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The Development of Social Essentialist Reasoning in Iran: Insight Into Biological Perception, Cultural Input, and Motivational Factors

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People express essentialist beliefs about social categories from an early age, but essentialist beliefs about specific social categories vary over development and in different contexts. Adapting two paradigms used with Western samples to measure social essentialism, we examined the development of essentialist beliefs about seven social categories (gender, race, nationality, religion, socioeconomic status, ethnicity, and team fan bases) among 5- to 10-year-old children ($N = 88$) and adults ($N = 273$) in Iran, a population that is underrepresented in psychology research. Focusing on natural-kind reasoning, we investigated the relative contribution of biological perception of social categories as well as cultural and motivational factors in the development of essentialist beliefs about these categories. Our findings suggest that biological perception of social categories plays a key role and that cultural and motivational factors become more relevant in essentialist reasoning about social categories that are *not* perceived as biologically marked. The developmental patterns of essentialist reasoning in our study also closely parallel those found in other cultures, namely the United States and Turkey, further suggesting the primary role of biological perception of social categories in natural-kind reasoning about the social world.

Public Significance Statement

Social essentialist bias contributes to negative attitudes and behaviors such as prejudice and discrimination. This article investigates factors, including biological perception of social categories, cultural input, and motivational factors, in the development of social essentialism in Iran, an understudied population in psychology research. The article also compares this bias among Iranian adults and children to adults and children in the United States and Turkey. The findings show that across all three cultures, biological perception of social categories plays a prominent role in essentialism, but cultural and motivational factors add interesting nuance to patterns of social essentialism, especially with respect to social categories that are not perceived as biologically underpinned.

Keywords: social essentialism, biology, culture, motivation, Iran

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Deidentified data, analysis codes, and materials are available on the Open Science Framework (OSF; https://osf.io/2cny5/). These findings have not been presented or published anywhere before. The authors used data from Davoodi et al. (2020) to compare against the data that they collected. Data from Davoodi et al. (2020) are publicly available on OSF (https://osf.io/3n4pm/). Ghazale Shahbazi and Hossein Samani share joint first authorship.

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عاقبت گرگ زاده گرگ شود
گرچه با آدمی بزرگ شود
One who is born to a wolf will at last become a wolf,
Even if raised among the humankind.
—Persian proverb

Psychological essentialism is the belief that many categories have deep, hidden, and unchanging properties that define category membership and cause category-specific properties (Gelman, 2003; Gil-White, 2002; Hirschfeld, 1996; Medin & Ortony, 1989; Prentice & Miller, 2007; Rothbart & Taylor, 1992). Children develop the capacity to engage in essentialist reasoning early in life. In the case of animal species, preschool children assume that a baby tiger born to tiger parents will grow up to be a ferocious tiger, even if it grows up in a peaceful sheep community (Gelman, 2003, 2004; Gelman & Wellman, 1991; Waxman et al., 2007). While it may facilitate reasoning in some domains such as biology (but see, Gelman & Rhodes, 2012; Shtulman & Schulz, 2008), psychological essentialism can have adverse effects, especially when employed in reasoning about the social world (Bastian & Haslam, 2006; Haslam et al., 2002; Rhodes & Mandalaywala, 2017; Williams & Eberhardt, 2008).

Social essentialist reasoning entails a set of interrelated beliefs, including the belief that categories define fundamentally different kinds of people (natural-kind reasoning) and beliefs related to the explanatory power or inductive potential of categories, summed up as "entitativity" beliefs (Coley et al., 2019; Haslam et al., 2000). While natural-kind beliefs are primarily about differences *between* categories, entitativity beliefs emphasize *within-category* similarities and the explanatory power of categories. For example, natural-kind beliefs about the social category of gender would dictate that men and women are fundamentally different kinds of people by virtue of natural differences; entitativity beliefs would posit, for example, that women act a certain way or have specific preferences by virtue of being women, and thus, that being a woman explains a lot about a person. While these various aspects of essentialist reasoning are interrelated, they do not always correlate in reasoning about social categories (Haslam et al., 2000; see Gelman et al., 2007, for lack of association among children). Moreover, different factors (e.g., cultural input vs. biological markers) can influence each set of beliefs to different degrees over development. In this study, we focus on the natural-kind aspect of social essentialism, although we include a proxy measure of entitativity. The implications of this approach will be discussed later.

Reasoning about social categories in terms of natural-kind essentialism involves intuitive beliefs that certain social categorizations (e.g., women, Hispanic, Muslim) reflect fundamental, immutable, and informative distinctions within nature (Rhodes & Moty, 2020). Adults from various cultures reason about a variety of social categories in terms of essences (Astuti et al., 2004; Coley et al., 2019; Xu et al., 2023), and so do children from an early age (for a review, see Rhodes & Mandalaywala, 2017). For instance, between 3 and 5 years of age, children develop essentialist beliefs about gender, believing that the distinction between boys and girls is fundamental, natural, discrete, and objective (Rhodes et al., 2014; Rhodes & Gelman, 2009). Understanding the developmental patterns of social essentialism has important implications for our social lives because the extent to which we essentialize social categories over development often affects our attitudes, beliefs, and behaviors about members of these categories (Bastian & Haslam, 2006; Bernstein et al., 2010; Rhodes et al., 2018; Zagefka et al., 2013; see also (Bigler & Liben, 2007).

Theories of Social Essentialism

There are infinite ways of categorizing people, but in fact, only a subset of these dimensions becomes grounds for reasoning about people in terms of essential differences. That is, we consider only some social categories to be informative, immutable, and/or innate. In fact, in the recent years, developmental studies have focused on understanding *which* social categories children develop essentialist beliefs about and *when* these beliefs emerge; for example, although Black children in the United States begin expressing essentialist intuitions about race as early as 5 years of age, their White peers do not show these same intuitions until 9–10 years of age (Kinzler & Dautel, 2012).

Some theories explain our "selective" natural-kind reasoning about social categories in terms of biological perceptions of categories. These theories posit that social categories with clear biological markers are prone to essentialism (Gil-White, 2002; Rothbart & Taylor, 1992). Yet biological perception is not the whole story. In fact, the role of cultural inputs and social experiences has been highlighted by researchers and supported by a considerable number of studies (see Rhodes & Moty, 2020, for a review). Theories that emphasize the role of cultural and social experiences explain different degrees of social essentialism in terms of specific cultural input about various social categories. This cultural input can interact with biological perception and strengthen or weaken the role that biological perception of social categories plays in natural-kind reasoning about the social world. For example, perceived biological differences between men and women can be deemphasized via language, social structures, or political systems that maximize gender equality; the interaction between this particular kind of social input and biological perception of gender can weaken essentialist beliefs about gender, especially over development as individuals become more exposed to cultural input. On the other hand, cultural input that contributes to gender inequality (e.g., gender-segregated public spaces; overly gendered language) builds up on perceived biological differences between men and women and possibly strengthens essentialist reasoning about gender over development.

Additionally, motivational factors can also play a role in social essentialism (Brescoll et al., 2013; Diesendruck, 2021). When asking why individuals essentialize certain social categories over, or in place of, other categories, motivational theories emphasize factors like preserving the status quo (Sidanius & Pratto, 2001) or protecting one's own identity or group dynamics (Morton & Postmes, 2009). Motivational factors, especially when they take the form of preserving the status quo, are intertwined with cultural factors in giving way to social essentialism. For example, cultural input and social structures that prioritize men's rights and access to resources and power can give way to the desire, on behalf of men, to preserve this gender-imbalanced social structure by appealing to the belief that men and women are inherently different kinds and that the imbalance reflects this "natural" difference. Moreover, to "naturalize" these conceived differences, the motivation to preserve the status quo can latch onto perceived biological differences between men and women. Thus, biological perception of social categories,

cultural input about social categories, and motivational factors can interact in unique ways to give way to specific patterns of essentializing social categories (see Mahalingam, 2007 for related discussions).

Developing a unified theory of social essentialism involves systematically documenting and clarifying how biological, cultural, and motivational factors interact in giving way to the expression of social essentialist beliefs. One of the most effective ways to examine the role of context and motivation is to examine phenomena across diverse populations and across the lifespan. In the current research, we adopt this cross-cultural and developmental approach to study social essentialism in Iran, a population severely underrepresented in research, and examine the development and expression of social essentialist beliefs about a variety of social categories. We also compare our results to patterns from earlier published work with children and adults in the United States and Turkey. Before presenting details of the current research, however, we briefly review literature on the biological, cultural, and motivational factors leading to social essentialism.

Biological Factors

According to the folk-biological account (Atran, 1998; Gil-White, 2001), while the *intended* domain of some conceptual biases, like essentialism, is biological kinds, their *actual* domain can extend to social categories that have biologically determined markers, such as gender (e.g., secondary sexual characteristics) or race (e.g., skin tone or physiognomy). A strong version of biological theories implies that (a) essentialism should apply *only* to social categories where biological markers are visible and (b) where various dimensions of biological thinking are triggered at the same time. The evidence, however, shows that both assumptions are incorrect (e.g., Bailey et al., 2021; del Río & Strasser, 2011; Diesendruck & HaLevi, 2006; Gelman et al., 2007; Gelman & Hirschfeld, 1999; Rhodes & Mandalaywala, 2017). That is, essentialism is not limited to social categories with biological markers. The evidence shows that traits without conspicuous biological features such as intelligence, shyness, mood, and aggression can be essentialized even by children (Bales & Sera, 1995; Giles & Heyman, 2003; Heyman & Gelman, 2000). In addition, the different dimensions of biological thinking do not necessarily emerge simultaneously, at least regarding psychological traits (Gelman et al., 2007).

Acknowledging the role of cultural input, another related viewpoint, the *biological relevance* account, implies that social categories with biological underpinnings, such as gender, race, and ethnicity (where distinctive accents are the salient "biological" marker), are more immediate candidates for essentialist reasoning than categories with no obvious biological underpinning, such as religion or arbitrarily formed groups like the fan base of a sports team. Importantly, the biological relevance account suggests that while cultural input impacts the absolute degree and developmental patterns of essentializing social categories, categories with biologically relevant membership criteria will be essentialized more overall, at least as compared to categories without biologically relevant membership criteria.

In cross-cultural research, evidence for this view might look like comparing cultures that differ with respect to input along the relevant categories and finding cross-cultural consistency in the relative degree of essentializing those particular social categories; specifically, the prediction would be that despite different cultural input, categories with biological markers are always more strongly essentialized than those with no biological markers. For example, cultures with diverging gender norms and different input about religion might nonetheless essentialize gender more than religion. In support of this account, comparing essentialist beliefs in Turkey and the United States, Davoodi et al. (2020) found evidence for the role of biological perception of social categories. Specifically, despite differences between the two societies in cultural input about gender and nationality as social categories with observable (pseudo-) biological markers, as well as differences in cultural input about religion and socioeconomic status (SES) as social categories with no clear biological markers, in both societies gender and nationality were essentialized to higher degrees than religion and SES. In addition, there was no meaningful difference in the absolute levels of essentialism of these categories between the two countries. Thus, cross-cultural research confirms the role of biological perception of social categories in social essentialism.

Cultural and Contextual Factors

There are several contextual factors that can influence the extent to which a category is essentialized (for a review, see Pauker et al., 2020). For example, the ways in which people talk about social categories play an important role in the transmission of essentialism (Rhodes et al., 2012). In particular, subtle *linguistic cues*, such as the use of generic descriptions (e.g., "boys," "Middle Easterners," "women"), contribute to the development of essentialist beliefs (Benitez et al., 2022; Gelman et al., 2010).

Furthermore, a *psychologically salient social category,* presumably salient because of how it is defined and talked about culturally and contextually, is likely to be more familiar to children and can be more readily used by children to organize their beliefs, feelings, and behaviors (Bigler & Liben, 2007; Pauker et al., 2020). For instance, in societies experiencing intense interethnic conflicts (e.g., Israel), essentialist intuitions about ethnicity (e.g., Jewish, Arab) emerge early in childhood and remain unchanged throughout adulthood (Diesendruck et al., 2013), presumably because of the cultural and experiential salience of the relevant category. Note, however, that biological markers of social categories can further interact with sociocultural input to render categories salient and contribute directly to essentialism. For example, perceived biological differences between different gender, ethnic, or racial groups coupled with social and political segregation along these dimensions can imbue the relevant category with additional significance; this, in turn, can render the segregated sociopolitical systems as legitimate when perceived as a reflection of "natural" differences between social groups. On the other hand, *exposure to diversity* can attenuate the social essentialist bias by rendering perceived differences as socially irrelevant and unimportant. For instance, in a study investigating children's essentialist beliefs about religious categories in Northern Ireland, 8- to 11-year-old children attending religiously segregated schools (as compared to integrated schools) were more likely to use religious categories to make inferences about other people and to express the essentialist belief that religion is a stable facet of one's identity (Smyth et al., 2017).

Cultural beliefs also affect the development of essentialism. Diesendruck and Haber (2009), for example, have demonstrated that children are more likely to endorse gender, race, and ethnicity

as stable and unchanging if they believe God created these characteristics in people. Notice how here, again, biological reasoning can provide a direct route from cultural input to social essentialism. For example, involvement of God or divine creation can render properties inborn (i.e., present at birth and possibly marked by biological underpinnings) and thus contribute to the essentialist belief that properties are stable and unchanging.

Another contextual variable that is related to essentialist reasoning is *one's own group membership* and specific experiences that come with it, contributing to different levels of essentialist reasoning about the relevant social category. For example, several studies have revealed that Black children in the United States are more likely to express essentialist intuitions about race than White children (Kinzler & Dautel, 2012; Mandalaywala et al., 2019; Roberts & Gelman, 2016), and Zhu (2022) found that low-income Hispanic participants essentialized SES more than non-Hispanic participants. These identity-related contextual factors are likely to be closely related to motivational factors, as described in the following section.

Motivational Factors

Various psychological needs, coupled with sociocultural realities and the biological perception of some social categories, may motivate people to ramp up (or tamp down) specific essentialist beliefs (Brescoll et al., 2013; Diesendruck, 2021; Kesberg & Keller, 2021; Ryazanov & Christenfeld, 2018). For example, Brescoll et al. (2013) found that participants tend to report more gender essentialism when they face a system threat. Specifically, when people read an ostensive news story reporting that the United States had reached a social, economic, and political nadir (system threat), both males and females were more likely to endorse essentialist explanations for gender differences (e.g., "I believe that men pursue math and science careers more than women do because of the innate difference between the genders"). Moreover, when provided with an opportunity to reject the news story as unreliable and inaccurate before essentialist beliefs were measured, participants had the chance to defend the system through a pathway unrelated to essentialism; this, in turn, attenuated gender essentialist beliefs (Brescoll et al., 2013).

These patterns of social essentialism suggest that increased motivation to engage in system-justifying reasoning prompts essentialist reasoning (Kay et al., 2005). Relatedly, in the context of essentialist beliefs about caste, Mahalingam (2003) found that Brahmin adults (higher caste among Hindus in India) tended to believe that a brain transplant from a rich character to a poor character will change the behaviors of the poor character (i.e., the poor character will act like the rich character), but a transplant in the opposite direction (from a poor character to a rich character) will not affect the rich one's behaviors (i.e., the rich character will not act like the poor character). Among participants from lower castes, this asymmetry was not observed. In other words, the privileged perceive the existing social hierarchy as impervious to biological changes, partly driven by the desire to preserve the existing hierarchy, thereby perpetuating their social privilege.

Beyond legitimizing and preserving the status quo, social essentialism can be deployed in more productive or even emancipatory ways through motivational mechanisms (Eide, 2016; Ryazanov & Christenfeld, 2018). Ethnic minorities or lesbian, gay, bisexual, transgender and queer/questioning individuals, for instance, can use essentialist beliefs strategically to resist assimilation or as defense against denying their identity. For example, Morton and Postmes (2009) showed that among lesbian, gay, bisexual, transgender and queer/questioning participants, when they were reminded of how their group is socially marginalized by thinking about situations when they were ignored or treated as if they are invisible, their identification with a sexual minority group was associated with a view of sexuality as biological. On the other hand, when they were reminded of how their group is discriminated against by listing situations when they were treated negatively because of their identity (i.e., when minority identity is recognized but devalued), their identification was unrelated to beliefs about sexuality as biological. This suggests a strategic deployment of biological perception of social categories based on how this perception interacts with one's own identity and perceived social treatment (see also Verkuyten, 2003). These examples further demonstrate the interactions among cultural/contextual, motivational, and biological factors contributing to social essentialism.

The Present Study

Developmental and Cultural Research

Our research focuses on two questions: (a) How do biological factors interact with cultural and motivational factors over development in giving way to essentialist reasoning about various social categories among Iranian children and adults? and (b) how do developmental patterns in Iran compare to patterns observed in our past work among United States and Turkish children and adults (Davoodi et al., 2020)? Given relevant differences in terms of cultural input and social structures among the three populations, comparing developmental patterns of social essentialism among these samples can uniquely contribute to the development of a unified theory of social essentialism that focuses on interactions between biological, cultural, and motivational accounts. We elaborate on these differences later in a section where we outline cultural input with respect to the social categories of interest in Iran and compare it to Turkey and the United States.

While an extensive body of literature focuses separately on each of the factors discussed above (biological, cultural, motivational), a richer understanding of the development and persistence of social essentialism can be derived from systematically teasing apart the relative contributions of these factors in the developmental trajectory of social essentialism. To clarify how these factors interact, cross-cultural studies and research on groups that are traditionally underrepresented in Western, English-language outlets can play a crucial role.

Moreover, developmental research is critical for understanding interactions among cultural, motivational, and biological factors. Specifically, throughout development, while cultural and motivational factors should become more salient, biological reasoning about social categories should weaken. As individuals are gradually exposed to cultural input and the specific norms of their community over development, cultural input is expected to play a more prominent role in their reasoning. Likewise, as motivated reasoning depends on mature cognitive processes for selective belief appraisal (see Kunda, 1990), including identity development or awareness of hierarchies and power structures, the role of motivational factors

in reasoning is also expected to become more prominent. Biological reasoning, however, usually follows a different developmental pattern with respect to several biases, where children seem to reason about biological relevance in the social world early on but emphasize cultural factors later in development. For example, when reasoning about mortality and death, children first learn and reason about biological aspects of death, perhaps intuitively grasping the physical cessation accompanied with mortality; only later in development, children incorporate psychological and supernatural aspects into their understanding of death, consistent with the specific cultural input they receive in their communities (Astuti & Harris, 2008; Giménez-Dasí et al., 2005; Harris & Giménez, 2005; Watson-Jones et al., 2017).

These opposite developmental patterns of biological reasoning on the one hand and motivational and cultural reasoning on the other have specific implications for the developmental trajectory of social essentialism. Among the various factors that feed into the development of social essentialism, we would expect stronger influence of cultural and motivational factors over development and a fading of influence of biological perception, all else being equal. However, we predict that all else is not equal. Based on previous cross-cultural work with children and adults (see Davoodi et al., 2020), we expect a prominent role of biological perception and patterns of nuanced interplay with cultural and motivational factors in contributing to essentialist reasoning about specific social categories. To test this, we studied 5–10-year-old children and adults in Iran. Across cultures, many studies investigating the development of social essentialism focus on this age range, as essentialist beliefs about a number of social categories emerge in early childhood (e.g., Davoodi et al., 2020; Kinzler & Dautel, 2012; Rhodes & Mandalaywala, 2017). Furthermore, studying this specific age range allows us to capture snapshots of child cognition before formal schooling begins, as well as once children have been in formal schooling for a few years. School is a primary place of socialization for children (Brint, 2006).

Most crucially, reflecting the need and necessity to decolonize and diversify psychological research (see Arnett, 2008; IJzerman et al., 2021; Nielsen et al., 2017; Silan et al., 2021), studying social essentialism in a non-Western, industrialized, educated, rich, and democratic society like Iran, which is severely underrepresented in psychological research, meaningfully contributes to the field by allowing for an evaluation of theories proposed based on patterns observed in a small group of individuals with uncharacteristic lives (i.e., Western, industrialized, educated, rich, and democratic populations: Henrich et al., 2010). Moreover, by focusing on a sample of children and adults in Iran and by presenting research led by young researchers living and studying in Iran, we hope to reduce ethnocentric and American-centric biases (Rad et al., 2018; Thalmayer et al., 2021) in psychological research. Beyond contributing to diversification efforts in psychological science, studying the development of social essentialism in Iran is especially informative for the field because of the unique social structure currently in place in Iran, which provides a distinctively informative context for exploring the development of social essentialism. We elaborate on Iranian society in the following section.

Iran

In the current research, we were interested in Iranian children and adults' patterns of essentializing specific social categories studied in past work among children and adults in Turkey and the United States (Davoodi et al., 2020), including gender, nationality, religion, SES, and the fan base of a sports team. In addition to these, we also included ethnicity and race. In what follows, we briefly explain the relevant sociocultural realities in Iran with respect to each of the social categories of interest and briefly compare to Turkey and the United States.[1]

As a country with an Islamic government, the influence of Islam extends to all spheres of society in Iran. Based on official surveys, a large majority of people in Iran identify as Muslim[2] (Haerpfer et al., 2022), and there is mandatory exhaustive religious education from preschool to university. All political structures and systems, including the judiciary, are governed by religious notions and rules. Some of these religious rules have important implications for essentialist reasoning about religious group membership. For instance, based on Sharia law, a Muslim cannot change their religion. Converting from any other religion *to* Islam, however, is allowed and encouraged (Sanasarian, 2000; Schirrmacher, 2020).

Turkey, like Iran, is a Muslim majority country but unlike Iran, a secular state (Göl, 2009). Thus, over development, although Turkish children are consistently exposed to religious traditions and beliefs, religion does not dictate the rules in all spheres of public life. In the United States, the religious composition of society is more diverse compared to both Turkish and Iranian societies, and children are not exposed to religious teachings if they attend public schools. Thus, if cultural and social experiences play a prominent role in shaping essentialist beliefs about religion, within the Iranian sample, we would observe an increase of these beliefs with age as more consistent messaging about religion is reinforced through different sources (e.g., school, parents, media, teachers), and among the Iranian, Turkish, and U.S. samples, we would observe notable differences in the strength of essentialist beliefs.

We would expect the same patterns with gender. Within the Iranian social and legal systems, there are structural disparities between men and women in terms of their rights, such as the right to divorce or travel, and norms that govern life for each gender, mostly reinforced by Islamic law. Moreover, gender segregation is common in most public and educational spaces. Children are exposed to gender-segregated systems from an early age, when they start elementary school. This consistent exposure to gendered norms differs from the experiences of children in Turkey and the United States, where, although *social* norms reinforce gender biases and unequal treatment of men and women, *legal* rights do not vary as a function of gender. Moreover, children in Turkey and the United States are not regularly exposed to gender segregation. Again, if cultural norms and practices play a key role in the development of social essentialist reasoning, we would expect a developmental increase in gender essentialism in Iran as children experience life

[1] More specifically, where relevant, we emphasize experiences of children and adults in Tehran because children recruited in the current study primarily lived in Tehran. We then briefly point out similarities and differences between common relevant experiences in Tehran and experiences in Istanbul and Boston because participants in the previous study lived in Istanbul and Boston.

[2] It is important to note that data from official surveys conducted by international polling organizations on religious affiliation in Iran possibly reflect biased statistics due to participants' social desirability bias or anxiety about public denouncement of religious affiliation and potential legal consequences.

in a system in which rules and rights are implemented according to the individual's gender. Moreover, comparing among the samples, we would expect to see differences in the strength of essentialist beliefs about gender due to differences in the relevant cultural input.

Iran is linguistically and ethnically more diverse than most Middle Eastern countries, including Turkey (Alesina et al., 2003). Iranian society consists of various ethnicities, including Fars, Azeri (Turk), Lor, Kurd, Baloch, Arab, Turkman, Gilaki, Mazani, and others with distinctive languages, dialects, or accents. In many major cities of Iran, including Tehran, where we collected the data from children, people from these ethnic groups interact with one another on a daily basis and form diverse communities. These cultural experiences and daily interactions should purportedly weaken the strength of essentialist reasoning about ethnicity based on cultural views of social essentialism, which emphasize the role of exposure to diversity (see Smyth et al., 2017).

However, despite this diversity and ethnic integration, especially in large cities like Tehran, non-Fars ethnic groups are considered ethnic *minorities* and generally reside or migrate from economically deprived regions of the country. Additionally, Farsi (Persian), the language of the Fars majority group, is the official language in the country and is taught in all schools across the country. Therefore, consistent with literature on motivational factors leading to essentialism, we might expect differences in the degree to which ethnicity is essentialized by Fars and non-Fars Iranians, such that those who identify as Fars would be more likely to essentialize ethnicity (see Mahalingam, 2003), motivated by factors such as preserving the status quo.

Since direct comparisons in degree of ethnic and linguistic diversity in Tehran, Istanbul, and Boston do not exist in the literature, it is difficult to predict how relative degree of essentialist beliefs about ethnicity would compare among the three samples; nonetheless, if cultural input plays a major role, we would not expect similar levels of essentialist beliefs about ethnicity in light of relevant cultural differences among the three samples.

In the case of nationality, different cultural trends would lead to different predictions for the Iranian samples. In recent decades, more economic and political sanctions have been imposed on Iran, and this has paved the way for more isolation from the international community with very little exposure to other nationalities. Therefore, one possibility is that nationality is not a culturally salient category for Iranian children and adults, and we would not expect strong levels of essentialist reasoning about nationality if cultural salience plays a major role.[3] Yet, another possibility is that precisely because of the international isolation and limited exposure to non-Iranian nationals, nationality may be essentialized strongly based on prior work showing that exposure to diversity decreases essentialist reasoning (Smyth et al., 2017). The lack of diversity with respect to nationality may therefore increase essentialist reasoning, especially over development.

In Turkey and the United States, however, the role of cultural input should presumably lead to different patterns in essentialist reasoning about nationality. In Turkey, there has been a rise in nationalistic sentiments (Bilali et al., 2014; Konda, 2011; Saraçoğlu, 2009), and children are exposed to an emphasis on Turkish identity and nationalistic values in their daily lives and via the educational system (Kaya, 2009). Thus, nationality is a culturally salient category, and we would expect stronger essentialist reasoning compared to patterns among Iranian children. In the United States, we would expect weaker essentialist beliefs about nationality compared to Iranian children in light of more consistent exposure to other nationalities and, especially before the 2016 election, when data were collected by Davoodi et al. (2020), no particularly strong emphasis on nationalistic sentiments.

In the case of SES as a social category, the role of cultural input would lead to a specific prediction. In Iran, as a few elite groups of society have monopolized wealth and trade in the recent years, social mobility for the middle class has become almost impossible (Laudati & Pesaran, 2023). Furthermore, the World Economic Forum rated Iran as the country with the fifth highest inflation rate in the world, with a rate of 50.4% in 2019 (Broom, 2019). The relatively high rate of inflation has worsened the quality of life for many Iranians, exacerbated the socioeconomic gap, and made it difficult for most people to live comfortably on their regular income. These specific economic experiences of the Iranian middle class, where most of our participants belong based on their income levels, conceivably can make social class a salient category in people's everyday lives and conversations. This in turn should lead to strong essentialist reasoning about SES based on theories that emphasize the role of cultural experiences. The experiences of the Iranian middle class most likely differ from the experience of the American middle class living in Boston, one of most affluent cities in the United States, or even from the experiences of the middle class living in Istanbul, especially in 2015 before the rapid depreciation of the Turkish currency.[4] Thus, again, we would expect cultural variability in essentialist beliefs among the three samples based on theories that emphasize the role of cultural salience of social categories. More specific predictions related to our research questions follow next.

Methodological Notes and Predictions

We investigated natural-kind reasoning about social categories using two tasks: (a) the Biological Perception Questionnaire from Davoodi et al. (2020), which measures the extent to which a social category is viewed as innate, based in the brain and the blood, and immutable, and (b) the switched-at-birth scenarios (Taylor et al., 2009), which measure the extent to which social category membership is perceived as a matter of birth rather than upbringing. Different measures utilized in empirical research measure the various dimensions and interrelated beliefs that make up the essentialist bias. Partly because

[3] However, the presence of social media, especially among young adults, can make nationality salient as young adults learn about and, in some cases, virtually interact with people from other countries over social media. This could increase essentialist reasoning about nationality, especially reasoning about immutability, when coupled with the realization that it is extra challenging for Iranians to change their nationality or to experience living in different countries due to deteriorating political relationships with the West.

[4] Although on the Gini Index, Iran, the United States and Turkey do not rank very differently, with all three categorized as countries with unequal distribution of wealth, the experiences of the middle class living in major cities in the three countries are most likely very different, as can be interpreted by the countries' poverty rates. The latest available Gini index score from Iran is 40.9 from 2019, 41.5 from the United States, and 41.9 from Turkey in the same year. The poverty rate in the same year (defined as the % of the population living on less than $6.85 a day on 2017 international prices) was 27% in 2019 in Iran, but only 12.6% in Turkey and 1.7% in the United States. All statistics came from the most recent publicly available data on the World Bank's website (World Bank, World Bank Development Indicators, 2019a, 2019b).

of the abundance of measures and the multifaceted definition of social essentialism, different experimental tasks sometimes provide what appears like inconsistent evidence for developmental patterns of the same facet or dimension of social essentialism (see Pauker et al., 2020). We included these two measures of interrelated dimensions of social essentialism to explore whether the documented pattern of the prominence of biological factors versus cultural factors in the development of essentialist beliefs is task-dependent.

We also decided not to ask about a social category as a whole concept (e.g., race) but about different group members (White and Black people) to more precisely assess participants' essentialist intuitions (as in Coley et al., 2019; Haslam et al., 2000). More specifically, this enabled us to track possible asymmetries in essentialist reasoning about specific groups of a category, which might be evidence for the role of motivational factors. For example, in the category of SES, those who are more affluent may be more motivated to essentialize the category of "rich," as compared with "poor," in order to preserve the status quo (as in Mahalingam, 2003). Similarly, with respect to some social categories, specific cultural input may contribute to asymmetries in essentialism about various groups. The category of religion is an instance of such asymmetry where "Muslim," as one of the groups belonging to this category, may be perceived as more immutable and "natural" by Iranians, as compared with "Christian," because of specific rules within Islam about religious conversion.

Last, in addition to the categories mentioned above, we also measured essentialist beliefs about race and sports-team fans. This decision was based on the goal to tease apart the role of biological factors from cultural and motivational factors. Specifically, the two additional categories were added as upper (race) and lower (sports-team fan base) anchor points for biologically influenced essentialist reasoning. We reasoned that if our sample of residents in Tehran essentialized race, this would be solely based on perceptual features and race being perceived as biologically relevant. Race is generally not a culturally salient category in Tehran, where the overwhelming majority of residents are White and exposure to Black Iranians or non-Iranians is extremely limited. On the other end of the spectrum, sports-team fan groups are formed based on preferences having to do with individuals' taste in sports, and it would be absurd to assume any biologically determined feature to establish what sports team people are a fan of. Therefore, we reasoned that sports-team fan groups would be essentialized very minimally if biological reasoning plays a major role in the development of social essentialism.

More generally, investigating the rank order of the categories of interest on both measures (e.g., whether participants viewed gender as the most essentialized, followed by ethnicity, nationality, SES, race, and then sports-team fan groups) and the degree of essentialist beliefs over age allows us to tease apart the relative contributions of biological reasoning and cultural input. Comparing the absolute levels of essentialist beliefs measured by the biological perception task among our Iranian sample to patterns observed among samples in Turkey and the United States in prior work further differentiates between the role of biological perception of categories and cultural input. Furthermore, comparing biological perception scores for reasoning about different groups representing a category (i.e., Azeri and Fars representing ethnicity) among participants belonging to these groups illuminates the nuances added by motivational factors. In the switched-at-birth task, motivational factors can be investigated by comparing results from two directions of the task (baby born into family A raised by family B, and vice versa).

Developmental Predictions Within the Iranian Sample

The prominence of biological factors would predict that categories with biological markers, specifically gender and race in our study, and to some extent ethnicity and nationality (because of language and accent markers), should be essentialized more strongly than categories with no obvious biological marker, such as SES, religion, and most definitely, sports-team fans. Moreover, over development, essentialist reasoning for these categories should remain relatively stable to the extent that children and adults perceive the biological markers (or the absence of such markers) as equally relevant.

If cultural input played the main role in giving way to patterns of social essentialism, however, we would expect that categories that are culturally salient and relevant due to the sociopolitical structure and cultural norms and practices should be essentialized more strongly than those that are less culturally salient. In the context of Iran, this would suggest that religion, SES, and gender should be essentialized more strongly than other categories such as ethnicity, sports-team fans, and race. Moreover, essentials beliefs about all of these categories should increase over development as children become exposed to more consistent and persistent cultural messaging through sources beyond the family.

We can also imagine ways of interaction between cultural and biological factors. For example, biological perception of categories like race and gender can also interact with cultural factors that might give way to an increase or decrease of essentialist reasoning over age, depending on the cultural input. Specifically, in a society where unequal gender rights are justified by the political discourse appealing to biological differences or divinely ordained differences, as is the case in Iranian society, we might expect an increase in essentialist reasoning over development if the cultural input plays a significant role above and beyond biological perception. On the other hand, cultural input that deemphasizes biological differences might contribute to a decrease in essentialist reasoning with age as individuals learn about the social rather than biological boundary conditions such as gender and race.

Motivational factors add interesting nuance to the predicted patterns. Specifically, in the context of our study and using the paradigms implemented here, motivational factors would affect reasoning about different groups (e.g., Iranian vs. Spaniard) within the same category (e.g., nationality). We do not have specific predictions about how motivational factors interact with biological and cultural factors to give rise to specific patterns of essentialist reasoning about the social categories in our study. However, we do believe that interesting cases of asymmetrical reasoning about different groups of the same category hint at the role of motivational factors. For example, the desire to preserve one's own national identity could contribute to Iranians reasoning that being an Iranian is more inherited, immutable, or even informative than being from a different country is. Thus, we would expect an asymmetry in reasoning about groups of the same social category in the direction of preserving one's own identity or privileges (e.g., being an Iranian or being a man in a male-dominated world) if motivational factors play a role in the degree of social essentialist beliefs. However, it

is also possible that only with respect to some categories (e.g., religion, gender), where one group has considerable advantage in all spheres of life over other groups, motivational reasoning, reinforced by cultural input (e.g., public discourse about boys being more capable in technical fields), contributes to essentialist reasoning. Furthermore, we would expect a more prominent role of motivational factors in adults' patterns of essentialist reasoning compared to children's since motivated reasoning depends on cognitive processes for selective belief appraisal that are developed later in life (see Kunda, 1990), including identity development.

Cross-Cultural Predictions

The prominence of biological factors would also predict minimal differences in the absolute levels of essentialist reasoning about the categories with biological makers, such as gender, race, and nationality, among the Iranian, Turkish, and U.S. samples and possibly more differences among the three cultures in essentialist beliefs about SES, religion, and sports-team fan groups. Cultural factors, on the other hand, should contribute to differences in the absolute levels of essentialist reasoning among the three samples to the extent that cultural input and salience vary in the three societies with respect to most of the social categories as briefly outlined in the above section.

In the following two studies, we test these predictions. In Study 1, we present findings from adults as an anchor point, and in Study 2, we shift our focus to developmental patterns among 5- to 10-year-old children.

Transparency and Openness

The studies reported here were not preregistered. All materials, data, and code are publicly available at https://osf.io/2cny5/.

Study 1

Method

Participants

Respondents ($N = 273$, 161 females, 111 males, three nonbinary/other) were adult users of two university student forums on Telegram between 18 and 46 years of age ($M = 25.30$, $SD = 7.69$), mostly from leading universities in Iran (191 were current students). An additional 54 adults participated but were excluded from all data analysis due to failing to correctly answer attention-check questions. Participants could opt in to take part in a lottery with the chance to win one of three monetary prizes, each valued at almost $100.

Table 1 shows the demographic information of our sample. The ethnic composition of our sample mirrors recent estimates of the ethnic diversity of Iranian people (see Majbouri & Fesharaki, 2019), and the religious diversity of our sample reflects the diversity of religious views among young Iranian university students. Participants also reported their SES using a 10-point scale, with 0 representing "the poorest in society" and 9 representing "the richest in society" ($M = 5.00$, $SD = 1.64$).

Based on a repeated-measures analysis of variance (ANOVA; for effect size $f = .2$, power = .8, and α of .05; G*Power, Faul et al., 2009), our sample was sufficiently powered to detect small-to-medium differences in biological perception scores across the social categories.

Table 1
Demographic Breakdown of Adult Participants

Category	Percent (*N*)
Ethnicity	
Fars	50.55 (138)
Turk	9.52 (26)
(Mixed) Fars and Turk	15.38 (42)
Other (Kurd, Gilak, Lor)	11.72 (32)
Indicated "not willing to answer"	6.96 (19)
Missing values	5.86 (16)
Religious affiliation	
Muslim	49.08 (134)
Not religious	28.20 (77)
Indicated "not willing to answer"	17.95 (49)
Other	0.73 (2)
Missing values	4.02 (11)
Race	
White	56.41 (154)
Black	0.73 (2)
Neither	36.26 (99)
Missing values	6.59 (18)

Note. For race, we asked participants whether they consider themselves "Black," "White," or "neither Black nor White." "Black" and "White" translate into "Black-skinned" and "White-skinned" in Persian.

Design and Procedures

Participants were presented with a 15-min online survey through Porsline, an Iranian online survey service (https://porsline.com/). Most scenarios and questions were adapted from previous research with adults in the United States and Turkey (Davoodi et al., 2020), with all deviations and additions explained below. Materials were translated from English to Persian by the first two authors and the last author who are all fluent in both languages. Participants provided all answers in Persian.

After completing a consent form, participants went through the two sections in the survey. Section 1 included the biological perception trials and switched-at-birth scenarios (presented in random order), and Section 2 included the identity and group orientation survey questions followed by a demographics questionnaire (presented in fixed order).

At the beginning of Section 1 of the survey, participants read a statement explaining the task to them and informing them that their answers would be compared with children's answers to the same questions. This served as an explanation for the child-friendly design of the task:

> The purpose of this study is to examine how adults and children perceive different social groups, and how culture influences this perception. We plan to ask children the same questions that you will be answering in this survey. Therefore, the language of the survey and the drawings are simple and clear.

This was consistent with the task introduction in Davoodi et al. (2020). Participants were then familiarized with the response options and moved through the two main parts of the survey. Each task is described in more detail below.

Biological Perception Task. Participants completed seven trials of the biological perception task in random order, intermingled with switch-at-birth scenario trials (see the following section). In each trial, they were presented with a pair of characters each representing a social category. Following Davoodi et al. (2020), the social categories of interest were gender, religion, nationality, football teams fan, and SES. We additionally included the categories of race and ethnicity.

All categories (except for gender) were illustrated with characters of the same gender and gender-matched with the participant (Figure 1). The characters were referred to by letters of the alphabet to prevent prior experience with actual names influencing participants' responses. For each category, we presented two characters representing members of the two groups within each category, and each character was labeled with their group membership (e.g., boy and girl; see Figure 1 for all labels).

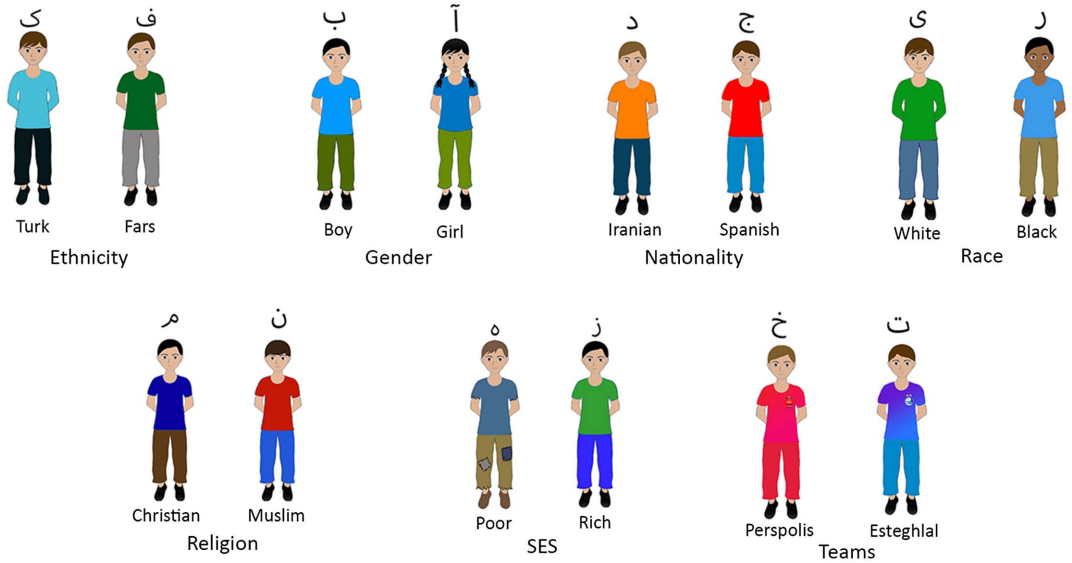
For each social category trial, participants were presented with five sets of questions (in a fixed order), asked separately for each type of category member. For example, in the religion trial, participants saw character "B" labeled as Muslim and character "G" labeled as Christian. They were asked a question about how B and G each were *born* (i.e., "Do you think B was born a Muslim?" and "Do you think G was born a Christian?"). The remaining four questions asked about both characters' blood ("Do you think in the future scientists can tell that [B/G] is a [Muslim/Christian] by looking at his/her blood under a microscope?"), brain ("Do you think that [B/G]'s brain is different from [Christians'/Muslims'] brain?"), potential for changing group membership ("Do you think that [B/G] could become a [Christian/Muslim] one day if they wanted to?"), and the role of the environment ("Why is [B/G] a [Christian/Muslim]? Do you think it's because of things people around them do?").

Coding. Following Davoodi et al. (2020), for questions about how the characters were born, their blood, and the differences in the brains, the essentialist response was "yes" and coded as "1"; the nonessentialist response was "no" and coded as "0." "Maybe" was coded as 0.5. For the "change" and "environment" questions, the essentialist response was "no" and coded as "1"; the nonessentialist response was "yes" and coded as "0." "Maybe" was again coded as 0.5. Each participant received two total biological perception scores for each category, one for each character representing each group (e.g., a "Christian" and a "Muslim" score). The score for each character was calculated by summing up responses across all five questions.

Switched-At-Birth Task. We presented participants with seven switched-at-birth scenarios, two for the category of gender and one for each of the other social categories. Switched-at-birth scenarios were intermingled in random order with the biological perception trials. In all scenarios except gender, a child was presented as having been born to a family belonging to one of the two groups from the respective social category (e.g., a Turk family for ethnicity) but raised by a family from the other group (e.g., a Fars family; see Figure 2). Participants were then asked whether the grown-up child belonged to the group of their biological parents or their adoptive parents. For example, for the ethnicity category, the participant heard,

Figure 1

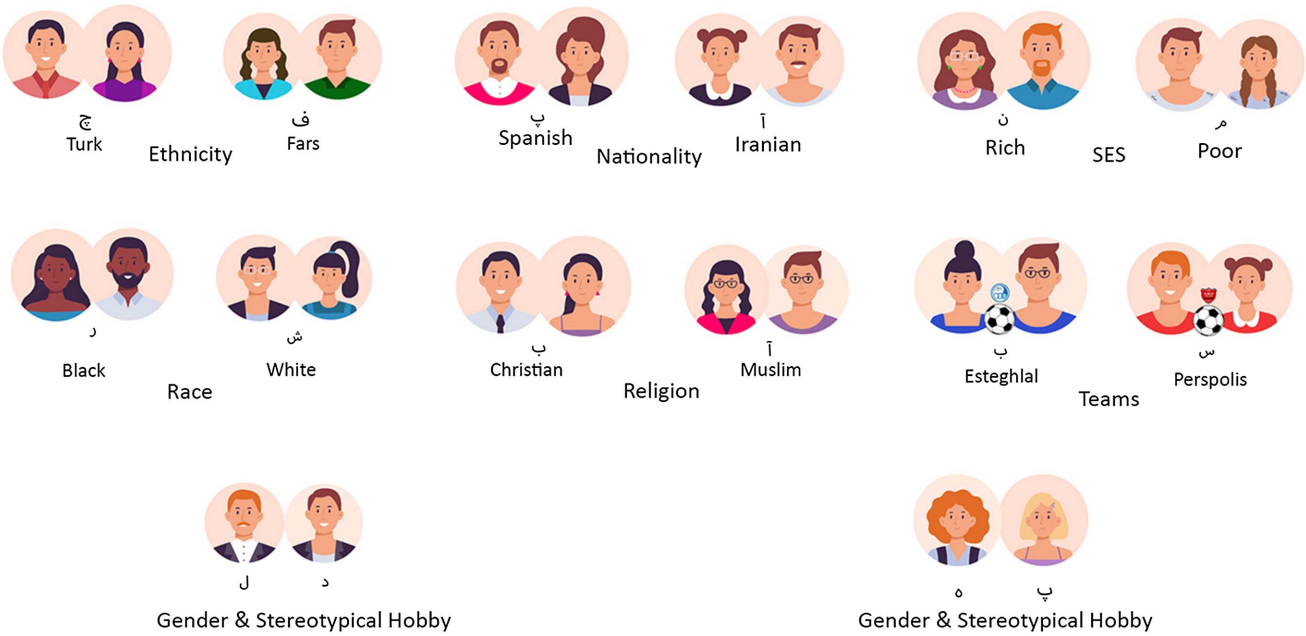
Stimuli Used to Introduce Categories to Participants in the Biological Perception Task



Note. Letters in Persian above each character were used to introduce the characters (e.g., this is "b," and this is "a"). For the category of gender, one character was labeled as a boy, the other as a girl. For the category of religion, one was labeled as Muslim and the other as Christian. For nationality, one was labeled Spanish and the other Iranian. For SES, one was labeled as poor and the other as rich. For ethnicity, characters were labeled as Turk and Fars. For race, one of the characters was labeled as Black and another as White. For teams, each character was labeled as a fan of one of the two most popular soccer teams in Iran, "Esteghlal" and "Perspolis," and their shirts signaled their membership. Although many among this group would describe themselves as "Azeri," ethnic Azeris are more commonly referred to as "Turk" in Iran. Therefore, to ensure comprehensibility, we decided to use the term "Turk." SES = socioeconomic status. See the online article for the color version of this figure.

Figure 2

Stimuli Used for Each Category in the Switched-At-Birth Scenarios



Note. Letters in Persian below each pair of characters were used to introduce the pair as a family (e.g., this is family "j," and this is family "f"). In each social category, one pair was introduced as the "biological parents" and the other pair as the "adoptive parents." The assignment of social groups (i.e., Turk) to "birth-family" versus "adoptive family" was randomized across participants. SES = socioeconomic status. See the online article for the color version of this figure.

> This family is called family "A." They are Turk. This family is called family "B." They are Fars. One day, family A gives birth to a baby. As soon as the baby is born, [it] is given to family B, and [it] is going to live with them forever and [it] is never going to see family A again. Now the baby is grown up. Is [it] a Turk or a Fars?

Note that there are no gender pronouns in Persian, and therefore the gender of the child was never referred to in the scenarios. We have used "it" in the English translation of the original text here because it is not gendered, but the Persian word used in the original text is the third-person pronoun used for humans of all genders.

Following Rad and Ginges (2018), the group membership of the birth and adoptive parents was a between-subjects variable and was randomized across participants (e.g., birth family being Turk and adoptive family being Fars vs. birth family being Fars and adoptive family being Turk) to investigate any possible asymmetries in essentialist reasoning based on the group membership of the biological versus the adoptive parents. The between-subjects design here allowed us to control for a consistency bias where participants may try to balance their answers with the purpose of being consistent.

In the case of gender, participants read two scenarios. In one scenario, the child was identified as a girl at birth who had been raised by two men. In the other scenario, the child was identified as a boy at birth who had been raised by two women. In addition to asking about the gender of the baby when they grow up, we also asked whether they would grow up to like a hobby stereotypically associated with men/boys or with women/girls (i.e., playing football or baking cake). All participants rated both gender scenarios.

Coding. Participants' responses were coded as essentialist (received a score of 1) if they indicated the child would be a member of the group to which her biological family belongs. For gender scenarios, the answer to the gender-in-adulthood question was classified as essentialist (received a score of 1) if it was identical to the character's gender at birth. Similarly, for the gender-stereotypical hobbies question, the essentialist response was equivalent to choosing hobbies associated with the character's gender at birth.

Identity and Group-Based Survey Questions. For each category, participants were also asked three questions: (a) the importance of that social category to their identity ("how important is your religion to who you are?") from not at all (0) to very important (4), (b) the informativeness of the social category ("if you don't know someone personally, how much does knowing their religion help you get to know their characteristics?") from not at all (0) to a lot (4), and (c) how warmly they felt toward outgroup members from that category ("how do you feel towards people of a different religion from you?") from very cold (0) to very warm (4). These questions were presented in fixed order after the switched-at-birth and biological perception tasks.

Demographics. As the last task before completing the study, all participants completed a short demographics questionnaire, indicating gender, ethnicity, religiosity, favorite soccer teams, occupation, SES, age, and race.

Results

We implemented all analyses in *R*, except when noted otherwise. When it was necessary, we used Bonferroni correction to correct α levels for multiple comparisons within the same sample.

Biological Perception Task

Biological Perception Scores Across Social Categories. Table 2 (bottom row) shows participants' average essentialism scores for each category (across both groups representing a category). To understand how essentialism scores compare among the categories, we examined whether the score for each category statistically differs from other categories. This informs the question about whether categories with biological markers (e.g., race, gender) are essentialized more strongly, as measured by the biological perception task, compared to categories that are more commonly understood as social constructs (e.g., SES, teams).

We ran six mixed effects linear regression models, with Category as a fixed effect and Participant as a random intercept, each time changing the reference level for Category to compare the reference level against all other levels of Category. We applied Bonferroni correction to account for multiple comparisons ($\alpha = .008$).

Participant's biological reasoning differed across the seven social categories, $F(4.65, 1232.74) = 438.56$, $p < .001$. As Table 2 illustrates, all pairwise contrasts were significantly different except for gender versus race and ethnicity versus nationality.

Biological Perception Sores for Groups Within Each Category. Recall that for each participant, a total score of essentialist reasoning about each character was calculated based on their responses to the five biological perception questions about that character (e.g., Muslim character; Figure 3). We compared essentialism scores across the two characters, each representing a group, for each category (e.g., Iranian vs. Spanish for nationality) by running seven paired *t* tests ($\alpha = .007$) separately, one for each of the social categories. This allowed us to explore the role of motivational factors in giving way to asymmetrical social essentialist reasoning about different groups that nevertheless belong to the same social category.

Participants differentially essentialized the two groups within a category for three of the social categories: SES, $t(272) = -6.21$, $p < .001$, $r = .35$, race, $t(272) = 3.09$, $p = .002$, $r = .18$, and religion, $t(268) = -5.37$, $p < .001$, $r = .31$.

More specifically, on average, participants essentialized poor people ($M = 1.58$, $SE = 0.04$) more than rich people ($M = 1.43$, $SE = 0.04$), Black people ($M = 3.09$, $SE = 0.04$) more than White people ($M = 3.05$, $SE = 0.04$), and Muslims ($M = 1.06$, $SE = 0.04$) more than Christians ($M = 0.95$, $SE = 0.03$). To find the sources of these differences, using paired *t* tests, we examined responses to each of the five biological perception questions separately for each of the three social categories. Recall that these were questions about how the characters were *born*, their *brains*, their *blood*, their *environment*, and a question about *changing* group membership.

For SES, participants reported that poverty, compared to wealth, is more due to *birth*, $t(272) = 2.07$, $p < .05$, $r = .125$, is less *changeable*, $t(272) = 5.46$, $p < .001$, $r = .315$, and is less affected by the *environment*, $t(272) = 2.58$, $p = .01$, $r = .155$. For race, participants reported that being Black is less *changeable* than being White, $t(272) = 3.11$, $p < .01$, $r = .18$. For religion, they reported that being a Muslim is more due to *birth*, $t(268) = -2.32$, $p = .020$, $r = .14$, and that it is harder for a Muslim to *change* her religion, $t(268) = -5.24$, $p < .001$, $r = .30$, in comparison with a Christian. Thus, when asymmetries are observed in participants' biological reasoning about specific social characteristics (e.g., being rich vs. poor), these asymmetries typically have to do with reasoning about how individuals are at birth and whether they can change these characteristics. The other facets of biological reasoning (e.g., brain and blood) do not seem to lead to asymmetric reasoning.

Links Between Demographic Factors and Biological Perception Scores. To more directly ask about the role of motivational factors in participants' essentialist reasoning, we investigated how participants' own demographic identification influences their biological reasoning about relevant social categories. We utilized demographic data on participants' ethnicity, gender, and perceived SES to ask whether participants' own group membership is related to their biological perception scores for the corresponding category. For example, for biological perception scores for the ethnicity category, we compared scores between our Fars participants (majority ethnic group) and all minority ethnic groups combined, including Azeris (Turks), Kurds, mixed, and so forth. Similarly, for gender, we compared male and female participants' essentialism scores for the category of gender. For SES, because our measure of participants' own SES was on a continuous scale, we used Pearson correlation to understand whether participants' own subjective SES correlates with their essentialism score for the category of SES. This analysis was only conducted for those social categories where we had data on how the participant identified with respect to that category. We had self-report data for ethnicity, gender, and perceived SES.

For ethnicity, participants who identified as Fars ($M = 4.83$, $SE = 0.16$) had on average higher ethnicity essentialism scores than

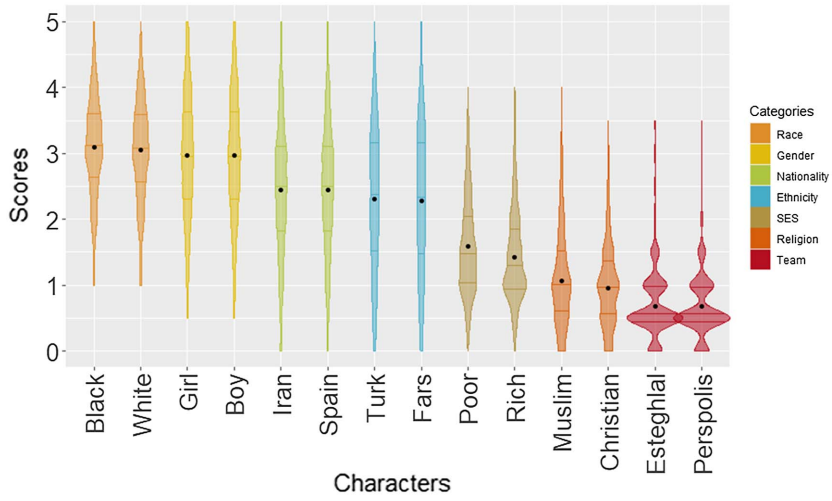
Table 2
Means, Standard Errors, and Patterns of Differentiation (Based on Regression Coefficients) of Total Essentialism Scores Among the Seven Categories for Adult Participants

Social category	Race	Gender	Nationality	Ethnicity	SES	Religion	Team
Regression coefficients comparing category in row and column *B* (*SE*)							
Race	—						
Gender	−0.21 (.13)	—					
Nationality	−1.25* (.13)	−1.04* (.13)	—				
Ethnicity	−1.56* (.13)	−1.35* (.13)	−0.31 (.13)	—			
SES	−3.13* (.13)	−2.92* (.13)	−1.88* (.13)	−1.57* (.13)	—		
Religion	4.13* (.13)	−3.91* (.13)	−2.88* (.13)	−2.56* (.13)	−0.99* (.13)	—	
Team	4.79* (.13)	−4.58* (.13)	−3.54* (.13)	−3.22* (.13)	−1.65* (.13)	−0.66* (.13)	—
M (*SE*)	6.15 (0.09)	5.94 (0.12)	4.89 (0.12)	4.58 (0.13)	3.01 (0.08)	2.02 (0.08)	1.36 (0.06)

Note. Bonferroni adjustments were applied. SES = socioeconomic status; *SE* = standard error.
* $p < .008$.

Figure 3

Adults' Average Essentialism Scores Broken Down by Category and Group Within Each Category



Note. Curves show the distribution of data. SES = socioeconomic status. See the online article for the color version of this figure.

non-Fars participants ($M = 4.17$, $SE = 0.23$), $t(188.1) = -2.26$, $p = .02$, $r = .16$. For gender, male participants ($M = 6.32$, $SE = 0.17$) reported greater gender essentialism than female participants ($M = 5.69$, $SE = 0.14$), $t(270) = 2.72$, $p = .007$, $r = 0.174$. Finally, for SES, participants' SES was not correlated with SES essentialism, $r = -.08$, $p = .21$.

Links Between Group and Identity-Based Beliefs and Biological Perception Scores. Probing the relationship between biological perception scores and ratings of importance of categories for participants' own identity further illuminates the role of motivational factors. Investigating how the biological perception scores are related to the informativeness question provides insight into patterns of divergence or convergence between natural-kind reasoning and entitativity beliefs, two facets of social essentialism. Last, links between warmth toward outgroups and biological perception scores inform questions about the role of group relations in the observed patterns. For these additional insights, we looked into these associations.

Table 3 shows the means and standard errors of answers to the three survey questions asked about each social category (i.e., importance of group for identity, social group informativeness, and warmth toward outgroup). We ran correlations between the biological perception scores and each of the three questions for each category.

The social group informativeness scores were positively related to biological perception scores for gender ($r = .196$, $p < .01$), religion ($r = .156$, $p < .05$), nationality ($r = .124$, $p < .05$), race ($r = .218$, $p < .01$), SES ($r = .251$, $p < .01$), and teams ($r = .195$, $p < .01$). Higher scores on the extent to which a social category is perceived as informative (e.g., the belief that knowing someone's religion helps you get to know the person's characteristics in the absence of other information) are related to higher essentialism scores for that social category. This did not hold for ethnicity.

Importance of group for identity was also positively related to biological perception scores for gender ($r = .311$, $p < .01$), religion ($r = .206$, $p < .01$), SES ($r = .256$, $p < .01$), race ($r = .194$, $p < .01$), and teams ($r = .223$, $p < .01$). Higher scores on the extent to which participants believe that social category membership (i.e., religion) is important to who they are are associated with higher essentialism scores for that social category. This did not hold for ethnicity or nationality.

There were no significant correlations between the question about warmth toward outgroups and biological perception scores.

Next, because these three survey questions can potentially tap into similar cognitive mechanisms, we aimed to understand the unique contribution of each to the biological perception scores. Therefore, we included both survey questions that correlated significantly with

Table 3

Mean and Standard Error for the Group-Based Survey Questions About Each Category

Survey item	Race *M* (*SE*)	Gender *M* (*SE*)	Nationality *M* (*SE*)	Ethnicity *M* (*SE*)	SES *M* (*SE*)	Religion *M* (*SE*)	Team *M* (*SE*)
Importance of group for identity	1.03 (0.06)	2.15 (0.07)	1.87 (0.06)	1.31 (0.06)	2.00 (0.06)	1.82 (0.08)	0.41 (0.04)
Social group informativeness	0.93 (0.05)	1.83 (0.06)	1.92 (0.06)	1.36 (0.06)	1.69 (0.06)	1.78 (0.06)	0.50 (0.05)
Warmth toward outgroup	2.11 (0.06)	2.01 (0.05)	2.04 (0.06)	2.02 (0.07)	2.01 (0.04)	2.08 (0.06)	1.99 (0.05)

Note. The range of the response options for each question was 0–4. SES = socioeconomic status; *SE* = standard error.

essentialism scores for most categories as predictors in a regression model on each of the seven social categories separately. The results are shown in Table 4. Importance of group membership for identity predicted greater essentialism for gender, SES, religion, and teams, whereas social group informativeness only predicted SES essentialism. Neither importance of group membership for identity nor social group informativeness predicted racial, national, or ethnic essentialism.

Comparing Essentialism Scores From Iran to Turkey and the United States From Prior Work. Using the data collected for this study and data reported in Davoodi et al. (2020), we compared essentialism scores (as measured by biological perception questions) among adults across Iran, Turkey, and the United States for the same social categories. This provides for a test of the relative contributions of cultural versus biological factors.

Participants in Turkey and the United States completed a similar procedure to our study, and data from them are reported in Davoodi et al. (2020). In Turkey, the participants were 117 adults (88 females), and in the United States, 106 adults (79 females). In Turkey, participants were students of psychology and other courses at a public, English language, secular university in Istanbul. In the United States, participants were psychology students at an urban, secular university in Boston.

In Davoodi et al. (2020), each participant was asked only one question about each social category (e.g., "do you think that A was born a Muslim and B was born a Christian?"). In the current work, however, we asked each question about each character separately (e.g., "do you think that A was born a Muslim?"; "do you think that B was born a Muslim?"). Therefore, to compare across the two studies, we divided the scores of the present study by 2.

As shown in Figure 4, essentialism scores, measured by biological perception questions, in our Iranian sample did not meaningfully differ from scores among Turkish and U.S. adults from Davoodi et al. (2020). To confirm these patterns, we ran a regression model for each of the five social categories shared between the two studies, with country as a predictor. We applied Bonferroni correction. Country did not predict the essentialism score for any category except for teams ($p < .01$). The rank order of essentialization for the categories is also quite similar across the three countries (Figure 4).

Switched-At-Birth Task

Switched-At-Birth Scenario Scores for Each Social Category. Recall that one of our research aims was to confirm whether the documented key role of biological perception from prior work (i.e., Davoodi et al., 2020) is task-dependent. Therefore, in the current work, we have included the additional measure of switched-at-birth paradigm. Here, we analyze biological responses in the switched-at-birth task and ask whether categories with biological markers are, in fact, more often reasoned about in biological terms based on scores from this additional task.

To analyze participants' essentialism scores measured by switched-at-birth scenarios, we first ran a binomial generalized linear regression model with only the intercept included in the model to understand whether responses were above or below chance. Overall, more participants attributed social group membership based on the group membership of the adoptive parents as compared to the biological parents for all social categories, except race and gender (Figure 5). The odds of saying the baby would have the group membership of

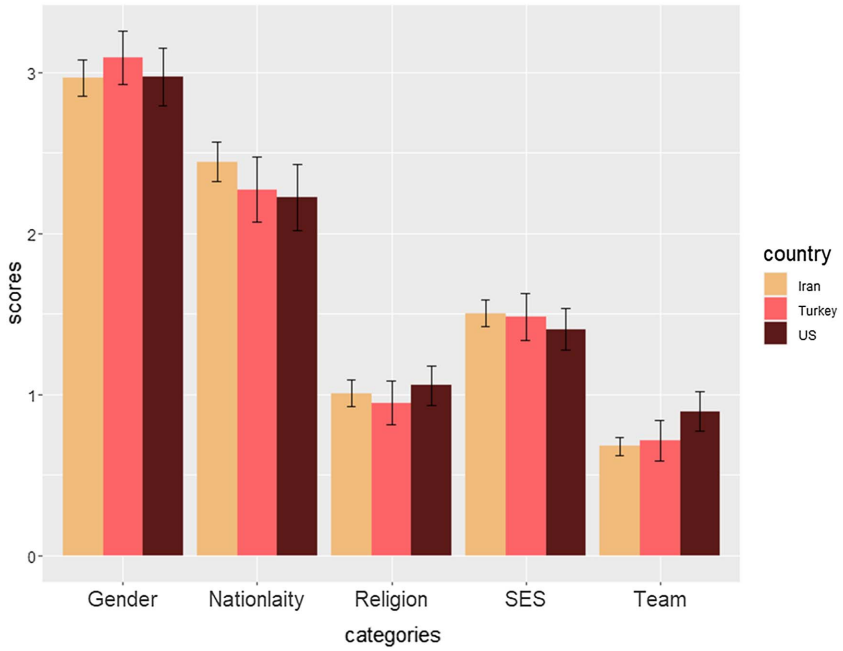
Table 4
Regression Coefficients and 95% Confidence Interval for Models Predicting Essentialism Scores for Each Category Based on Group-Based Beliefs

Model parameter	Race	Gender	Nationality	Ethnicity	SES	Religion	Team
Intercept	5.73*** [5.46, 6.01]	4.64*** [4.09, 5.20]	4.46*** [3.88, 5.04]	4.35*** [3.83, 4.86]	2.19*** [1.81, 2.57]	1.53*** [1.19, 1.86]	1.16*** [1.01, 1.31]
Importance of group for identity	0.14 [−0.11, 0.38]	0.50*** [0.26, 0.73]	0.04 [−0.23, 0.32]	0.07 [−0.24, 0.38]	0.22* [0.04, 0.41]	0.19* [0.03, 0.36]	0.25** [0.06, 0.43]
Social group informativeness	0.26 [−0.01, 0.54]	0.11 [−0.17,0.38]	0.19 [−0.11, 0.49]	0.11 [−0.23, 0.46]	0.23* [0.03, 0.43]	0.07 [−0.12, 0.26]	0.17 [0.00, 0.35]
observations	254	257	255	255	257	257	256
R^2 adjusted	0.04	.10	.00	0.00	.08	.04	.06
F	6.85**	13.96***	1.45	0.59	11.7***	5.90**	8.51***

Note. SES = socioeconomic status.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 4

Adults' Average Essentialism Scores Broken Down by Category and Country of Participant



Note. Error bars represent 95% confidence intervals. Data on adults in Turkey and the United States are from Davoodi et al. (2020). Data are available on OSF (Davoodi et al., 2022). SES = socioeconomic status. See the online article for the color version of this figure.

the biological parents versus the adaptive parents were significantly *lower* than chance in scenarios related to ethnicity (0.38, CI [0.29, 0.50], $p < .001$), teams (0.06, CI [0.04, 0.11], $p < .001$), SES (0.07, CI [0.04, 0.12], $p < .001$), religion (0.04, CI [0.02, 0.8], $p < .001$), and nationality (0.54, CI [0.42, 0.69], $p < .001$). The odds of giving a response based on the group membership of the biological parents versus the adaptive parents were significantly *higher* than chance for race (13.21, CI [8.29, 21.06], $p < .001$). For the question about whether the baby will grow to be their birth gender or their parents' gender, the odds of selecting the biological gender were higher than chance (11.62, CI [7.44, 18.14], $p < .001$). In contrast, for the question about whether the baby will grow to have hobbies that are stereotypical for someone of their birth gender or of the gender of their parents, the odds of selecting the biological parents were *lower* than chance (0.50, CI [0.39, 0.64], $p < .001$, Figure 5).

Scores from the switched-at-birth task confirm a specific pattern observed with the biological perception task. Namely, adults consistently essentialize social categories with biological makers (i.e., race and gender); they reason that membership in these categories is determined by factors at birth rather than environmental factors. Membership in social categories without clear biological markers, however, is attributed to the environment by adults.

Switched-At-Birth Scenario Scores for Each Direction of the Switch Within Categories. To analyze possible asymmetries in reasoning about biology versus adoptive environment within the same kind of scenario (e.g., Muslim biological family, Christian adoptive family vs. Christian biological family, Muslim adoptive family), we conducted Bonferroni-corrected chi-squared tests to compare the proportion of biology-based responses across the two switch directions for each social category. These asymmetries speak to the potential role of motivational factors in essentializing certain categories.

We found that for nationality scenarios, the proportion of biological responses was higher in the "from-Iran-to-Spain" scenario (42%), as compared to the "from-Spain-to-Iran" scenario (28%), $\chi^2(1) = 6.07$, $p = .01$. Note that in the "Iran-to-Spain" scenario, although biological reasoning was higher than the flipped scenario, it was still at chance levels, whereas for the flipped scenario, biological reasoning was lower than chance levels.

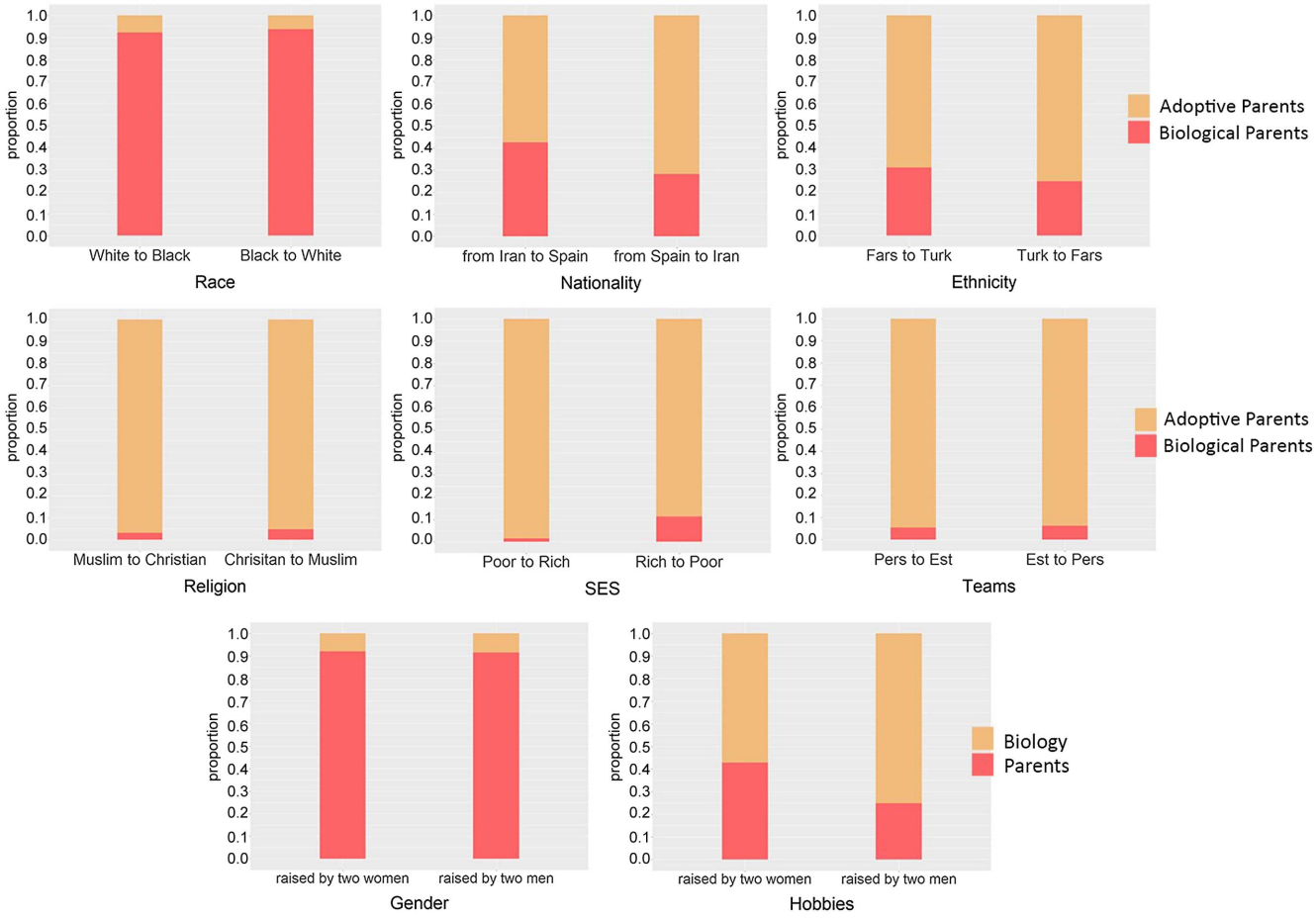
For gender stereotypical hobbies, the proportion of biological responses was higher in the boy-raised-by-two-women scenario (43%) than the girl-raised-by-two-men scenario (25%), $\chi^2(1) = 9.64$, $p = .001$. Again, in the former case, reasoning was at chance, whereas in the latter case, it was lower than chance. There were no differences in how male and female participants responded to either version of the gender stereotypical hobbies scenarios.

For SES, the proportion of biological responses in the rich-to-poor scenario (11%) was higher than in the poor-to-rich scenario (2%), $\chi^2(1) = 10.08$, $p = .001$, although in both directions, biological reasoning was lower than chance.

The proportion of biological responses did not differ across the two directions of the ethnicity switch scenario, $p = .25$. Note that we focused only on social categories where we expected asymmetric reasoning based on results from the biological perception task. If we repeat the following analysis for all eight scenarios and

Figure 5

Adults' Switched-At-Birth Responses Broken Down by Category Type and Direction of Switch



Note. SES = socioeconomic status; Pers = Perspolis; Est = Esteghlal. See the online article for the color version of this figure.

consequently set α to.006 (.05/8), some of the above results do not meet the stricter significance criteria.

Discussion

Investigating social essentialism among Iranian adults using two measures of essentialism, we found that gender and race are the most strongly essentialized categories, followed by nationality and ethnicity, and followed by considerably lower levels of essentialism for SES, religion, and finally the fan base of sports teams. The specific rank order in the degree of essentialist reasoning about this set of categories is consistent with accounts that emphasize the role of biological reasoning in social essentialism. Specifically, social categories with clear biological markers are more likely to be candidates for natural-kind-like reasoning; that is, membership in these natural-kind-like social categories is more likely to be thought of as acquired at birth, immutable, manifested in people's blood and brains, and not impacted by the environment.

If, on the other hand, cultural input played a primary role, we would have expected a different pattern of results. In particular, we would have expected a high degree of essentialism about religious categories by virtue of the key role that religion plays within the Iranian context, SES due to low social mobility in the context of economic hardships, and gender because of structural distinctions and segregations based on gender in Iran. The results only confirmed the last prediction. However, the high scores of essentialism for gender can be explained by the prominence of biological factors as well. Coupled with the finding that gender essentialism levels did not differ across Iran, Turkey, and the United States, we believe that biological rather than cultural factors are doing most of the work when it comes to essentializing gender. Stronger evidence for the prominence of biological factors, however, would come from developmental patterns, which we test in Study 2.

Religion is another interesting case. We would argue that religion is the most culturally salient category in Iran among the categories of interest here. However, similar to patterns observed with U.S. adults, we found that Iranian adults essentialize religion only weakly and only slightly more than they essentialize being a fan of a specific sports team. This particular pattern observed among Iranian adults, and the cross-cultural consistency cast doubt on the role of cultural input as the main factor in giving way to natural-kind-like reasoning in the social realm.

Strong essentialist reasoning about race within the Iranian context is further evidence for the relevance of biological markers in people's social essentialist reasoning. Race is not a salient category in Tehran, where we collected data from adults, and it is considered irrelevant to people's own identities. In fact, race was rated by our participants among the least important categories to their identity, and it was also rated among the least informative category (see Table 3). Given our specific measures of essentialism, the results suggest that among Iranian adults, race is thought of as a characteristic acquired at birth, with distinctive indicators in people's blood and brains, and one that is immutable and unaffected by environmental factors.

Yet, the mere presence of markers in the appearance of characters used to introduce the task, likely interpreted as biological markers, could have contributed to the high essentialism scores measured both by the biological perception and the switched-at-birth tasks. It is possible that our participants were reasoning about the biological basis and immutability of skin color rather than a richer interpretation of race that includes racialized systems of privilege and oppressions. This is especially likely given how "Black" and "White" are translated into Farsi as "Black-skinned" and "White-skinned" emphasizing the color of skin. In fact, previous work attempting to disentangle American adults' and children's essentialist beliefs about race has found that people are more likely to view race (or at least skin color) as stable than they are to view race as an inductively potent category marker (Mandalaywala et al., 2019). Future work should examine whether Iranians might reason similarly when given the opportunity to answer questions about the inductive potential of race, as this could further shed light on the role of both biological markers and cultural input on the expression of essentialist beliefs about race in Iran. Nevertheless, our informativeness measure partly speaks to this. Race was considered as one of the least informative categories by our participants, suggesting that Iranian adults do not view race as a marker with inductive potential. More generally, consistent with prior work showing divergence between natural-kind and entitativity dimensions of social essentialism, race was highly essentialized in terms of natural-kind reasoning but rated low on the informativeness measure, which can be interpreted as a measure of entitativity. In fact, informativeness scores did not predict natural-kind reasoning scores for any category other than SES when controlling for scores on the importance of group membership for identity.

We also observed patterns that speak to the role of motivational factors in essentializing certain social categories. Specifically, we found that male participants essentialize gender more than female participants. To justify the existing distribution of power and discrimination against minorities, privileged groups may be motivated to use essentialist beliefs and appeal to biological reasoning more than nonprivileged people (see Kraus & Keltner, 2013; Mahalingam, 2003). Given the structural differences that favor males in Iran, similar mental acrobatics can explain the observed differences between male and female participants. Furthermore, we found that the importance of participants' gender, SES, favorite football team, and religion to their identity significantly predicts how much they essentialize these categories, even when the informativeness of the categories is controlled for. This further supports the ways in which feelings about one's own identity and the motivation to preserve one's identity influence reasoning about the social categories that one belongs to as composed of an "essence."

Asymmetries observed in reasoning about switched-at-birth scenarios also reveal interesting motivational factors as well as the social realities that people are exposed to. For example, we found that participants are more likely to believe that being an Iranian is established by birth and persists despite changes in one's environment than they believe the same about being a Spaniard. Coupled with the finding that our participants rated nationality as highly important to their identity and as very informative about people, asymmetrical reasoning about the stickiness of "Iranian-ness" versus being a Spaniard is likely driven by motivated reasoning. Moreover, we found that participants reason about being a Muslim as more immutable than being a Christian, likely reflecting their exposure to Sharia law forbidding conversion *from* Islam but encouraging conversion *to* Islam.

Other kinds of asymmetries in the biological perception task and the switched-at-birth scenarios may seem inconsistent. For example, in the biological perception task, participants reasoned that being poor is more impervious to change compared to being rich, but in the switched-at-birth task, they were more likely to attribute *becoming* rich to the environment (i.e., the adoptive parents) than they attributed becoming poor to the environment. It is possible that variation in results across the two tasks is related to task demands and how participants reason through the specific questions. Namely, it is intuitive to believe that a child born into a poor family and adopted by rich parents will grow up to be rich by virtue of inheriting the adoptive parents' wealth, while a child born to rich parents but adopted by poor parents may not grow up to be as poor as the adoptive parents because they may still have a chance to inherit some wealth from the biological parents or to stumble upon other rich biological relatives at some point in their life. Despite a few inconsistent patterns between the two tasks, the main pattern of interest held across both tasks. Namely, in both tasks, categories with biological markers were essentialized to a higher degree and more systematically compared to categories without biological markers. This suggests that the observed role of biological perception of social categories in social essentialism is not task-dependent.

While the patterns observed among adults provide insight into the relative contributions of cultural, biological, and motivational factors to social essentialism, we believe that stronger evidence comes from developmental comparisons and observations of the developmental trajectory of interrelated essentialist beliefs. In Study 2, we present findings from 5- to 10-year-old children in Iran, compare these to findings from children in the same age range from Turkey and the United States, and discuss the developmental evidence that bears on our research questions.

Study 2

Method

Participants

Eighty-eight children between 5 and 10 years of age ($M = 7.07$, $SD = 1.54$, 42 females, $M_{SES} = 5.83$, $SD_{SES} = 1.83$) participated in this study. Four additional children were excluded because they did not complete the study. The final sample consisted of 49 5- to 7-year-old children ($M = 5.82$, $SD = 0.53$) and 39 7- to 10-year-old children ($M = 8.64$, $SD = 0.76$). All children lived in Tehran and were recruited from different branches of Hayat, a private childcare and after-school program for children of 3–12 years of

age. Hayat aims to provide a natural learning environment for children to facilitate free exploration by farming, cooking, and playing outdoors.

The parents of children filled out a demographic form. Forty-eight parents identified themselves as Fars (68.6%), 10 as Turks (Azeri; 14.3%), and 12 with a mixed ethnic background (17.1%). Testing took place in majority Muslim areas, and most parents identified as Muslim. It is important to note that for children, testing took place in person, and parents provided signed consent. We believe that this may have contributed to higher levels of reporting affiliation with Islam compared to the percentages reported in Study 1 (49% reported affiliation with Islam and 28% reported "not religious" in Study 1), where testing was completely anonymized, all procedures were presented online, and our sample was on average younger than parents in Study 2.

The study was approved by Shahid Beheshti University's Research Review Board. In addition, children provided oral assent, and written consent was obtained from their parents. As a token of appreciation for participating, we offered children the choice of a gift from a collection of kid-friendly stationery items. Parents also received a brochure on reflective parenting and were invited to a one-time workshop on emotion regulation in the context of the parent–child relationship. Based on previous work in Turkey (Davoodi et al., 2020), first, we aimed to recruit 74 participants for this study. Fourteen extra children were recruited for the sake of more diversity in terms of ethnic groups. Moreover, based on a between-subject ANOVA (for effect size $f = .2$, power = .8, and α of .05; G*Power, Faul et al., 2009), our sample was sufficiently powered to detect small-to-medium differences in the biological perception scores across the three societies.

Design and Procedure

At Hayat, each child was tested individually in a quiet room. They were shown seven pairs of characters (for the Biological Perception Questionnaire) and eight pairs of families (for switched-at-birth scenarios), each representing the seven social categories in Study 1 (with two scenarios for gender in the switched-at-birth task). All 15 trials were presented in random order. All the character features and questions were identical to those in Study 1.

The procedure was the same as in Study 1, with three exceptions: First, children completed all procedures in person, whereas adults in Study 1 participated online. Second, the survey questions (i.e., questions about the importance of social category membership to identity, informativeness of social category membership, and importance of social category membership), which were asked in Study 1, were answered by children's parents in Study 2. Third, children completed a "warmup" trial where the experimenter labeled a character with a letter name and asked children if they thought the character "goes to the cinema" and "likes chocolate." These warm-up questions were meant to familiarize children with the range of possible answers, and no feedback was provided.

Results

We used *R* to implement all analysis, and similar to Study 1, Bonferroni correction was used to adjust for the family-wise error rate due to multiple comparisons.

Biological Perception Task

Biological Perception Scores Across Social Categories by Age. The means and standard errors of children's essentialism scores measured by the biological perception task for each category (collapsed across characters representing groups of each category) within each age group are presented in Table 5. To explore whether children expressed differential essentialist beliefs about the social categories on the biological perception questions and whether this varied with age, we used mixed effect linear regression models with Age (mean-centered) as a continuous variable, Category as a categorical fixed effect, and participant as a random effect (*lmer4* package in R, Bates et al., 2015).

Figure 6 illustrates children's essentialization of each category over age. Using gender as a reference category, we found that both Category, $F(6, 486.87) = 50.87$, $p < .001$, and Age, $b = -0.26$, $F(1, 92.02) = 7.11$, $p = .01$[5], predicted essentialism scores.

In the next step, we ran six planned post hoc comparisons by resetting the reference level of Category each time to compare essentialist beliefs about each category with other categories ($\alpha = .008$). We found significant differences in the strength of essentialist reasoning across most categories. As shown in Table 6, with a few exceptions (e.g., race vs. nationality), children's expression of essentialist beliefs differed between any two categories.

Next, we included the Age × Category interaction term in the model, each time changing the reference for Category, to observe the relative developmental trajectories in essentialist reasoning between any two social categories. The overall model (with Gender as the reference category) showed a main effect of Category, $F(6, 480.95) = 52.96$, $p < .001$, and Age, $F(1, 92.46) = 7.04$, $p = .003$, as well as a significant effect of the interaction terms, $F(6, 480.75) = 5.00$, $p < .001$. As shown in Supplemental Material Table S1 and Figure 6, children's essentialist beliefs about some of the categories, compared to other categories, follow diverging developmental trajectories. To follow up on this significant interaction, in order to investigate *how* age contributes to differences in the development of essentialist thinking about different categories, we again performed six post hoc tests, each time resetting the reference level for category and asking about the effect of age when comparing the reference level to other categories. We found that the difference between teams (the least essentialized category) and the three categories with the highest essentialization scores (gender, race, and nationality) significantly increases with age. In addition, the gap between essentialism scores for gender (the most essentialized score) and the two categories of ethnicity and SES widens over development as essentialist thinking about SES and ethnicity gradually decreases.

To further follow up on the effect of age, we examined how age affects the degree of essentialization for each of the seven categories separately; we ran a regression model with Age as a predictor of essentialism scores for each category, with Bonferroni correction ($\alpha = .007$). Age was related to essentialism scores for teams and ethnicity (see Table 7); these two categories became less essentialized over development. The strength of essentialist reasoning did not

[5] Note that after applying strict correction (Bonferroni) for multiple comparison, the effect of age is not significant ($p = .009$; adjusted $\alpha = .008$ to account for six comparisons).

Table 5

Means and Standard Errors for Children's Essentialism Scores in the Biological Perception Task Broken Down by Category and Age Group

Social category	5–7-year-olds *M* (*SE*)	7–10-year-olds *M* (*SE*)	Both age groups combined *M* (*SE*)
Gender	7.43 (0.23)	7.68 (0.25)	7.54 (0.17)
Race	6.88 (0.23)	6.39 (0.25)	6.66 (0.17)
Nationality	6.63 (0.28)	5.93 (0.28)	6.32 (0.20)
Ethnicity	6.57 (0.29)	5.47 (0.33)	6.06 (0.23)
Religion	5.75 (0.31)	4.93 (0.36)	5.38 (0.24)
SES	5.12 (0.30)	4.22 (0.29)	4.72 (0.22)
Teams	5.04 (0.31)	3.26 (0.35)	4.25 (0.25)

Note. SES = socioeconomic status.

significantly change with age among 5- to 10-year-olds for any of the other categories.

Comparing Biological Perception Scores From Iran to Turkey and the United States From Prior Work. Similar to the analysis with adults from Study 1, we combined our data with data collected in Davoodi et al. (2020) from children in the same age range in Turkey and the United States. Seventy-three children were recruited in Istanbul, as reported in Davoodi et al. (2020), between the ages of 5 and 10 years ($M = 7.90$, $SD = 1.55$, 43 females, 31 males). The sample represented ethnic diversity in Turkey (see Davoodi et al., 2020).[6] The sample in the United States consisted of 73 children between 5 and 10 years of age ($M = 7.34$, $SD = 1.70$, 39 females, 34 males). All children were recruited in Boston, and the sample represented ethnic and racial diversity in the city (see Davoodi et al., 2020).[7]

We ran five one-way between-subjects ANOVAs to examine how biological reasoning about the five social categories common between our study and Davoodi et al. (2020) may differ among children from these three countries. There were no significant differences between the average scores of children's essentialist beliefs about any of the five categories among the three countries (see Figure 7).

To explore whether children in different countries showed different patterns of essentialist reasoning by age, we ran a regression model for each category to assess whether Age, Country, and their interaction term predicted essentialism ($\alpha = .01$). Neither Country nor the interaction term between Country and Age predicted scores significantly for any category (see Supplemental Material Table S2).

Comparing Biological Perception Scores Across Children and Adult Samples. We conducted *t* tests to evaluate potential differences between children's and adults' total essentialism scores for each of the seven categories. Bonferroni adjustment was applied ($\alpha = .007$). As shown in Figure 8, adult participants, as compared with children, hold weaker essentialist beliefs about gender, $t(158.57) = 7.67$, $p < .001$, $r = 0.52$, nationality, $t(148.33) = 5.95$, $p < .001$, $r = 0.44$, ethnicity, $t(135.27) = 5.43$, $p < .001$, $r = 0.42$, religion, $t(98.22) = 12.90$, $p < .001$, $r = 0.79$, SES, $t(100.19) = 7.07$, $p < .001$, $r = 0.58$, and teams, $t(91.74) = 11.28$, $p < .001$, $r = 0.76$. When it comes to race, the difference is not strictly statistically significant due to the adjusted significance threshold, but we observe a downward trend, $t(118.63) = 2.38$, $p = .02$, $r = 0.21$.

Switched-At-Birth

Switched-At-Birth Scenario Scores for Each Social Category by Age. For switched-at-birth scenarios, similar to Study 1, we compared biological reasoning to chance. There was no significant difference between the proportions of biological responses to different directions of any, scenario, and we therefore collapsed scores across directions. The likelihood of saying that the baby's group membership would match the biological parents was above chance in the gender (4.86, CI [2.67, 8.80], $p < .001$), gender-stereotypical hobbies (2.30, CI [1.41, 3.76], $p = .001$), nationality (1.74, CI [1.12, 2.71], $p = .014$), and race (3.05, CI [1.86, 4.99], $p < .001$, Figure 9) scenarios. In contrast, the likelihood of saying that the baby's group membership would match the biological parents was below chance in the SES scenario (0.40, CI [0.24, 0.64], $p < .001$). For the other three categories, the likelihood of saying the baby's group membership would match the biological parents was not significantly different from chance (i.e., teams, 0.65, CI [0.41, 1.01], $p = .058$, ethnicity, 1.10, CI [0.71, 1.70], $p = .66$, and religion, 0.68, CI [0.43, 1.07], $p = .093$). Again, the patterns from the switched-at-birth task confirm the findings from Study 1 that the prominent role of biological perception in the development of social essentialism is not task-dependent. In both tasks, social categories with biological markers were more strongly (and more systematically) essentialized compared to social categories with no clear biological markers.

Next, we ran eight logistic regression models to examine age as a predictor of children's responses to the switched-at-birth scenarios. For the categories of teams and SES, adding Age as a predictor meaningfully improved the fit of the models in comparison with the null model, $\chi^2(1) = 7.71$, $p = .005$ and $\chi^2(1) = 7.16$, $p = .007$,[8] respectively. For the other categories, however, the models including Age did not explain more variability in essentialist reasoning than the null models (see Supplemental Material Table S3, and Figure 10).

For the category of teams, age also significantly predicts switched-at-birth scores (see Supplemental Material Table S3). In other words, as they age, children reason in terms of environmental factors relatively more often than in terms of biological factors about sports team preferences. Age also seems to be a meaningful factor in children's reasoning about SES (see Figure 10),[9] and with age, children reason less often in biological terms.

Discussion

Our findings from Study 2 show that children have strong essentialist beliefs about gender, followed by race, nationality, and

[6] As reported in Davoodi et al. (2020), children lived in Istanbul and were recruited from summer school programs and cultural center. Most came from lower-middle or middle class, and the majority lived in Muslim neighborhoods of Istanbul.

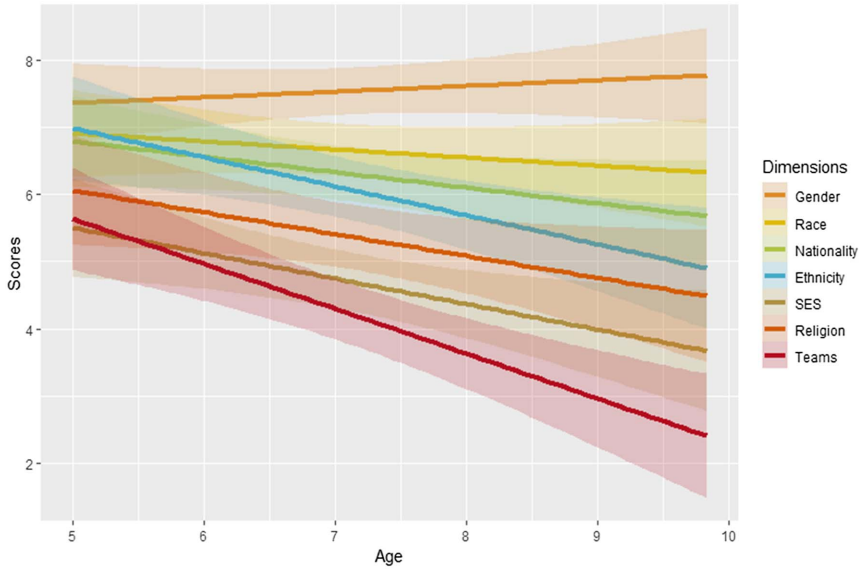
[7] As reported in Davoodi et al. (2020), 62 were identified by parents as "White—not of Hispanic origin," 4% as "Black/African American," 4% as "Hispanic," 3% as Asian/Pacific Islander, 3% as South Asian/Indian, 14% were identified as mixed-race ("White" and other), 5% "other," and 4% did not identify race/ethnicity. All children were visitors to a science museum in Boston, recruited from a local school in the city or tested in a local university lab. Most children were tested at the museum and came from lower-middle to upper-middle SES backgrounds (Soren, 2009).

[8] Note that after strict Bonferroni adjustment, $\alpha = .006$, and this is only marginally significant.

[9] Note that $p = .01$ (see Table S3), which is not strictly significant after applying Bonferroni adjument.

Figure 6

Children's Essentialist Beliefs About Each Category Across Age (in Years)



Note. The shaded area around each regression line represents the 95% confidence intervals. SES = socioeconomic status. See the online article for the color version of this figure.

ethnicity, and significantly lower levels of essentialism about religion, SES, and teams. Similar to Study 1, this pattern supports the predictions of accounts that emphasize the prominence of biological factors. Namely, social categories with (pseudo-) biological markers become the target of essentialization early in life. In terms of the specific measures used in this study, this implies that social categories that are perceived by children as biologically relevant are represented as categories similar to natural kinds rather than social constructs. The striking similarity in absolute levels of essentialist reasoning about various social categories among Iranian, Turkish, and U.S. children further corroborates evidence for the prominent role of biological perception of social categories in the development of social essentialism. The three societies compared here differ in important ways with respect to the cultural relevance and salience of the social categories of interest; yet, despite the meaningfully different cultural inputs and observations that children in these three countries are exposed to, significant differences in essentialism scores among the child (or adult) samples did not emerge. We also saw very similar rank-ordering of categories in terms of children's (and adults') essentialism scores across the three countries.

Given that gender is a salient category in Iran, accounts that assume the role of culture as the main driver or essentialism can also

Table 6

Children—Results From Regression Models Comparing Essentialism Scores Across All Categories, Controlling for Age

	Reference level for category					
	Gender	Race	Nationality	Ethnicity	Religion	SES
Model parameter	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)
Intercept	7.57 (0.21)**	6.65 (0.21)**	6.31 (0.21)**	6.07 (0.21)**	5.44 (0.21)**	4.76 (0.21)**
Age	−0.30 (0.10)*	−0.30 (0.10)*	−0.30(0.10)*	−0.30 (0.10)*	−0.30 (0.10)*	−0.30 (0.09)*
Category						
Race	−0.91 (.23)**	—				
Nationality	−1.25 (.22)**	−0.34 (.22)	—			
Ethnicity	−1.49 (.23)**	−0.58 (.23)	−0.24 (.23)	—		
Religion	−2.13 (.23)**	−1.21 (.23)**	−0.87 (.23)**	−0.63 (.23)*	—	
SES	−2.81 (.23)**	−1.89 (.23)**	−1.55 (.23)**	−1.31 (.23)**	−0.68 (.23)*	—
Team	−3.33 (.22)**	−2.42 (.22)**	−2.07 (.22) **	−1.83 (.23)**	−1.20 (.23)**	−0.53(.23)
Number of observations = 577						
Number of groups = 87						
Conditional R^2 = 0.59						

Note. SES = socioeconomic status.
* $p < .008$. ** $p < .001$.

Table 7
Children—The Effect of Age (Continuous) on Essentialist Scores for Each Category

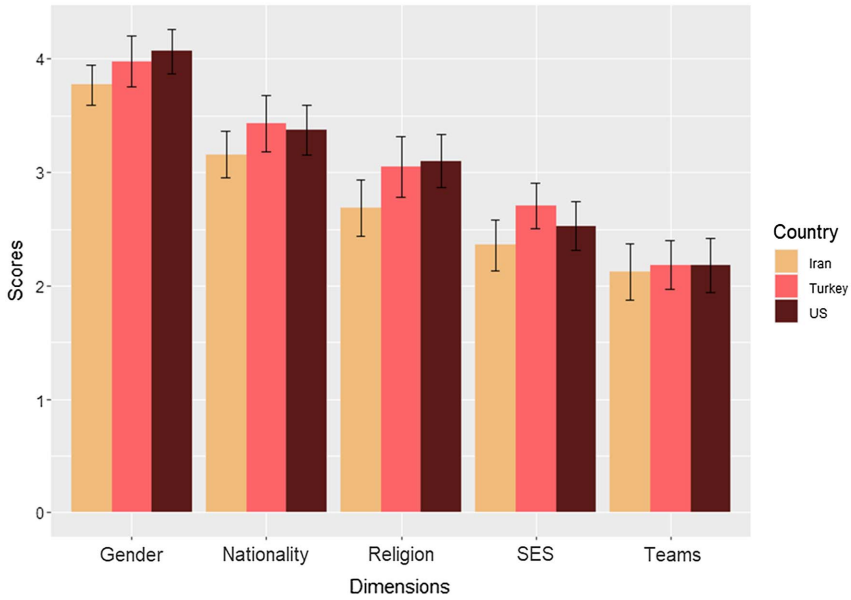
	Gender	Nationality	Religion	SES	Ethnicity	Race	Team
Model parameter	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)
Intercept	7.54*** (0.17)	6.3*** (0.20)	5.39*** (0.24)	4.72*** (0.21)	6.10*** (0.22)	6.66*** (0.19)	4.25*** (0.22)
Age	0.08 (0.11)	−0.23 (0.13)	−0.33 (0.15)	−0.38 (0.14)	−0.43* (0.14)	0.12 (0.12)	−0.67*** (0.14)
Multiple R^2	0.01	0.04	0.05	0.08	0.10	0.01	0.20

Note. Bonferroni adjustments were applied. Because strict corrections were made, the effect of age on reasoning about religion and SES is not significant $p = .04$ in the former and $p = .01$ in the latter case. *SE* = standard error; SES = socioeconomic status.
* $p < .007$. *** $p < .001$.

explain high levels of gender essentialism observed as early as 5 years of age. However, in a society like Iran, if cultural factors played the main role, we would expect to see an increase in essentialist beliefs with age as children become regularly exposed to gender segregation in school and experience the distinct gender norms and standards that are common to Iranian society and politics. Yet, our data do not support this prediction. In fact, children's gender essentialism does not significantly change with age, and later in adulthood, essentialism about gender decreases. It is worth noting, however, that whether gender essentialism or the *expression* of gender essentialism decreases is an open question with important implications for our understanding of the developmental trajectory of essentialist beliefs. In a sample of American adults, Eidson and Coley (2014) found that while explicit gender essentialism was generally low, adults' gender essentialism seemed to increase when participants were put under a cognitive load. This further illustrates the importance of exploring essentialism through a variety of methods.

Developmental patterns in essentialist reasoning about race further support the role of biological factors. Race is not a salient category in Iran, and children in Tehran receive very minimal cultural input about race (e.g., people usually do not use generic expressions related to race, such as "Whites" or "White people" in speaking about social groups). Yet, children essentialize race to a high degree; there is no decrease with age in essentialist scores for race, and even in adulthood, there is no significant decline in essentialist reasoning about race. Additionally, turning to categories that are uniquely salient and relevant to the current social structure and to people's everyday lives in Iran, such as religion and SES, cultural factors, if playing the role of a main catalyst of essentialist beliefs, should render these highly essentialized. Yet, both religion and SES were essentialized less than gender, race, nationality, and

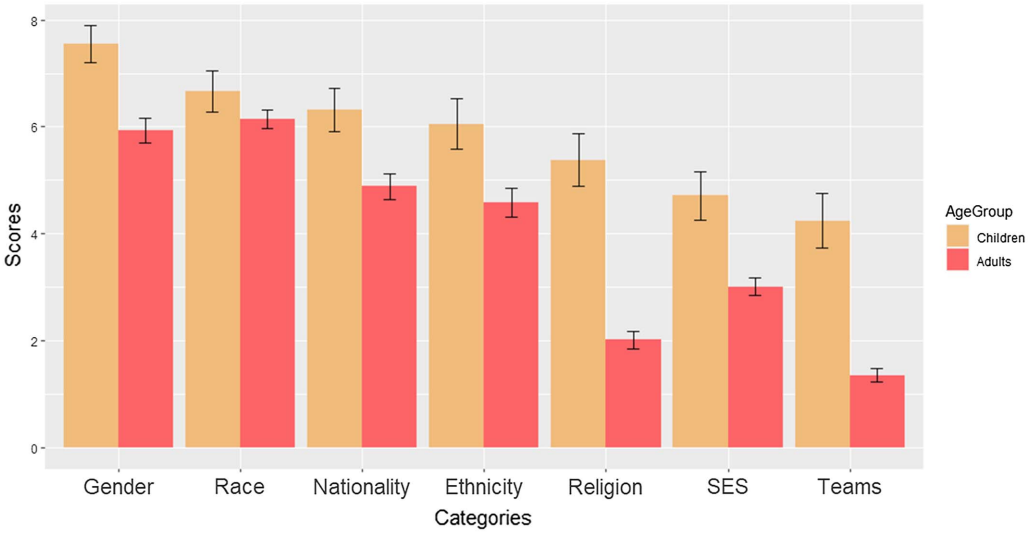
Figure 7
Children's Average Essentialism Scores Broken Down by Category and Country of Participant



Note. Error bars represent 95% confidence intervals. Data on children in Turkey and the United States are from Davoodi et al. (2020). Data are available on OSF (Davoodi et al., 2022). SES = socioeconomic status. See the online article for the color version of this figure.

Figure 8

Children's and Adults' Essentialism Scores for Each Category in the Biological Perception Task



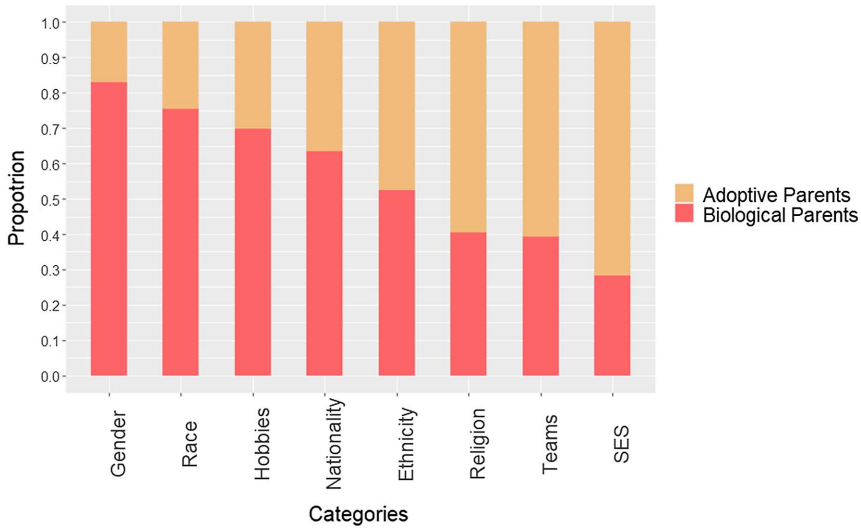
Note. Error bars represent 95% confidence intervals. SES = socioeconomic status. See the online article for the color version of this figure.

ethnicity, categories perceived by children to exhibit (pseudo-) biological markers.

It is worth noting, however, that two of the most essentialized social categories (i.e., race and gender) were represented by characters with distinct visual markers (different skin color in the case of race and hairstyles in the case of gender) and that these visual differences may have contributed to high scores on the biological perception task. Although this is a possibility, we do not think it explains the observed patterns for the following reasons: First, in all categories, the two characters differ in their looks to some extent, including different hair color and hair style (characteristics that could be considered biologically relevant). Second, the visual differences shown in the race and gender categories prototypically exist among members of different groups representing the categories. Therefore, to the extent that these visual markers may have elicited essentialization during the experiment, they would play the same role in real life and therefore not be considered a "side effect" of the experimental stimuli. Last, nationality and ethnicity were remarkably

Figure 9

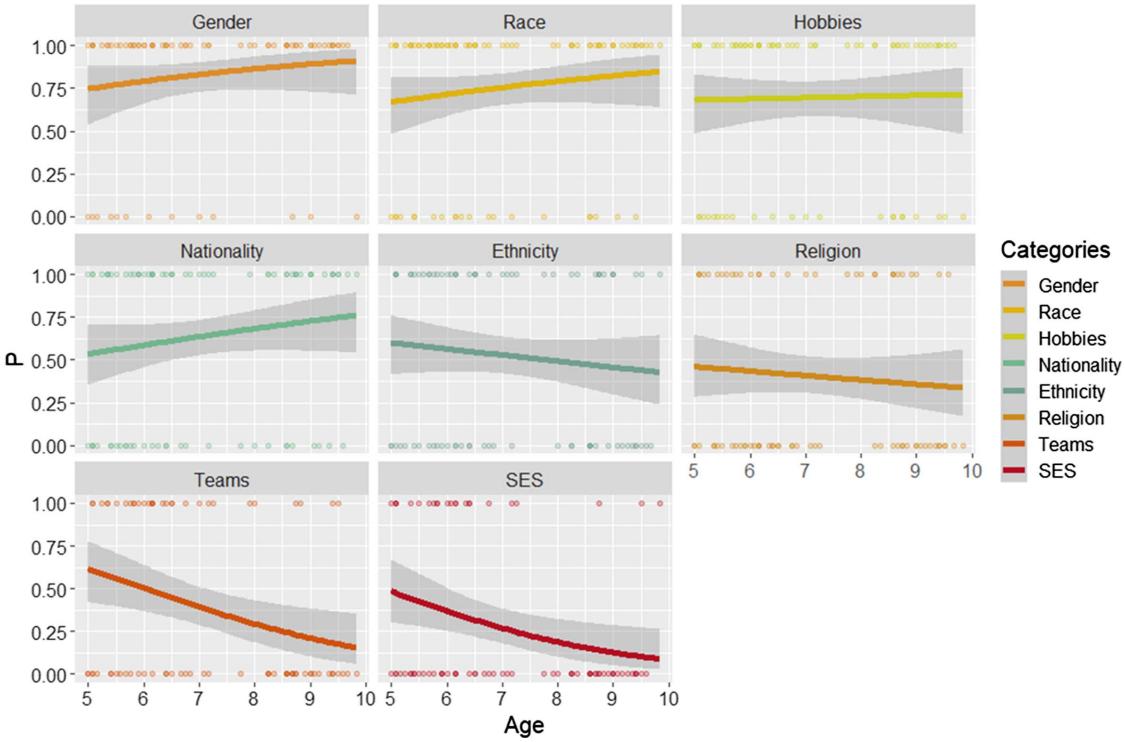
Children's Switched-At-Birth Responses Broken Down by Category Type



Note. SES = socioeconomic status. See the online article for the color version of this figure.

Figure 10

Children's Essentialist Beliefs About Each Category Across Age (in Years) in the Switched-At-Birth Tasks



Note. The shaded area around each regression line represents the 95% confidence interval. SES = socioeconomic status. See the online article for the color version of this figure.

more essentialized by children than SES and teams, while the characters assigned to the latter two categories were represented by distinct visual markers (clothing), whereas characters assigned to nationality and ethnicity were not represented by any distinct visual differences beyond hair color and style. Relatedly, in the switched-at-birth task, where race and gender are again the most highly essentialized categories, the possibility of visual matching of the baby with its biological parents was blocked since the baby was not represented by any figure (participants were just asked to imagine a baby).

Developmental differentiation across the categories also provides some evidence for the prominent role of biological factors. As children grow older, they differentiate more in their essentialist thinking between gender, the most essentialized category, and three other categories: ethnicity, SES, and teams. In the case of SES and teams, we speculate that since these categories have no clear biological underpinning, essentialist reasoning about them decreases over age, while essentializing gender stays stable to the degree that perception of biological markers of gender stays unchanged. The case of ethnicity, however, is more nuanced and does not fully support the prediction of the biological relevance account, which would posit that because of language or accent (potentially perceived by children as a pseudobiological marker), essentialist beliefs about ethnicity should remain stable or increase with age. However, the opposite seems to hold, perhaps speaking to the role of exposure to diversity. Specifically, due to the relatively high levels of ethnic diversity in Iran, and especially in Tehran, children in our sample likely meet people from different ethnicities as they grow up, which can buffer essentialist reasoning. Interestingly, while the biological relevance account would make the same prediction for ethnicity and nationality, in light of (pseudo-) biological markers (language and accent), our results show a steeper decline over age in essentialist reasoning about ethnicity compared with nationality. Again, this suggests that exposure interacts with children's early biological bias to essentialize ethnicity, but not in the case of nationality, since children living in Iran are not regularly exposed to different nationalities. It is interesting to note that biological responses in the case of nationality did not change with age in the switched-at-birth scenario. Although a direct comparison between our findings and findings on nationality essentialism from prior work with American and Canadian children (in Hussak & Cimpian, 2019; Siddiqui et al., 2020) is limited due to methodological differences, it is worth noting that among American and Canadian 5- to 9-year-old children, beliefs about nationality as a heritable trait decrease with age. The divergence can further speak to the role of exposure to diversity in attenuating essentialist beliefs, at least with respect to the heritability dimension.

Finally, our findings from the switched-at-birth scenarios show that children emphasize the role of biology more strongly, as compared with the role of the environment, in determining a character's race, gender, gender-stereotypical hobbies, and nationality. These results are again consistent with predictions from accounts that emphasize the role of biological perception of social categories in giving way to social essentialism.

General Discussion

Across two studies investigating Iranian adults' and children's social essentialism, we extended prior work by (a) studying the development of social essentialism in a population that, to our knowledge, has not been represented in the English-language literature on social or biological essentialism, (b) systematically designing an experimental approach that enables the evaluation of interactions between biological, cultural, and motivational factors in the development of social essentialism, and (c) allowing for a cross-cultural comparison with groups studied in prior work (specifically with two cultural groups from Davoodi et al., 2020) to speak to the role of cultural factors in potentially mediating the biological perception of social categories.

In Study 1, we found evidence for the role of biological perceptions in social essentialism. That is, our findings from the biological perception task suggest that adults are more likely to essentialize those social categories that are perceived as structured around biological underpinnings. These categories are more likely to be thought of as immutable, bound by markers in the blood and brain, acquired through birth, and impervious to the environment. On the other hand, adults are less likely to essentialize categories that are not perceived as biologically relevant; these groupings tend to be perceived as more flexible and organized around cultural norms rather than characteristics inherent to the members. Furthermore, our findings from the biological perception task are consistent with findings from the switched-at-birth task, which also measures the perceived relevance of biological underpinning for social category membership.

Beyond documenting the role of biological perception of social categories in essentialism, we also aimed to provide evidence for how cultural and motivational factors interact with biological perception of categories in giving rise to specific patterns of social essentialism. We conclude that cultural factors play more of a prominent role in cases where social categories are not clearly marked by biological underpinnings. For example, in the case of religion, a category that is not marked by biological factors and is essentialized to a low degree, we found evidence for the role of cultural factors. Specifically, Iranian participants tend to think of being a Muslim as less changeable than being a Christian; this speaks to the role of social norms (religious conversion rules in Islam) in the emergence of essentialist beliefs. In addition, higher exposure to diversity and more contact with outgroups can explain why non-Fars participants (who belong to ethnic minority groups) tend to essentialize ethnicity less than Fars participants (who are in the majority). Note that this specific finding, along with other observed asymmetries, can also be accounted for by appealing to motivational factors. Because in many cases, motivational reasoning stems from, or is backed up by, cultural realities and sociopolitical structures, more careful experimental designs in the future can focus primarily on teasing apart the role of cultural and motivational factors in social essentialist reasoning. For example, the novel group paradigm can be used to present participants with scenarios where cultural and motivational factors would lead to different patterns of essentialism.

In addition to the ambiguous case of asymmetries in reasoning among ethnic majority and minority groups, we observed other patterns that more closely speak to the role of motivational reasoning. For example, in Study 1, men essentialized gender more strongly than women, and the importance of group membership to one's identity predicted essentialist scores for several other social categories as well (i.e., SES, religion, and teams). Corroborating these findings, we found interesting asymmetries in responses to the switched-at-birth scenarios. In the case of nationality, when the character in the scenario was born to an Iranian family and then adopted by a Spanish one, a greater proportion of our participants in Iran tended to see the nationality of the character as identical to their biological family and impervious to effects of immigration, compared to the scenario with the opposite direction. This is consistent with findings from Rad and Ginges (2018), which report that American and Indian participants view outgroup nationality as more fluid than ingroup nationality. Rad and Ginges interpret this finding as a cognitive strategy that enables people to expand their ingroup. In addition, we think this flexible reasoning may help people guarantee their membership, which in turn meets the belongingness need, as suggested by Diesendruck (2021). It is noteworthy that nationality is an ideal category for this kind of motivated cognition. It is likely that individuals simultaneously represent both civic (social construction) and ethnic (biological) conceptions of nationality. This ambiguity makes space for motivated mental acrobatics. As Kunda (1990) put it, people "[D]raw the desired conclusion only if they can muster up the evidence necessary to support it" (p. 483). The easily accessible dual conception of nationality (in contrast with categories like gender or team fan base) provides grounds for motivated reasoning leading to the kind of asymmetry we observed in the switched-at-birth task. More generally, we conclude that motivational factors, unlike cultural factors, can play a prominent role in specific patterns of essentialism, even in the case of social categories that are perceived as biologically determined. Moreover, motivational factors are in many cases augmented by cultural realities; these interactions have implications for the role of cultural factors as well. Namely, cultural factors can interact with biological factors in leading to social essentialism in two ways: One is by directly contributing to essentialism in cases where social categories are not perceived as biologically determined, and the other is by indirectly exerting influence through motivational factors.

In Study 2, we found developmental patterns of essentialist reasoning that strikingly cohered with developmental patterns from previous work with different populations (the United States and Turkey), providing further evidence for the prominent role of biological factors. Specifically, the rank order of social categories in terms of essentialist reasoning revealed higher essentialism for categories with clear biological markers, such as gender and race, and lower essentialism for categories with no obvious biological markers, such as religion, SES, and sports-team fans. Interestingly, the rank order remained consistent across age and into adulthood and replicated across cultures despite structural and cultural differences with respect to the salience of, and norms around, the social categories of interest. More broadly, these cross-cultural similarities in the developmental patterns, including stronger essentialist beliefs about almost all categories among children as compared with adults, have implications for theories of the origins of essentialist thinking. It is possible that, similar to other cognitive biases and abilities, such as the teleological bias, attributing agency to the natural world (see Kelemen, 1999, 2004), or intuitive physics, natural-kind reasoning about some social categories is a very early developing, if not intuitive, bias. Again similar to patterns shown with teleological thinking, with cultural input and the maturation of

processes involved in motivated reasoning (see Rottman et al., 2017), the potentially default mode of natural-kind reasoning about specific social categories can be weakened or strengthened, leading to more differentiation among categories over development, as we, in fact, observed in our findings (see Figure 6 for patterns of differentiation among 5- to 10-year-olds and Figure 8 for comparison between child and adult samples).

Despite the prominence of biological factors, in our child sample, similar to patterns observed with adults, specific kinds of cultural input, such as exposure to diversity, lead to variability in essentialist reasoning about those social categories that are not perceived as marked by clear biological underpinnings. Specifically, we found that the tendency to essentialize ethnicity decreased with age. The age range in the child sample included preschoolers to students who have been in formal schooling for some years. Considering that children have many opportunities in school to form friendships with peers from other ethnicities, this trend can speak to the role of exposure to diversity in attenuating social essentialist beliefs (as found in McGlothlin & Killen, 2010, in the context of racial essentialism in the United States). It is worth nothing that in our experimental task, the groups forming the category of nationality were Fars and Turk. Turks (ethnic Azeris) are the biggest ethnic and linguistic minority in Iran and compromise one fourth of the population (Beehner, 2006). Thus, children in Tehran are very likely to be exposed to others who identify as Turk (Azeri), or many may come from Turk families themselves. In fact, 31% of the parents of our child participants identified as Turk, or Turk and Fars. We would expect that had we represented the ethnic groups in our stimuli as Fars and a more isolated minority group than Turks, such as Baluchis, we would have been less likely to see the decrease in ethnic essentialism that we observed here. More generally, our results suggest that although biological perception of social categories has a strong grip on our minds when it comes to essentialist beliefs, exposure to diversity along the relevant dimensions can substantially moderate the patterns of natural-kind reasoning about social categories. Future research should more systematically study the attenuating effects of exposure to diversity over development, especially in reasoning about those social categories that are perceived as biologically underpinned.

It is important to note that the biological, cultural, and motivational factors documented here are specific to the dimension of essentialism that we measured. In the present study, similar to the previous work in Turkey and the United States, our measures assess the *natural-kind* component of social essentialism. It can be assumed that instead of naturalness, cultural input (conveyed by linguistic cues such as generics) more directly affects other components of essentialism, such as homogeneity and inferential power of social categories. One observation in our study hinted at this possibility; the question of social group informativeness touches on the homogeneity component of essentialism (see Haslam et al., 2000). Interestingly, religion, SES, and gender, which are very culturally salient in Iran, are among the categories with the highest scores of informativeness. In contrast, race, which is not a culturally salient social category in Iran, has the least informativeness score after teams. Thus, had our measures of essentialism not focused on the natural-kind component but instead examined beliefs about inductive potential or category homogeneity (entitativity dimension of essentialism), we might have observed a different pattern of results.

Finally, a note about the contribution of our research to diversity in the field: As Nielsen et al. (2017) noted, a large portion of psychology's literature is biased toward studies with participants who have grown up in environments that are not representative of the vast majority of people across the globe. Taking a step to counteract this bias by studying an understudied community with unique social structures, we sought to uncover the relative contributions of biological, cultural, and motivational factors in the development of social essentialism. We believe that to take further steps toward the aim of diversifying our theories and our science, minority groups and marginalized groups within countries where research is conducted should be included, not only as research subjects but also as decision-makers in the research. We have tried to do this in our research and thereby have contributed both to the diversity of the research community and to the research itself.

Constraints on Generality

The work reported here was conceived of and conducted in Iran, a country dramatically underrepresented in psychology research. The research questions were shaped by a local research team familiar with Iranian social structures and cultural values. Additionally, we compared our data to data previously collected in Turkey and the United States, permitting us to examine patterns of development and expression of essentialist beliefs across three unique cultural contexts where there are important similarities and differences in both population demographics and cultural norms. Although we cannot extrapolate our findings to other countries across the world, this cross-cultural and developmental approach provides us with the ability to uncover the relative contributions of biological perception of social categories, cultural input, and motivational factors in explaining patterns of essentialist beliefs across these three countries. Our findings have implications for refining theories of social essentialism and taking a step toward a more unified theory that accounts for culturally unique patterns as well as more universal patterns in social essentialism.

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