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Exploring the Genetic Underpinnings of Bullying: A Contemporary Analysis of Scholarly Investigations

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ABSTRACT

Since the early 21st century, bullying has been a central focus for scholars, with various forms, such as relational, physical, cyber, and social bullying, receiving extensive attention. However, the role of genetic and hereditary factors in bullying remains underexplored. This study systematically reviews 31 scholarly articles published between January 2000 and December 2021. Articles were selected based on predefined inclusion criteria, including methodological rigor, relevance to genetic influences on bullying, and clear population samples. Data sources included Google Scholar, ResearchGate, SAGE Journals, and ERIC, with keywords such as "bullying and genetics," "bullying and hereditary," and "family genetics involvement." The findings reveal significant associations between genetic predispositions and bullying behaviors. For example, genetic factors were found to account for approximately 70–77% of bullying perpetration and victimization in multiple studies, highlighting a strong hereditary influence. Traits such as impulsivity and aggression, often linked to genetic predispositions, were also shown to interact with environmental factors such as family dynamics and peer relationships, amplifying bullying tendencies. These results underscore the critical role of genetic and hereditary transmission in shaping bullying behaviors across generations. The study emphasizes the need for a multidisciplinary approach that integrates genetic research with environmental interventions to address bullying effectively. Practical implications include the development of targeted anti-bullying programs that consider individual genetic susceptibility alongside fostering supportive family and school environments to reduce the intergenerational

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transmission of bullying behaviors.

Keywords: *Bullying Behavior; Genetic Predisposition; Hereditary Factors; Peer Victimization; Systematic Review*

1. Introduction

Bullying, a multifaceted and pervasive social phenomenon, has garnered significant scholarly attention over the past two decades. Extensive research has examined its various forms, including social, relational, physical, cyber, and sibling bullying, offering critical insights into its causes, consequences, and prevention strategies. While much of this research has focused on environmental and interpersonal factors, the role of genetic and hereditary influences in shaping bullying behaviors remains underexplored. This oversight is notable given emerging evidence suggesting that genetic predispositions, such as tendencies toward aggression, impulsivity, and social dominance, may significantly contribute to bullying behavior. Although studies indicate a hereditary component, their findings are fragmented and lack comprehensive synthesis (Ball et al., 2008; Johansson et al., 2022). To address this critical gap, the current study systematically reviews and analyzes 31 studies conducted between 2000 and 2021, investigating the relationship between bullying behaviors and genetic or hereditary influences. By synthesizing these findings, this research aims to clarify the role of hereditary factors in bullying and to explore the broader implications for theoretical advancement and practical intervention. This work not only bridges a significant gap in the literature but also lays a foundation for future studies to investigate the interplay between genetic predispositions and environmental factors, thereby contributing to the development of holistic strategies to mitigate bullying and its intergenerational transmission.

Bullying has become a major societal concern across the globe, particularly in recent decades, with youth being disproportionately affected. A study conducted by Musu et al. reported that 20% of American youth are involved in bullying, with the majority of cases occurring in schools. Among school-aged children, particularly those aged eight to twelve, active participation in bullying is more pronounced among Native American students (23%) and Asian immigrant students (7%) (Musu et al., 2019). These findings reflect an urgent need to understand the factors contributing to such behaviors.

Over the past few decades, school bullying has become a central focus for researchers, driven by the rising prevalence of bullying incidents and the need to identify their underlying causes. Cultural and societal norms, which shape community behaviors and living standards, are also known to influence the frequency and severity of bullying. Researchers have documented a growing number of bullying incidents in developed regions, such as the United States and the European Union (Chester et al., 2015; Zhang et al., 2021). Bullying not only affects academic performance but has also emerged as a critical issue impacting the psychological well-being and mental health of victims (Hertz et al., 2015; Zhang et al., 2021). Early research primarily examined the relationship between bullying and aggression, differentiating between direct and indirect forms of aggression. Over time, scholars such as Olweus expanded the understanding of bullying, identifying it as a deeply rooted societal issue with severe psychological and social consequences (Olweus, 1978).

More recently, bullying behaviors have been categorized into distinct types, including physical bullying, which involves slapping, punching, or kicking; verbal bullying, characterized

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by name-calling or abusive language; and cyberbullying, which involves spreading false information or defamatory content through digital platforms. The proliferation of bullying in its various forms underscores its complexity and the necessity for multidisciplinary approaches to address both its environmental and hereditary determinants.

1.1. Victimization and Self-Identification

Victimization is a prevalent issue among school-aged children and adolescents, with substantial variations observed across regions and populations. Modecki et al. found that approximately 30% of schoolchildren in the United States have experienced bullying victimization. In contrast, European data indicate significantly higher rates, with 60% of students reporting occasional victimization and 30% experiencing repeated bullying incidents (Modecki et al., 2014). Similar patterns have been observed in China. Cheng et al. reported that 25.7% of middle school students in major cities such as Hangzhou, Urumqi, Beijing, and Wuhan experienced bullying victimization at least once a month (Cheng et al., 2010). These findings underscore the pervasive nature of bullying victimization in educational settings globally.

A critical challenge in understanding victimization lies in the process of self-identification. Previous studies suggest that recognizing and acknowledging one's status as a bullying victim can be difficult, and responses to such experiences vary significantly. For instance, students who identify themselves as victims tend to respond more proactively or maturely compared to those who fail to classify their experiences as victimization. This inability to recognize bullying often exacerbates psychological distress, leading to prolonged suffering (Greenberg & Beach, 2004). Furthermore, Greenberg and Beach found that individuals who experienced severe or violent victimization were more likely to report their experiences to authorities, such as the police than those with less overt forms of bullying (Greenberg & Beach, 2004).

Unfortunately, there remains limited research examining the association between the experience of victimization and self-identification, particularly in younger children or infants (Zhang et al., 2021). Recognizing victimization is further complicated by its perceived overlap with other forms of interpersonal harm, such as minor crimes, which are often interconnected with bullying behaviors. Effective identification and reporting of bullying are essential, as these processes enable appropriate intervention by relevant authorities to prevent further victimization and its adverse effects.

Additionally, it has been suggested that bullying behaviors, as well as susceptibility to victimization, may have hereditary components. Genetic predispositions could influence an individual's likelihood of either becoming a bullying perpetrator or experiencing victimization. While this connection remains speculative, there is growing interest in exploring whether awareness of hereditary influences might encourage individuals to resist engaging in bullying behaviors. Such perspectives highlight the complex interplay between genetic, psychological, and environmental factors in understanding bullying victimization and self-identification.

1.2. School Bullying

In recent decades, bullying has emerged as a significant problem in school environments worldwide, affecting both victims and perpetrators. Research has demonstrated that a substantial proportion of school-aged children are involved in bullying activities, either as perpetrators or victims, with prevalence rates ranging from 20% to 54% (Demaray et al., 2016). Scholars have extensively studied the characteristics of children who exhibit bullying behaviors, identifying traits such as aggression, impulsivity, and a short temper as common among perpetrators (Veenstra et al., 2005). On the other hand, children who are uninvolved or

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victimized by bullying are more likely to experience adverse psychological outcomes, including stress, depression, low mood, and social withdrawal (Alsaker & Gutzwiller-Helfenfinger, 2009). These findings underscore the far-reaching consequences of bullying, which extend beyond immediate physical harm to long-term emotional and social difficulties.

Several studies have investigated the relationship between children's abilities, attributes, habits, and environmental factors that may predispose them to bullying behaviors or victimization. Despite these efforts, limited research has explored the connection between emotional development in early childhood and later behavioral problems associated with bullying. Schwartz et al. conducted a longitudinal four-year study demonstrating that children who display early emotional instability and behavioral issues are more vulnerable to victimization (Schwartz et al., 1999). Similarly, Ball et al. reported a correlation between assertive behavior and an increased likelihood of victimization over time (Ball et al., 2008). Further investigations by Jansen et al. found that emotional difficulties during childhood are often present in both victims and perpetrators of bullying (Jansen et al., 2011).

The role of social and environmental factors in fostering bullying behaviors is also well documented. Bowes et al. identified strong associations between family violence, neighborhood issues, and the adoption of bullying tendencies in children (Bowes et al., 2013). These findings suggest that adverse environmental conditions, such as exposure to violence and inadequate social support, can significantly contribute to bullying behaviors. Notably, while extensive research has focused on social and psychological determinants of bullying, the potential influence of biological factors remains underexplored. Understanding the interplay between genetic predispositions and environmental triggers could provide a more comprehensive explanation of bullying behaviors and inform targeted intervention strategies.

1.3. Early Childhood and Bullying Behavior

The formative years of childhood, often referred to as the "golden age," represent a crucial period of development during which the family and social environment highly influence a child. At this stage, children are entirely dependent on their families, teachers, and immediate surroundings, which shape their behaviors and perceptions of the world. The experiences encountered during early childhood play a significant role in determining not only the child's future behavior but also their contributions to society as adults. A nurturing environment at home, school, and within the community can positively influence a child's development, fostering social adaptability and emotional resilience. Conversely, exposure to unfavorable environments, such as dysfunctional family dynamics or negative peer influences, may lead to asocial or aggressive behavior, including bullying tendencies.

Early childhood is a critical stage for the emergence of new behaviors, which are often influenced by psychological, social, biological, and environmental factors. At this stage, children may assume roles as either perpetrators or victims of bullying. While no child is inherently predisposed to become a bullying perpetrator, certain factors, such as peer group dynamics, psychological stress, and environmental adversity, can push a child toward exhibiting such behavior. Yusuf and Fahrudin identified several factors contributing to bullying behaviors, including psychological development, biological growth, social influences, peer relationships, economic conditions, and environmental pressures (Yusuf & Fahrudin, 2012). Similarly, Nasution et al. emphasized the multifaceted nature of bullying, highlighting that family dynamics, individual traits, and environmental stressors collectively influence a child's propensity to engage in bullying (Nasution et al., 2018). However, despite these findings, the

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role of genetic and hereditary factors in bullying behavior remains largely underexplored, representing a critical gap in the literature.

In educational institutions, particularly early childhood settings, bullying is often viewed as an atypical yet increasingly prevalent behavior. Hong et al. describe bullying as a repetitive act of aggression intended to harm others, establish dominance, or exert power within peer groups (Hong et al., 2021). Such behavior manifests in various forms, including physical harm, verbal abuse, and social exclusion. It can be influenced by factors such as family issues, parenting styles, neighborhood environments, and peer interactions. Despite decades of research, the precise underlying causes of bullying, particularly in early childhood, remain unclear. Scholars continue to explore the complex interplay between social, environmental, and individual factors in the development of bullying behavior. Identifying these key factors, including the potential contribution of genetic predispositions, is essential for developing targeted interventions aimed at mitigating bullying behaviors during the formative stages of childhood.

1.4. Cyberbullying and Cyber Victimization

Since the beginning of the 21st century, advancements in modern technology have transformed global communication, offering unprecedented accessibility and connectivity. While these technological developments have provided numerous benefits, they have also facilitated harmful behaviors, particularly cyberbullying. Cyberbullying is defined as the use of digital platforms, such as social media applications (e.g., Instagram, Facebook, Twitter) and electronic communication tools (e.g., email), to spread negative content, such as defamatory comments, rumors, or other forms of harassment, with the intent to harm individuals indirectly (Henson, 2012).

Cyberbullying is most prevalent among students, particularly within educational settings. A significant body of research has focused on its impact on university and school-aged populations, demonstrating its alarming prevalence and associated risks. Recent studies collectively indicate that cyberbullying has become a normalized phenomenon, particularly among university students (Kokkinos, Antoniadou, & Markos, 2014; Kokkinos & Antoniadou, 2019; Kokkinos & Saripanidis, 2017; Peluchette et al., 2015; Varghese & Pistole, 2017). These studies report that over 50% of bullying incidents occur in online environments, posing a significant threat not only to educational institutions but also to the psychological and emotional well-being of victims.

The consequences of cyberbullying are profound and far-reaching. Victims often experience increased levels of stress, anxiety, depression, and social withdrawal, which may contribute to severe mental health challenges in adulthood. Unlike traditional bullying, cyberbullying is not limited by physical boundaries, allowing perpetrators to harass victims anonymously and persistently, thereby exacerbating its psychological impact. Furthermore, the persistence of such behaviors reflects broader social learning processes and moral deficits within society. As individuals observe and internalize harmful online behaviors, they may replicate them, contributing to the perpetuation of cyberbullying across generations.

Scholars have also suggested that hereditary factors may play an underlying role in the development of bullying behaviors, including cyberbullying. While this hypothesis remains speculative, it aligns with theories of behavioral inheritance, wherein aggressive or antisocial tendencies may be transmitted across generations through both genetic predispositions and environmental influences. This raises critical questions about the interplay between biological and social factors in shaping bullying behaviors, which require further exploration.

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Cyberbullying represents a serious and evolving challenge within contemporary society, particularly among student populations. Its impacts extend beyond immediate psychological harm to long-term mental health consequences, necessitating urgent attention from educators, policymakers, and researchers. Understanding the multifaceted causes of cyberbullying—including technological, social, and potential hereditary influences—will be essential for developing effective intervention strategies that promote a safer and more supportive digital environment.

1.5. Bullying and Social Dominance Trait

The transition from childhood to adolescence represents a sensitive developmental stage during which children begin to form distinct personality traits and seek recognition within their social environments. At this stage, children become increasingly aware of the importance of social legitimacy and societal norms (Cillessen & Rose, 2005; Galván, 2013). The pursuit of power and dominance is a prominent behavior observed during this period, and it often manifests differently across cultures and individuals. Research indicates that individuals in collectivist cultures and those in individualistic cultures exhibit different approaches to power and social dominance, reflecting cultural norms and societal expectations (Lasswell, 2017; Machiavelli & Wootton, 1995; Pratto et al., 2000; Vargas-Salfate et al., 2018; Wrong, 2017).

Individuals may pursue social dominance through either prosocial or antisocial behaviors. Positive demonstrations of social dominance include engaging in altruistic acts, participating in sports, excelling academically, or contributing to the community and religious activities. Conversely, some individuals assert dominance through antisocial means, such as participating in criminal activities, engaging in gang behavior, or creating social chaos (Hawley et al., 2008). Family dynamics play a critical role in shaping these behaviors. For example, children raised in educated and supportive family environments are more likely to adopt positive behaviors that reflect social responsibility. In contrast, children growing up in fragmented or dysfunctional households—where aggression, criminal activities, or abusive behaviors are normalized—are at a higher risk of developing antisocial tendencies. These observations highlight the interplay between environmental influences, family upbringing, and biological predispositions in shaping social dominance behaviors.

Cultural variations further complicate the understanding of bullying and social dominance traits. Studies have demonstrated that the expression, intensity, and forms of bullying differ across cultural contexts. For instance, cross-cultural research has shown that bullying behaviors are closely linked to personality traits, exploitative tendencies, and overt expressions of power (Book et al., 2012; Kokkinos, Antoniadou, Dalara, et al., 2014; Volk et al., 2018). These behaviors manifest differently in Eastern and Western societies, where cultural norms dictate how individuals perceive and engage in bullying (Purdy, 2016). While Western cultures may emphasize individual achievement and assertive dominance, Eastern cultures often focus on group harmony and indirect expressions of dominance.

Despite these insights, defining bullying in universal terms remains challenging due to its cultural variability. Cultural differences arise from the distinct social practices and values shaped over generations within specific communities. As generations evolve, variations in behaviors and traits may be influenced not only by cultural norms but also by genetic predispositions. The genetic aspects of bullying and social dominance behaviors remain an underexplored area of research, yet they may provide a critical understanding of intergenerational patterns of aggression and victimization.

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Bullying and social dominance are complex, multifaceted phenomena influenced by cultural, social, familial, and biological factors. While cultural variations highlight the diverse ways bullying manifests across societies, further research is needed to explore the genetic underpinnings of these behaviors. Investigating the interplay between genetic predispositions and cultural influences will contribute to a more comprehensive understanding of bullying and inform targeted interventions across different cultural and societal contexts.

1.6. Bullying and Genetic Factors

Bullying and victimization are behaviors that appear to have roots within family dynamics and may be influenced by genetic predispositions. Allison et al. found that children of parents who had experienced bullying are at a significantly higher risk of being victimized themselves. Their study indicated that only 25% of children whose parents had no history of victimization experienced bullying, compared to 55% of children whose parents had been victimized. This suggests a potential genetic link to victimization (Allison et al., 2014). Similarly, Veldkamp et al. reported exceptional cases where fathers had not been bullied, yet their offspring experienced bullying. Approximately 16% of fathers who had been bullied also found their children experiencing the same, underscoring the need to explore the genetic transmission of bullying behaviors (Veldkamp et al., 2019). Farrington further argued that bullying perpetration may persist across generations, highlighting the role of hereditary influences alongside environmental factors (Farrington, 1993).

While these studies provide valuable insights, they also reveal the difficulty in disentangling environmental influences from genetic factors. Victimization and perpetration appear to be influenced by both familial environments and potential hereditary predispositions. Parents who experienced bullying during childhood may inadvertently transmit behavioral patterns to their offspring, either through genetics or learned behaviors. This complexity necessitates further research to determine the relative strength of genetic versus environmental influences on bullying behaviors.

Twin studies provide some of the most compelling evidence for the hereditary nature of bullying and victimization. Brendgen et al. conducted studies on twins aged 6–12 years, finding that 32% of victimization could be attributed to hereditary factors. Another study involving twins aged 10 years reported a 45% genetic contribution to bullying victimization (Brendgen et al., 2011, 2015). Supporting these findings, Shakoor et al. examined over 5,000 twins aged 12 years using self-report inventories and found that 35% of victimization was linked to hereditary factors (Shakoor et al., 2015).

More recent research by Eastman et al. examined the interplay between genetic and environmental influences on bullying and victimization. Their findings indicated that hereditary factors accounted for 23% of social, property, and verbal victimization in preadolescent children, while genetic factors influenced 42% of physical victimization. However, Eastman et al. did not find significant differences in hereditary contributions to perpetration across genders, highlighting the need for further investigation into these dynamics (Eastman et al., 2018). This study was among the first to explore the combined influence of genetic and environmental factors on both bullying perpetration and victimization, setting the stage for future research.

The role of genetic predispositions in bullying behaviors remains an emerging area of study, requiring further large-scale investigations across diverse cultures, societies, and genetic backgrounds. Scholars must adopt interdisciplinary approaches that consider biological, cultural, and social dimensions to understand the hereditary transmission of bullying

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tendencies better. For example, in certain cultural contexts, such as South Asian societies, bullying may not be widely recognized as a behavioral problem but rather perceived as a culturally embedded activity. These perspectives underscore the importance of exploring the genetic and cultural aspects of bullying on a global scale to develop comprehensive and culturally sensitive intervention strategies.

Current research suggests that hereditary and genetic factors play a significant role in both bullying perpetration and victimization. Twin studies and familial investigations provide evidence for a genetic contribution, though the extent of this influence remains unclear. Future research must focus on disentangling the complex interplay between genetics and environmental factors to gain a deeper understanding of bullying behaviors. By exploring these aspects across cultures and populations, researchers can contribute to the development of effective strategies to address bullying as a multifaceted global issue.

This study aims to investigate the genetic underpinnings of bullying by synthesizing existing scholarly research better to understand the role of genetic factors in bullying behaviors. Specifically, the objectives are to explore the genetic influences that may contribute to bullying tendencies or victimization, analyze how genetic predispositions interact with environmental and social factors in bullying contexts, and evaluate current research methodologies to highlight key findings and identify existing knowledge gaps. By addressing these objectives, the study seeks to provide a comprehensive understanding of the biological and contextual influences on bullying, offering new insights into its complex and multifaceted nature.

The contribution of this research lies in its potential to deepen the current understanding of bullying by examining the genetic aspects of this behavior in detail. This work enriches ongoing academic discussions by emphasizing the interplay between genetic predispositions and external influences, such as family dynamics, peer interactions, and social environments. Insights gained from this synthesis could lead to more tailored and effective intervention strategies that incorporate both genetic and environmental considerations, thereby strengthening efforts to prevent and mitigate bullying behaviors. Additionally, by mapping existing knowledge gaps, this study establishes a foundation for future exploration into genetic and behavioral interactions, encouraging further research to unravel the biological, psychological, and social dimensions of bullying. Ultimately, this study advances the field by framing bullying as a multifactorial phenomenon influenced by both innate and external factors, promoting a more integrative and holistic approach to its study, understanding, and management.

2. Research Methodology

A systematic literature review was conducted to identify and synthesize relevant studies published between January 2000 and December 2021. The primary objective of this review was to explore the relationship between bullying behaviors and genetic or hereditary factors. Articles were gathered from key academic databases, including Google, Google Scholar, ResearchGate, SAGE Journals, and ERIC, using a comprehensive search strategy. Keywords and combinations such as “bullying and genetics,” “bullying and hereditary,” “family participation and genetics,” “bullying and parental participation,” “victimization and genetics,” “bullying and personality traits,” “bullying and dominance traits,” and “early childhood victimization” were employed to ensure a wide coverage of relevant literature. This broad search strategy was designed to capture diverse studies addressing the genetic underpinnings of bullying.

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2.1. Inclusion and Exclusion Criteria

A systematic selection process was employed to ensure methodological rigor and relevance. An initial search yielded 1,140 articles across the identified databases. Titles were screened to remove irrelevant studies, resulting in 170 potentially relevant articles. Following the removal of duplicates, 130 unique articles remained. Abstracts were then reviewed to assess alignment with the study's objectives, narrowing the selection to 87 articles. Full-text reviews were subsequently conducted, focusing on methodological quality, clear population sampling, and a strong emphasis on genetic influences related to bullying. During this phase, 56 articles were excluded due to insufficient methodological detail, lack of relevance, or failure to meet predefined inclusion criteria. Ultimately, 31 articles were selected for final analysis, forming the core dataset for this study.

The selected articles were subjected to a thorough examination, emphasizing their methodological rigor, clear study design, and focus on the genetic foundations of bullying. To ensure a structured analysis, studies were grouped into thematic categories based on shared objectives and methodological approaches, allowing for a coherent and comprehensive synthesis of findings.

2.2. Thematic Category Development

To facilitate a deeper understanding of the genetic factors influencing bullying, the selected articles were organized into the following thematic categories:

1) Genetic Predispositions Influencing Bullying Behaviors
   Studies that explored hereditary traits and genetic markers contributing to bullying tendencies.
2) Gene-Environment Interactions
   Research examining how genetic predispositions interact with environmental factors, such as family dynamics and peer relationships, influences bullying behavior.
3) Genetic Contributions to Resilience or Susceptibility
   Studies investigating how genetic factors may increase resilience or susceptibility to bullying victimization or perpetration.

The thematic categories were derived through an in-depth analysis of the full texts, focusing on recurring themes, shared methodologies, and key findings. By grouping studies into these categories, the analysis highlights significant patterns and relationships, enabling a more organized and systematic exploration of genetic influences on bullying.

2.3. Scope of the Problem

Defining and measuring bullying as a single variable presents significant challenges due to its complex and multifaceted nature. Similarly, assessing bullying as a hereditary behavior introduces additional difficulties, requiring specialized approaches to examine biological and genetic factors. This process demands interdisciplinary collaboration with professionals such as clinical psychologists, psychiatrists, medical doctors, and biological scientists to ensure methodological robustness and accuracy.

Despite the challenges, limited studies have explored the hereditary components of bullying. For instance, studies conducted investigations into genetic and environmental influences on bullying behaviors (Vaillancourt et al., 2008; Veldkamp et al., 2019). The latter study relied on secondary data collected from teachers, emphasizing the need for more comprehensive and primary data collection methods in future research. These findings

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highlight a significant research gap, suggesting that scholars should prioritize examining genetic factors influencing bullying through interdisciplinary and large-scale investigations.

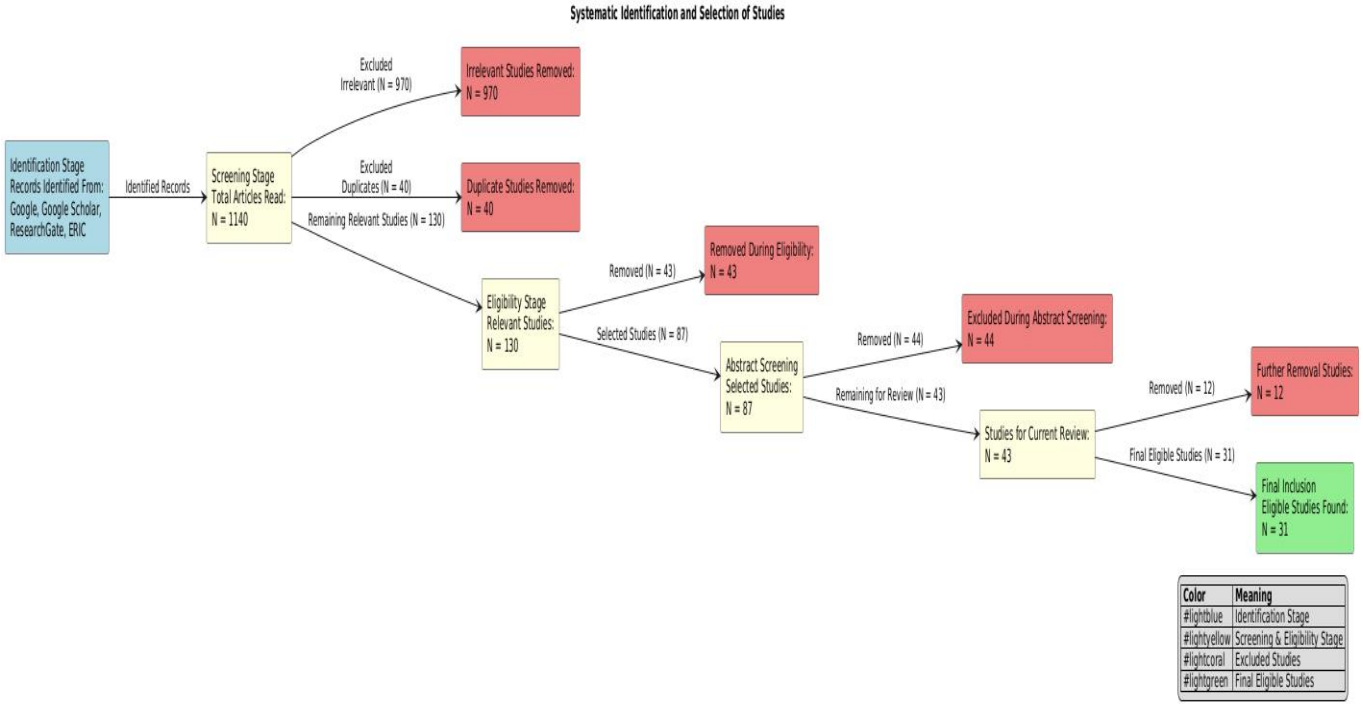

Figure 1. Systematic Identification and Selection of Studies

3. Results and Discussion

This review synthesized a wide range of studies investigating the relationship between hereditary factors and bullying behaviors, emphasizing both bullying perpetration and victimization. Bullying, defined as repeated aggressive behavior with an imbalance of power (Beldean-Galea et al., 2010; Olweus, 1978), has traditionally been explored through social and environmental lenses. However, recent findings underscore the substantial role of genetic predispositions in shaping bullying behaviors, with heritability estimates demonstrating consistent patterns across multiple studies. Ball et al. reported that genetic factors accounted for approximately 61% of bullying behaviors, emphasizing the significance of inherited traits such as aggression, impulsivity, and dominance (Ball et al., 2008). These findings align with those of Veldkamp et al., who estimated heritability rates of up to 70%, further highlighting the strong genetic contributions to bullying tendencies (Veldkamp et al., 2019). Similarly, research on antisocial and aggressive behaviors, which often precede bullying, revealed heritability rates ranging from 40% to 80% (Polderman et al., 2015; Porsch et al., 2016). This evidence collectively underscores the genetic foundation of bullying behaviors, suggesting that inherited personality traits may predispose individuals to assert dominance and control through aggressive actions.

Parallel to findings on bullying perpetration, studies have consistently shown that genetic factors play a pivotal role in bullying victimization. Johansson et al. reported that 77% of bullying victimization could be attributed to genetic influences (Johansson et al., 2022), aligning closely with earlier estimates (Ball et al., 2008; Bowes et al., 2013; Connolly & Beaver, 2016), which suggested heritability rates ranging between 70% and 77%. These studies identified specific traits, such as emotional sensitivity, low resilience, and difficulties in emotional regulation, as key genetic predispositions that may increase susceptibility to bullying victimization. Individuals with heightened emotional sensitivity may struggle to respond

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effectively to bullying situations, making them more likely to be targeted. However, heritability estimates are not uniform across studies. For example, research reported significantly lower heritability rates for victimization, approximately 26%, reflecting the complexity of genetic and environmental interactions (Brendgen et al., 2011; Shakoor et al., 2015). These discrepancies can be attributed to differences in sample sizes, age groups, cultural contexts, and research methodologies. For instance, studies utilizing self-reports, teacher ratings, or twin analyses may yield varying results, introducing challenges in interpreting the relative contributions of genetic and environmental factors.

The interplay between genetic predispositions and environmental influences remains central to understanding bullying behaviors. While genetic factors provide a foundational predisposition, environmental conditions determine how these traits are expressed. Studies explored this interaction and found that strong genetic influences on bullying behaviors were evident but not always moderated by environmental variables (Johansson et al., 2022; Pol-Fuster et al., 2024). Nevertheless, the importance of environmental influences cannot be disregarded. Family structure, school environments, peer dynamics, and societal norms interact with genetic predispositions to either amplify or suppress bullying tendencies. For example, Tsaousis demonstrated that personal factors such as low self-esteem, poor emotional regulation, and limited social skills exacerbate the likelihood of bullying behaviors when combined with genetic predispositions (Tsaousis, 2016). Children with inherited impulsivity or aggressive tendencies may be more likely to act out in environments lacking positive role models or consistent behavioral boundaries. Similarly, low self-esteem and social withdrawal, traits often linked to genetic vulnerability, may increase susceptibility to victimization in bullying-prone environments.

Societal and cultural factors further shape the relationship between genetic predispositions and bullying behaviors. Abdelrheem et al. observed that gender norms play a critical role in determining how genetic traits manifest (Abdelrheem et al., 2024). While boys and girls exhibit similar genetic susceptibility to bullying, differences arise in the forms, frequency, and intensity of bullying behaviors due to societal expectations. Boys are more likely to engage in overt, physical bullying, whereas girls tend to exhibit relational or social bullying, reflecting gendered norms surrounding aggression. This suggests that societal influences act as mediators in shaping the behavioral expression of genetic predispositions, reinforcing the need for gender-sensitive approaches in anti-bullying interventions.

Cultural variations also play an essential role in understanding how genetic predispositions are expressed. Basilici et al. emphasized that bullying behaviors are not universal and differ significantly across cultural contexts (Basilici et al., 2022). In societies where aggression is normalized or socially rewarded, individuals with genetic tendencies toward dominance and impulsivity may be more likely to exhibit bullying behaviors. Conversely, in cultures that prioritize collective responsibility, social harmony, and conflict resolution, genetic predispositions toward aggression may be mitigated by strong cultural norms against bullying. For example, individualistic societies, which often encourage competition and assertiveness, may provide environments where genetic traits such as impulsivity and dominance are expressed through bullying as a means of achieving social status. In contrast, collectivist cultures that emphasize group cohesion may suppress the same genetic traits, thereby reducing the likelihood of bullying perpetration. These cultural nuances underscore the importance of considering environmental and societal contexts in future research to understand the genetic-environmental interplay in bullying behaviors fully.

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The complexity of bullying behaviors arises from the dynamic interaction between genetic predispositions, personal mediators, and environmental contexts. While genetic factors play a substantial role in determining susceptibility to both perpetration and victimization, they do not act in isolation. Instead, they interact with various social, emotional, and cultural influences to shape individual behaviors. Methodological variations across studies, including differences in population samples, assessment tools, and analytical approaches, further contribute to discrepancies in findings, highlighting the need for greater standardization in bullying research. Future investigations must adopt longitudinal and cross-cultural approaches to capture the evolving nature of these interactions over time. By doing so, researchers can provide a more comprehensive understanding of how genetic predispositions, mediated by environmental and societal factors, contribute to the development and persistence of bullying behaviors.

4. Conclusion

This review consistently highlights the substantial role of genetic predispositions in both bullying perpetration and victimization. Findings reveal significant heritability rates, with genetic factors accounting for up to 70% of bullying tendencies and susceptibility to victimization. However, the interaction between genetic predispositions and environmental influences, such as family dynamics, societal norms, and cultural contexts, remains a critical component for understanding bullying behaviors. The discrepancies in heritability estimates across studies underscore the complexity of genetic-environmental interactions and point to the need for further research incorporating a broader range of contributing factors.

To effectively address bullying, comprehensive interventions must be developed that consider individual differences, genetic predispositions, and environmental influences. Strategies aimed at improving self-esteem, fostering social skills, and promoting anti-bullying norms within schools and communities are essential. Additionally, addressing the role of cultural and societal factors will ensure that interventions are contextually appropriate and effective.

Future research should prioritize longitudinal studies to examine the dynamic interaction between genetic and environmental factors over time. By employing representative samples, standardized assessment tools, and cross-cultural perspectives, researchers can identify the precise mechanisms underlying bullying behaviors. A holistic framework integrating genetic, environmental, and cultural dimensions is essential for understanding the multifaceted nature of bullying and developing targeted strategies to reduce its prevalence and mitigate its harmful impacts.

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6. Declaration of Conflicting Interests

The authors have declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

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