Social Factors Influencing Children's Pro-Environmental Behaviour

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Abstract

This study investigates how social factors influence pro-environmental behaviour (PEB) in children and adolescents aged 9 to 15 years. Participants (N = 164) from 13 classrooms across two schools completed an effort task in which they chose between low-effort/low-reward and high-effort/high-reward options for trials benefiting themselves, a pro-environmental organization, or a prosocial organization. Midway through the task, participants received one of three randomly assigned social norm manipulations: a message indicating high peer support for environmental behaviour, low peer support, or an unrelated control message. We assessed classroom cohesion through sociometric nominations and individual social susceptibility through self-report questionnaires. Using multilevel modeling to account for the nested structure of participants within classrooms and schools, we examined how social norm manipulation affects effortful pro-environmental behaviour. The moderating variables — classroom cohesion and social susceptibility — were derived using social network analysis and factor analysis, respectively. Results and implications for promoting pro-environmental behaviour in educational settings are discussed.

Keywords: pro-environmental behaviour, social norms, adolescence, multilevel modeling, climate

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Introduction

The climate crisis has become one of the most pressing global challenges of our time, posing significant risks to both present and future generations, with human activity both driving and experiencing its consequences (IPCC, 2023). Although human behaviour contributes to environmental problems, it also holds the potential to develop sustainable solutions. Understanding the psychological and social factors underlying pro-environmental behaviour (PEB) is therefore essential for promoting sustainable habits (Cantillo et al., 2025).

Given that behavioural patterns often form during childhood and adolescence, understanding PEB among young people is especially valuable. Early intervention may have lasting effects on environmental attitudes and behaviours throughout life. Children and adolescents demonstrate a strong capacity to recognize environmental harm as morally wrong, sometimes even when such perspectives conflict with those in their social surroundings. Because they are still developing their social identities and are more open to external influence, this group may be generally more receptive to pro-environmental norms and interventions (Liu & Green, 2024).

Previous research has demonstrated the influence of social environmental engagement among young people. Normative influences from peers can either promote or discourage pro-environmental behaviours (Collado et al., 2019; Gong et al., 2022), while classroom dynamics, such as cohesion and social connectedness, have been shown to shape adolescents' behaviours and attitudes more broadly (Bartolo et al., 2023).

However, much of the existing research relies on self-report or observational data, which limits conclusions about causal effects. Experimental approaches that combine behavioural tasks with measures of social context are therefore necessary to advance our understanding of how social factors influence pro-environmental behaviour in late childhood and early adolescence.

This paper analyzes data from 164 participants drawn from a larger ongoing study investigating children's and adolescents' PEB in relation to social environmental factors. In the experimental task, participants allocate effort between themselves, a pro-environmental organization, and a prosocial organization. The task design was adapted from Cutler et al. (2025), with modifications made to the incentive structure for effort. Beyond the experimental task, classroom cohesion and individual social susceptibility are assessed, reflecting the importance of social environmental factors highlighted by Collado et al.

(2019) and Gong et al. (2022). By combining behavioural and self-reported measures, the study aims to provide a more comprehensive understanding of PEB.

The current study addresses two primary research questions. First, we examine the effect of manipulating the social norm regarding pro-environmental behaviour on children's effortful behaviour in an experimental task. Second, we investigate how classroom cohesion and individual social susceptibility moderate changes in pro-environmental effort behaviour following social norm manipulation. We hypothesize that participants will demonstrate increased high-effort choices for pro-environmental targets following exposure to a positive pro-environmental social norm, particularly among those with higher social susceptibility and in more cohesive classrooms.

Methods

Participants and Design

The study used a mixed experimental design with both within-subject and between-subject factors. Participants were 164 children and adolescents, aged 9 to 15 years old, from 13 classrooms across two schools (School 1 with two locations and School 2 with one location). Class sizes ranged from 19 to 33 students. Of the 369 participants initially approached for participation, 164 provided parental consent and participant assent and completed the study.

The design included within-subject factors: social target (self, climate, prosocial), reward (2, 6, or 10 points versus 1 point for the low-effort option), effort level (40% or 90% versus 10% for the low-effort option), and block (pre-manipulation and post-manipulation). The between-subject factor was the social norm manipulation with three levels: positive pro-environmental norm ("Most of your classmates (80%) find it VERY important that you behave in an environmentally conscious way"), negative pro-environmental norm ("Most (80%) of your classmates find it NOT AT ALL important that you behave in an environmentally conscious way"), and control condition ("Most (80%) of your classmates find it VERY important that you listen to music"). Participants were randomly assigned to one of the three manipulation conditions using Qualtrics randomization, resulting in 55 participants in the positive norm condition, 53 in the negative norm condition and 56 in the control condition.

Procedure

Data were collected in classroom settings during regular school hours in and around Leiden. Following parental consent and participant assent (obtained via Qualtrics prior to data collection), children participated together with their classmates using school-provided

laptops or tablets separated between workstations. Researchers remained present throughout to answer questions. The total session duration was approximately one hour.

Participants completed a Qualtrics survey consisting of two questionnaires (sociometric nomination and social susceptibility scale) followed by a behavioural task.

The task began with calibration trials where participants clicked as many boxes as possible within a fixed time frame. This procedure allows the task to be adjusted according to each participant's prior experience with technology and their current experimental setup. Consequently, participants who select fewer boxes during the calibration trials will be required to select fewer boxes throughout all subsequent trials, whereas participants who initially select a larger number of boxes will face proportionally more demanding task requirements. Participants then completed 36 trials divided into two blocks of 18 trials each.

In each trial, participants chose between a low-effort/low-reward option (10% effort level for 1 point) and a high-effort/high-reward option with varying effort levels (40% or 90%) and reward amounts (2, 6, or 10 points). The effort level corresponded to the number of boxes participants would need to click on the screen. Each block included six trials for each of the three social targets (self, climate organization, and prosocial organization), with trial order randomized within each block for each participant. After completing the first block of 18 trials (pre-manipulation), participants received the social norm manipulation message corresponding to their randomly assigned condition. They then completed the second block of 18 trials with the same structure as the first block.

To ensure ecological validity, participants were informed that their choices would have real-life consequences: one trial per target would be randomly selected to determine additional gifts and actual donations to environmental and prosocial organizations. All children received a small gift for their participation.

Measures

Effort Task

The primary outcome measure was the binary choice between low-effort/low-reward and high-effort/high-reward options in each trial, coded as 0 (low-effort choice: 10%) or 1 (high-effort choice: 40% or 90% for 2, 6, or 10 points). The task manipulated three within-subjects factors:

Social target: where the trial benefited the participant (self), an environmental organization (climate), or a prosocial organization (prosocial)

Reward: points offered for the high-effort option (2, 6, or 10 points vs 1. for low-effort)

Effort level: physical effort required for the high-effort option (40% or 90% vs. 10% for the low-effort).

All combinations ($3 \times 3 \times 2 = 18$) were presented once per block.

Social Susceptibility Scale

Social susceptibility was measured using an 8-item questionnaire adapted for the Dutch language. The scale comprises two subscales: social anxiety (4 items; e.g., "I worry about what my peers say about me") and peer-based self-esteem (4 items; e.g., "To feel good about myself, it is important to me to be liked by children my age"). Participants rated each item on a 5-point scale from 1 (not true at all) to 5 (always true). Subscale scores were calculated by averaging the relevant items, with higher scores indicating greater social anxiety or greater dependence on peer approval for self-esteem. To ensure robustness, the internal consistency of the subscales was assessed. Traditionally, Cronbach's α has been the more commonly used measure. However, in recent years, McDonald's ω has been favored, as it accounts for the variability in factor loadings, whereas α assumes equal loadings across items (Hayes & Coutts, 2020). Additionally, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), were performed to investigate the factor structure driven by data. Based on the further analysis, a single-factor composite score was created by averaging all items from the questionnaire.

Sociometric Nominations

Classroom social dynamics were assessed through peer nominations. Participants could nominate up to five classmates they liked most from their class in response to the question "Which children from the class do you like the most?". Participants could also choose not to nominate anyone. Nominations were recorded using participant identification numbers corresponding to the full class, and thus children could nominate classmates who did not themselves participate in the study. The purpose of this assessment was to determine classroom cohesion and explore moderation effects on the main analysis.

In social network analysis, social cohesion generally refers to the connectedness and togetherness of a group of actors in a network. A cohesive group is one where members are well-connected, relationships are widely distributed, and the network holds together strongly as a single unit. However, the concept can be implemented in various ways. The most common metrics used to characterize network structure include density, reciprocity, transitivity (or clustering), average path length, and component count.

Density. Network density is one of the most basic cohesion measures and is used most often as an analogue to cohesion. Density is the proportion of all present ties versus all the possible ties in the network. A higher density indicates a more tightly knit network.

Reciprocity. In directed networks, reciprocity measures the fraction of ties that are mutual. A high reciprocity means if A likes B, B often likes A back. Reciprocity is often viewed as a sign of strong networks, since relationships are two-way. Some research combines reciprocity with density as indicators of cohesion.

Transitivity. Also known as the global clustering coefficient, captures the tendency for friends-of-friends to also be friends, in other words, tendency to form triangle relationships. It measures how often two people who share a common neighbor are themselves connected. High transitivity indicates that nodes may form triangles, reflecting a more tightly connected structure.

Path length. Another consideration is to look at distances between nodes. In a highly cohesive network, distances are short, everyone is either directly connected or just a friend-of-a-friend away. Usually, average paths lengths are considered, but maximum and minimum can also produce useful information.

Component count. Finally, network's fragmentation into subgroups is inversely related to cohesion. A fully cohesive group should ideally be one single cluster.

Statistical Analysis

Given the nested data structure (trials within participants, participants within classrooms), we used multilevel logistic regression with the `lme4` package in R (version 4.5.1) (Bates et al., 2015). The binary outcome was modeled as a function of the experimental factors.

School was treated as a fixed effect given only two schools participated. Random intercepts were included for participants and classrooms to account for differences in baseline effort choices. We tested whether adding a random slope for block at the participant level improved model fit, using a zero-correlation parameter structure (indicated by || in R syntax) to aid convergence (Bates et al., 2015).

We adopted a hierarchical model-building approach to test specific hypotheses:

Model 1: included main effects of social target, reward, effort level, manipulation condition, block, and school.

Model 2: added the two-way reward × effort interaction.

Model 3: added the three-way interaction Social target × Manipulation × Block interaction.

Model fit was assessed using Akaike Information Criterion (AIC) and likelihood ratio tests. Planned contrasts using `emmeans` (Lenth, 2025) tested pre-to-post changes across manipulation conditions for each target, with Holm's correction for multiple comparisons.

Model diagnostics were conducted using the `DHARMa` package (Hartig, 2024). Simulated scaled residuals were generated to assess overall model fit and distributional assumptions. The following tests were performed: Uniformity, dispersion, outlier, zero-inflation, and variance inflation factors.

For the second research question examining moderating effects of classroom cohesion and social susceptibility, we extended the previous models to include the moderating variables:

Model 4: added an additional three-way interaction Susceptibility × Manipulation × Block.

Model 5: substitute previous interaction with a four-way interaction Cohesion × Climate target × Manipulation × Block interaction.

Hypotheses

Based on previous research, the following hypotheses were formulated:

Main Effects

H_{1a} (Target): Participants will make more high-effort choices for self-target trials compared to trials benefiting the climate or prosocial organizations.

H_{1b} (Reward): Higher reward will result in more high-effort choices.

H_{1c} (Effort): Higher effort levels (90% vs. 40%) will result in fewer high-effort choices.

Interaction Effects

H_2 (Reward × Effort): The effect of reward on high-effort choices will be stronger at lower effort levels. Participants will therefore be more willing to increase effort when the physical cost is at 40% effort as opposed to 90% effort.

H_3 (Target × Manipulation): Social norm manipulation will affect pro-environmental behaviour:

H_{3a}: Participants in the positive environmental norm condition will show increased high-effort choices for climate trials from pre- to post-manipulation.

H_{3b} Participants in the negative environmental norm condition will show decreased high-effort choices for climate trials from pre- to post-manipulation.

H_{3c} Participants in the control condition will show no significant change in high-effort choices for climate trials from pre- to post-manipulation.

H_{3d} No manipulation effects are expected for self-target or prosocial organizational trials.

Moderation Effects

H_4: Participants with higher levels of social susceptibility and positive environmental norm group will show increased high-effort choices from pre- to post-manipulation.

H_5: Participants in classes with high social cohesion will show increased high-effort choices for climate trials from pre- to post-manipulation.

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