ORIGINAL RESEARCH

Preschool Aggression and Victimization: A Short-Term Longitudinal Analysis of the Immediate Social Environment

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Introduction: Preschool aggression, a significant concern, requires an in-depth examination beyond individual factors. This study explored the link between individual characteristics, immediate social environment variables, and the likelihood of preschoolers being nominated as aggressors or victims. The novelty of the study lies in its comprehensive longitudinal examination, using a multi-informant approach, of how family dynamics, peer relations, teacher-child interactions, and community factors are related to preschool aggression within the context of Bronfenbrenner's ecological system theory.

Methods: Data was collected at two points, four months apart, to investigate the interplay among sociodemographic, individual, family, and school factors and subsequent child aggression. The study included 394 children (184 girls, 210 boys), aged 3 to 6 years (M = 4.36, SD = 0.87). Caregivers completed questionnaires on socioeconomic status, community relationships, children's emotional regulation, and family functioning. Teachers rated closeness with each child, while children nominated liked and disliked peers, as well as those exhibiting aggressive or victimized behaviour.

Results: Logistic regression models revealed stronger associations between peer aggression and victimization and individual factors over microsystems. Surprisingly, community cohesion showed a robust positive link with an increased likelihood of children being nominated as victims, challenging the assumption that positive parenting practices and strong community cohesion always leads to positive outcomes for individuals.

Discussion: The study advances theoretical understanding by examining how factors within preschoolers' microsystems influence aggressive behaviors, contributing to more holistic models for addressing preschool aggression and victimization in schools. The findings highlight the significance of targeted interventions, emphasizing early identification of aggression or victimization signs and customized programs for social and emotional skill development. Addressing parental stress and interparental conflict is crucial. Additionally, community-based initiatives, like strengthening support networks, play a pivotal role in fostering healthier social dynamics among preschoolers.

Keywords: peer aggression, peer victimization, preschool, microsystem, community cohesion

Introduction

The period of childhood from 3 to 6 years old is marked by remarkable growth and development. During this time, children experience substantial cognitive, social, and emotional transformations.[1–3] Their language skills expand rapidly, and they become more proficient in communication.[4] Emotionally, they become more capable of recognizing and managing their feelings, although emotional outbursts are still common.[5,6] Socially, they start forming friendships and learning about cooperation, sharing, and empathy.[7,8] This period is crucial for the acquisition of foundational skills and behaviours that will lay the groundwork for their future development and educational experiences.

Alongside these positive developments, the preschool years also witness the emergence of certain challenging behaviours, including peer aggression. As children navigate the complexities of social interactions, instances of aggressive behaviours may become more noticeable.[9,10] Peer aggression in preschool refers to aggressive behaviours

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exhibited or received by young children towards their peers in a childcare center, preschool, or early childhood education settings. These behaviours can include physical aggression, such as hitting or pushing, verbal aggression, such as the use of hurtful words, as well as relational aggression, like exclusion or spreading rumours.[11] Global or nationwide reports on peer violence in school settings primarily focus on samples of children over six years old, as preschool-aged children typically cannot participate in survey-based research. However, available evidence from a nationwide study reported that approximately 20% of children under 6 years old have experienced physical aggression from their peers, while over 14% have encountered emotional or psychological aggression.[12] Studying preschool peer aggression and victimization is crucial because it addresses the early development of aggressive behaviours and their impact on the well-being of young children.[13,14]

Early developmental factors associated with these behaviours are increasingly under scrutiny. The majority of available research has primarily focused on analysing individual factors linked to the early manifestations of aggressive behaviours, such as temperament or genetic predisposition for aggression,[15,16] executive function, language, and cognitive function.[17–20] Other studies have explored personal variables with a social nature, such as difficulties in handling emotions,[21–23] the presence of depressive symptoms,[24] and relationships with callous-unemotional traits.[25] There has also been research on social environment variables, but to a lesser extent than research analysing personal variables. In this sense, a systematic review of studies examining trends in preschool aggression[26] revealed that the majority of the included studies explored individual-level factors in relation to aggression. Consequently, further examination of immediate social environmental factors related to peer aggression in preschool settings is still warranted.

Bronfenbrenner's ecological systems theory[27] provides a comprehensive framework for understanding the multi-faceted social environment that influences a child's development, including the emergence of peer aggression in preschool. The model comprises: (1) the immediate environments where children directly interact (microsystem), encompassing the quality of family and peer relationships, social norms within the preschool environment, and the dynamics between teachers and children; (2) the connections and interactions between family and school environments (mesosystem); (3) the social settings that indirectly impact these environments (exosystem), such as community resources; (4) the broader cultural and societal contexts (macrosystem), representing overarching cultural values and societal norms, such as societal attitudes towards aggression; and (5) the temporal dimension (chronosystem), acknowledging that changes over time can impact the development of aggression.

The family and school environment constitute the microsystem, the most proximal setting with the greatest influence on children's behaviour.[28] Previous research examining variables from the microsystem has found that, in the family environment, negative parenting behaviours—characterized by physical coercion, insecure attachment, low parental self-efficacy, and punitive styles—are associated with both aggression and victimization.[29,30] Conversely, positive family relationships and effective communication between parents and children has been associated to reduced social difficulties and aggressive behaviours.[31,32] In addition to these findings, parental mental health issues, including depression or anxiety, have been consistently correlated with both aggressor and victim roles.[33,34] Stress related to the parental role and a spectrum of parental emotions, both positive and negative, towards their children have also been associated with involvement in aggression.[35,36] Furthermore, parental attitudes supporting violence has been linked to aggressive behaviours.[37] Finally, while previous research did not find a correlation between mother's reports of interparental conflict and teachers' rating of aggressive behaviours,[38] other studies have found a relationship between witnessing interparental violence and aggressive behaviours towards peers.[39]

Regarding peer factors, research has shown that children's social standing among peers, such as acceptance or rejection, is associated to their likelihood of engaging in aggressive behaviours or becoming victims of aggression during the preschool years.[40] Positive peer relationships in school have been associated with a reduced risk of victimization, while negative peer relationships or rejection increased aggression or victimization.[14,41]

Concerning classroom factors, the closeness between teachers and preschool children has been associated with lower levels of aggression and victimization.[42–44] A positive teacher-child relationship fosters a supportive and secure environment, reducing the likelihood of aggressive behaviours and victimization among children.[40]

Finally, although preschool aggression takes place in educational institutions, the school is integrated into the neighbourhood context, and neighbourhood/community factors can influence the school environment.[27,45] Therefore,

the neighbourhood context can play an important role in the persistence of peer aggression. In fact, previous research has shown that neighbourhood resources and collective cohesion within the neighbourhood are associated with less aggressive and delinquent behaviours.[46,47] Regarding peer aggression, young people whose mothers have reported neighbourhood problems (low cohesion with neighbours) were more likely to be involved in aggressive behaviours.[48] Ramey and Harrington[49] found that living in high-crime neighbourhoods and witnessing community violence correlates positively with teachers' ratings of peer aggression in preschool.

Despite the growing body of research examining individual-level factors and specific aspects of the social environment in relation to preschool aggression, there remains an important gap in examining factors within the microsystems together.[26,50] Furthermore, there remains a significant gap in our understanding of how these factors interact across multiple levels within the socioecological context of early childhood, specifically the interplay between individual factors, family variables, and those in the school, peer an community context.[51] Exploring the connections with a lone factor or elements from a singular domain may lead to inflated results, as practical scenarios involve interactions among factors from multiple environmental subsystems working synergistically.[52] Additionally, few studies have examined the perspectives of different family members regarding these variables. The majority of the available studies focused solely on the mother or women caregivers' perspective, often adopting a cross-sectional design and placing greater emphasis on peer aggression than peer victimization.[51]

To address these gaps, the current study explores the relationships between a wide range of individual variables, immediate social environment factors, and peer aggression among a group of preschool children in Spain. Moreover, the study employs a short-term longitudinal design and adopts a multi-informant methodology with principal caregivers completing questionnaires regarding their socioeconomic status, relationships within their community, their children's emotional regulation, and family functioning factors, including parental mental health, parental stress, family socialization, interparental conflict and endorsement of violence. Teachers rated their closeness with each participant's children in the class, and children nominated peers who were most and least liked, as well as peers who either behaved aggressively or were victimized in physical, verbal, relational and indirect relational ways.

The novelty of this study lies in its comprehensive examination of the interplay between individual-level factors and immediate social environmental factors in relation to peer aggression. By investigating the connections between family, school, peer, and community environments, as well as individual factors such as emotion regulation and child-sex, this study aims to provide a more holistic understanding of the early developmental factors associated with peer aggression in preschool settings and, therefore, identify risk variables and protective mechanisms, enhancing prevention and intervention practices in aggressive interactions.[13,14]

Therefore, this study seeks to answer the following research question: Is there an association between the examined factors within the individual-level factors (such as children-sex and emotion regulation) and the immediate social environment of preschool children and the likelihood of being nominated as an aggressor or victim? We hypothesize that poor emotional regulation and negative indicators of peer, family, school, and community functioning will increase the likelihood of being nominated as an aggressor or victim, whereas good emotional regulation and positive indicators within the immediate social environment will be associated with a decreased likelihood of being nominated as an aggressor or victim.

Method
Design and Sample
Participants were recruited from nine mixed-gender preschools located in small and medium-sized towns in central Spain, representing diverse socio-economic backgrounds. The inclusion criteria comprised preschool-aged children (3 to 6 years old) whose participation was contingent upon both the child's and parental willingness. The exclusion criteria encompassed the presence of severe physical disease or mental disorders hindering a child's participation in the nomination procedure, as well as inadequate classroom participation rates below 55%. The final sample size of 394 children (46.7% girls, 53.3% boys) aged three to six years resulted from addressing refusals, dropouts, and exclusions (refer to Figure 1). The study included 388 mothers/principal women caregivers, 346 fathers/principal men caregivers,
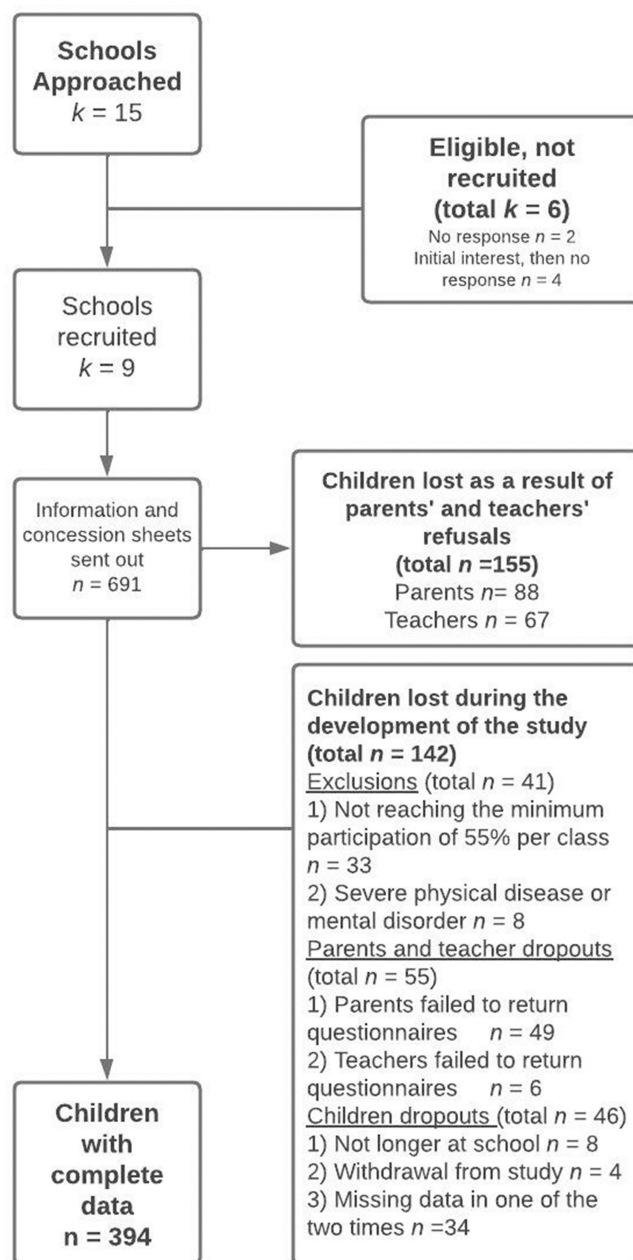
Figure 1 Flow diagram of recruitment and selection of schools and participants.

and 32 teachers (29 women and three men). The age range for mothers/principal women caregivers was 19 to 65 years (M = 37.52, SD = 5.67), for fathers/principal men caregivers was 23 to 59 years (M = 40.06, SD = 5.22), and for teachers was 26 to 62 years (M = 43.58, SD = 8.58).

Procedure

Data collection occurred at two time points, spaced four months apart, to explore the interplay between sociodemographic, individual, family, and school factors and subsequent child aggression. In the initial period (November to December 2022), Time 1 (T1), children underwent interviews for peer nominations regarding peer status and aggressive behaviours. Simultaneously, parents were tasked with completing questionnaires on family background and functioning, submitting them to teachers within a week. Teachers were also invited to complete questionnaires during this period, assessing their closeness to each student. The second period (April to May 2023), Time 2 (T2), involved a repeat of the

peer nomination interviews to capture changes in aggressive behaviours. The study protocol underwent rigorous review and received approval from the Social Research Ethics Committee (SREC) of the University of Castilla-La Mancha (Approval Number CEIS-639445-L9N3).

Measures
Child Reports
Peer Relations Evaluation
Peer relations were evaluated following a standard peer-nomination procedure. Children were asked to identify their top three and bottom three peers in the classroom, representing those they held the most positive and least positive feelings toward. Following previous research,[53,54] these nominations were tallied, adjusted for class size variations, and converted into separate z-scores for the most-like and least-like nominations.

Peer-Role Nominations
Utilizing an individual interview methodology,[55,56] children were presented with four cartoons illustrating instances of peer aggression, covering physical and verbal aggression, as well as direct and indirect relational aggression. Participants identified specific behaviours in the cartoons and nominated peers as exhibiting these aggressive behaviours or being the recipients. To streamline nominations, the study limited each child to four pupils, focusing on those closely matching descriptions of aggressive behaviours. These nominations were adjusted for class size, and resulting standardized scores were used in subsequent analyses, enabling the collection of peer nominations for roles such as aggressors and victims, an also classifications according to the different forms of aggression.

Parental Reports
Family Socio-Economic Advantage
The provided information encompassed various indicators of family socio-economic status (SES), such as monthly household income, maternal and paternal educational attainment, maternal and paternal employment status (whether part-time or full-time), and family size. Following the approach outlined by Baker et al,[57] these indicators were utilized to construct a composite measure representing family socio-economic advantage, where higher values indicated greater socio-economic advantage.

Children's Emotion Regulation
Parents or primary caregivers were jointly requested to assess their children's affective behaviours using the Emotion Regulation Checklist (ERC), developed by Shield & Shelleby.[58] For this study, we employed the Spanish version validated by Sarmento-Henrique et al.[58] The ERC is a 24-item assessment tool utilizing a 4-point scale to rate the frequency of a child's display of affective behaviours, ranging from 1 (*Never*) to 4 (*Almost Always*). Within the ERC, the emotion regulation subscale focuses on crucial processes associated with effective regulation, including socially appropriate emotional expressions and empathy (eg, "Is empathic toward others; shows concern when others are upset or distressed"). Conversely, the lability/negativity subscale assesses aspects such as arousal, reactivity, difficulties with anger regulation, and mood instability (eg, "Displays exuberance that others find intrusive or disruptive"). In the present sample, the internal consistency reliability, measured by Cronbach's α, was 0.69 for the emotion regulation subscale and 0.82 for the lability/negativity subscale.

Community Cohesion
Parents or primary caregivers were jointly requested to fill the Spanish version[59] of the Neighbourhood cohesion inventory (NCI).[60] The NCI assesses the level of cohesion within a specific community and comprises a self-administered scale consisting of 18 items. In addition to providing an overall total scores, it yields data on three subscales: the *sense of community*, belonging, and significant participation in a collective (9 items, win an example item: "The friendships and associations we have with other people in our neighbour mean a lot to us"), *satisfaction with the neighbourhood*, enjoyment of living in it, and the desire to continue doing so (3 items, with an example item:

"Overall, we are very attracted to living in this neighbourhood"), and the *relationships between neighbours* (6 items, with an example item: "We believe our neighbours would help us in an emergency"). Participants rated each item using a Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). In the current sample, Cronbach's α internal consistency reliability was 0.84 for the sense of community subscale, 0.75 for the satisfaction with the neighbourhood, and 0.81 for the relationships between neighbours subscale.

Parental Mental Health

Each parent or caregiver was asked to answer the General Health Questionnaire (GHQ-12), developed by Goldberg and Williams.[61] For this study, we employed the Spanish version validated by Rocha et al.[62] The questionnaire comprises 12 items describing mood states, with 6 of them being positive statements (item example: "Feeling reasonably happy") and 6 being negative statements (item example: "Loss of sleep over worry"). Participants answered these items using a four-point Likert scale from 0 (*No, not at all*) to 3 (*Much more than usual*). Negative items underwent recoding, and the resulting score contributed to the generation of a total score. In the current study, higher scores are indicative of better mental health. Cronbach's α internal consistency reliability was 0.83 for the sample of mothers and 0.80 for fathers in the present sample.

Parental Stress

Each parent or caregiver was asked to complete the Parental Stress Scale.[63] For this study, we utilized the Spanish version validated by Oronoz et al.[64] The scale comprises 12 items with two subscales: "Baby rewards", which assesses the satisfaction that mothers/fathers/caregivers find in the parental role (5 items, with an example item being "I derive enjoyment from spending time with my children"), and 'Parental Stress', which measures the stress levels parents/ caregivers experience in their parental role (7 items, with an example item being "My child(ren) constitutes the primary source of stress in my life"). Participants rated their agreement on a scale from strongly *disagree* (scored as 1) to *strongly agree* (scored as 5). The maternal and paternal 'Baby rewards' subscale showed good internal consistency (mothers: α = 0.74; fathers: α = 0.77), as did the 'Parental Stress' subscale (mothers: α = 0.80; fathers: α = 0.80).

Parental Socialization

Each parent or caregiver was asked to complete the TXP parenting questionnaire.[65] The questionnaire comprises 16 items describing parental socialization practices, with two subscales referring to *affection-communication* (12 items, item example: "In our family, we express affection regularly") and the transmission of the *prosocial values* (4 items, item example: "We educate our children in values such as respect, solidarity, tolerance, etc."). Participants answered to these items using a five-point Likert scale from 1 (*Totally Disagree*) to 5 (*Totally Agree*). The maternal and paternal "Affection-communication" subscale showed good internal consistency (mothers: α = 0.88; fathers: α = 0.91), as did the "Prosocial values" subscale (mothers: α = 0.71; fathers: α = 0.72).

Interparental Conflict

Each parent or caregiver was asked to complete the Frequency and Response to Conflicts in Couple Relationship Scale.[66] The scale comprises 7 items to assess the conflict dimension within couple relationships with three subscales: *conflict frequency* (3 items, item example: "There is a high degree of disagreement among us"), *positive response to conflict* (2 items, item example: "When I have a problem with my partner, I talk to her/his about it") and the *negative response to conflict* (2 items, item example: "I have come to insult my partner during an argument."). Participants answered to these items using a fourth-point Likert scale from 1 (*Totally Disagree*) to 5 (*Totally Agree*). The maternal and paternal "Conflict frequency" subscale showed good internal consistency (mothers: α = 0.83; fathers: α = 0.82), as did the "Positive response to conflict" subscale (mothers: α = 0.77; fathers: α = 0.79), and the "Negative response to conflict" subscale (mothers: α = 0.79; fathers: α = 0.73).

Parental Endorsement of Violence

To examine parental pro-violence attitudes, we utilized the Attitudes Towards Violence Scale (ATVS) developed by

Funk et al.[67] Specifically, we focused on the "reactive violence" subscale, which comprises statements justifying the use of violence as a response to real or perceived threats. This subscale comprises six items rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Illustrative statements include: "If a person hits you, you should hit them back" and "Parents should tell their children to use violence if necessary." Scores for all items were averaged, with higher values reflecting more pronounced pro-violence attitudes. In the current sample, the internal consistency reliability, as measured by Cronbach's α, was 0.77 for mothers and 0.82 for fathers.

Teacher Reports

Teacher-Child Closeness

To assess the level of closeness between teachers and students, the closeness subscale of the Student Teacher Relationship Scale (STRS)[68] was employed. This subscale comprises 10 items that assess the extent to which a teacher experiences affection, warmth, and open communication with a specific student. An illustrative item is: "I share and affectionate, warm relationships with this child." Teachers assigned ratings to these items on a five-point Likert scale, ranging from 1 (*Definitely does not apply*) to 5 (*Definitely applies*). The responses to all items were averaged, with higher scores reflecting elevated levels of teacher-child closeness. The internal consistency of the scale within the current sample was high (α = 0.86).

Analytic Approach

Due to the substantial number of immediate social environment variables reported by parents/caregivers (21 variables), we employed an exploratory factor analysis (EFA) with oblique (Oblimin) rotation to reduce the number of parameters and unveil the latent structure of the family and community variables. The EFA served as a tool to uncover underlying patterns and relationships among these variables, ultimately simplifying the interpretation of the results.

After identifying the latent structure of immediate social environment variables, binary logistic regressions were conducted to explore the relationship between the social environment and preschool children's involvement in aggression and victimization at T2. The explanatory variables included social environment factors (family and community variables) obtained from the EFA, along with control variables such as children's sex, age, family socioeconomic advantage, like-most peer nominations, like-less peer nominations, emotional regulation and lability reported by parents, teacher-child closeness, and aggression and victimization peer nominations measured at T1. This approach allowed us to control for the baseline levels of aggression, isolating the unique contribution of family variables to changes in aggression over time (T2).

Two approaches were employed for analysing these relationships: peer nominations for general aggressor and victim roles, and peer nominations for each type of aggression (physical, verbal, relational, and indirect relational) in each role (aggressor and victims). The multivariate logistic models expressed the probability that a child exhibits the peer-nominated role based on the variables examined. The analysis identified aspects that significantly increase the probability of presenting a role related to aggression and/or victimization.

The final model, including all significant variables, was assessed for its validity using the Area Under the Curve (AUC) and the goodness-of-fit test by Hosmer and Lemeshow. The significance level was set at 0.05. All statistical analyses were performed using SPSS version 28.

Results

Descriptive Statistics

Descriptive statistics of the participants, prevalence of peer-nominated aggressive behaviours and control variables are shown in Table 1. Categorical assignment to roles of aggressor and victim was made using the method described in Guy et al.[53] Children were classified as peer-nominated aggressors if their z-score for the aggressor role exceeded one, and those with z-scores greater than one for the victim role were identified as peer-nominated victims. Children who did not achieve a z-score exceeding one in any of these roles were categorized as not involved. This procedure was employed for the categorization of general roles of aggressor and victim, regardless of the form of aggression, and to categorize children as aggressors or victims in each form of aggression. Peer nominations for general (χ^2 (394,1) = 43.722. $p < 0.001$), physical (χ^2 (394,1) = 19.770. $p < 0.001$), and indirect relational aggressors (χ^2 (394,1) = 13.247. $p = 0.001$) were higher in T2 than in T1. Peer nominations in T2 compared to T1 were also higher for general (χ^2 (394,1) = 11.964. $p = 0.001$) and relational victims (χ^2 (394,1) = 7.856. $p = 0.012$).

Table 1 Descriptive Statistics of Demographic Variables, Peer-Nominated Aggressive Behaviours, and Control Variables

Variable	n/M	%/SD
Demographic variables		
Children's Sex		
Girls	184	46.7%
Boys	210	53.3%
Children's Age	4.53	0.91
Family Socioeconomic Advantage	13.93	4.40
Peer-Nominated Aggressive Behaviours		
General Aggressor Role T1	61	15.5%
General Aggressor Role T2	74	18.8%
Physical Aggressor Role T1	47	11.9%
Physical Aggressor Role T2	63	16.0%
Verbal Aggressor Role T1	48	12.2%
Verbal Aggressor Role T2	51	12.9%
Relational Aggressor Role T1	63	16.0%
Relational Aggressor Role T2	64	16.2%
Relational Indirect Aggressor Role T1	40	10.2%
Relational Indirect Aggressor Role T2	66	16.8%
General Victim Role T1	58	14.7%
General Victim Role T2	72	18.3%
Physical Victim Role T1	51	12.9%
Physical Victim Role T2	63	16.0%
Relational Victim Role T1	51	12.9%
Relational Victim Role T2	73	18.5%
Relational Indirect Victim Role T1	40	10.2%
Relational Indirect Victim Role T2	37	9.4%
Control Variables		
Most-Like Peer Nominations	0.022	0.93
Least-Like Peer Nominations	0.032	0.91
Emotional Regulation	3.44	0.35
Emotional Lability	1.91	0.35
Teacher-Child Closeness	4.38	0.59

Abbreviations: n, number of participants; M, Mean; SD, Standard Deviation.

The descriptive statistics offer a comprehensive overview of the participants and shed light on the prevalence of peer-nominated aggressive behaviors within the study cohort. Notably, we observed a noteworthy increase in peer nominations for various forms of aggression at T2 compared to T1. This escalation suggests a potential evolution in aggressive behaviors over the course of the study, underscoring the dynamic nature of peer interactions and social behaviors among preschool-aged children.

Factor Analysis of Social Environment Variables

To group the variables of the immediate social environment into factor scores, the data set of the sample was subjected to an exploratory factor analysis. Table 2 provides a brief overview of each included variable. The Kaiser-Meyer-Olkin (KMO) measure was employed in this research to assess multicollinearity in the data, determining the feasibility of conducting a factor analysis. The initial outcome of the EFA employing Oblimin rotation revealed a KMO measure of 0.792, and the Bartlett's Test of Sphericity reached statistical significance (χ^2 S−B = 2849.33, p < 0.001), indicating that the data was likely factorizable.

Seven factors were extracted, each possessing an eigenvalue exceeding 1. The communalities (refer to Table 3) showed that two variables, namely mother/women caregiver mental health and satisfaction with the neighbourhood, exhibited communalities below the threshold of 0.3. Consequently, recognizing their limited contribution to the model,

Table 2 Overview of Used Variables with Regard to the Social Environment

Variable (Construct)	Response Rate	M	SD
Sense Of Community (Community Cohesion)	1–5	3.63	0.64
Satisfaction With the Neighbourhood (Community Cohesion)	1–5	3.95	0.88
Relationships Between Neighbours (Community Cohesion)	1–5	3.54	0.72
Mother/Women Caregiver Mental Health	0–3	1.98	0.52
Father/Men Caregiver Mental Health	0–3	2.05	0.45
Mother/Women Caregiver Affection and Communication (Parental Socialization)	1–5	4.46	0.44
Father/Men Caregiver Affection and Communication (Parental Socialization)	1–5	4.42	0.50
Mother/Women Caregiver Transmission of Prosocial Values (Parental Socialization)	1–5	4.76	0.32
Father/Men Caregiver Transmission of Prosocial Values (Parental Socialization)	1–5	4.69	0.37
Mother/Women Caregiver Baby Rewards (Parental Role Stress)	1–5	1.24	0.40
Father/Men Caregiver Baby Rewards (Parental Role Stress)	1–5	1.29	0.42
Mother/Women Caregiver Parental Stress (Parental Role Stress)	1–5	2.41	0.80
Father/Men Caregiver Parental Stress (Parental Role Stress)	1–5	2.28	0.79
Mother/Women Caregiver Conflict Frequency (Interparental Conflict)	1–4	1.68	0.65
Father/Men Caregiver Conflict Frequency (Interparental Conflict)	1–4	1.63	0.62
Mother/Women Caregiver Positive Response to Conflict Interparental Conflict)	1–4	3.52	0.63
Father/Men Caregiver Positive Response to Conflict (Interparental Conflict)	1–4	3.37	0.65
Mother/Women Caregiver Negative Response to Conflict (Interparental Conflict)	1–4	1.87	0.82
Father/Men Caregiver Negative Response to Conflict (Interparental Conflict)	1–4	1.63	0.73
Mother/Women Caregiver Pro-Violence Attitudes (Parental Endorsement of Violence)	1–5	1.86	0.60
Father/Men Caregiver Pro-Violence Attitudes (Parental Endorsement of Violence)	1–5	2.20	0.76

Table 3 Communalities

	Initial	Extraction
Mother/Women Caregiver Mental Health	0.277	0.221
Father/Men Caregiver Mental Health	0.422	0.443
Mother/Women Caregiver Affection and Communication	0.737	0.872
Father/Men Caregiver Affection and Communication	0.746	0.803
Mother/Women Caregiver Transmission of Prosocial Values	0.588	0.642
Father/Men Caregiver Transmission of Prosocial Values	0.616	0.683
Mother/Women Caregiver Conflict Frequency	0.604	0.744
Father/Men Caregiver Conflict Frequency	0.563	0.568
Mother/Women Caregiver Positive Response to Conflict	0.338	0.323
Father/Men Caregiver Positive Response to Conflict	0.317	0.357
Mother/Women Caregiver Negative Response to Conflict	0.370	0.366
Father/Men Caregiver Negative Response to Conflict	0.424	0.873
Mother/Women Caregiver Pro-Violence Attitudes	0.319	0.619
Father/Men Caregiver Pro-Violence Attitudes	0.292	0.347
Sense of Community	0.686	0.993
Relationships between Neighbours	0.643	0.625
Satisfaction with the Neighbourhood	0.099	0.061
Mother/Women Caregiver Baby Rewards	0.342	0.333
Father/Men Caregiver Baby Rewards	0.401	0.418
Mother/Women Caregiver Parental Stress	0.478	0.696
Father/Men Caregiver Parental Stress	0.454	0.460

Note: Extraction method: Principal Axis Factorization.

these items were excluded, and the EFA was executed again. The new EFA no longer yields any variable with a communalities value less than 0.3. The KMO value was optimal at 0.797, and the Bartlett's Test of Sphericity reached statistical significance (χ^2 S−B = 2740.81, p<0.001).

The analysis extracted six components with eigenvalues greater than 1, initially explaining 66.5% of the explained variance. Table 4 shows the variance explained by the factors extracted before rotation. The cumulative variance explained by these 6 factors in the extracted solution is 53.4%, a difference of 13 points compared to the initial solution. Thus, around 13% of the variation explained by the initial solution is lost due to latent factors exclusive to the original variables and variability that simply cannot be explained by the factorial model.

Component loadings of the rotate solution are presented in Table 5. All loadings are above 0.4, with the majority surpassing 0.5. The pattern and structure matrices provide information about the composition of the 6 factors. In this model, both matrices yield similar results, indicating robustness in the results. We interpreted the six factors as they are representing the following variables of immediate social environment measurement. Factor 1: women caregiver positive parenting practices, factor 2: community cohesion, factor 3: men caregiver positive parenting practices, factor 4: parental pro-violence attitudes, factor 5: child-related parental stress, factor 6: positive interparental interaction.

The factor analysis conducted on the immediate social environment variables effectively grouped them into six distinct factors, collectively explaining a substantial portion of the observed variance. Upon meticulous refinement of the analysis, pivotal factors emerged, illuminating crucial aspects of the social milieu. These factors encompassed an array of influential components, including positive parenting practices, community cohesion, and parental attitudes toward violence. This nuanced understanding sheds light on the multifaceted dynamics operating within the social environment, underscoring the complex interplay of factors that shape preschool-aged children's socio-emotional development.

Table 4 Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.782	28.908	28.908	5.362	26.809	26.809	3.100
2	1.809	9.046	37.954	1.523	7.616	34.425	2.173
3	1.727	8.635	46.589	1.256	6.282	40.708	3.666
4	1.571	7.855	54.444	1.145	5.723	46.431	1.048
5	1.330	6.651	61.095	0.838	4.192	50.623	2.264
6	1.078	5.392	66.487	0.562	2.812	53.435	3.031
7	0.867	4.336	70.823				
8	0.836	4.178	75.001				
9	0.687	3.433	78.434				
10	0.669	3.343	81.777				
11	0.612	3.062	84.839				
12	0.533	2.666	87.505				
13	0.481	2.407	89.911				
14	0.422	2.112	92.023				
15	0.396	1.978	94.001				
16	0.318	1.588	95.589				
17	0.315	1.577	97.166				
18	0.220	1.101	98.266				
19	0.195	0.975	99.241				
20	0.152	0.759	100.000				

Note: Extraction method: Principal Axis Factorization.

Table 5 Rotated Component Matrix

	Structure Matrix						Pattern Matrix					
	Factor						Factor					
	1	2	3	4	5	6	1	2	3	4	5	6
Mother/Women Caregiver Affection and Communication	0.913					0.433	0.838					
Mother/Women Caregiver Transmission of Prosocial Values	0.749						0.714					
Mother/Women Caregiver Baby Rewards	−0.492						0.417					
Mother/Women Caregiver Positive Response to Conflict	0.482						−0.408					
Sense of Community		0.889						0.916				
Relationships between Neighbours		0.884						0.892				
Father/Men Caregiver Affection and Communication			0.873			0.513			0.804			
Father/Men Caregiver Transmission of Prosocial Values			0.789						0.766			
Father/Men Caregiver Baby Rewards			−0.63						−0.605			
Father/Men Caregiver Positive Response to Conflict			0.55						0.517			
Father/Men Caregiver Mental Health			0.532						0.418			
Mother/Women Caregiver Pro-Violence Attitudes				0.633						0.621		
Father/Men Caregiver Pro-Violence Attitudes				0.617						0.592		
Mother/Women Caregiver Parental Stress					0.786						0.756	
Father/Men Caregiver Parental Stress			−0.423		0.612						0.544	
Mother/Women Caregiver Conflict Frequency			−0.548			−0.675						−0.641
Father/Men Caregiver Conflict Frequency	−0.588					−0.674						−0.564
Mother/Women Caregiver Negative Response to Conflict						−0.673						−0.516
Father/Men Caregiver Negative Response to Conflict						−0.582						−0.509

Notes: Extraction method: Principal Axis Factorization. Rotation Method: Oblimin with Kaiser Normalization.

Relationships Between Immediate Social Environment Variables and Peer-Nominated Aggressor Role

Logistic regression was performed to ascertain the relationships between women caregiver positive parenting practices, community cohesion, men caregiver positive parenting practices, parental pro-violence attitudes, child-related parental stress, and positive interparental interaction on the likelihood that preschool children were nominated as aggressors by their peers. Logistic regressions were separately conducted to examine relationships with a general aggressor role and aggressor role in each form of aggression examined (physical, verbal, relational, and indirect relational). Table 6 summarizes the results of the logistic regression analysis on the likelihood of children being nominated as aggressor. Only statistically significant variables in each model are shown.

Globally, regression analyses revealed significant factors related to the aggressor role across various forms of aggression. Notably, gender emerged as a pivotal factor, with boys exhibiting a heightened likelihood of being nominated as aggressors. Furthermore, the frequency of positive peer nominations emerged as a critical determinant, as children receiving fewer positive nominations were more likely to assume an aggressor role. Additionally, the presence of emotional lability emerged as a significant predictor, indicating that children prone to emotional fluctuations were more inclined to engage in aggressive behaviors. Conversely, our findings underscored the protective role of positive interparental interaction, which was associated with a diminished likelihood of being nominated as a verbal aggressor. The results regarding the different aggressor roles are described in detail below.

General Aggressor Role

The logistic regression model was statistically significant, $\chi^2 = 67.788$, $p < 0.001$. The model explained 30.8% (Nagelkerke R^2) of the variance in the general aggressor role. Of the fifteen variables included in the model, four were statistically significant: children's sex, less-like nominations, emotional lability, and aggressor role in T1 (as shown in Table 6). That is, being a boy, having higher least-like nominations, experiencing emotional lability, and being nominated as an aggressor by peers in T1 were associated with an increased likelihood of being nominated as an aggressor in T2. No variable from the social environment had a statistically significant relationship with the role of aggressor.

Physical Aggressor Role

The logistic regression model was statistically significant, $\chi^2 = 50.972$, $p < 0.001$. The model explained 25.1% (Nagelkerke R^2) of the variance in the physical aggressor role. Of the fifteen variables included in the model, three were statistically significant: children's sex, least-like nominations, and emotional lability (as shown in Table 6). That is, being a boy, having higher least-like nominations, and experiencing emotional lability, were associated with an increased likelihood of being nominated as a physical aggressor in T2. No variable from the social environment had a statistically significant relationship with the role of physical aggressor.

Verbal Aggressor Role

The logistic regression model was statistically significant, $\chi^2 = 61.103$, $p < 0.001$. The model explained 33.1% (Nagelkerke R^2) of the variance in the verbal aggressor role. Of the fifteen variables included in the model, five were statistically significant: children's sex, least-like nominations, verbal aggressor role in T1, child-related parental stress, and positive interparental interaction (as shown in Table 6). That is, being a boy, having higher least-like nominations, and being nominated as a verbal aggressor by peers in T1 were associated with an increased likelihood of being nominated as a verbal aggressor in T2. Additionally, among the immediate social environment variables, child-related parental stress increased the likelihood of being nominated as a verbal aggressor, whereas positive interparental interaction was associated with a reduction in the likelihood of being nominated as a verbal aggressor in T2.

Relational Aggressor Role

The logistic regression model was statistically significant, $\chi^2 = 40.765$, $p = 0.001$. The model explained 20.1% (Nagelkerke R^2) of the variance in the relational aggressor role. Of the fifteen variables included in the model, three were statistically significant: most-like nominations, emotional lability, and relational aggressor role in T1 (as shown in

Table 6 Logistic Regression Analysis of the Relationship Between Social Environment and Preschool Children's Aggressor Role (n = 394)

Study variables		B	SE	Wald	Sig.	Exp(B)	95% C.I. for EXP (B)		AUC (IC95%)	Hosmer y Lemeshow
							Lower	Upper		
General Aggressor Role	Children's Sex	0.770	0.331	5.419	0.020	2.160	1.129	4.131	0.694 (0.623–0.766)	$\chi^2 = 2.148$, $p = 0.976$
	Least-Like nominations	0.566	0.188	9.085	0.003	1.760	1.219	2.543		
	Emotional lability	0.971	0.420	5.343	0.021	2.640	1.159	6.015		
	Aggressor Role T1	1.860	0.398	21.834	0.000	6.423	2.944	14.013		
	Constant	−3.513	0.614	32.719	0.000	0.003				
Physical Aggressor	Children's Sex	1.293	0.407	10.076	0.002	3.642	1.640	8.901	0.642 (0.563–0.721)	$\chi^2 = 6.032$, $p = 0.644$
	Least-Like nominations	0.554	0.157	12.429	0.000	1.740	1.279	2.367		
	Emotional lability	1.268	0.463	7.482	0.006	3.552	1.432	8.810		
	Constant	−6.542	1.181	30.712	0.000	0.001				
Verbal Aggressor	Children's Sex	1.308	0.488	7.180	0.007	3.697	1.421	9.623	0.698 (0.613–0.786)	$\chi^2 = 3.085$, $p = 0.929$
	Least-Like nominations	0.671	0.206	10.553	0.001	1.955	1.305	2.931		
	Verbal Aggressor Rol T1	1.563	0.520	9.021	0.003	4.774	1.721	13.241		
	Child-related parental stress	0.699	0.324	4.652	0.031	0.497	0.263	0.938		
	Positive interparental interaction	−0.780	0.316	6.074	0.014	0.458	0.247	0.852		
	Constant	−7.406	1.460	25.745	0.000	0.001				
Relational Aggressor	Most-Like nominations	0.413	0.163	6.453	0.011	1.511	1.099	2.079	0.674 (0.596–0.751)	$\chi^2 = 4.251$, $p = 0.834$
	Emotional lability	1.192	0.442	7.274	0.007	3.294	1.385	7.834		
	Relational Aggressor Rol T1	1.135	1.154	7.990	0.002	3.111	1.522	6.359		
	Constant	−3.262	1.154	7.990	0.005	0.038				
Indirect Relational Aggressor	Most-Like nominations	0.318	0.162	3.864	0.049	1.375	1.001	1.889	0.641 (0.566–0.717)	$\chi^2 = 3.083$, $p = 0.929$
	Emotional lability	1.167	0.430	7.378	0.007	3.214	1.384	7.462		
	Indirect Relational Aggressor Rol T1	0.967	0.421	5.275	0.022	2.630	1.152	6.001		
	Constant	−4.121	0.890	21.441	0.000	0.016				

Table 6). That is, having higher most-like nominations, experiencing emotional lability, and being nominated as a relational aggressor by peers in T1, were associated with an increased likelihood of being nominated as relational aggressor in T2. No variable from the social environment had a statistically significant relationship with the role of relational aggressor.

Indirect Relational Aggressor Role

The logistic regression model was statistically significant, $\chi^2 = 40.765$, p = 0.023. The model explained 15.6% (Nagelkerke R^2) of the variance in the indirect relational aggressor role. Of the fifteen variables included in the model, three were statistically significant: most-like nominations, emotional lability, and indirect relational aggressor role in T1 (as shown in Table 6). That is, having higher most-like nominations, experiencing emotional lability, and being nominated as a indirect relational aggressor by peers in T1, were associated with an increased likelihood of being nominated as indirect relational aggressor in T2. No variable from the social environment had a statistically significant relationship with the role of indirect relational aggressor.

Relationships Between Social Environment Variables and Peer-Nominated Victim Role

Logistic regression was performed to ascertain the relationships between women caregiver positive parenting practices, community cohesion, men caregiver positive parenting practices, parental pro-violence attitudes, child-related parental stress, and positive interparental interaction on the likelihood that preschool children were nominated as victim by their peers. Logistic regressions were separately conducted to examine relationships with a general victim role and aggressor role in each form of victimization examined (physical, verbal, relational, and indirect relational). Table 7 summarizes the results of the logistic regression analysis on the likelihood of children being nominated as victim. Only statistically significant variables in each model are shown.

Globally, results revealed that being nominated as a victim at Time 1 (T1) significantly increased the likelihood of victimization at Time 2 (T2). Additionally, factors such as community cohesion and positive parenting practices were associated with higher victimization rates, while positive interparental interaction showed a protective effect against victimization. However, the influence of these factors varied across different victimization roles. For instance, community cohesion was a significant predictor of indirect relational victimization, whereas men caregiver positive parenting practices were associated with a higher likelihood of being nominated as a relational victim. Overall, these findings highlight the nuanced interplay between individual and social environmental factors in shaping victimization dynamics among preschool-aged children. The results regarding the different victim roles are described in detail below.

General Victim Role

The logistic regression model was statistically significant, $\chi^2 = 38.884$, p = 0.002. The model explained 18.8% (Nagelkerke R^2) of the variance in the general victim role. Of the fifteen variables included in the model, three were statistically significant: victim role in T1, community cohesion and positive interparental interaction (as shown in Table 7). That is, being nominated as a victim in T1 was associated with an increased likelihood of being nominated as a victim in T2. Among the social environment variables, community cohesion was associated with an increase likelihood of being nominated as a victim, whereas positive interparental interaction was associated with a reduction in the likelihood of being nominated as a victim in T2.

Physical Victim Role

The logistic regression model was statistically significant, $\chi^2 = 46.398$, p < 0.001. The model explained 23.2% (Nagelkerke R^2) of the variance in the physical victim role. Of the fifteen variables included in the model, three were statistically significant: physical victim role in T1, women caregiver positive parenting practices and community cohesion (as shown in Table 7). That is, being nominated as a physical victim in T1 was associated with an increased likelihood of being nominated as a physical victim in T2. Among the social environment variables, women caregiver positive parenting practices and community cohesion was associated with an increase likelihood of being nominated as a physical victim in T2.

Table 7 Logistic Regression Analysis of the Relationship Between Social Environment and Preschool Children's Victim Role (n = 394)

Study variables		B	SE	Wald	Sig.	Exp(B)	95% C.I. for EXP (B)		AUC (IC95%)	Hosmer y Lemeshow
							Lower	Upper		
General Victim Role	Victim role T1	1.526	0.356	18.320	0.000	1.939	1.352	2.780	0.654 (0.574–0.734)	χ^2 = 10.026, p = 0.2263
	Community cohesion	0.614	0.175	12.361	0.000	1.848	1.312	2.602		
	Positive interparental interaction	−0.346	0.169	4.174	0.041	0.707	0.508	0.986		
	Constant	−1.751	0.163	115.599	0.000	0.174				
Physical Victim	Physical victim role T1	1.233	0.403	9.362	0.002	3.429	1.557	7.549	0.688 (0.609–0.766)	χ^2 = 6.529, p = 0.588
	Women caregiver positive parenting practices	0.426	0.215	3.932	0.047	1.531	1.005	2.334		
	Community cohesion	0.445	0.182	5.947	0.015	1.560	1.091	2.231		
	Constant	−1.946	0.179	118.408	0.000	0.143				
Verbal Victim	Children's sex	0.743	0.314	5.602	0.018	2.102	1.136	3.889	0.683 (0.609–0.757)	χ^2 = 6.170, p = 0.628
	Verbal victim role T1	0.994	0.370	7.213	0.007	2.703	1.308	5.584		
	Constant	−2.985	0.883	11.437	0.001	0.051				
Relational Victim	Men caregiver positive parenting practices	0.368	0.179	4.232	0.040	1.445	1.018	2.053	0.574 (0.497–0.650)	χ^2 = 11.395, p = 0.180
	Constant	−1.604	0.149	115.282	0.000	0.201				
Indirect Relational Victim	Community cohesion	0.536	0.230	5.430	0.020	1.709	1.089	2.682	0.664 (0.559–0.770)	χ^2 = 3.468, p = 0.902
	Positive interparental interaction	−0.553	0.216	6.547	0.011	0.575	0.377	0.879		
	Constant	−2.568	0.227	128.220	0.000	0.077				

Verbal Victim Role

The logistic regression model was statistically significant, $\chi^2 = 40.380$, p = 0.001. The model explained 19.1% (Nagelkerke R^2) of the variance in the verbal victim role. Of the fifteen variables included in the model, only two were statistically significant: children's sex and verbal victim role in T1 (as shown in Table 7). That is, being a boy and being nominated as a verbal victim in T1 was associated with an increased likelihood of being nominated as a verbal victim in T2.

Relational Victim Role

The logistic regression model was not statistically significant, $\chi^2 = 17.375$, p = 0.429. The model explained 8.6% (Nagelkerke R^2) of the variance in the relational victim role. Of the fifteen variables included in the model, only one was statistically significant: men caregiver positive parenting practices (as shown in Table 7). That is, men caregiver positive parenting practices were associated with an increased likelihood of being nominated as a relational victim in T2.

Indirect Relational Victim Role

The logistic regression model was statistically significant, $\chi^2 = 26.537$, p = 0.050. The model explained 17.5% (Nagelkerke R^2) of the variance in the indirect relational victim role. Of the fifteen variables included in the model, only two were statistically significant: community cohesion and positive interparental interaction (as shown in Table 7). That is, community association was associated with an increased likelihood of being nominated as an indirect relational victim in T2, whereas positive interparental interaction was associated with a reduction in the likelihood of being nominated as a indirect relational victim in T2.

Given that among the variables of the immediate social environment examined, community cohesion has shown a higher number of statistically significant relationships with victimization, Figure 2 illustrates the probability of being nominated as a general victim, physical victim, or indirect relational victim when the score on the community cohesion factor increases.

Discussion

Guided by Bronfenbrenner's ecological model, our research examined factors within the microsystems of preschool children to investigate a significant health concern in school settings: aggression and victimization behaviours. In the current study, employing a short-term longitudinal analysis, we explored whether factors within the school microsystem (such as peer status and teacher-child closeness), family-related variables (including parental practices, interparental interaction, and attitudes toward violence), and community-related factors (specifically, community cohesion) were
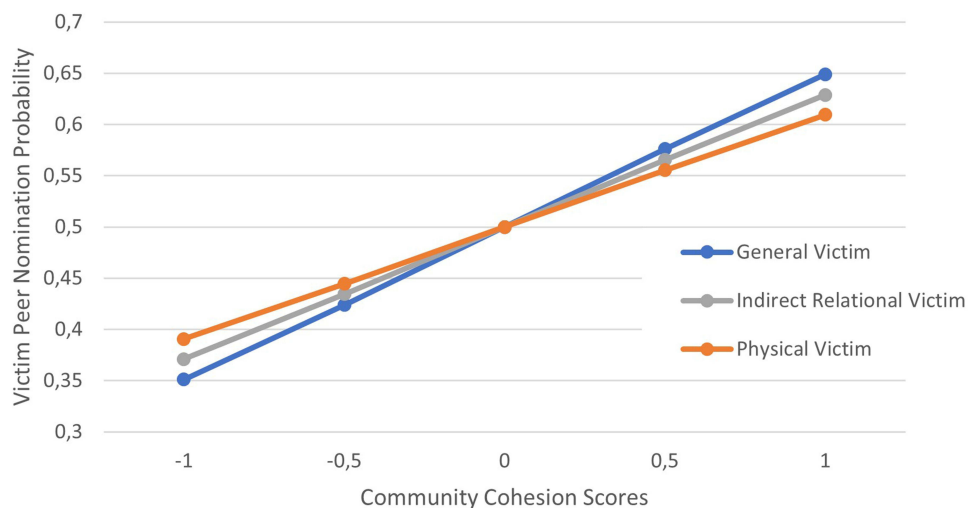

Figure 2 Probability of being nominated as a victim according to the score on the Community Cohesion factor.

associated with preschool aggression and victimization. The study offers valuable theoretical insights into preschool aggression and victimization dynamics by analyzing the intricate relationships between various ecological systems and their collective associations with preschool aggression and victimization.

In summary, findings from logistic regression models revealed complex interactions among individual, familial, and community factors in preschool aggression and victimization. Individual-level analysis revealed sex differences in aggressor roles, the link between emotional lability and aggression, and the stability of peer roles over time. Peer nominations indicated that general, physical, and verbal aggressors were often less liked, while relational and indirect relational aggressors were more liked. Family-related variables showed mixed associations with peer-nominated roles. Unexpectedly, positive parenting practices by women caregivers were linked to an increased likelihood of being nominated as a physical victim, while positive parenting practices by men caregivers were associated with an increased likelihood of being nominated as a relational victim. Surprisingly, community cohesion, usually linked to positive outcomes, correlated with increased likelihood of victimization. Results are subsequently discussed by factors to provide in-depth explanations and theoretical insights of the results found within each examined domain.

Associations Between Individual Factors and Preschool Aggression and Victimization

The results of the current study indicate that individual factors are associated with being nominated as aggressor and victim in preschool. Specifically, significant associations were found between the sex of the children and aggression and victimization. In particular, boys were more likely to be identified as aggressors (general, physical and verbal) and victims of verbal aggression than girls. This finding is consistent with previous studies in preschool that found significant sex-related differences for aggressor roles, and little to no differences in victim roles.[54,69,70]

Emotional lability was found to be significantly associated with preschool children identified by their peers as general aggressors, physical aggressors, relational aggressors, and indirect relational aggressors. Furthermore, there was no significant association between emotional lability and being identified as a victim by peers. Our findings are in line with previous research and systematic reviews, showing that emotional regulation challenges are more associated with impulsive and aggressive behaviours compared with victimization.[15,22,71] Several explanations can shed light on this association. For example, heightened emotional states triggered by frustration or stress might prompt children to resort to aggressive actions as a coping mechanism.[72] Additionally, difficulties in navigating social interactions and interpreting social cues due to emotional lability can lead to interpersonal conflicts, fostering aggressive responses.[40] Lastly, communication challenges, including a struggle to express needs verbally, may result in the adoption of aggression as an alternative means of communication.[73] Future research could analyse which of these psychological and social processes are more closely related to each form of aggression among preschoolers.

Consistent with previous research,[13,56,74,75] our study highlights a noteworthy association between peer nominations in T1 and an increased likelihood of receiving similar nominations in T2 during the four-month follow-up. This finding implies the presence of a persistent behavioural pattern or social role within the class. This stability could stem from consistent social interactions, responses to conflict, or established social dynamics within the peer group.[76] The roles of aggressors and victims may become ingrained in the dynamics of the peer group, persisting due to reinforcing interactions and responses from other group members.[77] Further research into the specific social dynamics within peer groups, such as leadership structures, group norms, and friendship patterns, could provide insights into how these factors influence the persistence of aggressor and victim roles.

Associations Between School-Related Factors and Preschool Aggression and Victimization

Our findings revealed differences in the broader peer relations according to the nominated behaviours within the aggression dynamics. Nominations for general, physical and verbal aggressor role were significantly and positively associated with less-liked nominations. In line with previous research, this suggests that children who exhibit aggression in the early years of school are frequently not well-liked by their peers.[54,69] However, in the current study, nominations

for relational and indirect relational aggressor roles were significantly and positively associated with most-liked nominations.

The observed pattern in peer nominations where physical and verbal aggression is associated with least-like nominations while relational and indirect relational aggression is linked to most-like nominations, may be elucidated by the distinct social dynamics underlying these aggression types. Physical and verbal aggression often involve direct confrontations and visible actions, which may lead peers to perceive individuals engaging in such behaviours less favourably.[78] On the other hand, relational and indirect relational aggression, being less overt and more subtle, might be less immediately apparent to peers. In the preschool setting, individuals employing relational and indirect relational aggression may maintain a positive image, making them more likely to receive most-like nominations despite their involvement in less overt forms of aggressive behaviour.[30,79]

Peer nominations for being victims of preschool aggression were not significantly associated with either most-liked or least-liked nominations. This finding aligns with previous studies that have not identified a relationship between social preference and victimization.[69,75] In accordance with earlier research, this result suggests that a clear and identifiable association between social preference and victimization may not be evident in preschool settings.[54,55]

Contrary to our expectations, a significant relationship was not found between teacher-child closeness and peer-nominated aggressor and victim roles. This contradicts research results showing that children who are more likely to engage in peer aggression or experience peer victimization tend to have less close relationships with their teachers.[42,80] The lack of association can be explained by the fact that aggressive interactions are often shaped by different factors such as social skills, communication abilities, and peer groups acceptance,[76,81] which may not be directly impact by the closeness with a teacher. Additionally, teachers may not have a comprehensive view of children's interactions during unstructured playtime or outside the classroom, limiting their ability to observe and influence specific peer dynamics.[82,83] Moreover, individual differences among children, including temperament and personality, can contribute to variations in behaviour, regardless of their relationship with the teacher.[84] Future research could explore how teacher-child closeness is related to the teacher's ability to manage children´s behaviour and promote positive interactions in the classroom and on the playground.

Associations Between Family-Related Factors and Preschool Aggression and Victimization

Against our expectations, no clear pattern of relationships emerged between family-related variables and peer-nominated aggressors and victims. Only four of the six extracted factors were associated with any of the nominated aggressor or victim roles, and some of them were not in the expected direction: child-related parental stress, positive interparental interaction, and positive parenting practices in women and men caregivers.

Child-related parental stress was only associated with an increased likelihood of being nominated as a verbal aggressor. This finding aligns with prior research showing that negative parental emotions and stress towards children are linked to aggression.[35,36,85] Negative emotions in parent-child interactions can influence communication patterns, and children may respond to perceived hostility with defensive or aggressive behaviours, possibly due to a lack of more adaptive communication skills[86] or reproducing negative communication pattern learn in home.[87] Additionally, children may adopt aggression as a maladaptive coping mechanism in response to perceived threats or stressors within the family environment.[88,89] Future research could explore the subtle mechanisms through which child-related parental stress influences verbal aggression in children. Investigating specific aspects of parent-child communication affected by stress, such as tone, content, or non-verbal cues, may provide a more detailed understanding of the pathways linking parental stress to children's aggressive behaviours.

Positive parental interparental interaction was associated with a decreased likelihood of being nominated as verbal aggressor, general victim, and indirect relational victim. These results underscore the significant role of positive family dynamics in shaping children's social behaviours. The presence of constructive interparental interactions may contribute to a more stable and supportive family environment, fostering positive social-emotional development in preschoolers.[90,91] These findings suggest that when children witness harmonious interactions between their parents,

they are less inclined to engage in verbal aggression and are less likely to be nominated as victims in both general and relational contexts. This emphasizes the importance of cultivating positive family dynamics as a potential protective factor against various forms of aggression during the preschool years.[51]

Surprisingly, positive parenting practices by women caregivers increased the likelihood of being nominated as a physical victim, while positive parenting practices by men caregivers increased the likelihood of being nominated as a relational victim. These findings contradict existing research that shows parenting practices characterized by affect and positive communication to reduce aggressive behaviours.[92,93] However, research has shown that while parental engagement, assistance, and vigilant supervision reduce the likelihood of children participating in aggression, victims face an elevated risk when exposed to overprotection.[94] Our findings could be related to overprotective parenting, which may limit a child's exposure to challenges, potentially impacting their ability to navigate social activities or conflicts independently.[95,96] While children require support, certain parents attempt to shield them from all adverse experiences, hindering their acquisition of skills to cope with aggressor and rendering them more susceptible to victimization.[97] Future research could explore the specific mechanisms underlying these unexpected associations, including the role of cultural factors and societal expectations on parenting behaviours. Investigating the long-term effects of such parenting styles on children's social development and resilience in the face of adversity could offer valuable insights for preventive interventions and support strategies.

Associations Between Community-Related Factors and Preschool Aggression and Victimization

Past research has shown that neighbourhood cohesion and community belonging are both important factors in relation to youth violence, reducing rates of aggression and victimization, or buffering their effects.[98–101] In the current study, we anticipated that community cohesion, defined as the interconnectedness and mutual support among neighbours, would decrease the likelihood of being nominated as an aggressor or victim. Contrary to our expectations, we found no associations between community cohesion and the likelihood of being identified as aggressor by peers. Unexpectedly, a strong and significant positive relationship was found between community cohesion and an increased likelihood of being nominated as general victim, physical victim and indirect relational victim.

While community cohesion is typically associated with positive outcomes,[102,103] this counterintuitive result can elucidate through several reasons. One interpretation is that an excessively cohesive community might harbour a darker side, being less tolerant of differences and more prone to conformity pressures, potentially leading to the victimization of those deviating from perceived norms.[104] This way, children who do not conform to the established norms of a closely-knit community might be at a higher risk of experience victimization, reflecting a paradox where a cohesive environment meant to promote well-being becomes a source of social exclusion and harm.[105,106] The observed relationship between community cohesion and an increased likelihood of being nominated as a victim could indeed be related to the "healthy context paradox", highlighting the idea that even in generally positive and nurturing settings, peer aggression, specifically bullying, can still occur and be overlooked or underestimated.[107] Our results underscore the need for a nuanced understanding of the complex and multifaceted dynamics shaping the healthy context paradox in community settings. Future research may benefit from qualitative exploration to gain deeper insights into the underlying mechanisms at play within the specific community context under study. Furthermore, exploring specific aspects of cohesion or community interactions that contribute to the observed outcomes could provide valuable insights in future research.

Interconnection of Ecological Systems and Peer Aggression/Victimization in Preschool

While the findings discussion has been presented in separate paragraphs for clarity, the study acknowledges the interconnectedness of individual, familial, and community factors. Indeed, results in the current study prompt further exploration into the complex interplay between different ecological systems and their impact on children's behavioral outcomes. In fact, the results from individual-level factors, school, familial, and community factors are likely interconnected and mutually influencing in shaping preschool aggression and victimization dynamics. For instance, individual characteristics such as emotional lability and sex differences in aggressor roles may not only influence peer interactions

within the school microsystem but also be influenced by familial and community contexts. Positive interparental interaction within the familial microsystem may contribute to a supportive family environment, which in turn could influence children's emotional regulation skills and social behaviors. Similarly, community cohesion may impact family dynamics and individual well-being, potentially affecting children's peer relationships and experiences of aggression and victimization at school. Conversely, patterns observed in peer perceptions of aggression types within the school microsystem may reflect broader community norms and values.

Future research should focus on multilevel modeling techniques to simultaneously analyze data collected at different levels (individual, school, family, community), allowing for a comprehensive examination of how factors within each ecological system interact to each other and contribute to preschool aggression and victimization dynamics. Within this framework, mediation and moderation analyses can be employed to investigate potential mechanisms (eg, emotional regulation skills) and contextual factors (eg, community support networks) that mediate or moderate the relationships between different ecological systems and children's behavioral outcomes. Additionally, integrating qualitative methods such as interviews and observations can provide deeper insights into the underlying processes and contextual nuances shaping these relationships, enriching the interpretation of quantitative findings, and informing the development of targeted interventions.

Strengths and Limitations

The study possesses notable strengths, employing a multi-informant methodology that collects data from primary caregivers, teachers, and children. It comprehensively investigates individual, school, family, and community factors concerning preschool aggression and victimization. The two-phased methodology, spaced four months apart, enables the exploration of relationships over time. In addition to examining general aggressor and victim roles, the study goes a step further by scrutinizing various forms of aggression—physical, verbal, relational, and indirect relational. However, it is important to acknowledge certain limitations when interpreting the findings. Firstly, the study's focus on preschool-aged children from nine mixed-gender preschools in central Spain may restrict the generalizability of findings to diverse cultural and socio-economic contexts. Secondly, the reliance on self-report measures from caregivers and teachers introduces potential biases such as social desirability or recall errors. Thirdly, the study's concentration on short-term changes over four months may not fully capture the long-term effects of the examined social environment variables on aggression and victimization. Furthermore, despite the examination of various family and community factors, the study may not comprehensively encompass all relevant contextual variables influencing preschool aggression, including aspects like neighbourhood safety or community resources, the nature of interactions within the community or specific cultural aspects. Notably, the intricate interplay of child social dynamics and behaviour may not have been entirely encapsulated by the selected variables, as children's behaviours are influenced by multifaceted factors such as peer interactions, school status, classroom environment, and childbirth order or individual temperament. Additionally, the specific context of the preschool setting and the unique social dynamics within each classroom could contribute to variability in the impact of different social environment variables. Furthermore, the measure of community cohesion used might have not fully captured its nuanced effects over peer nominations. Finally, it is essential to recognize that statistical analyses, including logistic regression, are sensitive to the strength of relationships and sample size, which may pose challenges in identifying statistically significant relationships when effects are small or substantial variability exists within the sample.

Conclusions and Practical Implications

The present study sheds light on the intricate interplay of factors impacting aggression and victimization among preschool children, emphasizing the need to examine individual factors alongside familial and community dynamics. This study's novelty lies in its nuanced exploration of these complex relationships, offering fresh insights into the mechanisms underlying preschool aggression and victimization. In the aggressor role, results indicate a stronger association between individual factors, such as being male and experiencing emotional fluctuations, and aggression within this age group, contrasting with broader ecological dynamics such as parenting or community cohesion. In the victim role, parenting stress emerged as a risk factor for victimization and positive interparental interaction was found to be protective against victimization. However, the

unexpected findings about how positive parenting practices and community cohesion increase the likelihood of being nominated as victims challenge conventional beliefs about how positive environments promote social harmony and support.

These findings carry significant practical implications for interventions aimed at mitigating aggression and victimization among preschool-aged children. It is evident that effective strategies must adopt a holistic approach that considers both individual and family/community factors.

Firstly, interventions should incorporate components targeting individual characteristics associated with aggression, such as emotional lability. Research indicates that enhancing emotional competence skills can be instrumental in curbing aggressive behaviors.[108] Therefore, interventions should prioritize interventions that focus on emotions and emotion regulation in children. Programs rooted in social and emotional learning (SEL) offer promising avenues for fostering emotional understanding and management, as well as cultivating positive conflict resolution skills. By integrating SEL principles into interventions, children can develop a better grasp of their emotions, learn to regulate them effectively, and acquire essential skills for resolving conflicts in constructive ways. In addition, the results in relation to children's sex suggest the need to intensify efforts to identify and prevent bullying among boys. The importance of interventions specifically addressing gender dynamics is highlighted, providing differentiated support that addresses the particular needs of boys and girls. Implementing these strategies can contribute to building a supportive and inclusive environment within preschool settings, fostering healthier social interactions among children.

Secondly, interventions should integrate parent training modules to address parenting stress and foster positive parent-child interactions. Research has consistently shown that interventions incorporating a family component yield greater effectiveness in reducing aggressive behaviors.[109] For example, The Incredible Years® program[110] offers evidence-based training programs for parents, teachers, and children, emphasizing the importance of early intervention to prevent the escalation of problematic behaviors. Moreover, interventions should be expanded and intensified for children and families already exhibiting problematic behaviors, as they are at higher risk of developing aggression later in life.[111] By providing targeted support and resources to at-risk families, interventions can mitigate the likelihood of aggressive behavior development.

Lastly, while the relationship between community cohesion and victimization is complex, promoting positive forms of cohesion within communities is crucial for creating safer, more supportive environments for children's healthy development. Interventions should explore and address specific aspects of community cohesion that may contribute to aggressive behaviors or victimization, such as pressures to conform to perceived norms, while strengthening social ties and support networks.

In conclusion, multi-component programs are essential for effectively addressing aggression and victimization among preschool children. By addressing individual, familial and community factors, interventions can create a more nurturing and supportive environment conducive to children's healthy development and well-being.

Data Sharing Statement

The data used in the study cannot be publicly shared due to the limitations specified for the ethical committee regarding personal data protection. The datasets used and/or analysed during the current study will be available privately from Raúl Navarro on reasonable request.

Ethical Approval

This study was conducted in compliance with the ethical standards of APA and the 1964 Declaration of Helsinki, its later amendments, and comparable ethical standards. The study protocol was reviewed and approved by the Social Research Ethics Committee (SREC) of the University of Castilla-La Mancha (Approval Number. CEIS-639445-L9N3).

Consent to Participate

Informed consent was obtained from all individual participants included in the study. Teachers gave written consent to participate in the study. Parental written consent to authorize both their own and their children's participation in the study was also gathered before the beginning of the study.

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Disclosure

The authors declare that there are no conflicts of interest for this work. Specifically, the authors declare that there has not been any conflict of interest with the funding institution that could have biased the results of the research or affected the publication of this paper.

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