Revisiting the Causal Structure of Social Essentialism: A Theoretical Model of Developmental Change Across Four Dimensions

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Abstract. This paper aims to revisit the underlying causal links between the four dimensions of social essentialism by proposing three theoretical conceptual frameworks: Developmental Gradient Model, Interdimensional Causality Model, and Trait-type Moderation Framework. Social essentialism refers to the idea that a certain group owns a fixed trait. It includes inheritance, heritability, group uniformity, and immutability. Past studies have shown a general decline in social essentialism during childhood; however, it is unclear whether this decline occurs at the same or different rates. To address this gap, this paper will comprise three interrelated conceptual frameworks. This research will also enhance the understanding of social essentialism, particularly its causal structure, and provide meaningful implications for reducing prejudice and advancing scientific development.

Keywords: causal structure, social essentialism, theoretical model, developmental change.

1. Introduction

Language is part of a culture and also a tool for human beings to communicate and learn from each other. For children, language is not only a communication tool but also a way for them to learn the culture they are in and also the rest of the world. When young children hear their parents or other adults use generic language, they unconsciously refer the content of those generic statements to the whole group. For example, when adults say, "girls like pink," which is a generic statement, children will perceive it as all girls like pink after they hear it, even though that is not the actual meaning of the original statement. Generic statements are invaluable for children to learn kinds and properties, but they will also help them form social essentialism, a belief that a certain group owns a fixed trait.

Social essentialism is formed in the early development of children and greatly contributes to the learning of different social groups or natural groups, like gender groups and race groups. This belief can be explained in four major dimensions: inheritance, heritability, group uniformity, and immutability. Learning how these four dimensions link with each other is crucial for understanding their trajectory of social reasoning abilities and future scientific developments. Also, this can help teachers and parents better educate children to abandon social essentialism because it will not only bring social prejudice but also prevent scientific development.

Overall, this research paper aims to elucidate the deep causal structure of the four dimensions of social essentialism by proposing three conceptual frameworks. In particular, this paper is going to address: (a) Do children's essentialist beliefs decrease with age? (b) Are the four dimensions of social essentialism interconnected (causally linked), or do they decline independently? Through conceptual frameworks, we integrate developmental, causal, and moderating elements to advance the field.

2. Literature Review

2.1 Generic Language Definition

Generic language (e.g., "Boys like blue") is a linguistic tool in guiding children's understanding of kinds and properties, but it may mislead children by implying general, timeless conclusions while glossing over exceptions and variabilities [1, 2]. For example, during daily conversations, a child is more likely to describe a kind as a whole rather than accurately define exceptions (e.g., saying "I think girls like pink" rather than "I think girls like pink, but some girls dislike pink"). Since such generic statements imply that a property or a characteristic is true of an entire kind, they provide a

causal explanation for human behaviors [2, 3]. For example, a child would not be surprised by a dog eating bones, but might be surprised by a dog eating vegetables. It's because the causal explanation for the behavior of dogs is that dogs eat bones rather than vegetables.

In the study conducted by Foster‐Hanson et al. [2], children aged five to seven years old were exposed to a novel category("Zarpies")) that was subsequently corrected by narrowing their scope to a single individual of that group ("a Zarpie") [2]. They found that correcting the generics limits children's belief that the learned category could explain the differences in individuals. It shows that even in early childhood, children do have the ability to adjust their essentialist beliefs when confronted with counterexamples that challenge the universality of that group. Regarding the primary four dimensions of social essentialism (inheritance, heritability, group uniformity, and immutability), their finding suggests that group uniformity could be challenged by counterexamples, but leave the gap of whether there are also changes that have happened in inheritance, heritability, and immutability, and if so, whether they have the same rates or not.

2.2 Social Essentialism Definition

Social essentialism is the intuitive belief that categories, particularly natural kinds (like animals) and certain social groups (like gender or race groups), are defined by an underlying, unobservable essence that dictates their observable properties and behaviors [4, 5]. This belief is often used as a causal explanation to help people understand why individuals of a certain group share common beliefs or behave similarly. It contains primarily four dimensions: inheritance, heritability, group uniformity, and immutability.

2.3 Four Dimensions of Social Essentialism

The social essentialism consists of several different dimensions, yet they are all interconnected with each other. This concept enables children to form a coherent understanding of kinds and properties [3]. However, it also brings social prejudice to society and prevents scientific development. The four main dimensions are, in particular, inheritance, heritability, group uniformity, and immutability.

One primary dimension of social essentialism is inheritance, the belief that a certain trait of a group could be passed down through generations. This is closely related to another dimension, heritability, the belief that a certain trait is biologically determined or based on an innate blueprint like genes [5, 6]. In the study conducted by Byers‐Heinlein et al., they investigated whether personal experience with second language acquisition could alter children's essentialist biases [7]. They found that both five to six-year-old monolinguals and simultaneous bilinguals claimed that a baby born to duck parents and adopted by cats would quack and grow feathers, and monolinguals claimed that a baby born to English parents and adopted by Italian parents would grow up to speak English [7]. This shows that children do initially have a strong inheritance belief in their early childhood, that is, viewing many traits as innately determined rather than shaped by the environment, and inflexible.

Another dimension is group uniformity, the belief that all individuals of a certain group share the same properties and behavioral patterns. This dimension brings inductive inference, a reasoning process of drawing general conclusions from a specific observation (e.g., "Emily likes pink, so girls all like pink.") [2]. This inductive inference may be reinforced by the use of generic language since generic language would activate pre-existing stereotypes and strengthen them [8]. Also, since the activated expectations would be rooted in children's previous experiences, the activated stereotypes would be more vivid and threatening [8]. However, the perception of categories as a cohesive group is influenced by cultures. In the study conducted by Xu et al., they found that "Chinese adults perceived higher group cohesiveness than American adults", and they attributed this result to the Chinese cultural influence (e.g., valuing group unity) on social essentialism beliefs in highlighting group coherence [9].

The fourth dimension of social essentialism is immutability, the idea that essential traits are stable and resistant to change over time and different environments. This belief is somewhat interrelated

with the first one (inheritance) since they both talk about the static and unchangeable characteristics of an individual from a group. If this characteristic is considered immutable, then that means core traits would not be influenced by environmental changes or personal willpower. This highlights the inflexibility of essential traits. For example, when a child believes that an individual from a certain group (e.g., Zarpies) has a core trait like honesty, they would not think this individual would be dishonest even when he/she is raised in a different environment. Similarly, the example in the inheritance part also aligns with this example. This idea is also shown in children's reasoning about heart transplants, where children frequently predict that "receiving a heart from another individual would transfer the personality, feelings, or behaviors of the donor, including characteristics that are not traditionally associated with the heart (e.g., intelligence [from a smart person's heart]; acting like a pig [from a pig's heart])" [10]. The underlying causal structure of these four dimensions forms the basis of our conceptual frameworks.

2.4 Development through Childhood

Research shows that the formation of social essentialism happens in early childhood, often by preschool age [4, 5, 11]. Young children actively attempt to make sense of their environment by relying on several basic representational and explanatory biases, like learning what are dogs, cats or other animals, which give rise to the widespread emergence of social essentialist views in early childhood, but allow for vast variability across development and cultural contexts [4]. For example, even four-year-olds show their tendency towards an essentialist reasoning about poverty [12].

However, the coherence of these essentialist beliefs develops over time. In the study conducted by Gelman et al., they found that "essentialist beliefs were endorsed most often by the youngest children" and their beliefs may consist of separate, less integrated strands first and then developed into a more cohesive theory with age [3]. This suggests that while the formation of social essentialism starts early in childhood, it needs time to be developed as a more interconnected reasoning framework. However, this development process is not uniform across cultures. This suggests that while the concept of social essentialism is widespread worldwide and can be developed with time, its developmental trajectories may vary from culture to culture [11].

Though social essentialism is quite powerful during early childhood, it decreases with age. The decline in essentialism over childhood is consistent with prior findings in the gender domain [13] and in trait reasoning [14], showing that older children endorse essentialist beliefs less often than younger children [3]. Some research findings indicate that there is a general trend towards decreased essentialism for certain categories as children mature.

For example, in the study conducted by Taylor et al, they found that "while five to six-year-old children treat animal species and human genders as equivalent, making similar levels of category-based inferences and endorsed similar explanations" [13], 10-year-olds and adults began to differentiate because they know that animal species and humans are different. Older children and adults view gender‐linked behavioral properties as open to environmental influence and endorse environment‐based mechanisms [13]. It shows that there is a decline in the immutability dimension of social essentialism in the related category [13]. Also, in another study conducted by Gülgöz et al., they found that "whereas cisgender participants showed a decline in essentialism with age, transgender children did not show any age-related changes in their beliefs" [15]. Their findings showed the influence of personal identity perception on the developmental trajectory of social essentialism.

However, the decline with age is not universal across all dimensions. For example, in the study conducted by Mandalaywala et al., they found that "young children ($n = 203$, $M_{age} = 5.45$) hold only the more limited belief that the physical feature of skin color is inherited and stable, but rejected the causal essentialist view that behavioral and psychological characteristics are constrained by an inherited racial essence" [16]. Their findings show that for race groups, children's essentialist beliefs may focus more on physical features (e.g., skin color) rather than behavioral and psychological

characteristics, and the latter may not change with age [16]. This also implies that the change of social essentialism about race groups may be less evident than other groups, like gender groups.

Similarly, the development of social essentialism is not universal across different cultures. In particular, though the essentialist beliefs emerge both in China and the United States, their trajectories are varied significantly. In the study conducted by Xu et al., they demonstrated that, in the United States sample, essentialist beliefs that categories and their features are fixed at birth and inflexible increased across age, which contradicts the idea that essentialist beliefs decrease by age. However, "in the sample from China, children held stronger beliefs that categories are objective and explanatory and viewed them as more homogenous with age" [11]. This shows that the hypothesis that social essentialism would decline with age is not universal across different cultures but is deeply intertwined with specific cultural contexts.

2.5 Which Dimension Will Decrease First

The question about which dimension of social essentialism—inheritance, heritability, group uniformity, or immutability—decreases first was raised early in the study conducted by Foster‐Hanson et al. in 2022. In their study, they found the change in group uniformity when children encountered counterexamples. However, it also left the question: which one of these four dimensions would decrease first? This question is crucial because if they do have the same rate of decline, then we can predict that there is indeed a causal relationship between the four dimensions, which is that inheritance causes the other three dimensions. Simply speaking, it is the gene that causes traits. However, if these four dimensions have different rates, or not interconnected rates, then we can predict that there isn't a causal relationship and children just learn them independently.

2.6 Experiences and Counterexamples' Impact

The reason why children's essentialist beliefs as they age is largely influenced by the experiences and counterexamples they faced during their growth. For example, a child who used to think that all girls like pink may find a girl who dislikes pink, and then change their essentialist belief.

Learning a new language can help children reduce their essentialist beliefs. In the study conducted by Byers-Heinlein et al., they found that "sequential bilingualism does have an effect on children's essentialist beliefs: sequential bilinguals were more likely than other children to believe that human language, animal vocalizations, and animal physical traits are learned from the environment rather than innately endowed" [7]. This study suggests that learning a new language and an experience in life could change children's essentialist beliefs about heritability.

Also, in the study conducted by Deeb et al., they found that "interethnic exposure alleviated children's essentialist bias towards ethnicity and did so via making children aware of, rather than blind to, ethnic categories" [17]. In their study, they proposed four possible answers for the changing essentialist beliefs: "(a) children in integrated schools are less essentialist than children in regular schools, (b) interethnic exposure decreases children's tendency to essentialize ethnicity—rather than lack of exposure increasing it, (c) the effect has already appeared after less than two years of integration, and (d) the effect is stronger for majority than minority children" [17]. This shows that the gradual, direct interaction between different groups can challenge group uniformity, helping children understand the individual differences within a certain group. Thus, it is reasonable to predict that when children are exposed to different Zarpies who show different traits or behavioral patterns, they will gradually reduce their belief that all Zarpies are like this.

2.7 How Is the Study of Social Essentialism Important to Society

As the paper has discussed before, generic statements are very helpful for children to learn kinds and properties, but they also help children form social essentialism. Learning social essentialism is crucial because it influences children's social reasoning, social development, and behaviors, which brings lots of risks, including forming social stereotypes and prejudice, and preventing them from scientific reasoning.

Social essentialism refers to the idea that all group members within a certain group are unchangeable (immutability) and alike (group uniformity), which creates potential risk of forming social stereotypes and prejudice, especially about race and gender groups. Research conducted by Rhodes et al shows that inducing essentialist beliefs about a new group will lead children to share fewer resources with members of that group [5]. Even though they did not show any kind of discrimination or dislike, it certainly showed that social essentialism negatively affects intergroup relationships.

Another risk of social essentialism is that people who have strong social essentialist beliefs are less likely to accept scientific reasoning, like natural selection. People who hold social essentialist beliefs tend to consider groups as a whole rather than pay attention to the in-group variation. They also believe that environmental factors are not as important as genes, the internal factor, which makes it difficult for them to understand the natural selection principles, a concept that is rooted in environmental influences and in-group changes. This shows that letting children develop their social essentialism without correcting them is not beneficial or even harmful to future scientific progress.

2.8 Research Gap

Although the studies this paper reviewed earlier have documented the developmental trajectory of social essentialism in childhood, few studies have systematically examined whether there is a causal link between the four dimensions of social essentialism or whether the decline occurs at the same or different rates. Thus, this research proposal will aim to revisit the underlying causal links between these four dimensions by proposing theoretical models to fill this gap.

3. Conceptual Frameworks

Social essentialism evolves through a dynamic interplay between individual cognitive biases and environmental input. According to causal learning theory [18], children construct intuitive ontologies of kinds and properties by inferring causal mechanisms from observable regularities. In early childhood, limited counterevidence and strong linguistic cues (e.g., generic statements) strengthen essentialist thinking. As exposure to diverse exemplars and social variation increases, these intuitions undergo gradual restructuring. This theoretical orientation suggests that the development of essentialism is not linear but systemically interdependent, influenced by internal causal beliefs and moderated by trait types and cultural contexts.

This paper aims to revisit the inner causal structure of four dimensions of social essentialism in early childhood by proposing three conceptual models. By integrating insights from existing literature, we develop three interrelated conceptual models that address the developmental trajectories, causal interconnections, and moderating factors influencing these dimensions.

Our frameworks are guide by the following research questions:

Statement of research questions:

RQ1: Do children's essentialist beliefs decrease with age?

RQ2: Are the four dimensions of social essentialism interconnected (causally linked), or do they decline independently?

Statement of hypotheses:

H1: Children’s social essentialism will decrease across all four dimensions with age.

H2: The decline is not uniform, and they don’t have the same decreasing rate.

H3: Counterexamples about one dimension will negatively influence all other three dimensions.

H4: The effect of counterexamples will be stronger on social traits than physical traits.

3.1 Developmental Gradient Model

This model suggests a gradient of developmental change, where the four dimensions of social essentialism decline with age. In the literature review part of this paper, experiments and studies conducted by other researchers have already shown that children’s social essentialist beliefs will

certainly decrease as they age, though there are some cultural influences, as shown in the study conducted by Xu et al. about differences between the developmental trajectory in China and the United States of America.

Building on findings that essentialism emerges early but coheres over time [3, 4], the model posits that younger children (e.g., ages 4-6) hold stronger, more integrated essentialist views, treating categories as innate and immutable. On the other hand, older children (e.g., ages 8-10) show increased flexibility due to accumulated counterexamples and environmental awareness

Theoretically, we predict that as we test older age groups, we will see a non-linear decreasing trend in children's social essentialist beliefs. Group uniformity and immutability may be faster than inheritance and heritability, since they are more susceptible to direct observational counter-examples. On the other hand, inheritance and heritability, originated from biological intuitions, may persist longer in one's life. This non-linear decreasing trend shows a developmental hierarchy, where surface-level dimensions decrease first, revealing an underlying causal relationship.

Cultural influences are also an important factor in this model. For example, in the study conducted by Xu et al., they demonstrated that, in the United States sample, essentialist beliefs that categories and their features are fixed at birth and inflexible increased across age, which contradicts the idea that essentialist beliefs decrease by age. However, in the sample from China, children held stronger beliefs that categories are objective and explanatory and viewed them as more homogenous with age (Xu et al., 2024). This shows that the hypothesis that social essentialism would decline with age is not universal across different cultures but is deeply intertwined with specific cultural contexts.

3.2 Interdimensional Causality Model

Building on the developmental gradient, this model theorizes the causal relationship between the four dimensions of social essentialism, proposing that they are inter-related by a networked structure rather than being independent. Essentially speaking, there is a high possibility that inheritance is the cause of other dimensions of social essentialism because the other three dimensions can all somewhat be explained by inheritance. Take immutability for example, the idea that essential traits are stable and resistant to change over time and different environments, when we ask a child how many legs does a baby frog has, the answer will be four because in their mind, a baby frog will always have the same physical traits as its parents, and these physical traits will not change over time and different environments. Thus, in this model, we hypothesized that inheritance is a primary causal node.

Logically speaking, the change in one dimension of the whole network would somehow bring changes to other dimensions. For example, if one's group uniformity is affected by counter-examples, then there is a high chance that other dimensions, maybe not all, would be affected as well, though the rate might be different. If the rate is indeed different throughout all decreasing dimensions, then that re-confirms the bidirectional or hierarchical causality, rather than equal independence. This is supported in literature; studies show that experimentally manipulating perceptions of heritability (e.g., through bilingual exposure) affects beliefs about inheritance [7], suggesting feedback loops.

This model also accounts for variability. In racial essentialism, physical traits, like skin colors, can be the basis of more causal routes to inheritance. For example, in the study conducted by Mandalaywala et al., they found that "young children (n = 203, Mage = 5.45) hold only the more limited belief that the physical feature of skin color is inherited and stable, but rejected the causal essentialist view that behavioral and psychological characteristics are constrained by an inherited racial essence" [16]. Their findings show that for race groups, children's essentialist beliefs may focus more on physical features (e.g., skin color) rather than behavioral and psychological characteristics, and the latter may not change with age [16]. Theoretically, this causality makes clear why essentialism persists despite downturns.

3.3 Trait-type Moderation Framework

This model posits that trait types (social traits vs. physical traits) is also an important factor in the developmental change of social essentialism. It also suggests that children will be more flexible in

changing social essentialist beliefs on social traits (e.g., honesty, shyness) than on physical traits (e.g., skin color). As children grow older and gain more experiences, they will find out that social traits, like shyness and honesty, can be changed across time and environments. However, they will also recognize that physical traits, like having two arms and two legs, are not likely to change, no matter where they are or how old they are. They will not have only one leg if they live with their relatives rather than their parents, but they might be shy when they are young, but outgoing when they are older. Thus, this model predicts that it is easier for children to change their essentialist beliefs on social traits than on physical traits.

4. Discussion

4.1 Framework overview:

This study systematically discussed whether there is a deep causal relationship between the four dimensions of social essentialist beliefs by combining both literature review and three interconnected conceptual frameworks. In the literature review part, we found that there is indeed a decreasing trend of social essentialism as children age, but there are also other factors that have influenced the trajectory, like cultures. However, it also raised the question of whether there is a causal relationship between these four dimensions. In the conceptual frameworks, we predicted to show that: (a) as children age, their social essentialism will certainly decrease, (b) inheritance may be the cause of the other three dimensions, and (c) children are more flexible in changing their social essentialist beliefs on social traits than physical traits.

4.2 Theoretical and Practical Implications

These three predicted findings not only highlight the importance of counterexamples and experiences in children's development but, more importantly, support the claim that there is indeed a causal relationship between the four dimensions of social essentialism. They will also provide evidence for the developmental model of social essentialism because we predict that there is a heterogeneous decline pattern in four different dimensions of social essentialism. Besides, in the scientific field, this study also gives insights into real life. Since social essentialism is a major cause of social stereotyping and discrimination, it is important for teachers and parents to know how to reduce children's social essentialism beliefs when they are young. It also shows that cultures have profound influences on children's cognitive development.

4.3 Limitations & Future Research Directions

As a theoretical paper, our models derive from logical deduction and prior literature rather than new empirical data, limiting its generalizability until being tested. Assumptions about causal structure may overlook the bidirectional influences.

Since cultures have a strong influence on children's social essentialism beliefs, there may also be religious influences on social essentialism. Religious faiths usually underlie the group uniformity and immutability (e.g., if you die, your soul will not die). We can predict that for more religious people, they will be less flexible in changing their social essentialist beliefs. Thus, future research can compare different traditions of religions and see their influences on children's social essentialist beliefs. Effect.

5. Conclusion

In conclusion, the four dimensions of social essentialism are interconnected and gradually decrease as children grow older. The trajectory of this decline varies across dimensions and is strongly influenced by cultural and possibly religious contexts. By constructing three interrelated conceptual frameworks, this study provides a theoretical foundation for understanding how developmental, causal, and moderating factors jointly shape essentialist reasoning. The findings also offer practical

implications for education and social development, suggesting that exposure to diverse experiences and counterexamples can effectively reduce stereotyping, enhance cognitive flexibility, and promote inclusive and evidence-based thinking in future generations.

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