of energy saving
H1	Confirmation of preservation (H1a) and appreciation (H1b) as predictors of recycling	Confirmation of preservation (H1a) and appreciation (H1b) as predictor of energy saving
RQ2	Confirmation of the moderating role of CEfEB on the link between utilization and recycling	Moderating role of CEfEB on the link between utilization and energy saving not confirmed
H2	Confirmation of the moderating role of CEfEB on the link between preservation and recycling link–H2a	Confirmation of the moderating role of CEfEB on the link between preservation and energy saving – H2a
	Confirmation of the moderating role of CEfEB on the link between appreciation and recycling–H2b	Confirmation of the moderating role of CEfEB on the link between appreciation and energy saving – H2b
RQ3	No studied	Confirmation of the maintenance of the observed interaction between utilization and collective efficacy with energy saving in the presence of place of residence as covariate
H4	No studied	Confirmation of the maintenance of the observed interaction between preservation and CEfEB with energy saving in the presence of place of residence as covariate–H4a; Confirmation of the maintenance of the observed interaction between appreciation and CEfEB with energy saving in the presence of place of residence as covariate–H4aConfirmation of the maintenance of the observed interaction between appreciation and CEfEB with energy saving in the presence of place of residence as covariate–H4a

Table 9 *(continued)*

	Study 1. Recycling as pro-environmental behavior	Study 2. Energy saving as pro-environmental behavior
ANOVA analyses results		
H3	Not studied	Confirmation of the difference on energy saving between urban and rural people

4. Discussion

4.1. Study one

In accordance with previous literature (Binngießer and Randler, 2015; Kaiser et al., 2014; Kibbe et al., 2014; Mancha and Yoder, 2015; Roczen et al., 2014), the results of Study 1 have shown that regarding the personal variable, the three environmental values explored were related to recycling. Therefore, it has been shown that the more individuals appreciate and enjoy the use of nature, and the more they value it as an item that must be preserved and protected, then the more they recycle. In contrast, the more they think that nature must be exploited by humans, the less they report recycling.

More interestingly, the distinctive contribution of this research is its confirmation that personal and collective variables interact to explain pro-environmental behavior, as other authors have claimed (Bamberg et al., 2015; Fritsche et al., 2018; Jugert et al., 2016; Tabernero et al., 2015); the novelty of this study is that the specific interaction explored between environmental values and collective efficacy in predicting pro-environmental behavior has not been studied in previous researches. It means, interactions between collective and individual variables have been found before, but the interaction that we have explored in this research has not been studied previously. In this sense, in Study 1, collective efficacy for ecological behavior moderated the relationships that environmental values established with pro-environmental behavior. Indeed, the results have shown that the lower the values for preservation and appreciation of nature, the greater the necessity of collective efficacy beliefs for individuals to exhibit high levels of recycling behavior; moreover, when preservation and appreciation of nature are high, levels of collective efficacy beliefs are not relevant to predict recycling behavior. In contrast, the higher the utilization value is, the more necessary collective efficacy beliefs are for individuals to present high levels of recycling behavior, while when utilization levels are low, there is no difference in the recycling behavior levels between individuals with high and low collective efficacy levels (see Fig. 5). These results indicate the pertinence of promoting collective efficacy for ecological behaviors, especially in individuals with low levels of preservation and appreciation values, or with high levels of utilization values. In this sense, the critical perspective on environmental education could be highly relevant.

By using participatory collaborative activities oriented to increase the perception of the importance of maintaining biodiversity and preserving nature, typical of the critical environmental education approaches (Stevenson et al., 2017), perceived collective efficacy for ecological behaviors will be inevitably enhanced, and in turn pro-environmental behaviors displayed by individuals and societies.

4.2. Study two

The results of Study 2 supported almost all the results found in Study 1, as well as almost all the new hypotheses introduced. As in Study 1, and in agreement with previous studies that have found that collective and individual variables interact to explain individual behaviors, and specifically pro-environmental behavior (Cuadrado and Tabernero, 2015; Fritsche et al., 2018; Jugert et al., 2016; Tabernero et al., 2015), the moderating effect of the collective efficacy beliefs on the relationships that both preservation and appreciation of nature established with pro-environmental behavior was confirmed. Moreover, this interaction remained in the presence of place of residence as covariate, revealing a significant impact of place of residence on pro-environmental behavior. As in Study 1, collective efficacy for ecological behavior buffered the negative impact of low preservation and low appreciation of nature on pro-environmental behavior. Nevertheless, the moderating effect hypothesized in the relationship between utilization and pro-environmental behavior was not confirmed.

In addition, individuals living in urban areas reported greater energy-saving behavior than people living in rural areas, highlighting the importance of policies oriented specifically toward rural areas. These results are in agreement with previous studies (Gifford and Nilsson, 2014; Tabernero et al., 2015).

4.3. General discussion

Encouraging pro-environmental behaviors in individuals is necessary for the preservation and sustainability of the planet. The actions and behaviors often included in pro-environmental behaviors are always directed toward common objectives, such as preservation and/or environmental conservation, and the resolution of environmental problems (Liu and Chen, 2019). The previous does not mean carrying out an individualistic education based solely on the correction of actions already performed. We cannot rely only on the sum of individual actions and expect an impact on society—on the contrary, we need to understand the complexity of environmental

and social interactions and the participation of all individuals as a whole, in order to expect a social impact (de Albuquerque et al., 2015). Both recycling and energy saving are behaviors that can be undertaken by individuals at home or at work, and that have an impact on different environmental problems, including climate change, pollution, and the depletion of natural resources (Cui and Zhang, 2008; Echegaray and Hansstein, 2017; King et al., 2006; United Nations Environment Programme, 2011; Zeng et al., 2015). Consequently, the study of how to increase these behaviors seems to be highly relevant to advance from individual changes to community changes to bring about a new reality at the social level.

The best way to stimulate pro-environmental behavior is probably not to limit the focus to related individual variables, but rather to emphasize the collective variables that can affect them (Bamberg et al., 2015; Fritsche et al., 2018; Jugert et al., 2016; Peattie and Peattie, 2009; Shove, 2010; Tabernero et al., 2015). Given that individuals are social by nature, they are highly influenced by the group and collectivity around them (Bandura, 2006; Ferguson and Branscombe, 2010; Fritsche et al., 2018; Jugert et al., 2016). In this regard, the extent to which individuals perceive that their group can behave effectively in an ecological way may influence their pro-environmental behavior, as well as the extent to which their environmental values are capable of producing such pro-environmental behaviors (Chen, 2015; Jugert et al., 2016; Tabernero and Hernández, 2011b; Tabernero et al., 2015). The results of these two studies have partially supported this hypothesis. In accordance with previous literature (Boeve-de Pauw and Van Petegem, 2013a; Kaiser et al., 2014; Kibbe et al., 2014; Mancha and Yoder, 2015; Roczen et al., 2014), Studies 1 and 2 have shown that the more individuals believe that nature must be preserved and protected, and the more individuals appreciate and enjoy its use, the more they report acting pro-environmentally for both pro-environmental behaviors explored (recycling and energy saving). Moreover, both studies have shown that collective efficacy for ecological behavior moderated these relationships, supporting the results attained by Tabernero et al. (2015), in which collective efficacy acts as a moderator in relationships established between other personal variables and waste management. In our two studies, the results have demonstrated that individuals with low values for preservation and appreciation of nature require high collective efficacy beliefs to endorse strong pro-environmental behaviors. These results indicate the importance of promoting high

levels of belief in collective efficacy for ecological behavior, especially among those with low levels of preservation and appreciation values. Encouraging ecological behavior can be achieved via critical environmental education, through an integral approach of social, economic, and environmental dimensions (de Albuquerque et al., 2015), and by involving individuals in collective activities and approaches, typical in critical environmental education (Stevenson et al., 2017), in which they must construct collectively and through critical thinking their own though and perceptions about the importance of preserving biodiversity and nature as a whole. This can lead to a more cooperative and ecocentric society, which could favor the development of collective efficacy and thus encourage ecological behavior at both individual and societal levels.

Regarding utilization, in the same way that inconsistencies appear in the results of different studies in the scientific literature—the relationship between utilization and pro-environmental behavior not always being observed (Binngießer and Randler, 2015; Boeve-de Pauw and Van Petegem, 2013a; Milfont and Duckitt, 2004)—our results have revealed inconsistencies between the two studies. The more individuals exhibited an anthropocentric perspective regarding the use of nature (i.e., by thinking that individuals dominate and can exploit and alter nature as they want), the less they reported recycling behaviors, while no relationship was confirmed between utilization values and energy-saving behaviors. Moreover, collective efficacy for ecological behavior moderated the relationship established between utilization and recycling (i.e., by reducing the negative impact of utilization on recycling), yet no interaction effect was found between utilization and collective efficacy in predicting energy saving. The fact that no relationship was identified between utilization and energy saving when a negative correlation might be expected may be due to the fact that energy saving can be adopted by individuals not to preserve nature, but rather in a more egoistic way. In this sense, utilization situates the individual as the main beneficiary in the use of natural resources (Schumm and Bogner, 2016). This is because saving energy is a means of saving money as well, and so it is plausible that this latter motive influences energy-saving behavior and operates as a covariate or moderator, affecting the possible negative relationship between utilization and energy saving. This finding is therefore congruent with the notion that people with strong egoistic values and motivation will behave pro-environmentally when they perceive that the benefits outweigh the costs (de Groot and Steg, 2008, 2009). For example, some individuals

who think that nature must be exploited for human gain may save energy in order to save money (an egoistic motive), while others who agree that resources should be exploited and who moreover do not perceive that the benefits of saving energy outweigh the personal costs involved, may have no interest in preserving nature and hence may not save energy. In line with this idea, Brandsma and Blasch (2019) have found that when individuals hold egoistic values, they are less willing to save energy, except when doing so gives them a monetary benefit. Future studies may place special attention on the plausible moderation effect of egoistic motives in the relationship established between utilization and energy saving. It is important to note that this moderating effect may help explain the inconsistencies found in the studies regarding the relationship established between utilization and pro-environmental behavior. In this sense, it can be considered that several countries have endorsed payments for environmental services (Gómez-Baggethun et al., 2010; Tacconi, 2012) and that natural ecosystems can provide economic benefits—that is, what is called ecological services (McCauley, 2006). This perspective is congruent with the view of a sort of egoistic perspective, by safeguarding nature for self-benefit. Nonetheless, this economic view of the natural world and the mechanisms for conservation that are based on an economic perspective are probably not the most relevant to cope with the actual relevant ecological problems, and most authors argue that our efforts have to be reoriented to encourage connection and love for the natural world (McCauley, 2006). In this sense, a critical environmental education approach, oriented to help individuals and groups to construct moral arguments for biodiversity conservation not only based on human interest, but also on ecocentric values, seems to be highly relevant. Environmental education should be oriented to a collaborative construction of the conviction that nature and biodiversity are intrinsically of interest and have to be valued beyond their possible interest as an element at the service of individuals (Kopnina, 2020; Taylor et al., 2020). On the other hand, it is necessary to emphasize that although individuals depend on natural resources and common natural goods for their survival, the use they make of nature is not only destructive, but also many individuals make a sustainable use of them, independently if they do so for egoistic or ecocentric motives.

No egoistic motives can be perceived in terms of household recycling, as no economic benefit is obtained in either Spain or Ecuador for doing so, and thus the

relationship between utilization and recycling remains. Preservation reveals selfless preservation and protection preferences toward the natural environment (Schumm and Bogner, 2016). Therefore, our results confirmed that the more individuals believe that nature must be exploited by humans, the less they recycle, especially where they do not believe that their group is able to effectively behave in an ecological way. In contrast, high levels of collective efficacy for ecological behavior had the power to eliminate the negative impact of high utilization values on recycling: when individuals possess strong collective efficacy beliefs, those with high utilization values recycle to the same extent as those with low utilization values. Again, the promotion of collective efficacy beliefs seems to be relevant to stimulate pro-environmental behavior in individuals, especially among those with high utilization values. In this sense, again, critical environmental education may be highly relevant; this type of educational perspective, based on sharing collaboratively activities and critical approaches on learning, could increment not only more ecocentric values on individuals and groups, but also the necessary collective efficacy beliefs about ecological behavior, that could in turn increment pro-environmental behavior at the individual and collective level.

5. Limitation and future research

The major limitation of both studies is related to the samples, which comprise mostly female university students. At this stage, it should be considered that using homogeneous samples helps to reduce extreme variations in responses (Meisenberg and Williams, 2008). It should be mentioned that the sample taken is narrow in both cases and may not fully represent the local context. Nonetheless, it is relevant to note that our student sample is composed of students of very different areas, showing in this sense some heterogeneity. Moreover, students may not differ substantially in their manner of perceiving the natural environment compared to the general population. Future studies may replicate the results of these studies in a more heterogeneous sample.

It may be relevant to note that the results have shown a significant predictive role of place of residence on energy saving, with people who live in urban areas reporting more pro-environmental behaviors, in accordance with previous studies (Gifford and Nilsson, 2014; Tabernero et al., 2015). These differences demonstrate the need for heterogeneous samples in future investigations on pro-environmental

behaviors to highlight these relationships. Moreover, as we explained earlier, the inconsistencies found in the relationship established between utilization and both pro-environmental behaviors explored might be analyzed in the future by placing the focus of attention on the plausible moderator role of egoistic motives in such relations. In this sense, comparison between countries in which an economic prize for recycling is given and those in which it is not may prove interesting, as well as experimental studies in which the economic prize gain is manipulated to observe its effects on the relationship between utilization and recycling behavior. In Ecuador, regarding recycling, the Ecuadorian Constitution derives the competence in the Decentralized Autonomous Governments (Seventh Section, Art. 415); however, there are no records of incentives for recycling aimed at individuals, but rather at companies (Burneo et al., 2020). On the other hand, in Spain, Law 11/97 of April 24, about packaging and packaging waste, and Royal Decree 252/2006, of March 3 regulate aspects that have to do with recycling but do not include economic incentives aimed at individuals, in the same way of the Ecuadorian regulation.

6. Conclusions

As concern about an increasingly degraded environment escalates in our society, the importance of and interest in pro-environmental behaviors has also risen. Although focus was initially placed on personal variables related to individual pro-environmental behavior, investigations are now exploring collective variables as well. Being social animals, individuals are inevitably influenced by the behavior of the collective. In this study, we have shown that not only does perceived collective efficacy have a direct impact on individual pro-environmental behaviors, but it also interacts with environmental values to explain individual pro-environmental behaviors. Therefore, when individuals hold low values for preservation and appreciation of nature, they require strong collective efficacy levels in order to recycle and save energy.

Accordingly, with high utilization values, individuals also need substantial collective efficacy levels, with the power to counteract the negative effect of utilization values on recycling. These results indicate the relevance of promoting perceptions of collective efficacy for ecological behavior in individuals and groups, especially when they hold low levels of preservation and appreciation of nature, as well as strong

utilization values. Putting the focus on cooperation and critical and eco-pedagogy (Kopnina, 2020) could be an advantage to encourage pro-environmental behavior in individuals, by increasing the confidence in the group capability to behave in a pro-environmental way. Nevertheless, no interactive effect or relationship was found between utilization and energy saving, perhaps owing to the moderating or mediating role of additional variables that were not studied in this study, necessitating further research on this link.

6.1. Conflict of interest.

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8. Appendix

Appendix 1 Table 5. Ad Hoc Scale.

Collective Efficacy for Ecological Behavior Scale (CEfEB scale) and Individual Recycling Behavior Scale (IRB scale)	
Collective Efficacy for Ecological Behavior Scale (CEfEB scale)	
To what extent do you feel that your group is capable of…	
Item 1	Separating all the paper and cardboard generated and depositing it in the appropriate container?
Item 2	Separating all the glass generated and depositing it in the appropriate container?
Item 3	Separating all the plastic generated and depositing it in the appropriate container?
Item 4	Separating all potentially recyclable waste generated and depositing it in the appropriate container?
Item 5	Taking appropriate measure to save water (shower, washing machine, etc.)?
Item 6	Using non-polluting or collective means of transport (bike, bus, etc.)?
Item 7	Turning off lights and electrical appliances when not in use?
Item 8	Consuming only what is necessary?
Individual Recycling Behavior Scale (IRB scale)	
As for recycling…	
Item 1	I throw used batteries in a specific container for batteries
Item 2	I recycle used paper and cardboard
Item 3	I throw used glass bottles in specific containers for glass recycling
Individual energy-saving behavior scale (IE-SB scale)	
As for saving water and energy…	
Item 1	I take short showers to limit the use of water
Item 2	I turn off the tap while brushing my teeth
Item 3	I turn on the washing machine and/or dishwasher only when they are full
Item 4	When I must travel short distances or when I travel through the city, I walk, cycle, or use public transport instead of taking car or motorcycle
Item 5	I turn off the lights when there is enough natural light
Item 6	I turn off electrical appliance when I'm not using them

III. Factors that determine the connectedness with nature in rural and urban contexts.

Macias-Zambrano, L., Cuadrado, E., Carpio, A. J. (under review in PLoS ONE)

Abstract

Connectedness with nature is considered a key element for the future of conservation. There are both internal and external factors that determine the levels of connectedness with nature. Among these factors are gender, age, knowledge about the environment and place of residence. In the latter case, there may be differences in the way in which dwellers of urban and rural areas perceive nature, based on their experiences and contact with it. The main objective of this research is to evaluate and establish the factors that influence and determine the levels of connection with nature, examining how these factors are related and interact with each other, taking the urban and rural context as a starting point. The ABC-CNS scale, which addresses the affective, behavioral and cognitive aspects of the connection with nature, was applied via online questionnaire to a sample of university students from two countries, Spain (496 students) and Ecuador (872 students), who were also clustered according to career, age, gender, and place of residence. The results obtained through four General Linear Mixed Models (ABC-CNS and its dimensions as response variables) and LSD test, demonstrated that the ABC-CNS scale presented significant differences for all the variables analyzed (place of residence, gender, age, and career), also demonstrating which levels influence and interact in higher ABC-CNS values. Finally concluding that the factors analyzed contribute to the development of the connection with nature, and in the case of place of residence, attention should be place in the setting of the environments under study.

Keywords: CNS scale, contact with nature, environmental knowledge, environmental behaviour, place of residence, sustainable development

1. Introduction

The increase in the urban population along with the increased use of new entertainment technologies has caused people to spend less time outdoors, in nature (Hughes et al., 2018). This reduction of contact with nature is considered one of the reasons why society is increasingly disconnected from today's conservation problems. Various studies have shown that the individual's attachment to nature, known as connection to nature, positively influences the development of environmental behaviors, attitudes, and concerns (Capaldi et al., 2014; Mustapa et al., 2021; Yang et al., 2022).

The nature connectedness is considered a critical factor for the future of conservation (Hughes et al., 2018), even, this connection may be more important to encourage pro-environmental behavior than accepting an ecological paradigm based on beliefs (Sparks et al., 2022). The connection with nature is greater in people who have had previous experiences in natural environments (Baceviciene and Jankauskiene, 2022). Considering the nature connectedness as a potential precedent for perception of positive experiences in natural settings (Tang et al., 2014), individuals positively linked to a certain location are more likely to exhibit positive behaviors (Ramkissoon et al., 2012), and care more about conservation (Hughes et al., 2018). Nature connectedness describes a deep appreciation and affiliation toward natural environments, therefore, individuals with high levels of nature connectedness are assumed to perceive natural settings as more attractive and fascinating (Tang et al., 2014), so they show positive appreciation towards the natural environment, versus the built environment (Baceviciene and Jankauskiene, 2022).

The gap between pro-environmental attitudes and behavior will be influenced by the knowledge and experience gained from the level of personal exposure to natural environments, as well as by the general perception of the culture of natural resources in the community (Mankad and Gardner, 2016). Internal and external demographic factors, in the latter case, sociocultural, economic and institutional factors are considered influential in environmental behavior (Siegel et al., 2018).

Gender and age are internal demographic factors that influence nature connectedness (Mustapa et al., 2021). Gender plays a critical role to understand how people include nature within the cognitive representation of themselves (Pérez-

Ramírez et al., 2021). In the case of age, it has been shown that, depending on the context, levels of nature connectedness can increase or decrease with an increase in age (Kural et al., 2020). For Ernst and Theimer (2011) knowledge is key in the connection with nature, education through contact with nature using experiences and outdoor practices is a factor that affects the development of environmental concerns and preference towards natural environments. The increase in the levels of nature connectedness has been obtained through education, even in higher education (Lankenau, 2018).

Place of residence is another important factor in explaining the nature connectedness and pro-environmental behavior (Anderson and Krettenauer, 2021). People who feel attachment to natural environments develop a sense of identity with that environment (Imran et al., 2014). Also, affection and knowledge about a place increases the likelihood of protective behaviors toward that place and can generate a sense of commitment and responsibility towards the places which the individual feels more linked (Ramkissoon et al., 2012). Contact with nature can result in high levels of nature connectedness, this can occur when an individual interacts with natural components or is surrounded by a natural environment, these interactions are diverse, from outdoor sports, such as cycling or walking, to working in an office overlooking the forest (Garza-Terán et al., 2022).

Studies developed in urban and rural environments have shown differences in the way individuals perceive the natural environment, these perceptions may also be shaped by the cultural context in which these individuals develop (Sedawi et al., 2020). Several studies report that exposure to nature is associated with its proximity, the availability of nature and green spaces in the living environment, especially in highly urbanized places (Baceviciene and Jankauskiene, 2022). Contact with natural environments is part of the development of experiences that promote the well-being and health in individuals, on the contrary, inequality in access to healthy natural environments between individuals of different ethnicities and socioeconomic contexts is also transferred in inequality in development (Sedawi et al., 2020). As a result, the way rural dwellers experience the environment differs from their counterparts in urban areas (Gifford and Nilsson, 2014). Within these contexts the level of urbanization and environmental degradation to which the individual is exposed can also play an important role (Chen et al., 2011). The scientific literature states that rural and urban

populations differ in their environmental and ecological perceptions (Bogner and Wiseman, 1997).

Urbanization's rapid pace has significantly altered the relationship between individuals and nature, impacting well-being and societal harmony. The importance of understanding connectedness with nature lies in its profound implications for quality of life. Identify factors shaping nature connectedness, provide insights critical for policymakers, urban planners, and health professionals. For example, Restall et al. (2021) highlight the importance of the nature connectedness in the administration of protected areas, especially when involving communities into its management, in this context it has been reported that higher levels of nature connectedness, greater the desire to get involved in the management of these areas.

The main objective of this research is to assess and establish the factors that influence and determine the levels of nature connectedness and its dimensions, examining how these factors relate and interact with each other, taking as a starting point the urban and rural context. In addition, the following hypotheses are raised:

Hypothesis 1: An individual's place of residence influences their levels of connection with nature. Those who maintain greater contact with nature, such as in rural areas, may report a higher level of pro-environmental behavior.

Hypothesis 2: People with a higher level of knowledge about nature will exhibit a higher degree of connection with it.

Hypothesis 3: Older individuals and those of the female gender will demonstrate higher levels of connectedness with nature.

2. Material and methods

2.1. Participants

The present research was carried out with a sample composed of university students from two countries, Spain (496 students) and Ecuador (872 students), for a total of 1368 individuals (932 women and 436 men) with an age mean of 21.09 (standard deviation of 3.78) in a range from 18 to 49 years old. This sample was taken from classes where the researchers were teaching when this research was carried

out. The sample was selected taking into consideration the careers that offer and/or represent different levels of knowledge and contact with nature. Also, the sample comprises university students living in rural or urban zones near the cities where the universities' campus are. The sample is not representative of the broader student population, but representative of the careers included in the research. Students were clustered according to the careers in which they were enrolled and by place of residence.

2.2. Procedure

This study, which was previously approved by the Cordoba Research Ethics Committee, through code 4429, was correlational and transversal. University professors disseminated the link to the online questionnaire on the websites of the courses they were teaching and invited their students to participate, for informed consent, they were advised that participation was voluntary and anonymous, and that they could withdraw whenever they wanted. Before answer the participants gave their consent for the respective data gathering checking their approve on an item in the same questionnaire that states "I give my consent to participate in the study" (Doy mi consentimiento para participar en el estudio). The data analyzed only correspond to students that checked their consent in the mentioned item, also, no minors were enrolled in the study. The data gathering took place between February 3 and March 27, 2020.

2.3. Measures

A questionnaire was designed containing basic information, as age and gender, also variables as country, university, career, place of residence. The ABC Connectedness with Nature scale (ABC-CNS) was used for the nature connectedness variable (Cuadrado et al., 2022). This scale is focused on the analysis of the nature connectedness as an attitude, based in a tridimensional model that aboard the affective, behavioral, and cognitive aspects of the construct. Each dimension is composed of five items valued on a five-point Likert scale. The reliability of this scale was $\alpha = 0.949$. Items in the scale can be appreciated in appendix 1.

Cronbach's alpha was carried out to know the reliability of the ABC-CNS scale and its dimensions in the research sample. The result for the ABC-CNS scale was .949 (Spain .919, Ecuador .961); for the dimensions were: Cognitive .941 (Spain .890,

Ecuador .962), Affective .938 (Spain .886, Ecuador .960) and Behaviour .872 (Spain .748, Ecuador .922). As we can see there was optimum values for the scale, as well present in both countries. Also, for the dimensions all except Behaviour are over .9, and by country Ecuador was over .9 in all dimensions.

2.4. Data analysis

In order to determine the underlying intrinsic and extrinsic factors driving the nature connectedness, four General Linear Mixed Models (GLMMs) were performed using the variable ABC global (model 1), affective (model 2), behavioral (model 3), and cognitive dimensions (model 4) as response variables. These variables were calculated as the average of the items that comprise each dimension, and for ABC global, the average of each item. A protocol for data exploration was applied and the assumptions were checked on the residuals of the model (Zuur et al., 2010). In all models, a normal distribution and the identity link function were used. In these models, gender (2 levels), age (three levels), career (three levels), place of residence (three levels), and the interaction between gender and place of residence were included as fixed effect. The university nested within the country was included as a random factor. Fisher's least significant difference test (LSD test) for comparisons of the estimated means within a mixed analysis was developed to check the differences among the levels of categorical variables. Statistical analyses were performed by employing InfoStats software.

3. Results.

3.1. Descriptive analysis.

Cronbach's The mean for ABC-CNS scale was 4.08 (± SD= 0.76), in a five points scale. For the dimensions were: Cognitive 4.00 (± SD= 0.95), Affective 4.22 (± SD= 0.87), Behaviour 4.02 (± SD= 0.77). For the scale and its dimensions, values for means in Ecuador were above 4.0, on the contrary, in Spain values are under 4.0, except for Affective dimension. Detailing the ABC-CNS scale values by variables, in Spain, means over 4.0 displayed in variables such countryside, age range 26-50, and environment and biology careers, in Ecuador all variables displayed mean values over 4.0, with higher values on women, age range 26-50 and environment and biology careers. The detailed sample is shown in Table 10. Details about descriptive analysis

by each variable and country are in appendix 2. Also, descriptive analysis for each item on the scale is on Table in appendix 1.

Table 10. *Place of residence, gender, age, university, and career of the participants*

		Spain	Ecuador	Total
Residence	City	319	530	849
	Town	163	175	338
	Countryside	14	167	181
Gender	Men	112	324	436
	Women	384	548	932
Age range	18-20	277	487	764
	21-25	186	315	501
	26-50	33	70	103
University	ESPAM	0	167	167
	ULEAM	0	286	286
	UTM	0	334	334
	UNESUM	0	85	85
	USAL	25	0	25
	UCO	471	0	471
Career	Engineering, industry and administration	0	300	300
	Environment and biology	103	278	381
	Psychology, education and social sciences	393	294	687

3.2. Factors that determine the connection with nature

Regarding Regarding the variables that affect the nature connectedness, Model I, the ABC-CNS scale, presented significant differences for all the variables analyzed. Model II (cognitive) presented significant differences in all the variables except career, Model III (affective dimension) did not present significant differences for age range and place of residence, finally Model IV (behaviour dimension) only presented significant differences for age range and career (Table 11).

The post-hoc Fisher test (Table 12) shows the following findings. The variable gender presented significative differences between the two levels in all models except of Model IV, the values being higher in the case of women. For the age range, in all models the range 26-50 years old stands as an independent category from the other two ranges, these levels together made it into one category, also, this category presented higher values. The variable career presented the levels “environment and

biology” and “psychology, education and social sciences” as separated categories, with the first one presenting higher value than the rest, while the level “engineering, industry and administration” belongs to both previous categories, these findings apply in all models.

In the case of the variable place of residence, the difference among levels varies between the models. For the Model I, countryside and town stands in their own categories, while city fits in both previous categories. For Model II and III, both countryside and city made one category, while town made a category by itself. Countryside category values stay higher than the other categories. Finally, for the combination of the variables place of residence and gender, like the previous variable, place of residence, differences among levels appeared between the models. For Model 1, from the six levels, only men:town appeared in its own category, the five levels left join together in one category, this effect is present also in Model II. For Model III the difference becomes a bit complex, since women:town, men:city and men town stands in their own categories each one, but women:countryside, women:city and men:countryside share categories with both, women:town and men:city. The previous made men:town as the only level that did not shows similitudes with other levels. Also, the combination women:countryside was the category with higher value across all models but Model IV, also in a tie with women:town in Model III. In Model IV the category men:countryside presented the higher values.

Table 11. *General Linear Mixed Models (GLMMs) with the variable ABC global (model 1), affective (model 2), behavioral (model 3), and cognitive dimensions (model 4) as response variables.*

		Marginal			
		F-value	p-value		Value ± S.E.
MODEL I	Intercept	1161.49	<0.0001	Intercept	3.93 ± 0.14
ABCCNS	Gender	11.40	0.0008	Women	0.11 ± 0.05
	Age range	6.77	0.0012	Age range 21-25	0.01 ± 0.05
				Age range 26-50	0.28 ± 0.08
	Career	4.05	0.0176	Environment and biology	0.12 ± 0.07
				Psychology. education and social sciences	-0.04 ± 0.07
	Place of residence	3.11	0.0447	Countryside	0.11 ± 0.11
				Town	

					-0.24 ± 0.09
	Gender:Place of residence	4.00	0.0186	Women:Countryside Women:Town	-0.08 ± 0.13 0.28 ± 0.11
MODEL II	Intercept	937.00	<0.0001	Intercept	3.85 ± 0.15
COGNITIVE	Gender	11.04	0.0009	Women	0.10 ± 0.07
	Age range	7.95	0.0004	Age range 21-25 Age range 26-50	-4.9E-03 ± 0.06 0.38 ± 0.10
	Career	2.67	0.0697	Environment and biology Psychology. education and social sciences	0.11 ± 0.09 -0.06 ± 0.09
	Place of residence	3.53	0.0295	Countryside Town	0.02 ± 0.14 -0.36 ± 0.12
	Gender:Place of residence	3.75	0.0238	Women:Countryside Women:Town	-2.2E-04 ± 0.16 0.36 ± 0.14
MODEL III	Intercept	2150.66	<0.0001	Intercept	4.09 ± 0.12
AFFECTIVE	Gender	11.80	0.0006	Women	0.15 ± 0.06
	Age range	2.91	0.0551	Age range 21-25 Age range 26-50	-0.01 ± 0.05 0.20 ± 0.09
	Career	3.97	0.0190	Environment and biology Psychology. education and social sciences	0.14 ± 0.08 -0.04 ± 0.08
	Place of residence	2.90	0.0554	Countryside Town	0.12 ± 0.13 -0.27 ± 0.11
	Gender:Place of residence	3.59	0.0278	Women:Countryside Women:Town	-0.11 ± 0.15 0.30 ± 0.13
MODEL IV	Intercept	805.59	<0.0001	Intercept	3.85 ± 0.16
BEHAVIOUR	Gender	3.70	0.0547	Women	0.09 ± 0.06
	Age range	5.79	0.0031	Age range 21-25 Age range 26-50	0.06 ± 0.05 0.27 ± 0.08

Career	3.03	0.0487	Environment and biology	0.10 ± 0.07
			Psychology. education and social sciences	-0.03 ± 0.07
Place of residence	2.35	0.0957	Countryside	0.20 ± 0.11
			Town	-0.10 ± 0.09
Gender:Place of residence	2.16	0.1152	Women:Countryside	-0.13 ± 0.13
			Women:Town	0.17 ± 0.11

Reference levels:
Gender: Men
Age range: 18-20
Career: Engineering. industry, and administration
Place of residence: City

Table 12. *LSD Fisher test. Mean values with a common letter are not significantly different (p > 0,05).*

		ABCCNS					Cognitive					Affective					Behaviour				
		Mean	S.E.				Mean	S.E.				Mean	S.E.				Mean	S.E.			
Gender	Women	4.22	0.08	A			4.13	0.09	A			4.37	0.07	A			4.16	0.08	A		
	Men	4.04	0.08		B		3.91	0.10		B		4.15	0.08		B		4.06	0.09	A		
Age range	26-50	4.32	0.10	A			4.27	0.13	A			4.40	0.11	A			4.27	0.10	A		
	21-25	4.04	0.08		B		3.89	0.09		B		4.18	0.07		B		4.06	0.08		B	
	18-20	4.03	0.07		B		3.89	0.09		B		4.19	0.07		B		4.00	0.08		B	
Career	Environment and biology	4.22	0.08	A			4.11	0.10	A			4.36	0.08	A			4.19	0.09	A		
	Engineering, industry and ..	4.12	0.09	A	B		4.01	0.11	A	B		4.23	0.09	A	B		4.11	0.09	A	B	
	Psychology, education and ..	4.05	0.08		B		3.94	0.10		B		4.18	0.08		B		4.04	0.08		B	
Residence	Countryside	4.22	0.09	A			4.09	0.11	A			4.35	0.09	A			4.21	0.10	A		
	City	4.14	0.07	A			4.07	0.09	A			4.28	0.07	A			4.07	0.08		B	
	Town	4.03	0.08		B		3.89	0.10		B		4.15	0.08		B		4.05	0.09		B	
Gender:Residence	Women:Countryside	4.24	0.10	A			4.14	0.12	A			4.37	0.10	A	B		4.19	0.10	A		
	Women:Town	4.23	0.08	A			4.13	0.10	A			4.37	0.08	A			4.18	0.09	A		
	Men:Countryside	4.20	0.12	A			4.04	0.15	A			4.33	0.13	A	B		4.23	0.12	A		
	Women:City	4.20	0.08	A			4.12	0.09	A			4.35	0.07	A	B		4.11	0.08	A		
	Men:City	4.08	0.08	A			4.02	0.10	A			4.20	0.08		B		4.03	0.08	A	B	
	Men:Town	3.84	0.11		B		3.66	0.13		B		3.93	0.11			C	3.92	0.11		B	

4. Discussion

Regarding our main objective, it was verified that factors addressed in the present research, as gender, age, career (knowledge), and place of residence, determined the levels of connectedness with nature. It was shown that the construct of connectedness with nature is indeed an amalgamation of both external and internal factors that shape it. Although, in many cases the nature of these factors dictates that they cannot be modified or are unavoidable, we can learn from the characteristics of each one of these, to determine more effective ways to connect with nature, in order to improve our environmental behavior.

Prior studies have delved in the complex interplay between individuals and their environments. Mayer and Frantz (2004) emphasize the positive impact of nature exposure on the developing of environmental attitudes, addressing the potential influence of limited natural spaces in urban areas on hindering connectedness. Also, Kellert and Wilson (1995) found that direct interaction with nature, such as outdoor activities, fosters a deeper connection, particularly in rural settings. Kaplan (1995) emphasizes the mental restorative benefits of natural environments compared to the potential stressors in built settings. Our study aligns with the previous context identifying challenges in both, rural and urban environments, where built structures and other factors may difficult connectedness with nature, indicating a potential urban-rural disparity in the factors influencing nature connectedness. About this potential disparity, Nisbet et al. (2009) noted obstacles to nature connection due to the absence of natural spaces in environments.

Our research findings show correlations between age and connectedness to nature, that extents to the cognitive and behavior dimensions. Many researchers support the relationship between age and connectedness to nature (Lumber et al., 2017; Mustapa et al., 2021; Zhang et al., 2014). Although most of the studies focused on this relationship in children (Mustapa et al., 2021; Zhang et al., 2014) those results support the fact that age is an important predictor of connectedness to nature and environmental behaviour, more over in a context of contact with nature (Liefländer et al., 2013). Results in our research shows that 26-50 age range had a strong difference compared to the other groups. Findings in research from Mustapa et al. (2021), Liefländer et al. (2013), van Heezik et al. (2018) and Savolainen (2021) show strong

values of connectedness with nature in youngers groups, that seems to support the idea that connectedness with nature correlates negatively with age, especially in childhood. Noteworthy our context consists of adult students from 18 years old, and don't consist in a comparative between older and younger groups. Based on the previous the age variable leads to other factors linked to the growth process, for example adolescence and learning. Liefländer et al. (2013) mentions that during the transition towards adolescence there is a reduction in the level of connection with nature. The previous can explain the loss of connectedness with nature in adults. In our research learning or knowledge may can explain the differences between groups, given the context in which the study was developed. In our study the knowledge and learning factors are attached to the career variable, that will be addressed later this section. Also, Passmore et al. (2021) explains that findings like this are consistent with the "teenage dip", so levels of nature connectedness do not reach preteen levels again until close to age 30 years. Kural et al. (2020) found a positive correlation between age and connection with nature in a group of teachers that were in the age range of 31-35, as the age of teachers increases, their connectedness to nature scores increases, this may suggest that their relationships with nature develop based on experience. Also, Teixeira et al. (2021) found in their research that increasing age contributed to a higher connectedness to nature, adding the higher connectedness to nature in older individuals is linked to a higher number of visits to natural spaces and to greater opportunities for engaging with them.

As previously mentioned, our study considered the variable career into the analysis. It was found that career has influence on connectedness with nature, also in its dimensions affective and behavioral. In the present research the career variable groups together a set of careers in common, based on the area of knowledge, with environment and biology group resulting in higher levels of connectedness with nature than the rest of the groups. We can assume, since our sample is composed by university's students, that knowledge about environment is related, in greater or less extent, with the career they were enrolled. People knowledge is associated with the level of education (Prévot et al., 2018). For Winfried et al. (2020) knowledge about environment can be achieve though education, adding that this knowledge is an important part of biological studies, together with practical learning with activities in nature. Richardson et al. (2020) reports that people in environmental careers spend

more time in nature, that could result in higher interest about nature and levels of connectedness. Knowledge about environment is positively correlated with connectedness with nature (Sellmann and Bogner, 2013; Sheffield et al., 2022; Winfried et al., 2020). Bruni et al. (2017) mentions the lack of knowledge about the local environment could be a factor to disconnection from nature. Prévot et al. (2018) adds that knowledge correlates with environmental attitudes and behaviour, but although is necessary, is not sufficient, since it can increase connectedness to nature in short term. For Otto and Pensini (2017) acquiring knowledge of the functioning of the natural environment may, for example, confront individuals with the interconnectedness of all life, impacting their connectedness to nature.

Regarding the gender variable, our findings also show significative differences between genders in connectedness with nature, and the dimensions cognitive and affective, with higher values in women than men. Pérez-Ramírez et al. (2021) found gender is one of the determinant factors in the connectedness with nature. In the same way for Winfried et al. (2020) gender is a factor that has a special influence on several environmental variables, as a strong predictor for environmental behavior and attitude. High values of connectedness with nature in women are often reported in various contexts (Musitu-Ferrer, Esteban-Ibañez, et al., 2019; Pérez-Ramírez et al., 2021). Musitu-Ferrer et al. (2019) mentions that, in relation to gender, much research has concluded that women show greater connectedness and empathy with the natural environment, commitment to environmental protection and more pro-environmental behaviours than men. Also, this can be explained through gender-role socialization. Socialization theory posits that individuals are shaped by gender expectations within the context of cultural norms, these differences in socialization between the genders could then be reflected in their environmentalism (Boeve-de Pauw and van Petegem, 2017). For Musitu-Ferrer et al. (2019) the gender-socialization results in female's heightened capacity for empathy what ends in greater commitment and empathy toward the natural environment. Musitu-Ferrer et al. (2019) adds that women's socialization is more oriented towards aid and cooperation and more pro-social and empathic, in turn implying greater empathic concern for other animals and nature in general. However, some studies report contradictory findings showings no differences between genders (Di Fabio and Rosen, 2019; Koivisto and Grassini, 2022; Zhang et al., 2014). In our findings we report a difference in the interaction between gender and

place of residence, resulting in the combination of men-town as a stand-alone group (with the lowest value), while the rest combinations grouped all together in one. In part, this result supports the previous reports, there are no differences between genders, and those differences found are more based in the context of the research. Teixeira et al. (2022) addresses the differences between genders about proenvironmental behaviour, entails those differences to values influenced by social roles, these values can develop into positive environmental attitudes. Continuing, the author mentions these differences can be found depending on the dimensions analyzed. In the other hand, Teixeira et al. (2021) mentions this lack of differences between genders could be more contextual, like availability of green space in the living area, and equality in the opportunity to connect with those natural spaces.

Finally, the place of residence variable reports influence for connectedness to nature, also, in the cognitive dimension. The findings show higher values for countryside in connectedness to nature and for all dimension for Spain, and for behaviour dimension in Ecuador, while city shows higher values in connectedness to nature, for affective and cognitive dimensions for Ecuador. Various authors have reported the influence that the place of residence variable has on the connection with nature (Basu et al., 2019). As Boiral et al. (2019) mentions, the places in which individuals live have been shown to influence their levels of contact with nature, and as a result, their environmental behavior, the proximity to nature of the place of residence has clearly a strong impact on connectedness to nature. A factor that has been reported as important within the place of residence is contact with nature, closeness to nature looks to increase connectedness with nature (Gosling and Williams, 2010) through experiences and contact (Otto and Pensini, 2017). This can be explained through concepts such as place attachment. Place attachment is usually defined as a positive connection or emotional bond between a person and a particular place (Gosling and Williams, 2010; Lokhorst et al., 2014), definition that is closest to connectedness to nature, but addresses a connection in superior level, with the whole environment and not only the natural dimension (Galway et al., 2021). Various studies have identified a positive correlation between place attachment and connectedness to nature, specifically the behaviour dimension, contributing on the frequency of pro-environmental actions (Galway et al., 2021; Lokhorst et al., 2014; Riechers et al., 2021). Individuals can identify themselves with elements present in their places of

residence, including nature, and in this way reinforce their emotional links with said contexts, manifesting behaviors oriented to the protection of said places (Boiral et al., 2019; Gosling and Williams, 2010). In our findings, countryside reports higher values of connectedness to nature in Spain. Rural areas have been shown to offer greater opportunities for their residents to experience contact with nature (Gifford and Nilsson, 2014). Rural residents spend more time in nature than their urban counterparts, recalling their experiences in nature as positive (Duron-Ramos et al., 2020). Hinds and Sparks (2008) found that children in rural settings are more connected to nature than children in urban settings, showing more environmental attitudes and behaviour, and preference for activities on nature, this explained through the children experiences in nature. Rosa et al. (2019) adds that childhood experiences and bonds with natural environments can lead to more connectedness to nature in adulthood, but there are other pathways to achieving this experiences, and not only rural settings, but also experiencing nature in urban settings.

In line with the previous, results in Ecuador shows higher values of connectedness to nature in the city. For Gifford and Nilsson (2014), research from numerous countries has yielded conflicting results, specifically people in urban contexts showing more pro-environmental attitudes than people in rural settings. Arcury and Christianson (1993) found that more metropolitan and urban respondents had a stronger environmental world view and were more knowledgeable about global environmental problems. Continuing with the previous, their findings don not differ from non-metropolitan and rural residents in environmental concern or environmental actions. For Kennedy et al. (2009) the differences among rural and urban citizens may be diminishing since factors as migration of urban residents with pro-environmental values to rural communities and access to environmental services in rural communities can influencing the growing similarities between rural and urban populations. Restall et al. (2021) finds in their research higher values of connectedness to nature in places extensively shaped by man that combine ‘artificial’ nature and anthropogenic landscape, concluding that connectedness to nature may possibly be best enhanced by providing a diversity of natural elements close to where people live and spend their day, focusing on landscapes instead of urban-rural settings.

The findings of this study have significant implications for conservation efforts and the promotion of pro-environmental behavior in both rural and urban settings in

order to avoid the potential ecological repercussions of diminished connectedness with nature. A lack of engagement with nature may contribute to weakened environmental stewardship (Schultz, 2002). In rural contexts, where individuals often have direct and tangible interactions with nature, fostering a deeper connectedness can be leveraged to enhance local conservation initiatives. The promotion of engagement with natural environments can lead to increased pro-environmental attitudes and behaviors (Wells and Lekies, 2023). In urban environments, where disconnection from nature could be more prevalent, interventions should focus on creating opportunities for meaningful nature experiences. The previous underscores the importance of urban natural spaces in fostering a sense of connectedness with nature (Frantz and Mayer, 2014; Mayer and Frantz, 2004). Incorporating green infrastructure and accessible parks can contribute to improve the cities landscape and to increased environmental awareness and pro-environmental behaviors in urban dwellers. Also, these efforts must be focused on develop the connectedness with nature on children and young adults (since the 18 to 25 years old presented lower values on our research) reinforce this connection in later stages of adulthood and reducing the gap of contact with nature opportunities between genders.

Moreover, understanding the role of factors in shaping connectedness with nature is crucial. As noted by Schultz (2002), tailoring conservation messages to resonate with diverse cultural backgrounds and socioeconomic contexts is essential for effective environmental advocacy. By recognizing the diverse determinants of connectedness with nature in both rural and urban contexts, conservationists and policymakers can design targeted strategies to develop pro-environmental behaviors and enhance overall ecological stewardship.

4.1. Limitations and future research

The resulting data are cross-sectional and correlational, which prevents us from making conclusions regarding the meaning of relationships and causality. Although we consider our sample meets the requirements for our research, we can suggest future research a more heterogenous sample, specifically in the age and gender variable. The majority of female participants in the research can has implications for generalizability. Since our sample is composed by university students, we can justify this selection with the need for a way to measure the knowledge about environment

from the career variable, that comprise various factors that contextualize connectedness with nature for the students in determined field of knowledge. . Also, using data gathered from students difficult the generalizability of the results and present the possibility of bias as it is self-recorded data. However, to reproduce the present research in a larger sample, we suggest that other ways of measuring participants' knowledge about the environment be considered.

In light of the results, our conclusions and the literature consulted, we suggest that future studies analyze the construct of connectedness with nature, focusing on the composition of the environments under study, considering the natural and built elements that compose the environments, and accessibility to these elements, addressing social norms, culture, and other normative influences that can shape pro-environmental attitudes (Mankad and Gardner, 2016). Finally, we could suggest future lines of research in which we consider replicating the results with longitudinal studies and with a general sample and not just students. Including studies exploring interventions to enhance nature connectedness and investigating the long-term effects of nature connectedness on conservation behavior, including methodologies that explore the underlying mechanisms through which different factors influence the connection with nature.

5. Conclusions

Regarding our main objective, it was verified that factors addressed in the present research, as gender, age, career (knowledge), and place of residence, determined the levels of connectedness with nature. It was shown that the construct of connectedness with nature is indeed an amalgamation of both external and internal factors that shape it. Although, in many cases the nature of these factors dictates that they cannot be modified or are unavoidable, we can learn from the characteristics of each one of these, to determine more effective ways to connect with nature, in order to improve our environmental behavior.

Following our hypotheses, we can conclude that, indeed, the factors place of residence, gender and age influences the levels of connectedness with nature. However, it must be considered that this influence is based on the contexts in which individuals develops, contexts that can be very particular to a country or even a region. We must understand that although contact with nature, one of the main variables to

consider in connection with nature, occurs more frequently in rural than urban settings, a paradigm shift is necessary towards the analysis of the composition of environments, beyond the urban/rural classification, to understand the interaction of natural and build elements on connectedness with nature. In other words, the capacity of environments, regardless of whether they are urban or rural, to provide opportunities for contact with nature in equity of conditions across age and gender, thus raising the levels of connectedness with nature.

5.1. Data availability statement

The dataset analyzed during the current study is available in the Mendeley database, with the link: Reserved doi: 10.17632/bgzbc7tvx4.1.

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7. Appendix

Appendix 1. *Mean and standard deviation of each item (in general and by country) of the ABC-CNS scale.*

	General		Spain		Ecuador	
	Mean	Stan. dev.	Mean	Stan. dev.	Mean	Stan. dev.
Cognitive.						
CNS1. I am an integral part of nature.	4.19	1.03	4.30	0.85	4.12	1.12
CNS2. My relationship to nature is an important part of who I am.	4.00	1.04	3.83	0.92	4.10	1.09
CNS3. I feel a sense of oneness with the natural world around me.	3.91	1.04	3.78	0.91	3.99	1.10
CNS4. I feel spiritually bound with nature.	3.81	1.10	3.48	1.01	4.00	1.10
CNS5. I think of the natural world as a community to which I belong.	4.07	1.05	4.09	0.96	4.06	1.10
Affective						
CNS6. I feel joy just being in nature.	4.34	0.98	4.37	0.84	4.32	1.06
CNS7. I feel a deep love for nature.	4.15	0.98	3.97	0.89	4.25	1.01
CNS8. I feel emotionally connected to nature.	4.04	1.01	3.73	0.98	4.22	0.98
CNS9. I feel happy and at home when I am in the midst of nature.	4.16	0.97	3.95	0.91	4.28	0.99
CNS10. Contact with nature gives me a feeling of peace and tranquility.	4.38	0.92	4.41	0.78	4.37	0.99
Behavioral						
CNS11. I often go out to the countryside or nature.	3.92	0.99	3.73	1.00	4.03	0.96
CNS12. When I am in the midst of nature. I merge with it.	3.81	1.00	3.45	0.98	4.02	0.94
CNS13. I take care of nature as if it were a part of myself.	4.03	0.91	3.91	0.90	4.09	0.91
CNS14. I often listen and watch nature.	4.08	0.90	3.90	0.95	4.18	0.86
CNS15. I take care of animals as if they were human beings.	4.27	0.92	4.23	0.98	4.29	0.89

Appendix 2. *Mean and standard deviation of the ABC-CNS scale and each of its dimensions depending on the study variables.*

		Spain								Ecuador							
		ABCCNS		Cognitive		Affective		Behaviour		ABCCNS		Cognitive		Affective		Behaviour	
		Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.
All		3.94	0.63	3.90	0.78	4.09	0.73	3.84	0.68	4.15	0.81	4.05	1.03	4.29	0.93	4.12	0.80
Residence	City	3.91	0.61	3.87	0.73	4.06	0.73	3.80	0.67	4.18	0.78	4.10	0.97	4.32	0.91	4.13	0.79
	Countryside	4.28	0.37	4.17	0.67	4.49	0.41	4.17	0.52	4.16	0.81	4.04	1.04	4.29	0.93	4.15	0.77
	Town	3.98	0.68	3.93	0.86	4.11	0.75	3.91	0.70	4.06	0.90	3.92	1.15	4.20	1.01	4.08	0.83
Gender	Men	3.84	0.69	3.81	0.78	3.95	0.79	3.75	0.75	4.07	0.92	3.95	1.17	4.18	1.04	4.08	0.91
	Women	3.97	0.61	3.92	0.77	4.13	0.71	3.87	0.66	4.21	0.73	4.12	0.93	4.35	0.86	4.15	0.72
Age range	18-20	3.90	0.61	3.86	0.78	4.04	0.74	3.80	0.66	4.16	0.76	4.06	0.96	4.32	0.86	4.10	0.77
	21-25	3.94	0.64	3.88	0.77	4.11	0.69	3.84	0.70	4.12	0.89	3.99	1.13	4.22	1.02	4.14	0.85
	26-50	4.30	0.65	4.28	0.72	4.39	0.81	4.24	0.59	4.32	0.75	4.35	0.90	4.38	0.97	4.23	0.74
University	ESPAM	.	.	.	.	.	.	.	.	4.03	0.90	3.91	1.13	4.18	1.06	3.98	0.90
	ULEAM	.	.	.	.	.	.	.	.	4.07	0.83	3.96	1.07	4.18	0.99	4.06	0.83
	UNESUM	.	.	.	.	.	.	.	.	4.33	0.88	4.19	1.15	4.47	0.98	4.32	0.82
	UTM	.	.	.	.	.	.	.	.	4.25	0.70	4.17	0.87	4.39	0.78	4.19	0.69
	UCO	3.96	0.63	3.92	0.76	4.09	0.73	3.85	0.68	.	.	.	.	.	.	.	.
	USAL	3.69	0.66	3.36	0.91	4.04	0.70	3.66	0.63	.	.	.	.	.	.	.	.
Career	Engineering. industry and administration	.	.	.	.	.	.	.	.	4.09	0.85	3.98	1.08	4.22	1.00	4.05	0.85
	Environment And biology	4.05	0.58	4.04	0.72	4.18	0.69	3.94	0.62	4.21	0.84	4.10	1.08	4.35	0.94	4.19	0.84
	Psychology. education and social sciences	3.91	0.64	3.86	0.79	4.06	0.74	3.82	0.69	4.17	0.74	4.09	0.91	4.29	0.85	4.13	0.69

IV. The role of implicit theories about climate change malleability in the prediction of pro-environmental behavioral intentions.

Cuadrado, E., Macias-Zambrano, L., Guzmán, I., Carpio, A. J., & Tabernero, C. (2023). The role of implicit theories about climate change malleability in the prediction of pro-environmental behavioral intentions. *Environment, Development and Sustainability, 25*(10), 11241-11261. https://doi.org/10.1007/s10668-022-02525-x

Abstract

Understanding the variables that influence pro-environmental intentions is key promoting pro-environmental actions. In this research, we analyze the sense of responsibility toward climate change and implicit theories about climate change (ITCC) interact to condition individual pro-environmental intention. A total of 48 Psychology students with a mean age of 19 years were randomly divided into two experimental groups and participated in a pretest-posttest experiment. The experimental manipulation consisted of a reading a news extract regarding scientific research: one group was given information stating that climate change is still reversible, instilling incremental ITCC; the other group was given the opposite information, instilling static ITCC. The results of the one-way ANOVA (F =4.206, p < .05) showed that people with incremental ITCC. Moreover, the moderating analysis showed that ITCC act as a moderating variable in the relationship between the sense of responsibility and pro-environmental behavioral intentions when individuals held incremental ITCC (p < .01) but not when they held static ITCC (p =.901). This research emphasized the relevance of promoting incremental ITCC interventions in the environmental education field, as the sense of responsibility toward climate change is deterministic but not in itself enough to acquire the intention to behave in a pro-environmental way.

Keywords: Implicit theories about climate change · Environmental responsibility · Pro-environmental behavioral intention · Experiment · Pretest-posttest

1. Introduction

From a scientific point of view, climate change is one of the most concerning environmental issues, because of the aggravation and speed of the potentially negative consequences for the planet (Bouman et al., 2020; Brulle et al., 2012; O'Neill et al., 2017). The Synthesis Report (SYR) of the International Panel of Climate Change (IPCC) Fifth Assessment Report (IPCC, 2014, p. 40) left no room for doubt: "Human Influence on the climate system is clear" and "Recent climate changes have had widespread impacts on human and natural systems." Moreover, the SYR provides evidence for the need to effectively implement adaptation and mitigation strategies to address climate change, effectuated through integrated responses at all scales, linked with other societal objectives. More recently, the findings of the Working Group I contribution to the IPCC's Sixth Assessment Report (IPCC, 2021, p. 5) reaffirm that "It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes […] have occurred." At least in the last 2000 years, our climate system has been changing rapidly and at unprecedent rates, unquestionably due to human activity, the principal driver of climate change (IPCC, 2021). Slowing climate change implies that society is fully aware of this problem; then, interventions that promote a change in a behavior toward a more pro-environmental approach are required to reduce environmental pollution. For this reason, scientific research should focus on analyzing the possible individual and collective variables that support pro-environmental behavior and the socioeducational interventions capable of activating this kind of behavior.

Many researchers have sought to explain why individuals do or do not behave in a pro-environmental way, focusing on knowledge-action systems that attempt to explain the dynamic relationship between knowledge, attitudes and behavior (Bell et al., 2013; Gifford, 2014). However, linear models (which claim that greater environmental knowledge and concern for the environment predict high levels of pro-environmental attitudes in individuals, leading them to behave in a more pro-environmental way) have been harshly criticized and even called deficit models (Burgess et al., 1998) because the individual knowledge and concern for the environment is not often accompanied by the expected pro-environmental behavior.

Indeed, human beings are complex and, as indicated by the cognitive-affective-personality system (Mendoza-Denton et al., 2001; Mischel and Shoda, 1995; Mischel et al., 2002; Shoda and Mischel, 2006), there are many elements that can intervene in their behavior: dispositional personal factors (knowledge about the environment, social status, perceptions, depictions and conceptions of the world, etc.), motivational factors (motivation, emotions, self-efficacy, sense of responsibility, etc.) and external factors (from the physical and social environment itself: social pressure, social group, culture, access to recycling bins, etc.). Moreover, all these elements interact with each other to explain the individuals' behaviors (Mendoza-Denton et al., 2001; Mischel and Shoda, 1995; Mischel et al., 2002; Shoda and Mischel, 2006). Consequently, analysis of the different psychosocial variables that influence pro-environmental behavior, as well as their interactions, is essential. For this reason, in this research we intend to analyze how certain psychosocial variables interact to explain pro-environmental behavior.

1.1. Implicit theories of climate change and pro-environmental actions

Several studies have supported the idea of the inclusion of social representations as good practice in environmental education (Castro, 2006). In particular, social representations about the world, such as implicit theories (IT) about reality, could be especially relevant. The concept of IT is derived from Dweck and Leggett's social-cognitive theory of motivation (SCTM; Dweck and Leggett, 1998; Dweck and Yeager, 2021). These IT are relatively stable explanations or beliefs that individuals possess about the malleability of personal attributes, such as intelligence (Blackwell et al., 2015) or leadership capacity (Lord et al., 2020), or even attributes of the world (e.g., climate change). People can have static IT (believing that personal or world attributes cannot change) or incremental IT (believing that these attributes are modifiable). They are called "theories" because they offer an organized scheme of knowledge about the functioning of the physical or social world; and they are "implicit" because they tend to operate unconsciously: although people present them and apply them, they usually are not able to verbalize them in elaborate and coherent speech (Dweck and Leggett, 1998; Dweck and Yeager, 2021).

Therefore, the SCTM (Dweck and Leggett, 1988; Dweck and Yeager, 2021) provides a strong theoretical framework according to which the assumptions that

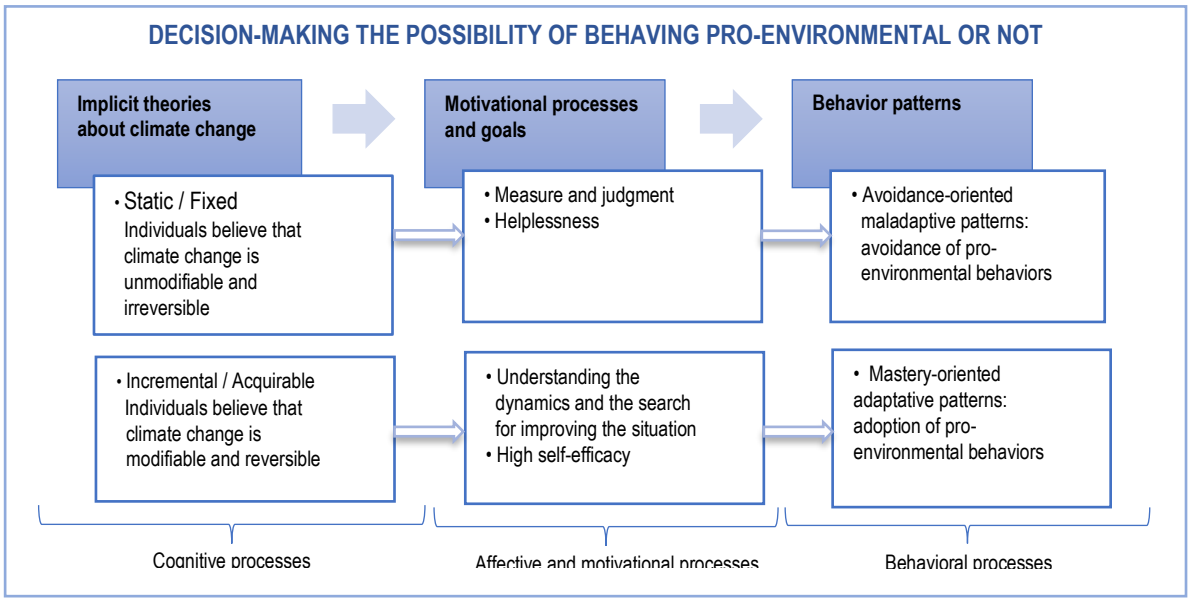
individuals have about the world guide their decisions and ultimately influence their behaviors. Incremental and static IT lead individuals to different motivational processes and goals, which can lead them to adopt different behavioral patterns in the face of challenging situations. These two different ways of perceiving the world —static or incremental —are related to behaviors oriented toward mastery and success (incremental perception) or, on the contrary, to behaviors oriented toward avoidance and failure (static perception). These socially internalized IT constitute a precedent for emotional, self-regulatory and behavioral patterns and should be one of the bases for achieving changes in human behaviors that could intervene in climate change.

But how does this theory about IT and climate change and pro-environmental behaviors relate? Although there is practically no controversy over the existence of global warming and the consequent climate change, there is still heated debate about whether warming can be stopped through specific actions of individuals and society in general or if warming is already irreversible (Markandya, 2009). Some individuals understand that climate change is already irreversible, whereas others firmly believe that it can still be slowed and reversed. This different perception about the possibility (or not) of change or the reversibility of global warming is related to IT about the world (Chiu et al., 1997; Dweck et al., 1995; Yung-Jui and Ying-Yi, 2010), which refer to individuals' beliefs about whether the social world and its institutions can be modified (incremental IT) or whether they cannot change (static IT). As explained by Yung-Jui and Ying-Yi (2010), people with static beliefs about the world perceive that the social and institutional world consists of fixed characteristics that cannot be changed. On the other hand, people with incremental theories about the world think that the social world and its institutions consist of characteristics that can change and improve. Individuals can have IT about different elements (from about one's own intelligence to about the world in general), and one of these elements is climate change. Therefore, we will name the beliefs about whether climate change is reversible or not "implicit theories of climate change" (ITCC), which can be incremental when individuals believe that climate change is modifiable and reversible, or static when individuals believe that climate change is no longer modifiable (i.e., irreversible).

Beliefs about the environment are defined as part of the psychological component that explains the pro-environmental behavior of human beings (Correa and Rodrigo, 2001) and numerous research studies have concluded that beliefs can be

direct precursors of ecological behavior. Based on the theory of Dweck and his followers (Chiu et al., 1997; Dweck et al., 1995; Dweck and Grant, 2008; Dweck and Leggett, 1988; Dweck and Yeager, 2021; Yung-Jui and Ying-Yi, 2010), it could be deduced that individuals with incremental ITCC will adopt a behavior that is more oriented to dominance and achievement in their relationship with the environment, trying to change and improve the situation. Consequently, in situations where individuals must choose whether to adopt an ecological behavior, people with incremental IT will more easily choose pro-environmental behavior. In contrast, people who assume that climate change is an immutable fact will adopt helpless behavior patterns, thus avoiding pro-environmental behavior, which will be viewed as doomed to failure (see Figure 6). In this sense, previous nonexperimental studies have found a relationship between the IT of people and their environmental behaviors (Duchi et al., 2020; Soli- man and Wilson, 2017).

Figure 6. *Adaptation of the Social-Cognitive Theory of Motivation of Dweck (Dweck and Leggett, 1998; Dweck and Yeager, 2021) to the Implicit Theories of Climate Change.*



Although the fact that believing in the reversibility of climate change may lead us to more pro-environmental behaviors may seem like common sense, it should be noted that, if demonstrated, it would have relevant practical repercussions. This would indicate that changing this assumption could influence individuals to behave in a more pro-environmental way. And although these IT are relatively stable, it has been shown that they are subject to influences and can change. People can be persuaded to

momentarily display an adherence to either a static or incremental theory by reading scientific articles that defend one stance or another (Dweck and Grant, 2008). Furthermore, in the environmental sense, there is evidence that manipulation of the individual context infers IT in either direction (Correa and Rodrigo, 2001).

According to the literature summarized above, we hypothesized that people with incremental ITCC are more prone to carry out pro-environmental actions than individuals with static ITCC.

1.2. Relationship between responsibility, implicit theories about climate change and pro-environmental behavior

An individual's sense of responsibility toward the environment can be crucial in turning personal attitudes and values into action. Responsibility promotes the feeling that behaviors can have a real impact on the environment (Punzo et al., 2019). The sense of responsibility can lead people to believe that it is up to them to make the effort to improve valued situations, instead of transferring this responsibility to others (Bateman and O'Connor, 2016; Gifford et al., 2011).

This psychological factor is one of the keys to explaining the multiple anthropogenic causes of climate change. The sense of responsibility is a psychological construct that allows people to carry out certain action when they perceive that someone or something (in this case, the planet) needs our help. Thus, on many occasions, pro-environmental inaction could be due to the absence of this construct, which gives us an idea of its potential impact (Bateman and O'Connor, 2016). The theory of perceived responsibility and social motivation (Weiner, 2006) suggests that the causal attribution of social problems, such as climate change, influences the perception that individuals have about their responsibility regarding those social problems, which affects their emotional and behavioral responses.

In this sense, numerous studies have confirmed the relationship between the sense of responsibility and pro-environmental behavior (Bouman et al., 2020; Punzo et al., 2019). Data from the Eurobarometer (Directorate-General for Climate Action, 2017) suggest that the sense of responsibility is the variable that most directly and significantly affects individual pro-environmental action, among other variables such as social values, moral values or the moral coefficient. Moreover, the degree to which factors such as global citizenship, the moral coefficient and the mentality of society

affect the sense of individual responsibility and, indirectly, positive environmental behaviors, has been studied (Janmaimool and Khajohnmanee, 2020). Likewise, the sense of responsibility strongly predicts the intention to act pro-environmentally and various kinds of environmental behaviors, with different studies having shown that higher levels of corporate social responsibility directly influence the pro-environmental behavior of individuals in their jobs (Attaran and Celik, 2015; Fielding and Head, 2012; Reese and Jacob, 2015; Wenshun et al., 2011).

However, considering the SCTM (Dweck and Leggett, 1988; Dweck and Yeager, 2021), we could ask ourselves whether the individuals who feel responsible for climate change will always have the intention to carry out pro-environmental behaviors. As explained earlier, the SCTM (Dweck and Leggett, 1988; Dweck and Yeager, 2021) would indicate that IT guide decisions and influence individuals' behaviors, leading static and incremental IT to different motivational processes and goals when facing challenging situations. In this sense, a question that could be posed is whether individuals who possess high responsibility regarding climate change will have the intention to behave in this way if they also possess static ITCC. This behavior does not seem to be adaptable. If static ITCC lead individuals to helpless behavioral patterns, does their high responsibility influence their pro-environmental behavior?

On the other hand, different studies have found that IT can play a moderating role between different variables in fields other than pro-environmental behavior (Butler, 2000; Knee et al., 2004; Yung-Jui and Ying-Yi, 2010). In this sense, the social-cognitive approach and the theoretical framework of IT help us to understand the mechanisms through which an individual persists in complex situations and makes decisions (Tabernero and Wood, 2009). Therefore, the relevance of studying the possible interaction between feeling responsible for climate change and perceiving that climate change can (or cannot) be reversed is worth noting (i.e., the interaction relationship between the sense of responsibility for climate change and ITCC). In this sense, it is easy to think that how much an individual feels responsible for climate change does not matter if he or she presents static ITCC, that is, if such an individual perceives that there is nothing that can be done to reverse climate change or that we have already reached a point of no return. This individual will perceive that there is no point in acting in a pro-environmental way and therefore will not engage in pro-environmental behaviors. In contrast, when individuals feel responsible and perceive that climate

change is reversible, this will lead them to implement pro-environmental behaviors. In other words, the perception of greater responsibility for climate change coupled with incremental ITCC will induce greater pro-environmental behavior, whereas when it is coupled with static ITCC the likelihood of adopting pro-environmental behavior will be reduced.

Congruent with the discussion above, we expect to find that ITCC act as a moderator in the relationship between responsibility for climate change and intentions to behave in a pro-environmental way. A greater sense of responsibility for climate change leads individuals to higher intentions to behave pro-environmentally only when they hold incremental ITCC, but not when they hold static ITCC.

1.3. Objectives and Hypotheses

In this research, the main objective was to analyze how ITCC and the sense of responsibility toward climate change interact to explain the pro-environmental behavioral intentions of individuals. In the frame of this objective and the previous literature, the following study hypotheses were proposed:

H1: Individuals with incremental ITCC display greater pro-environmental behavioral intentions than do individuals with static ITCC.

H2: ITCC act as a moderating variable in the relationship between responsibility toward climate change and pro-environmental behavioral intention: when individuals have incremental ITCC, perceiving greater responsibility for climate change leads them to have the intention to behave in a pro-environmental way; however, when individuals have static ITCC, the degree of responsibility they feel toward climate change does not influence their pro-environmental behavioral intentions.

2. Method

2.1. Procedure

After approval of the Research Ethics Committee of Córdoba (Spain), with reference number 4429, students were enrolled during a psychology class by one of the researchers. Participation was voluntary and no incentives were given. Before taking part in the study, the participants gave their informed consent. They were informed that the objective of the study was to analyze their perception about the

natural environment.

Once students gave their informed consent to participate, they were randomly assigned to one of two conditions (a malleable and a fixed condition) to perform the pretest-posttest experimental study (see Figure 7 for a schematic representation of the procedure used). The manipulation consisted of each experimental group being assigned to read a different alleged scientific article (see Appendices 1a and 1b) to inoculate the participants with incremental (experimental group G1) or static (experimental group G2) ITCC. This manipulation structure has been used previously in studies on IT (Bauer and Hannover, 2020; Walton and Cohen, 2007). The text read by both experimental groups was presented as a short newspaper article on recent research carried out by an ostensible research team in the environmental field and published in a renowned scientific journal. The texts were the same except that for G1 the prestigious scientific group concluded that climate change is still reversible and that individual and collective actions could facilitate that reversibility (instilling incremental ITCC on the participants); in contrast, for G2 the prestigious scientific group concluded that climate change was now irreversible and individual and collective actions could not change this fact (instilling static ITCC on the participants).

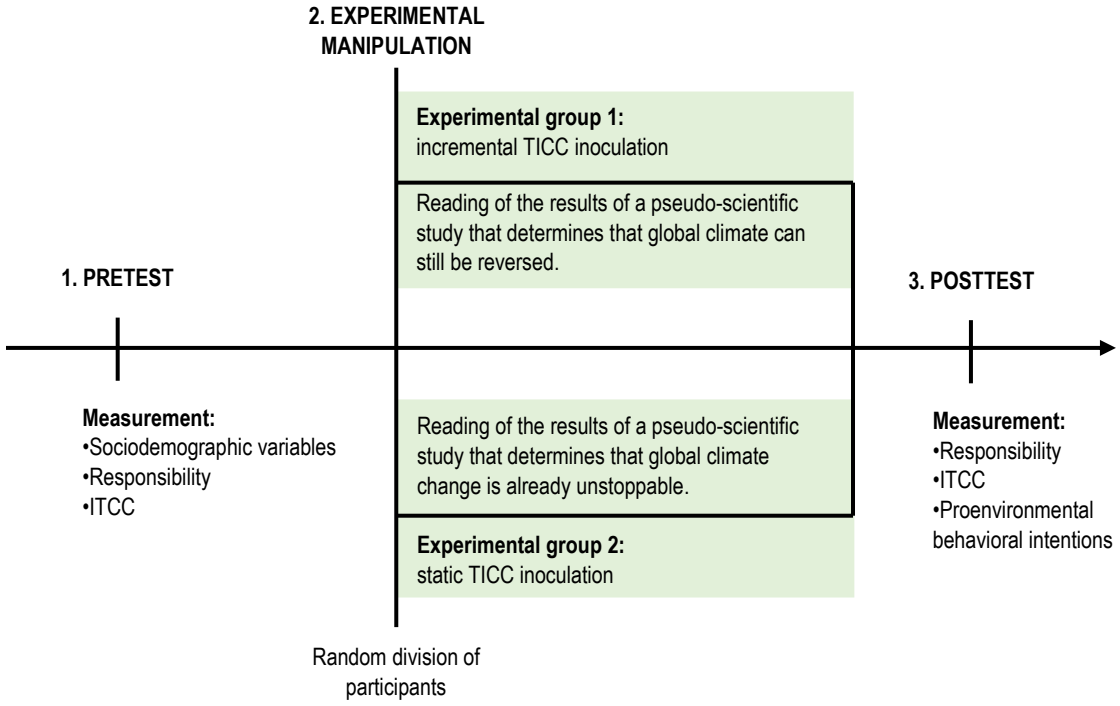
An online questionnaire was administered to participants two weeks before (pretest) and just after manipulation (posttest) to explore their sense of responsibility toward climate change and their ITCC. Moreover, in the posttest phase, their pro-environmental behavioral intention was also measured through the personal interest shown in participating in an alleged environmental activity that involved picking up trash and cleaning riverbanks in their city.

Two weeks after having completed the pretest, a different link was sent to the participants randomly assigned to G1 and G2, to complete the test and posttest phases. The links for G1 and G2 included the experimental manipulation for instilling incremental ITCC and static ITCC, respectively. Immediately after reading the assigned article, all participants completed the posttest questionnaire.

Following these steps, the participants were fully debriefed about the real purposes of the study and the experimental procedure. They were also informed about the fictional nature of the scientific articles they had read, as well as the

riverbank cleaning activities.

***Figure 7**. Schematic representation of the procedure*



2.2. Participants

The participants were 48 psychology students (79.2% women, 20.8% men) of a psychology class in their first (91.7%) and second (8.3%) year of university. The mean age of the sample was 19.17 years, with a standard deviation of 1.87 and an age range of 17-25 years. According to Gall et al. (1996), there should be at least 15 participants in the experimental groups for comparison. In this case, one class group was sufficient to perform the experiment.

2.3. Measurements

2.3.1. Responsibility toward climate change

To measure responsibility toward climate change, we used the three items of the scale developed by Kellstedt et al. (2008), to which we added three items of our own creation (scale items are shown in Table 15) to improve the reliability of the original scale. The participants answered the six items on a five-point Likert scale, where 1 = *Totally disagree* and 5 = *Totally agree*. The reliability of the scale was high both before (α = 0.78) and after (α = 0.84) the experimental manipulation.

***Table 13**. Items of the Responsibility Toward Climate Change Scale.*

1	I believe that my actions have an influence on global warming and climate change
2	My actions to reduce the effects to global warming and climate change in my community will encourage others to reduce the effects of global warming though their own actions
3	Humans are responsible for global warming and climate change
4	I have part of the responsibility for global warming and climate change
5	Through my actions I can influence global warming and climate change to get better or worse
6	Human beings can stop global warming and climate change through their actions if they want to

2.3.2. Implicit theories about climate change

To measure the type of IT shown by the participants in the questionnaires, a brief seven-item ad hoc scale was designed. Four items were designed to reflect a static view about climate change and three to reflect an incremental view (the items of the scale and its sub-scale are shown in Table 16). The participants answered on a five-point Likert scale, where 1=*Totally disagree* and 5=*Totally agree*. The reliability of the ITCC subscale was high both before (static ITCC: α =0.89; incremental ITCC: *α* =0.76) and after (static ITCC: *α* =0.90; incremental ITCC: *α* =0.88) the experimental manipulation. Explanatory factorial analyses performed with Oblimin direct rotation showed the two expected factors both before and after the experimental manipulation. The two factors explained 72.66% of the variance before the manipulation and 78.68% after the manipulation. All the items were properly loaded on their proposed dimension, with Factor 1 corresponding to static ITCC and Factor 2 to incremental ITCC (see Table 16).

***Table 14**. Items of the Implicit Theories About Climate Change Scale and Explanatory Factorial Analyses results*

	Higher loading for each one of the two factors			
	Before experimental manipulation		After experimental manipulation	
	Factor 1 (Static ITCC)	Factor 2 (Incr. ITCC)	Factor 1 (Static ITCC)	Factor 2 (Incr. ITCC)
1. It is now impossible to reserve the effects of global warming and climate change	.911		.912	
2. Climate change and global warming are already irreversible phenomena	.899		.962	
3. The global warming process that the planet is undergoing is already unstoppable	.901		.854	
4. By changing our behavior and habits, we can still curb the effects of global warming and climate change		.781		.810
5. A social change that implies less pollution and more ecological behavior will make it possible to reverse or stop global warming and climate change		.801		.736
6. There is nothing we can do anymore to stop climate change and global warming	.761		.855	
7. If individuals and big industries take action to reduce greenhouse gases, then global warming and climate change could be slowed		.776		.892
Percentage of explained variance	53.89	18.77	64.31	14.37

Static ITCC = static implicit theories about climate change; Incr. ITCC = incremental implicit theories about climate change

2.3.3. Pro-environmental behavioral intention

To measure the extent to which participants had the intention to adopt pro-environmental behaviors, they were asked if they wanted to participate in an alleged pro-environmental activity (without knowing that it was fictional). At the end of the posttest survey, students were informed that their university was collaborating with a prestigious nonprofit, non-governmental organization for environmental defense that was currently carrying out a campaign to clean up the rivers around their city, and that they could voluntarily participate.

In this campaign, indicating in the survey the number of days (from zero to seven) they wanted to participate. The selection of a greater number of days indicated a higher level of pro-environmental behavioral intention.

2.4. Data analysis

To verify the effect of the experimental manipulation, a one-way analysis of variance (ANOVA) was performed, introducing the experimental group as the factor and incremental and static ITCC before and after experimental manipulation as dependent variables (DVs).

To verify the effect of ITCC on pro-environmental behavioral intention, a one-way ANOVA was performed, introducing the experimental group as the factor and pro-environmental behavioral intention as the DV.

To evaluate the moderation hypothesis, a moderation analysis was performed, using Model 1 of the Process macro for SPSS (Hayes and Preacher, 2013), with 10,000 repeated bootstrap samples and a 95% confidence interval. Pro-environmental behavioral intention was introduced as the DV, responsibility toward climate change as an independent variable (IV) and the experimental group as a moderating variable (MV), coded as - 0.50 for static and 0.05 for incremental ITCC.

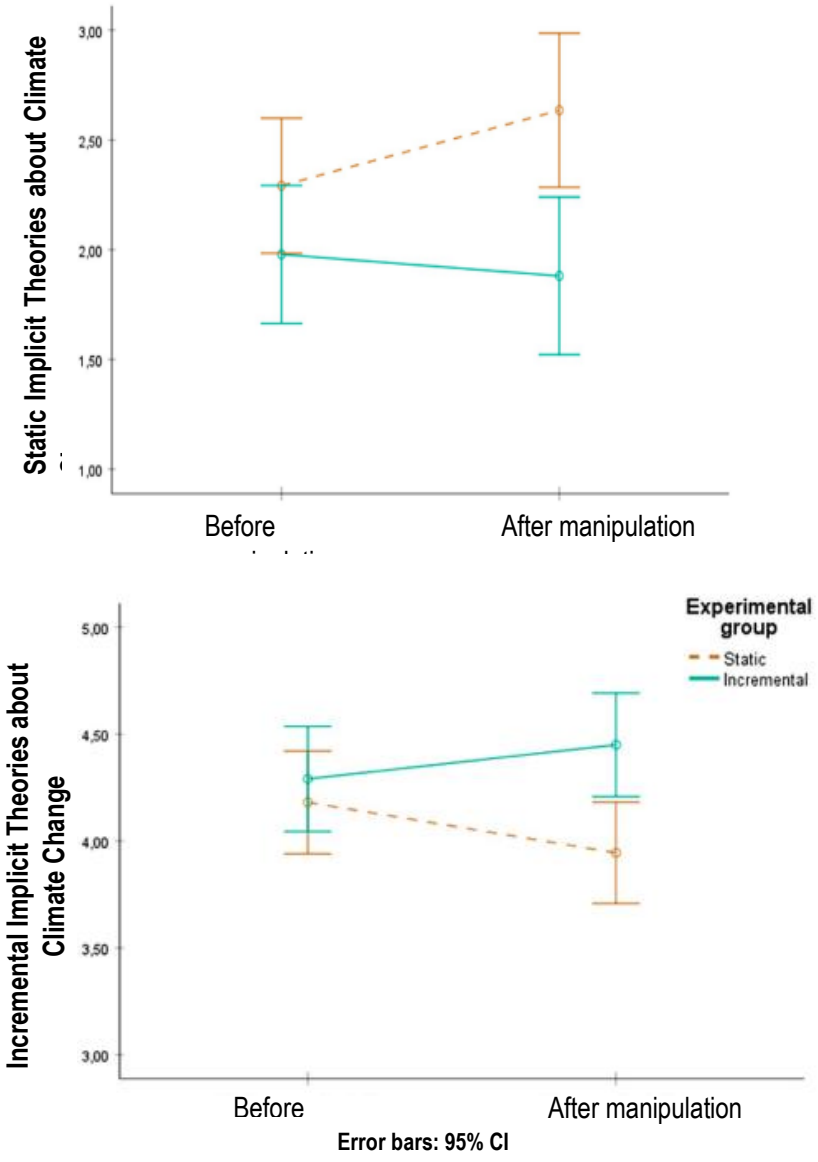
3. Results

3.1. Effects of experimental manipulation

The one-way ANOVA showed no significant differences in incremental [$F(1,46) = 0.410$; $p = 0.525$, $\eta^2 = 0.01$; observed power (OP) = 0.10] or static [$F(1,46) = 2.060$;

$p = 0.158$, $\eta^2 = 0.04$; OP = 0.29] ITCC between the two experimental groups before manipulation (Figure 8). However, after experimental manipulation, the results showed significant differences in incremental [$F(1,47) = 7.923$; $p < 0.01$, $\eta^2 = 0.15$; OP = 0.79] and static ITCC [$F(1,47) = 8.834$; $p < 0.01$, $\eta^2 = 0.16$; OP = 0.83], thus confirming the effectiveness of the experimental manipulation. These results are similar to previous studies that have used the same experimental manipulation in another field of research and have found that their manipulation on IT successfully changed the IT (Bauer and Hannover, 2020).

Figure 8. *Static and Incremental Implicit Theories of Climate Change (ITCC) Before and After Manipulation in the Two Experimental Groups.*

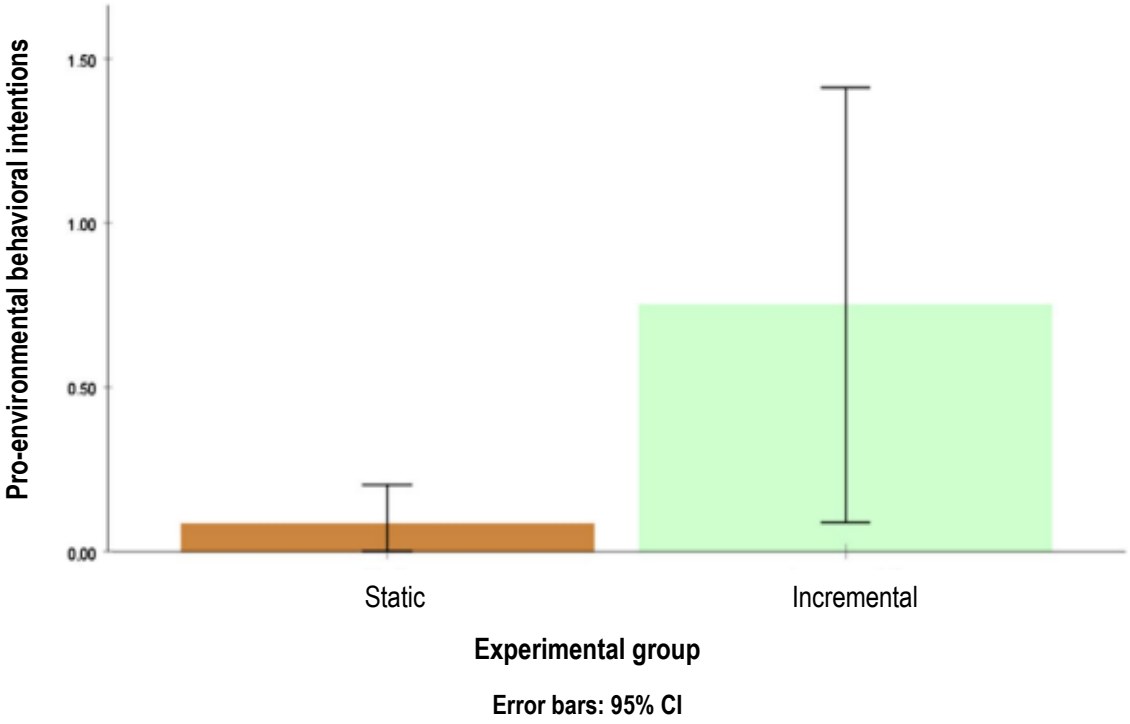


Note: CI = confidence interval

3.2. *Effect of manipulation on pro-environmental behavioral intention*

The one-way ANOVA performed with pro-environmental behavioral intention as a DV and experimental group as a factor showed significant differences between G1 and G2 [$F(1,47) = 4.206$, $p < 0.05$, $\eta^2 = 0.08$, OP = 0.52], thus confirming H1 (Figure. 9).

Figure 9. *Pro-Environmental Behavioral Intention for the Two Experimental Groups.*



Note: CI = confidence interval

3.3. *Moderating effect of implicit theories of global warming in the relationship between responsibility and pro-environmental behavior*

The moderating analyses showed that the interaction effect (Table 17) between the level of responsibility and the experimental group was only marginal. However, the simple effect of the level of responsibility perceived toward climate change was statistically significant for the incremental experimental group but not for the static experimental group (Table 18 and Figure 10). Thus, H2 is confirmed, according to which the perception of responsibility toward climate change influences the pro-environmental behavioral intention of individuals in a different way, depending on whether climate change is perceived as reversible (incremental ITCC) or not (static ITCC).

Table 15. *Coefficients of the Moderation Models for Hypothesis 2, With Implicit Theories About Climate Change as a Moderating Variable in the Relationship Between Perceived Responsibility Toward Climate Change and Pro-Environmental Behavioral Intention*

		Coeff	*SE*	*p* [LLCI, ULCI]
Constant	i1	-1.973	1.128	.088 [-4.25, 0.31]
X (Responsibility)	b1	0.536	0.260	.046 [0.01, 1.06]
M (ITCC)	b2	-3.726	2.257	.107 [-8.29, 0.84]
XM (Responsibility x ITCC)	b3	0.977	0.521	.068 [-0.08, 2.03]
	R^2 = .25 F(3,39) = 4.350, p = .010		ΔR^2 = .068 F(1,39) = 3.519, p = .068	

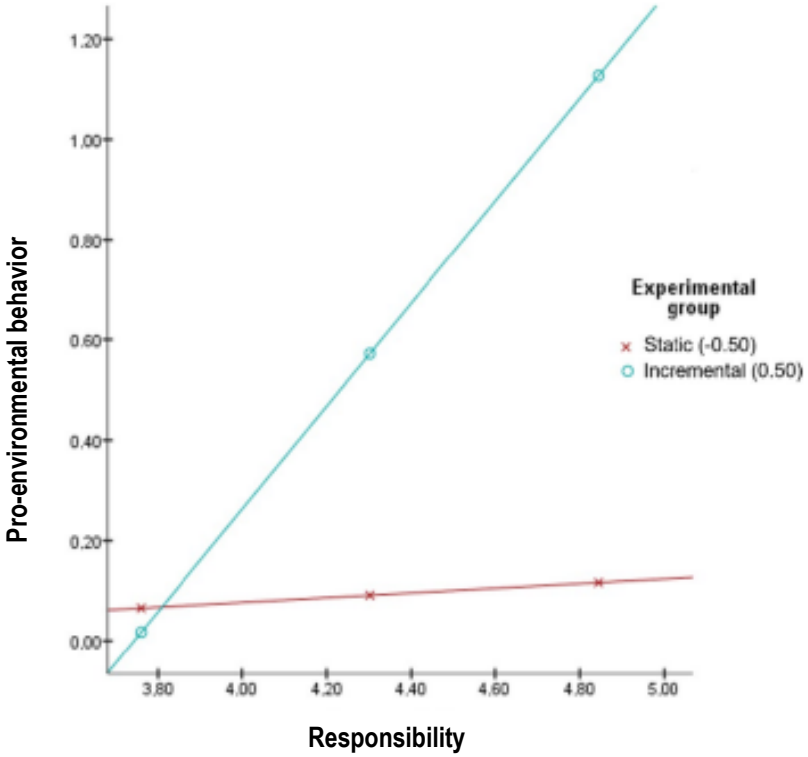
X independent variable; *M* moderator; *Y* dependent variable: *ITCC* implicit theories about climate change; *Coeff* Coefficient; *SE* standard error; *LLCI* lower-level confidence interval; *ULCI* upper-level confidence interval

Table 16. *Conditional effect of responsibility toward climate change on pro-environmental behavioral intention according to the experimental group values*

Experimental group	Effect	*SE*	*p* [LLCI,ULCI]
Static (−0.50)	0.047	.41	.908 [-0.78, 0.87]
Incremental (0.50)	1.024	.33	< .01 [0.37, 1.68]

SE standard error; *LLCI* lower-level confidence interval; *ULCI* upper-level confidence interval

Figure 10. *Environmental Behavior Versus Responsibility in the Two Experimental Groups: Induced Static Implicit Theories About Climate Change (Red) and Induced Incremental Implicit Theories About Climate Change (green).*



4. Discussion

There is practically a consensus in society that climate change is one of the most worrying global environmental issues, based on scientific evidence for its current consequences and potential risk (Yuan et al., 2017). Education is a key tool for facing this issue (Ledley et al., 2017; Monroe et al., 2019). Indeed, inclusive and equitable quality education is one of the main goals in the 2030 Agenda for Sustainable Development (United Nations, 2015). This bestows great responsibility on educational institutions and educators to convey the support and contributions that can be made from this field.

Our data analysis showed that ITCC seem to be a potentially powerful ally for educational work on environmental awareness. This study's results show that the beliefs that individuals have regarding the reversibility of climate change can condition their pro-environmental behavioral intentions, which is a relevant predictor of pro-environmental behavior (Ajzen, 2020). The results demonstrated that people with

incremental ITCC presented a greater intention to behave in a pro-environmental way than individuals with static ITCC. These results can be explained, as claimed by Dweck and other researchers (Chiu et al., 1997; Dweck et al., 1995; Dweck and Leggett, 1988; Dweck and Yeager, 2021), because IT about the world create a conceptual framework on which to base decisions and behaviors, by leading individuals with incremental IT to mastery-oriented behavioral patterns and individuals with static IT to passive avoidance-oriented behavioral patterns. In this sense, believing that climate change is malleable and modifiable makes individuals more prone to adopt mastery-oriented pro-environmental behavior patterns and more prone to participate in environmental care activities. Putting those results in the light of the 2030 Agenda for Sustainable Development (United Nations, 2015) seems to be relevant. Developers of policies and educational programs oriented to the promotion of sustainable development should consider the relevance of promoting and instilling in people and pupils the malleable view of climate change to achieve the promotion of pro-environmental behavioral intentions and behaviors in individuals and communities, and in this way favoring the 2030 Agenda for Sustainable Development goals (United Nations, 2015).

These results are especially relevant if we consider that the malleability of ITCC can be induced in people. In this sense, our results have corroborated the effectiveness of the manipulation. After manipulation, the levels of static and incremental ITCC were higher in the group in which they had been induced. This fact shows not only the effectiveness of experimental manipulation but also that our own beliefs about the malleability of climate change can be induced by different mechanisms. At the practical level, these results indicate that catastrophic environmental awareness practices and information regarding the irreversibility of climate change should be avoided. If the idea that there is nothing we can do to avoid environmental disasters is generated in the population, then unwanted static IT will be induced, along with the negative consequences on pro-environmental behavioral intentions found in this study. Moreover, considering that our results have demonstrated that ITCC can be modified with experimental manipulation, it would be interesting to encourage direct efforts in environmental education programs toward the development of incremental ITCC, which would lead to more pro-environmental behavior intentions in individuals.

The results of this study confirmed that the perception of responsibility toward climate change influences pro-environmental intentions in a different way depending on whether individuals perceive climate change to be reversible or not. Congruent with previous research, the more individuals feel responsible for climate change, the more they tend to behave in a pro-environmental way (Attaran and Celik, 2015; Fielding and Head, 2012; Reese and Jacob, 2015; Wang et al., 2011). Nevertheless, the novelty of the results of this study is that the effect of responsibility on the intention to behave in a pro-environmental way is different in individuals who believe that climate change is reversible than in individuals who believe that it is irreversible.

Specifically, the results showed that the levels of perceived responsibility toward climate change do not influence people's intentions to behave in a pro-environmental way when they have static ITCC; on the contrary, for individuals with incremental ITCC, the more they feel responsible toward climate change, the more they have the intention to behave in a pro-environmental way.

Thus, ITCC act as a moderator and seem to be a relevant key for individuals to develop pro-environmental behaviors, by influencing the relationship between responsibility and pro-environmental intention. These results are in line with previous research showing that IT act as moderators in the relationship between different variables in other research fields (Butler, 2000; Knee et al., 2004; Yung-Jui and Ying-Yi, 2010).

Thus, incremental ITCC could be a relevant protective factor for pro-environmental behavioral intentions, whereas static ITCC is a risk factor that hinders the implementation of pro-environmental behavior even if individuals feel responsible for climate change. With static ITCC, regardless of the degree of responsibility felt by individuals, if they perceive that climate change is no longer reversible then few actions will be carried out to try to change this fact. Thus, once again it seems fundamental, from the psychoeducational interventions in the field of environmental education, not only to promote the feeling of responsibility for climate change and environmental protection but also to promote incremental ITCC—a non-catastrophic vision of the possibility of change—to encourage individuals to take pro-environmental action.

4.1. Limitations and future research

Although the research results are promising, some limitations are worth noting.

First, the sample was limited in size and comprised entirely of students, which limits the possibility of generalizing the research to the global population. Therefore, it would be interesting to replicate this study in a more heterogeneous and larger sample, to observe whether the results found here are generalizable and to compare age groups and other variables to observe possible different behavior patterns between groups. Nonetheless, there is no reason to think that the relations between variables would be different in the student and global population. On the other hand, this study is representative of the behavior of the young population, so the conclusions could be applicable to this population group.

Another limitation is the greater percentage of women in the participant sample, which is a characteristic of the degree course from which the data were taken. Therefore, it would be interesting in future studies to replicate this experiment in a more homogeneous sample regarding gender in order to avoid possible bias due to this variable. Moreover, future research with larger and more heterogeneous samples could segregate the results by gender to explore any differences between men and women.

Likewise, it could be interesting to include other variables, as well as their interactions with the variables explored here, for a more complex and complete pro-environmental behavioral intention model. Also, because our research was carried out prior to the COVID-19 pandemic, it would be pertinent to consider the dynamics that could bring this actual scenario into new research on this field.

It should be noted that previous research has actually found that people with malleable views about the world reported being more willing to engage in pro-environmental behaviors (Duchi et al., 2020; Soliman and Wilson, 2017). The results of the present research not only support prior findings but also add more insights to the field, and also introduce an experimental methodology to find ways to improve environmental behaviors through the induction of malleable implicit theories about climate change.

This is an opportunity to develop new research lines in the field of environmental education, given the importance of learning how the way information is received by people can mold our daily actions, as well as the responsibility of educational institutions and educators to ensure the quality of this information.

4.2. Implications and policy recommendations

The results confirm that individuals with incremental ITCC present greater intention to behave in a pro-environmental way, and they also confirm an interaction effect of responsibility and ITCC to predict individuals' pro-environmental behavioral intention. Together, these results highlight the relevance of promoting incremental ITCC in environmental education programs. In this sense, the results indicate the relevance of the transmission of positive public messages regarding the possibility of overcoming climate change, thus promoting the induction of incremental ITCC to improve pro-environmental behavior in society. Environmental educators must be aware that their pupils' inherent beliefs can be modified by veering away from catastrophism regarding climate change. Also, educators must disclose information on the reversibility of climate change and global warming—in short, to instill incremental ITCC—so that the sense of individual responsibility can improve overall social pro-environmental behavior. All these actions must aim to support and attain the U.N. Sustainable Development Goals from the 2030 Agenda.

5. Conclusions

The main aim of this pretest–posttest study was to explore how the sense of responsibility toward climate change and ITCC interact to explain pro-environmental behavior. The results showed that people with incremental ITCC are more prone to behave in a pro-environmental way than individuals with static ITCC: the results of the one-way ANOVA showed that people with incremental ITCC presented a greater intention to behave in a pro-environmental way than individuals with static ITCC. Moreover, the sense of responsibility was shown to predict the intention to behave in a pro-environmental way only in individuals with incremental ITCC, but not in individuals with static ITCC: the moderating analysis showed that ITCC act as a moderating variable in the relationship between the sense of responsibility and pro-environmental behavioral intentions. The sense of responsbility predicted pro-environmental behavioral intention when individuals hold incremental ITCC but not when they hold static ITCC. Thus, one relevant conclusion is that a sense of responsibility is one of the relevant factors for the promotion of pro-environmental intentions and actions in individuals and societies; however, this is not enough, as shown by the moderating effect of ITCC. In addition to this sense of responsibility, it is

also necessary for individuals to perceive that these actions will achieve change, understanding that climate change and global warming can be stopped through individual and collective action.

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7. Appendix.

Article Extract Presented in The Posttest Questionnaire to Instill Incremental and Static Implicit Theories About Climate Change (ITCC).

Appendix 1a: Article Extract to Instill Incremental ITCC.

Text presented in the posttest questionnaire to the research participants, in which an extract from a newspaper article is presented that defends the reversibility of climate change to inoculate incremental ITCC:

Climate change: the point of no return was not reached

Results of the Climate Dynamic Research Group published in the high-impact scientific journal *Environmental Reviews*

Polar bears drifting on melting icebergs.

The scientific community is unanimous: climate change is a fact. While there has been no doubt about the existence of global warming and climate change for a long time, until recently the controversy was whether such climate change was irreversible, or whether there was still the possibility of stopping it by changing the behaviors of individuals and of the societies. However, it seems that a recent scientific study has finally resolved this question.

Indeed, the Research Group 'Climate Dynamics Group' of the Department of Atmospheric, Oceanic and Planetary Physics of the University of Oxford, led by a professor in the scientific branch of climatology, Myles Allen, has published on October 25, in the high-impact scientific journal 'Environmental Reviews', an article that leaves no room for doubt, and determines that global change can still be reversed.

The conclusions of the study, based on exhaustive statistical and climatological calculations, are conclusive and clear: Human beings can still slow down the global warming of the planet. The study determines that to curb climate change, both the small individual actions of the citizen (such as recycling, making less use of motor vehicles, or stopping dumping plastics into the environment), as well as the possible actions to reduce greenhouse gases or the polluting effects of large industries, count to stop global warming. We have not yet reached a point of no return; if individuals, industries and societies take action and act, we still have time to stop global warming. The climate change process is still reversible, and it is in the hand of the human being to achieve this fact if he takes the reins and acts accordingly, minimizing its environmental impact.

"Human beings can still slow down the global warming of the planet. to curb climate change, both the small individual actions of the citizen and the possible actions to reduce greenhouse gases or the polluting effects of large industries count to stop global warming"

- Myles Allen -

Appendix 1b: Article Extract to Instill Incremental ITCC

Text presented in the posttest questionnaire given to the research participants, in which an extract from a newspaper article is presented that defends the irreversibility of climate change to instill static ITCC:

Climate change: point of no return was reached

Results of the Climate Dynamic Research Group published in the high impact scientific journal *Environmental Reviews*

Polar bears drifting on melting icebergs.

The scientific community is unanimous: climate change is a fact. While there has been no doubt about the existence of global warming and climate change for a long time, until recently the controversy was whether such climate change was irreversible, or whether there was still the possibility of stopping it by changing the behaviors of individuals and of the societies. However, it seems that a recent scientific study has finally resolved this question.

Indeed, the Research Group 'Climate Dynamics Group' of the Department of Atmospheric, Oceanic and Planetary Physics of the University of Oxford, led by a professor in the scientific branch of climatology, Myles Allen, has published on October 25, in the high-impact scientific journal 'Environmental Reviews', an article that leaves no room for doubt, and determines that global change is already unstoppable.

The conclusions of the study, based on exhaustive statistical and climatological calculations, are conclusive and clear: there is nothing that humans can do to stop global warming on the planet. Neither the small individual actions of the citizen (such as recycling, making less use of motor vehicles, or stopping dumping plastics into the environment), nor the possible actions to reduce greenhouse gases or the polluting effects of large industries will be enough to stop global warming. We have already reached a point of no return where neither individual action nor those of industries or societies will have an effect. The climate change process is already unstoppable, and human beings can no longer do anything to change this fact.

"There is nothing that humans can do to stop global warming on the planet. Neither the small individual actions of the citizen nor the possible actions to reduce greenhouse gases or the polluting effects of large industries will be enough to stop global warming"

- Myles Allen -

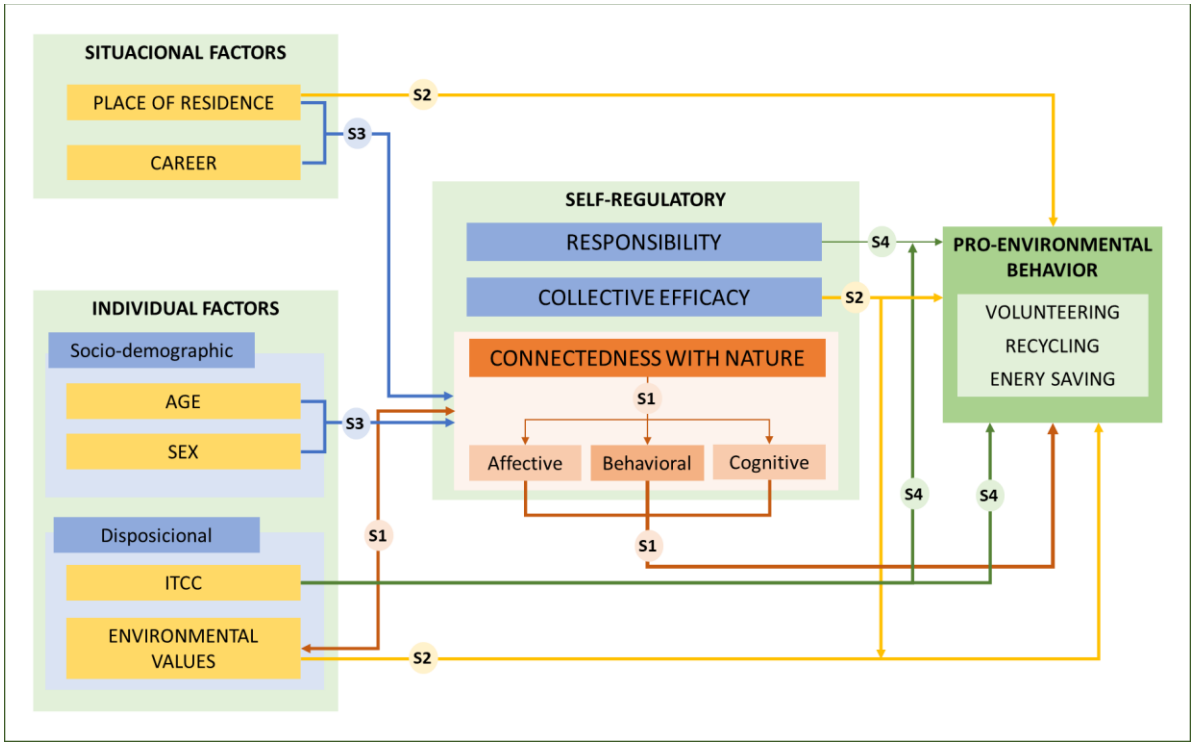
CAPÍTULO 4. DISCUSIÓN

CAPÍTULO 4. DISCUSIÓN

1. Discusión general de los cuatro estudios

El comportamiento proambiental puede ser influenciado y mediado por diferentes factores que hemos estudiado a lo largo de esta investigación. Como se puede observar en la Figura 11, y basándonos en la aplicación del CAPS (Mischel y Shoda, 1995) al comportamiento proambiental, sostenemos que estos factores pueden ser tanto personales (individuales y factores autorregulatorios; ver **estudios 1 a 4**) como situacionales (factores externos, **estudios 2 y 3**); además, pueden ubicarse a nivel individual o colectivo. En el presente estudio, a través del cumplimiento de los objetivos principales, se han obtenido diferentes hallazgos que discutiremos a continuación.

Figura 11. *Diagrama de las relaciones analizadas en cada estudio de la presente tesis.*



Nota. S = Estudio; ITCC = Teorías implícitas acerca del cambio climático.

El desarrollo de una escala integral para medir el constructo de conexión con la naturaleza es una de las principales necesidades para lograr una comprensión más profunda este y de las variables que lo influyen, así de cómo desarrollarlo en los individuos (Riechers et al., 2022). Como mencionan Barrera-Hernández et al. (2020), la relación entre los seres humanos y la naturaleza tiene un impacto en nuestros comportamientos y, a su vez, en el futuro del planeta. Por esta razón, como se puede

observar en el **estudio 1**, uno de los principales objetivos alcanzados en este trabajo no solo fue demostrar la relación entre la conexión con la naturaleza y el comportamiento proambiental, sino también incluir este último como una dimensión dentro del constructo de conexión con la naturaleza, a través de un enfoque de actitudes. En este sentido, la presente tesis permite confirmar que la conexión con la naturaleza está compuesta por tres dimensiones diferentes (**estudio 1**) y puede ser influenciada por factores como la edad, el género, la carrera o el lugar de residencia (**estudios 2 y 3**); además, la dimensión comportamental también puede ser influenciada por teorías implícitas (ITCC) (**estudio 4**).

El producto final, la escala ABC-CNS, responde a la necesidad de abordar las relaciones entre los seres humanos y la naturaleza a través de un nuevo enfoque e integrar nuevos aspectos en el campo de la conexión con la naturaleza (Corraliza y Bethelmy, 2011). Para Fränkel et al. (2019), las numerosas escalas desarrolladas previamente para medir el constructo de conexión con la naturaleza expresan diferentes dimensiones de nuestra relación con la naturaleza, esto desde aspectos afectivos, conductuales y cognitivos. El resultado de nuestra propuesta logró incluir los factores afectivos, conductuales y cognitivos (ABC) en ambas muestras de investigación (España y Ecuador); el análisis factorial exploratorio y confirmatorio muestran un ajuste sólido y una estructura trifactorial para nuestra escala.

Lo anterior respalda la idea de la conexión con la naturaleza como un constructo multidimensional, propuesta por Barnes et al. (2021). Además, los resultados del **estudio 3** evidencian la practicidad de la escala multidimensional en diferentes contextos. La integración de estos tres aspectos mencionados en una escala contribuye a un cambio necesario hacia una visión con matices emocionales sin descuidar los aspectos cognitivos y conductuales (Corraliza y Bethelmy, 2011).

En el **estudio 1** también fue posible verificar, a través de la validez externa de la escala, que aquellos individuos que presentan niveles altos de conexión con la naturaleza también muestran niveles altos de actitudes y comportamientos ambientales, como el reciclaje y el consumo sostenible. Por lo tanto, las contribuciones para lograr una mayor conexión ambiental se traducen en la obtención de comportamientos proambientales (di Fabio y Rosen, 2019). Además, se verifica que el factor comportamental analizado en el **estudio 1** (es decir, la tendencia a actuar

como parte del mundo natural) está especialmente correlacionado con el comportamiento proambiental.

Previo a esto, diversos investigadores han visto la necesidad de desarrollar escalas adaptadas a sus contextos y las particularidades de sus muestras, así como a las dimensiones que requieren investigación (Fränkel et al., 2019; Krettenauer et al., 2020; Sedawi et al., 2021). Los resultados obtenidos en el **estudio 1**, así como su metodología, pueden contribuir a futuros estudios desarrollados en el mismo campo, enfocados en desarrollar escalas específicas para contextos particulares. Además, de acuerdo con lo anterior, se debe tener en cuenta que factores situacionales y externos, como la cultura, afectan la relación de los individuos con la naturaleza (Fränkel et al., 2019). Por lo tanto, esta escala puede seguir siendo desarrollada y probada en diferentes contextos, con el fin de elaborar diagnósticos socioambientales más completos. Asimismo, la información obtenida servirá como retroalimentación para mejorar la escala.

Otro de los puntos clave abordados en esta tesis fue la influencia del lugar de residencia en el constructo de conexión con la naturaleza (ABC-CNS, **estudio 3**) y en los comportamientos proambientales (**estudio 2**). En la figura 11 se puede observar un diagrama sobre la interacción entre las diferentes variables en el estudio y el comportamiento ambiental.

Los resultados indican que, aunque los diferentes factores bajo estudio (como la edad y el género, **estudio 3**) influyen en el constructo, su influencia, ya sea positiva o negativa, a menudo obedece al contexto en el que se desarrollan los individuos. Fränkel et al. (2019) mencionan que el contexto cultural puede influir en la forma en que el ser humano se relaciona con el entorno, asumiendo así que las personas nativas en un determinado ecosistema podrían sentirse más conectadas con la naturaleza que las personas no nativas (**estudio 2 y 3**).

En el caso del factor lugar de residencia, partimos de la premisa de que en contextos rurales esta conexión es mayor debido a las condiciones propias de una intervención humana "no muy alta" en el ecosistema natural (**estudio 3**), lo que ofrecería un mayor contacto con la naturaleza, un factor precursor de la conexión con la naturaleza (Barnes et al., 2021).

Sin embargo, los resultados sugieren que, aunque es cierto que las oportunidades de contacto con la naturaleza son mayores en las áreas rurales, también hay altos niveles de conexión con la naturaleza y comportamiento proambiental en áreas urbanas (**estudio 2**). Para explicar lo anterior, se podría considerar el sentido de pertenencia. La conexión con la naturaleza se ha asociado con el sentido de pertenencia de los seres humanos, de esta forma se explica cómo los seres humanos se conectan con los lugares y cómo esta conexión influye en su conexión con la naturaleza, y a su vez pueden desarrollar comportamientos ambientales (Sedawi et al., 2021). A partir de lo anterior, también se puede incluir el apego al lugar, que es un vínculo desarrollado con el entorno físico y sociocultural, que integra el constructo de conexión con la naturaleza como una dimensión (Rodríguez-Díaz et al., 2022). Para Colléony et al. (2017), la noción de espacio natural puede cambiar de persona a persona, y este espacio puede variar en su configuración, desde parques hasta jardines privados, lo importante es conocer cuáles son esos elementos a través de los cuales las personas se conectan con la naturaleza.

A partir de lo anterior, se debería prestar más atención a la configuración de los paisajes de estas áreas, y qué papel juegan los elementos naturales dentro de estos, en otras palabras, cuáles son las oportunidades de contacto con la naturaleza ofrecidas tanto en áreas rurales como urbanas, y en qué condiciones se produce dicho contacto. Para Riechers et al. (2022), la calidad de los paisajes y su composición influyen a nivel social (factores externos estudiados en el **estudio 3**), tanto en los niveles de conexión con la naturaleza como en el resto de las contribuciones que los seres humanos podrían recibir de esos entornos. Schönbach et al. (2022) mencionan que uno de los factores que pueden influir es el acceso limitado a áreas naturales, lo que puede reducir los beneficios obtenidos de estas.

Asimismo, en el caso de los comportamientos ambientales (**estudio 2**), el lugar de residencia influye en la frecuencia de estos; sin embargo, se debe tener en cuenta que además de las oportunidades de contacto con la naturaleza y la conexión con esta, el entorno debe proporcionar infraestructura, políticas y sistemas de gestión que faciliten tales comportamientos, por ejemplo, el reciclaje. Los estudios relacionados con el apego al lugar y la conexión con la naturaleza pueden proporcionar indicaciones para desarrollar comportamientos ambientales centrados en la

conservación de áreas naturales (Gosling y Williams, 2010). Los estudios en esta área pueden contribuir a la planificación del paisaje, a través del cual se pueden aumentar las oportunidades de contacto con la naturaleza; con el diseño de áreas verdes y naturales que deben implementarse de manera que puedan ser visitadas y utilizadas (Colléony et al., 2017).

En cualquier caso, la ventaja de este estudio de tomar dos muestras, una española y otra ecuatoriana, nos presentó la oportunidad de revisar dos contextos y realidades, que son similares en idioma y otros factores socioculturales y demográficos, pero diferentes en su configuración de paisajes rurales y urbanos, así como en las oportunidades de contacto con la naturaleza. Los resultados de los **estudios 2 y 3** deberían ayudar a futuras investigaciones a centrarse en el estudio de los elementos que componen los entornos naturales y construidos, con el objetivo de mejorar aspectos del contacto con la naturaleza y permitir el desarrollo de la conexión con la naturaleza y comportamientos proambientales.

Los resultados de esta tesis respaldan varios de los factores individuales que contribuyen al desarrollo y ejecución de comportamientos proambientales (**estudios 1, 2, 3 y 4**). Además, también ha sido posible establecer aquellos factores externos que contribuyen tanto a la conexión con la naturaleza como al comportamiento ambiental (**estudios 2 y 3**). Uno de los resultados más relevantes es la importancia del entorno social (**estudio 2**) en el momento de la ejecución de dichos comportamientos.

Los seres humanos son seres sociales por naturaleza (Li y Liu, 2016), sin embargo, gran parte del estudio sobre el comportamiento ambiental tiende a relegar este aspecto. Para Maki y Rothman (2016), las normas sociales que un grupo desarrolla son un determinante clave en la intención de comportamiento ambiental. Además, Joireman et al. (2001) consideran que tanto el uso de recursos como el comportamiento proambiental pueden entenderse como dilemas sociales. Aunque los comportamientos proambientales individuales son importantes para lograr objetivos de conservación, nuestros resultados sugieren que estos esfuerzos deben reflejarse en toda la sociedad, para producir cambios a mayor escala y más duraderos.

Nuestro comportamiento puede ser modificado por nuestro entorno social (Li y Liu, 2016). Los individuos tienden a alinear su posición con la de las mayorías en sus

grupos, debido a la percepción de que estas posiciones son más correctas y competentes o para satisfacer preocupaciones de identidad; se ha encontrado que las mayorías influyen en las personas en resultados como el consumo diario de energía (Lalot et al., 2017).

Los resultados del **estudio 2** indican que las creencias de eficacia colectiva pueden modular el desarrollo de comportamientos ambientales basados en valores individuales. En este sentido, los resultados presentados en el **estudio 2** han demostrado que los valores ambientales a nivel individual y la eficacia colectiva a nivel colectivo afectan conjuntamente los comportamientos proambientales presentados por los individuos. Los dos estudios realizados muestran que cuando las personas exhiben bajos niveles de valores ambientales, necesitan niveles altos de confianza en que su grupo podrá actuar de manera proambiental para también comportarse de manera proambiental. La idea detrás de estos hallazgos es no solo poder replicar estos comportamientos a través de los individuos que conforman un grupo social, sino también asegurar que los individuos puedan confiar en la capacidad de su entorno social para realizar tales tareas, especialmente en individuos que tienen bajos niveles de valores ambientales, ya que la eficacia colectiva puede ayudar a estos individuos a desarrollar y presentar comportamientos proambientales. Las dinámicas sociales de cada entorno, como la escuela o el hogar, pueden determinar las diferentes oportunidades para participar en comportamientos de conservación y reciclaje en dichos entornos, incluso acciones visibles en espacios públicos pueden facilitar el comportamiento proambiental (Maki y Rothman, 2016). Promover un alto nivel de eficacia colectiva para el comportamiento proambiental parece ser particularmente relevante en el contexto social (tanto a niveles académicos formales como educación informal) para aumentar los comportamientos proambientales en individuos y comunidades.

Para Afsar et al. (2020), el efecto combinado de contextos sociales y diferencias individuales puede ser el desencadenante del comportamiento proambiental. Por lo tanto, las estrategias aplicables individualmente para promover valores ambientales o la conexión con la naturaleza, en un entorno social que brinde apoyo, confianza y eficacia colectiva, pueden mejorarse al ejecutar comportamientos proambientales. La importancia de los resultados obtenidos en el **estudio 2** radica en

que su aplicación puede ocurrir en diferentes niveles de grupos sociales, desde centros educativos y entornos laborales, hasta incluso pueblos y ciudades.

También es importante destacar el papel de la información en el desarrollo de comportamientos proambientales. Nuestros resultados en el **estudio 4**, basados en experimentación con teorías implícitas, enfatizan cómo se percibe la información. Debido a lo anterior, los resultados demuestran la importancia de cómo se maneja la información; la forma en que se presenta la información influye en la percepción de los individuos (Kellstedt et al., 2008). A su vez, la percepción que tienen los individuos sobre la reversibilidad de los problemas ambientales influye en la idea que tienen sobre la posible solución a estos problemas y su intención de comportamiento proambiental. Específicamente, los resultados presentados en el **estudio 4** muestran que tanto la responsabilidad percibida que los individuos presentan con respecto al cambio climático como la creencia que tienen sobre la posibilidad de mitigar el cambio climático (Teorías implícitas sobre el cambio climático; TICC) son variables relevantes que influyen en las intenciones de comportamiento proambiental. Sin embargo, los resultados muestran que el sentido de responsabilidad predijo la intención de comportarse de manera proambiental solo cuando las personas piensan que el cambio climático aún es mitigable, pero no cuando piensan que ninguna acción puede mitigar el cambio climático. En este sentido, la investigación enfatiza la relevancia de promover intervenciones socioeducativas orientadas a aumentar las TICC incrementales, ya que el sentido de responsabilidad hacia el cambio climático es determinante pero no suficiente por sí mismo para adquirir la intención de comportarse de manera proambiental.

Cabe destacar que los resultados del **estudio 4** confirman la maleabilidad de las TICC y, por lo tanto, pueden ser inducidas. Estos resultados denotan la responsabilidad que debe existir entre aquellas personas que gestionan la información dentro de las sociedades. Estos hallazgos se integran con los resultados anteriores en el **estudio 2** sobre la eficacia colectiva para el comportamiento ecológico. Esta percepción de que la colectividad es capaz de actuar de manera proambiental no se limita solo al desarrollo de comportamientos y acciones, también aborda la forma en que la sociedad maneja la información y cómo llega a los individuos.

Parte de esta información es la que se transmite a través de la educación. En esta tesis, se ha podido demostrar cómo la educación puede influir en el desarrollo de comportamientos proambientales. Esta influencia no solo puede proporcionarse directamente en el aula, sino también creando programas que permitan el desarrollo de conocimientos, experiencias y emociones en contacto con la naturaleza. Así es como la educación ambiental debería destacarse, brindando oportunidades para involucrar a las personas con la naturaleza en contextos de aprendizaje (Riechers et al., 2022). Además, la forma en que se comparte la información con la población y los estudiantes parece ser muy importante, evitando los discursos catastróficos en las comunicaciones enviadas por gobiernos y educadores, ya que se ha demostrado que las creencias sobre la imposibilidad de mitigar el cambio climático suponen una parálisis en los individuos con respecto a sus intenciones y comportamientos proambientales (**estudio 4**).

Barnes et al. (2021) destacan el papel de las instituciones educativas en el desarrollo de programas que buscan reconectar a los jóvenes con el entorno natural para involucrarlos en actividades proambientales. Asimismo, las instituciones deben buscar involucrar a niños y jóvenes en proyectos de ciencia ciudadana, de manera que, además de recibir información, puedan ayudar a recopilar y procesar dicha información, y también comunicar los resultados a sus pares, todo esto mientras desarrollan el pensamiento crítico y las habilidades científicas para abordar problemas ambientales (Williams et al., 2021). En el contexto de la educación para el desarrollo sostenible, se considera que la conexión con la naturaleza es un requisito previo para el desarrollo de comportamientos proambientales (Fränkel et al., 2019). Además, estos espacios sociales se convierten en entornos que deben transmitir confianza y eficacia colectiva para los comportamientos ecológicos a los individuos, así como confianza en la posibilidad de implementar acciones que puedan mitigar el cambio climático, de modo que la información transmitida en estos espacios tenga la capacidad de formar y definir patrones de comportamiento a corto y mediano plazo.

Luego, surge la necesidad de que los centros educativos asuman un papel responsable en la sociedad, no solo definiendo la calidad de la información, sino también cómo se transmite a los individuos. Los resultados obtenidos a lo largo del cumplimiento de los objetivos de esta tesis pueden contribuir, como mencionan Fränkel et al. (2019), al desarrollo de programas de educación ambiental

culturalmente sensibles que tengan en cuenta tanto el contexto ambiental como social en el que operan los individuos, con el fin de responder a requisitos reales y establecer metas de desarrollo sostenible reales.

2. Conclusiones generales

A la luz de los resultados presentados a través de los cuatro estudios que componen esta tesis, se presentan varios puntos clave expresados a continuación en las siguientes conclusiones:

- El comportamiento ambiental correlacionó positivamente con la conexión con la naturaleza. Se pudo verificar que la conexión con la naturaleza influye en comportamientos ambientales como el consumo responsable y el reciclaje. Ambos constructos pudieron correlacionarse, pero además de esto, se creó con éxito una propuesta para una nueva escala, la escala ABC-CNS, que aborda el constructo de conexión con la naturaleza mediante un enfoque de actitud, integrando los tres componentes de las actitudes: afecto, comportamiento y cognición.
- La escala demostró tener tanto consistencia interna, probada a través de los valores alfa de Cronbach y el coeficiente H, como consistencia externa, probada a través de la correlación con las diferentes variables utilizadas en el estudio (2- MEV y NEP). Además, tanto el EFA como el CFA verificaron la estructura multifactorial de la escala propuesta. Esto demuestra que el constructo es realmente multidimensional, respaldando la teoría detrás del enfoque tridimensional propuesto.
- Otra de las variables analizadas que tuvo influencia en el comportamiento ambiental fue la eficacia colectiva. Se pudo demostrar que la eficacia colectiva para el comportamiento ecológico moderaba la relación entre los valores ambientales y el comportamiento proambiental de reciclaje y ahorro de energía. Por lo tanto, ante bajos niveles de valores ambientales positivos y altos niveles de valores ambientales negativos, se requiere una mayor eficacia colectiva para poder ejecutar acciones y comportamientos ambientales.
- El lugar de residencia tiene un impacto en el ahorro de energía, con valores más altos para las áreas rurales. Esto respalda la noción de que el lugar de

residencia puede influir en el comportamiento proambiental según los contextos socioculturales y físicos presentes en esos lugares.

- Las variables analizadas, género, edad y carrera, demostraron influir en los niveles de conexión con la naturaleza. Dentro de estas variables, las categorías que presentaron los valores más altos fueron mujeres (género), rango de edad de 26-50 (edad) y ambiente y biología (carrera). En el caso de la variable de lugar de residencia, el campo presentó los valores más altos. Lo que significa que, de hecho, estas variables influyen en la conexión con la naturaleza, sin embargo, su influencia depende del contexto sociocultural y físico en la mayoría de los casos.
- Existen diferencias significativas en los grupos con TICC estáticas y TICC incrementales después de la manipulación experimental, lo que a su vez influyó en la intención de comportamiento proambiental, resultando en una mayor intención de comportamiento proambiental en aquellos individuos que presentan ITCC incrementales.
- Además, las ITCC demostraron tener un efecto moderador entre el sentido de responsabilidad y la intención de comportamiento ambiental. En otras palabras, no solo es necesario sentirse responsable de los problemas ambientales, sino también percibir que los problemas ambientales pueden mitigarse, para materializar acciones y actitudes ambientales.

Además, se pueden realizar diversas recomendaciones. Como se mencionó anteriormente, uno de los resultados de esta tesis es la escala ABC-CNS. Esta escala ha demostrado ser una herramienta útil para recopilar información sobre la conexión con la naturaleza. Se sugiere probar la escala en otros contextos de la relación entre los seres humanos y la naturaleza, con el fin de continuar mejorándola. Crear y mejorar métodos de educación ambiental basados en el contacto con la naturaleza y el desarrollo de experiencias y emociones en la naturaleza. Estos métodos pueden aplicarse en varios niveles del sistema educativo, además de la preparación y formación de individuos. Se debe prestar atención al desarrollo de entornos y sistemas sociales que generen confianza en la eficacia individual y colectiva para comportamientos ecológicos, lo que permitirá llevar a cabo acciones y comportamientos proambientales con la certeza de que el entorno proporciona las condiciones físicas y de gestión necesarias. Además, estas acciones pueden

replicarse en el resto de los individuos y convertirse en parte de su estilo de vida. Se debe prestar mayor atención a la información ambiental a la que pueden acceder los ciudadanos. Crear y gestionar sistemas y canales para la divulgación oportuna y adecuada de problemas ambientales que afectan a nivel local y global. Además, estos espacios de información deben permitir la discusión y participación entre los habitantes y los informantes, y deben centrarse en la posibilidad de mitigar los impactos negativos en el medio ambiente, evitando el catastrofismo. Además, los espacios deben diseñarse de manera que proporcionen oportunidades de contacto con la naturaleza. Estos espacios deben distribuirse dentro del territorio de manera que ningún grupo de la población se sienta excluido en su acceso y disponibilidad. Además, estos espacios deben integrarse con el territorio y formar parte de la configuración del paisaje.

Se deben desarrollar nuevas líneas de investigación centradas en la relación entre los seres humanos y el medio ambiente, especialmente en el estudio de las oportunidades de contacto con la naturaleza y la gestión de la información sobre problemas ambientales. En ambos casos, estos son aspectos que deben analizarse para el desarrollo de ciudades con un enfoque sostenible.

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