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Review Article

Phobia, fear, and anxiety of dental treatment in pediatric patients: Etiology and clinical implications

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Abstract

Dental fear and phobia in childhood represent a significant challenge in pediatric dentistry, with potential long-term negative consequences for both oral health and emotional well-being. Despite considerable advancements in understanding the psychological and behavioral aspects of dental fear, there remains a lack of long-term studies examining the effectiveness of management strategies and the impact of cultural differences on children's perceptions of dental treatment. Early identification of the severity of dental fear, which can hinder children from seeking timely dental care, is crucial in clinical practice. Recognizing and assessing signs of dental anxiety allows for the adaptation of behavioral interventions and the implementation of tailored management approaches. Parental influence, particularly maternal anxiety and parenting styles, along with biological predispositions and sociocultural factors such as media portrayals, play a significant role in the development of dental fear. Future research should focus on individualized treatment approaches and further exploration of family dynamics affecting dentophobia in children. Developing effective preventive interventions and strategies to reduce dental fear can improve not only children's oral health outcomes but also their overall emotional and social stability.

Keywords

Dental fear, dental anxiety, dental phobia, pediatric dentistry, child behavior, psychological factors

Introduction

Dental fear and anxiety among children represent a significant challenge not only for pediatric dentists but also for public health systems worldwide. Early negative experiences or untreated anxiety can lead to avoidance of dental care, which often results in poor oral health outcomes that may persist into adulthood. This avoidance cycle contributes to an increased prevalence of dental diseases, higher treatment costs, and an overall decreased quality of life. Therefore, understanding the underlying mechanisms and consequences of dental fear in children is critical for developing effective prevention and intervention strategies.

Despite advances in dental technology and pain management, many children continue to experience significant emotional distress during dental visits. This distress is often underestimated by healthcare providers, resulting in insufficient attention to the psychological needs of young patients and reinforcing the cycle of fear and avoidance [1].

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Dental visits often provoke intense emotional distress in young children. What adults perceive as routine procedures may become sources of apprehension, with fear and phobia being common reactions that impact both psychological and physical health. Failure to recognize early signs and the potential progression of these negative emotions can lead to serious psychosocial and clinical consequences, including avoidance of necessary dental visits, deterioration of oral hygiene, and denial of dental care [1,2].

Fear and anxiety are natural protective responses that can become exaggerated in the dental context and sometimes remain unrecognized by practitioners, which further perpetuates avoidant behaviors and intensifies anxiety [1].

In response to these challenges, research interest is growing to better understand the multifaceted nature of dental fear and anxiety, aiming to develop tailored approaches that promote positive dental experiences from an early age. The current review aims to explore the etiology, epidemiology, and management of dental fear and anxiety in children, highlighting the importance of early identification and intervention. Special attention will be given to psychosocial factors influencing children's responses to dental care, as well as the roles of parental influence and effective communication strategies. Addressing these issues comprehensively is essential for improving clinical practice and oral health outcomes among children.

Terminology and definitions

In dental medicine, the topic of dental fear and anxiety is often underestimated and overlooked, which can intensify negative emotional reactions in children and create a vicious cycle: anxiety and fear, such as fear of pain during treatment, lead to avoidant behavior, which in turn reinforces and sustains dental fear and anxiety [1].

In scientific literature, three related but distinct terms, fear, anxiety, and dental phobia, are frequently used to describe avoidant behaviors exhibited by children during dental visits [2]. According to the Cambridge Dictionary, both fear and anxiety are defined as "unpleasant" feelings that are closely associated with worry or distress [3]. While these terms often overlap in everyday usage, researchers have made deliberate efforts to clarify their specific definitions to better understand and address the emotional responses in pediatric dental care.

Fear of dental treatment is most commonly understood as an immediate emotional reaction triggered by a specific, identifiable stimulus, such as needles, dental handpieces, or drills. While fear itself is a psychological construct that cannot be directly observed, it becomes evident through various cognitive, behavioral, and physiological responses. Researchers categorize the components of dental fear into two broad groups: subjective elements, which encompass emotions and thoughts, and objective elements, including observable behaviors and physical reactions. The majority of studies highlight the predominant influence of subjective experiences—such as personal feelings and perceptions—over the direct impact of external stimuli during dental procedures [3,4]. Importantly, fear is a manageable condition that can be alleviated through targeted interventions, such as behavioral training and educational programs designed to prepare children for dental visits.

In contrast to the immediate nature of fear, anxiety related to upcoming dental procedures often involves an unclear or ambiguous threat that may not be directly visible or present at the moment [3]. Anxiety is described as an internal feeling of worry or apprehension about an anticipated event. It manifests as a subjective sensation, with its cause not always obvious or present in the surrounding environment [5].

The term "dental fear and anxiety" (DFA) commonly refers to intense negative emotional reactions associated with dental visits and treatments. DFA is a prevalent issue that frequently begins with early childhood experiences in dental care. Research shows that more than 50% of adults reporting DFA first developed these feelings during childhood [3]. Furthermore, nearly half of the children affected by DFA tend to postpone or avoid dental appointments, which can lead to worsening oral health and further strengthen their fear and anxiety [4].

Anxiety experienced by children during dental procedures can be categorized into two main types: individual and maternal anxiety. Individual anxiety refers to the inherent emotional response present in some children. Those with this type of anxiety tend to express their worries and fears during dental treatments. Moreover, higher anxiety levels at the initial dental appointment often predict a similar or increased level of anxiety in subsequent visits. Maternal anxiety, on the other hand, originates from the mother and has been shown to influence the behavior of young children during dental examinations and treatments.

Phobia represents the third component of avoidant behavior in dental contexts and is recognized as a diagnosable mental disorder. This diagnosis typically involves a psychiatrist when a patient consistently displays intense and excessive fear or anxiety. A phobia is characterized by an irrational and disproportionate fear of an object or situation that would not usually cause fear in most individuals. It often presents as a persistent, unrealistic, and overwhelming fear of a specific trigger, resulting in avoidance of the perceived danger. Phobias are generally classified into two types: social and specific.

In the context of dentistry, social phobia may present as an intense fear of being observed while performing potentially embarrassing actions—such as gagging, vomiting, or crying during treatment. Specific phobia, by contrast, is directed toward a clearly identifiable object or situation, such as the dental drill, injection, or even the dental chair itself [3]. These types of phobic responses can lead to considerable psychological discomfort and distress. They are often marked by heightened anxiety that disrupts

the child's ability to function normally in a dental environment or, in severe cases, in everyday life [6]. Children suffering from such phobias may experience overwhelming panic when exposed to the source of their fear [1,7].

Phobias associated with dental visits can be classified into three main types:

- **Simple phobia:** This form is triggered solely by the presence of the dentist or specific dental instruments. Even the sight of dental equipment may evoke immediate fear.
- **Complex phobia:** Here, fear is provoked by the need to undergo more advanced or invasive procedures. It typically involves a combination of multiple triggers—such as the dentist, the dental chair, and instruments—which individually might already elicit fear but together create a more intense reaction.
- **Phobic crisis:** This severe response may be initiated by a stimulus such as a thought, image, or physical object. The individual experiences a subconscious hyperfocus that may escalate into a full-blown panic attack, often accompanied by physiological symptoms like sweating, palpitations, and dizziness [8].

Due to their conceptual proximity, overlapping definitions, and frequent interchangeability, the terms fear, anxiety, and dental phobia are often examined collectively or grouped under the broader term “Dental Fear and Anxiety” (DFA). A comprehensive understanding of these emotional states in children is essential for identifying their sources and implementing effective strategies to alleviate distress before, during, and after dental procedures. Such insight facilitates the development of individualized behavioral management techniques and supports the creation of a more positive and cooperative attitude toward dental care [1].

Given the clinical importance and multifactorial origins of dental fear and anxiety in children, it is crucial to examine their underlying causes, epidemiological patterns, and psychosocial correlates in greater detail.

Epidemiology

Given the widespread nature of dental fear and anxiety among children and the variety of terms used to describe it, it is important to understand how these emotional responses are distributed across populations. Exploring the prevalence and demographic patterns of DFA can provide insight into at-risk groups and inform targeted interventions. The following section outlines current epidemiological data on dental fear and anxiety in pediatric populations.

Avoidant behavior during dental treatment represents a widespread public health concern that can affect individuals across all age groups and socioeconomic strata. However, the onset of clinically relevant dentophobia is most frequently observed in early childhood, when children are particularly vulnerable to negative dental experiences. Studies estimate that between 5% and 20% of children suffer from some form of clinically significant dental phobia [9].

Various demographic factors have been shown to influence the prevalence and severity of dental fear, including age, gender, and socioeconomic status. Notably, children between the ages of 6 and 12 who are exposed to more complex or invasive procedures tend to exhibit more intense symptoms of fear and avoidance behavior [1].

Gender-related trends in dental fear have been inconsistently reported in the literature. Some studies indicate that girls are more likely to exhibit higher levels of dental anxiety than boys, potentially due to differences in emotional expression and psychological coping mechanisms [10]. However, other authors find no statistically significant differences between the sexes, suggesting that additional variables may play a stronger role.

Socioeconomic status (SES) has shown a more consistent association with dental fear. Children from lower-SES backgrounds are more likely to experience elevated levels of anxiety related to dental care, often as a result of reduced access to preventive services, fewer positive experiences, and a greater likelihood of delayed or complicated treatments [11].

Folayan et al. reported a wide range in the prevalence of dental fear and anxiety, with 3% to 43% of their study participants exhibiting such symptoms, highlighting variability likely influenced by differences in study design, population characteristics, and assessment methods [3]. Similarly, Bedi et al. found a 7.1% prevalence of dental fear in a Scottish cohort, while Morgan et al. documented a 10.5% prevalence among children in the United States, underscoring the global nature of the issue across diverse settings [3].

The prevalence of dental fear and anxiety (DFA) among children varies widely, with studies reporting rates from as low as 4% up to 98%. Such disparity is primarily attributed to variations in cultural contexts, family environments, individual child characteristics, and the diverse methodologies or assessment tools utilized across studies. Key family-related factors influencing DFA development include parental dental anxiety, socioeconomic status, number of siblings, and maternal education level. Moreover, individual child factors such as temperament, gender, age, previous dental experiences, and history of toothache have been consistently associated with increased risk of dental fear and anxiety [12].

Etiology

Understanding the epidemiological landscape of dental fear and anxiety (DFA) in children is essential, yet it only provides a partial view of this complex phenomenon. While prevalence data and demographic patterns highlight the scope and distribution of dental fear, a deeper insight into the underlying causes is necessary to inform effective prevention and intervention strategies. The etiology of dental fear in childhood is multifactorial, encompassing a combination of personal experiences, psychological predispositions, familial and social influences, as well as biological factors. Exploring these contributory elements enables a more comprehensive understanding of why certain children develop persistent dental anxiety, thereby guiding tailored approaches to pediatric dental care.

Dental fear, dental anxiety, and dentophobia represent emotional reactions of varying intensity and characteristics that influence a child's behavior differently (see section 'Terms and Definitions'). This section explores the main factors contributing to the development of these conditions. While these states are related, they differ in intensity, cognitive patterns, and behavioral outcomes. Understanding their origins and interrelations is critical for developing effective preventive and therapeutic strategies in pediatric dentistry.

Dental fear during childhood represents a prevalent psycho-emotional condition that persists as a significant barrier to effective pediatric dental treatment, despite technological advancements and the availability of efficient anesthesia [12]. The etiology of dental fear is multifactorial, involving a complex interplay of personal experiences, psychological and social influences, alongside biological and cultural determinants [13]. A thorough understanding of these contributing factors is imperative for the development of targeted prevention measures, behavioral management techniques, and improvements in pediatric dental care delivery.

One of the predominant etiological factors contributing to dental fear in children is their direct personal experience during dental treatments. Painful or uncomfortable dental procedures, as well as experiences of inadequate or harsh clinical management, can establish strong negative associations with dental care [14]. These adverse encounters are often vividly remembered and can result in long-lasting fear and heightened anxiety toward future dental visits. For example, a child who endures significant pain or receives insufficient anesthesia may develop a conditioned emotional response, generalizing this negative experience to all aspects of dental care, thereby exacerbating fear and avoidance behaviors [15]. Such conditioning processes highlight the critical importance of effective pain control and gentle clinical approaches in pediatric dentistry.

Several specific risk factors have been identified that amplify dental fear and anxiety in children. Notably, prior negative dental experiences and painful treatments stand as principal contributors to elevated anxiety levels [16]. Additionally, the anticipation or fear of needles—common in invasive procedures such as local anesthesia injections—frequently exacerbates anxiety. Beyond these, the dental environment itself can be inherently intimidating for a child; unfamiliar surroundings, clinical smells, the sharp sounds of drills, and the vibrations from dental instruments can all provoke heightened sensory distress. These environmental and procedural stimuli may act as conditioned triggers, further reinforcing dental fear and avoidance. Understanding these multifactorial influences is essential for designing tailored behavioral management and desensitization strategies in pediatric dentistry.

The dentist's attitude and the interpersonal dynamics within the dental team play a pivotal role in shaping a child's emotional response to treatment. Empathy, as a core component of the therapeutic alliance between clinician and patient, is critical; its absence can contribute to heightened anxiety and the emergence of uncooperative or negative behaviors during dental visits. Psychological research consistently demonstrates that empathetic communication enhances patient satisfaction and fosters trust, which in turn facilitates more effective management of dental fear and reduces behavioral challenges [17]. Furthermore, empathetic engagement can empower children, helping them feel understood and supported, which is particularly important in pediatric dentistry where building rapport significantly influences treatment outcomes.

Effective communication between the dentist and the pediatric patient constitutes a cornerstone for establishing a productive and trusting relationship, which is essential for delivering high-quality clinical care. Research by Hamasaki et al. highlights that children who perceive their communication with dental professionals as positive demonstrate greater treatment satisfaction and reduced dental fear compared to those who report suboptimal interactions [18]. Fundamental elements of successful communication include reciprocal dialogue, authentic validation of the patient's concerns instead of dismissal, attentive observation of non-verbal signals, active listening, accurate reflection and clarification of the patient's expressions, empathetic responses, and the use of a calm, reassuring vocal tone. These communicative strategies not only enhance the child's comfort but also mitigate anxiety, enabling smoother clinical procedures and better behavioral compliance.

Sensory stimuli encountered during dental visits—such as painful needle injections, unsettling auditory sensations from dental equipment, uncomfortable pressure during procedures, and unfamiliar tastes—can significantly contribute to the development or exacerbation of dental fear and anxiety in children [19]. These aversive experiences may be particularly distressing for pediatric patients due to their heightened sensory sensitivity and limited cognitive coping mechanisms. Furthermore, the anticipation of such unpleasant stimuli can itself provoke anxiety, creating a cycle where fear amplifies the perception of discomfort. Understanding the impact of

these sensory factors is critical for designing dental environments and clinical protocols that minimize distress and foster more positive patient experiences [19].

One of the primary deterrents for patients avoiding dental care is the anticipation of pain or discomfort during treatment. This anticipatory anxiety often originates not only from the individual's own prior negative experiences but also from vicarious learning through observing or hearing about adverse dental encounters from family members, peers, or media. Such experiences can leave a lasting emotional imprint that extends beyond childhood, contributing to sustained avoidance behaviors and complicating dental care in adulthood [17]. Recognizing the powerful influence of anticipatory fear highlights the need for early intervention and effective communication strategies to mitigate anxiety before it becomes entrenched.

Empirical evidence consistently demonstrates that children with parents who exhibit dental fear or anxiety are significantly more likely to develop similar fears themselves [20]. This intergenerational transmission of dental anxiety is often mediated through parental modeling of avoidance behaviors, verbal expressions of fear, and heightened vigilance toward dental stimuli. Such parental influences contribute to shaping the child's cognitive and emotional responses to dental care, underscoring the importance of involving families in anxiety reduction programs.

Parental dental anxiety is frequently transmitted to children via behavioral modeling, wherein parental expressions of fear or avoidance of dental care act as powerful social cues that children internalize, shaping their own emotional responses [21]. Additionally, parenting styles profoundly influence a child's psychological development and coping mechanisms in dental settings. Baumrind's typology, grounded in the dynamics of attachment, communication, and control, classifies parenting into authoritative, authoritarian, and neglectful styles, each of which bears distinct implications for a child's emotional resilience and fear responses during dental treatment [22,23]. Understanding these parenting dimensions is vital for tailoring behavioral management strategies that effectively address the needs of anxious pediatric patients.

The association between adolescent dental fear and parenting style has been demonstrated in various cultural contexts, including studies from India that identify a positive correlation between authoritarian parenting and increased dental anxiety, whereas authoritative and permissive parenting styles tend to correlate with lower levels of fear [21,22]. Notably, data indicate a prevalence of authoritarian parenting among mothers (approximately 39.5%), followed by authoritative styles (32.6%). Children raised by authoritarian parents exhibit significantly higher dental fear, likely due to the more rigid and less supportive parental approach that may inhibit effective coping mechanisms during stressful dental procedures. Based on these findings, it is suggested that adopting a permissive style among mothers and an authoritative style among fathers could be beneficial in mitigating dental anxiety in children, emphasizing the importance of flexible yet structured parenting in fostering emotional resilience [21,22].

The use of physical punishment and a lack of effective communication characteristic of authoritarian parenting have been associated with poorer behavioral outcomes during dental treatment [24,25]. Such disciplinary methods tend to foster fear, resistance, and even aggression in children, thereby complicating clinical management and potentially exacerbating dental anxiety. In contrast, authoritative parenting—characterized by warmth, clear communication, and consistent but reasonable expectations—is positively correlated with greater child cooperation and reduced dental fear. It is therefore crucial that dental practitioners recognize the significant role parents play in shaping a child's behavior and actively involve them in behavioral guidance strategies. Supporting parents in adopting more adaptive interaction styles can facilitate smoother dental visits and contribute to long-term positive attitudes toward oral healthcare [24,25].

The influence of media portrayals on children's perceptions of dental care is increasingly recognized as a contributing factor to dental fear. Television programs, movies, and advertisements frequently depict dental offices and procedures as intimidating, painful, or unpleasant experiences, reinforcing negative stereotypes and heightening anticipatory anxiety in young patients [26]. These representations can shape children's expectations prior to any personal dental experience, thereby exacerbating fear responses even before they encounter the dental environment firsthand. Addressing these media-driven misconceptions is an important consideration in the broader context of dental fear prevention and education.

Psychological and cognitive dimensions constitute significant components in the development of dentophobia. Children who possess a general predisposition to anxiety or specific phobic tendencies are especially vulnerable to heightened dental fear. These individuals often engage in cognitive distortions, amplifying perceived threats linked to dental procedures and interpreting even routine interventions as potentially harmful or terrifying [27]. Such exaggerated anticipations of pain or discomfort can lead to catastrophic thinking patterns, wherein children expect the worst possible outcomes. This maladaptive cognitive framework not only intensifies fear but may also reinforce avoidance behaviors, thereby perpetuating a cycle of anxiety and hindering timely dental care.

Cognitive theories, particularly the theory of cognitive distortion, provide a framework to understand how children with dental fear misinterpret dental stimuli. These children frequently perceive pain or the dental environment as disproportionately threatening, a phenomenon that exacerbates their fear responses [27]. Such distorted cognitions may contribute to the emergence of specific phobias, characterized by intense, irrational fears that interfere with daily functioning.

Consequently, these children may adopt avoidance behaviors, refusing or delaying dental visits, which can exacerbate oral health problems and complicate future dental treatments. Addressing these cognitive distortions through psychological interventions can be instrumental in mitigating dental anxiety and improving patient outcomes.

Biological and physiological factors constitute another critical dimension in the etiology of childhood dentophobia. Certain children demonstrate heightened pain sensitivity, which may predispose them to stronger fear responses during dental interventions [28]. Moreover, genetic predispositions to anxiety disorders can further increase vulnerability, suggesting an interplay between inherited traits and environmental triggers. Empirical studies reveal that children exhibiting exaggerated physiological stress responses—such as tachycardia, hypertension, or elevated cortisol levels—during stressful or novel situations are more susceptible to dental fear [28]. Understanding these biological underpinnings not only aids in identifying at-risk individuals but also informs the development of tailored interventions that may include pharmacological support or behavioral therapies to mitigate physiological hyperarousal.

Communication between the dental practitioner and the pediatric patient plays a pivotal role in shaping the child's emotional response to dental care. Ineffective communication, characterized by a lack of trust or heightened tension, can inadvertently exacerbate the child's anxiety and fear [29]. Conversely, dental professionals who employ patient-centered communication strategies—such as active listening, empathic responses, and age-appropriate explanations—can significantly alleviate fear and foster cooperation. Additionally, distraction techniques, positive reinforcement, and the creation of a child-friendly, reassuring environment contribute to reducing anxiety levels and establishing a more positive association with dental visits. This not only enhances immediate treatment outcomes but also supports the development of long-term, health-promoting behaviors related to oral care.

The etiology of childhood dentophobia is inherently complex and multifactorial, encompassing an interplay between direct personal experiences, parental modeling and influences, broader social and cultural contexts, and underlying biological and psychological predispositions. This intricate network of factors contributes cumulatively to the onset and progression of dental fear and anxiety in children [30]. Early identification of behavioral and emotional indicators of dental fear is critical for timely intervention. Through comprehensive preparatory strategies that involve both the child and their caregivers, dental professionals can implement preventive measures that reduce the likelihood of persistent dentophobia. Such approaches not only mitigate immediate anxiety but also promote positive dental attitudes and compliance, ultimately improving oral health outcomes.

Research consistently demonstrates that managing pediatric patients who exhibit dental fear and anxiety constitutes a significant challenge for dental practitioners, often serving as a major source of occupational stress. This sustained pressure can contribute to the development of burnout syndrome, characterized by emotional exhaustion, depersonalization, and reduced professional efficacy among dentists. The demanding nature of treating fearful children, requiring extended time, heightened communication skills, and behavioral management techniques, underscores the importance of effective strategies to alleviate both patient anxiety and clinician stress. Addressing this dual burden is essential for maintaining high standards of pediatric dental care and the wellbeing of dental professionals [31].

The etiology of dental fear and anxiety in children is complex and multifactorial, encompassing personal experiences, psychological predispositions, social and familial influences, as well as biological factors. Negative dental experiences, particularly those involving pain or inadequate management, are primary contributors to the development of dental fear. Parental attitudes and behaviors play a crucial role in shaping a child's perception of dental care, with anxiety often transmitted through modeling. Furthermore, psychological characteristics such as cognitive distortions and temperament predispose certain children to heightened anxiety responses. The dental environment itself, including the behavior of dental professionals and sensory stimuli, can either exacerbate or alleviate these fears [31]. Recognizing these diverse factors is essential for the development of tailored preventive strategies and effective behavioral management techniques aimed at reducing dental fear in pediatric patients. Early identification and intervention can mitigate long-term negative consequences, improve treatment outcomes, and enhance overall oral health.

Conclusion

Childhood dentophobia represents a complex and multifactorial challenge with significant implications for pediatric oral health and psychological well-being. Despite advances in understanding its epidemiology and management, further research is necessary to develop reliable diagnostic tools and effective prevention strategies tailored to the pediatric population.

Early identification and comprehensive assessment of dental fear in children are essential to inform individualized interventions and reduce the long-term burden of dentophobia. Integrating epidemiological insights with clinical and psychosocial data will provide a foundation for evidence-based protocols that can be adapted across diverse populations and cultural contexts.

Future studies should aim to deepen the understanding of familial, psychological, and sociocultural determinants of dental fear, thereby informing holistic management approaches. The present work lays the groundwork for such endeavors, with potential for expanded analyses and

practical applications to be explored in subsequent focused reviews.

Additional information

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Ethical compliance

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

The authors declared that no informed consent was obtained from the humans, donors or donors' representatives participating in the study.

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Conflict of interest

The authors declare that they have no conflict of interest and no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Author contributions

Conceptualization, N.M., V.P., M.G.; software, P.B.., M.G.; validation, N.M., V.P., M.G. and P.B..; resources, V.P. and M.G.; data curation, P.B.. and M.G.; writing—original draft preparation, N.M. and M.G.; writing—review and editing, N.M., V.P., P.B.. and M.G.; supervision, N.M.; All authors have read and agreed to the published version of the manuscript.

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