It Just Looks the Same: An Evolutionary Psychological Account of Differences in

Racial Cognition among Infants and Older Humans

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Abstract

Forms of racial cognition begin early: from about 3 months onwards, many human infants prefer to look at own-race faces over other-race faces. What is not yet fully clear is what the psychological mechanisms are that underlie racial thoughts at this early age, and why these mechanisms evolved. In this paper, we propose answers to these questions. Specifically, we use recent experimental data and evolutionary biological insights to argue that early racial cognition is simply the result of a Bfacial familiarity mechanism^: a mental structure that leads infants to attend to faces that look similar to familiar faces, and which probably has evolved to track potential caregivers. We further argue that this account can be combined with the major existing treatments of the evolution of racial cognition, which apply to (near-) adult humans. The result is a heterogeneous picture of racial thought, according to which early and later racial cognition result from very different psychological mechanisms.

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1. Introduction

There is now considerable developmental psychological data suggesting that, starting from about 3 months onwards, humans are attuned to racial differences among people: in particular, there is now a wealth of evidence for the contention that many 3-month olds prefer looking at faces of their own race to those of another race (D. J. Kelly et al., 2005). There is also considerable evidence—from many different sources—that adult humans often think in racial terms (Gil-White, 2001; Haslanger, 2012; Kurzban, Tooby, & Cosmides, 2001). These facts raise (at least) three questions. First: why is it that humans think in racial terms at all? Second: why is it that humans think in racial terms from about 3 months onwards? Third: do all forms of racial cognition—whether in infants or adults—stem from the same set of psychological mechanisms, or are different such forms the results of quite different such mechanisms? In this paper, we propose answers to these questions.

Specifically, we argue for a pluralistic account of racial cognition. Racial cognition, as we understand it here, concerns thinking in terms of racial categories in general; this obviously includes racial categorization, but it also incorporates racial facial, social, or other preferences. Given this, we suggest that (a) infants do notice and care about racial categories, but (b) they only do so because they track visual familiarity in faces: they are driven to attend preferably towards types of faces that they regularly see by the workings of an evolutionary relatively old mechanism that most likely evolved to track potential

caregivers. However, we further argue that it is plausible that (c) as humans get older, the nature of racial cognition changes and becomes psychologically richer, in line with some of the prominent accounts of the nature and evolution of racial cognition already in the literature—such as those of Hirschfeld (1996), Kurzban et al. (2001), and Gil-White (2001).

In the paper, we proceed as follows. In section 2, we present some key empirical findings concerning early human racial cognition. In section 3, we present three existing accounts of the evolution and nature of racial cognition—those due to Hirschfeld (1996), Kurzban et al. (2001), and Gil-White (2001)—and show why, given these accounts, the data concerning infant racial cognition are a bit of a puzzle. In section 4, we present an account of racial cognition for very young infants that can solve this puzzle. In section 5, we show how our account of infant racial cognition can be combined with the accounts of section 3 to yield a pluralist picture of racial cognition. We conclude in section 6.

2. Early Human Racial Cognition

It has now been fairly well documented that there is an own-race bias in early infant cognition: in particular, infants show a bias towards looking at faces of their own race (Anzures, Quinn, Pascalis, Slater, & Lee, 2013; Anzures, Quinn, Pascalis, Slater, Tanaka, et al., 2013; Bar-Haim, Ziv, Lamy, & Hodes, 2006; D. J. Kelly, Liu, et al., 2007; D. J. Kelly et al., 2009; D. J. Kelly, Quinn, et al., 2007; D. J. Kelly et al., 2005; Liu et al., 2015; Sangrigoli & De

Schonen, 2004; Vogel, Monesson, & Scott, 2012).[1] Three important further facts concerning this finding need to be noted.

1.   The own-race preferences are, at least initially, quite labile. For example, even brief visual exposure to faces from different races during infancy is associated with a lack of own-race preferences for faces (Bar-Haim et al., 2006; Sangrigoli, Pallier, Argenti, Ventureyra, & Schonen, 2005). In particular, the own-race face perception bias has been shown to be eliminated in Caucasian 3-month-old infants after only 2 minutes of visual exposure to photos of three different Asian faces (Sangrigoli & De Schonen, 2004). However, as children get older, this lability decreases, and longer exposure to other races is necessary to attenuate own-race facial preferences (Anzures et al., 2012). [2]

2.   In order for human infants to be able to successfully discriminate faces from other races, they need significant exposure to other-race faces, and the more so the older they are. Put differently, there is "perceptual narrowing" when it comes to the faces of other races: many infants lose the ability to perceptually discriminate faces from other races (Pascalis, de Haan, & Nelson, 2002). So, while Sangrigoli and De Schonen (2004) showed that brief two-minute exposure to other-race faces was sufficient for 3-month-old infants to successfully individuate other-race faces, Anzures et al. (2012) showed that visual exposure

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[1] A word about the term "race": we do not think that this term picks out a meaningful natural—as opposed to socially constructed—kind (for some supporting arguments, see, e.g., Appiah, 1992; Appiah, 1996; Haslanger, 2012). What the research surveyed in this section shows, therefore, is that infants show preferences that range over a purely socially constructed kind. See also note 13.

[2] While this lability thus decreases with age, there is evidence that it remains relatively strong even into adulthood: for instance, Kurzban et al. (2001) were able to deflate the tendency to categorize by race in adults simply by exposing them to an alternate social world for about 4 minutes.

of a longer duration of time is needed to reverse the effects of perceptual narrowing and to attenuate own-race face biases among 9- to 10- month olds (100 to 155 minutes).[3]

3.   Newborns do not demonstrate any racial facial preferences (D. J. Kelly et al., 2005).

What needs to be considered next is how these facts can be explained.

3. Three Evolutionary Psychological Accounts of Racial Cognition

In order to explain the existence and nature of human racial cognition, several different authors have proposed—mutually consistent—accounts of the evolutionary biological pressures that have led humans to have minds that think in racial terms (D. Kelly, Machery, & Mallon, 2010). Three of the most widely discussed of these accounts are those of Hirschfeld (1996), Kurzban et al. (2001), and Gil-White (2001). While (as we make clearer in section 5 below) these accounts significantly contribute to our understanding of the evolution and nature of human racial thinking, they do not make sense of the data concerning infant racial cognition (which they were not designed to do either). Bringing this out is the aim of this section.

First, Hirschfeld (1996) argues for an innate adaptation for folk sociological thinking—i.e. for detecting and essentializing social groups in a given social environment.

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[3] Similarly, D. J. Kelly, Quinn, et al. (2007) found that while 3-month-old Caucasian infants could discriminate other-race faces (i.e. African, Middle Eastern, and Chinese), 6-month-old infants could only discriminate Caucasian and Chinese faces, and 9-month-old infants only discriminated among own-race faces. Note that infants also need time to acquire the ability to distinguish the identity of faces (e.g. Chien, Wang, and Huang (2016)). Still, what matters here is just that, with more exposure to own-race faces and little exposure to other-race faces, infants cease to have the ability to recognize other-race faces while they retain their ability to recognize own-race faces.

He then argues that racial cognition results from the interaction between this innate capacity and the social structure that this capacity works in: when there are racial differences in a society, the folk sociological mechanism guides humans to identify and essentialize the properties of the relevant social groups. In short: according to Hirschfeld (1996), race-encoding is a byproduct of a module for tracking and essentializing social groups.[4]

Second, Kurzban et al. (2001) argue that racial categorization is the result of a cognitive system whose function is to track coalitions, i.e. groups of people who cooperate with each other in a given social environment. (Note that this differs from Hirschfeld's account, as not all of the coalitions in a given environment need to map onto stable, essentialized social groups.) This will lead to racial categorization, as "coalition detectors may perceive (or misperceive) race-based social alliances, and the mind will map race onto the cognitive variable *coalition*" (Kurzban et al., 2001, p. 15388). Put differently, encoding by race is a byproduct of a cognitive system that evolved to detect coalitions, within-group cooperation, and between-group competition.

Third, Gil-White (2001) argues that, in humans, a cognitive system for identifying "ethnies" has evolved. Ethnies are groups of people which consist of several hundred or thousand culturally homogenous members, and whose members share various essential properties which determine their behavior. According to Gil-White, evolution encouraged the development of such an "ethnies module", as "processing ethnic groups as species

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[4] We use the term "byproduct" in the sense standard in evolutionary biology and evolutionary psychology: as traits that have evolved not because they have been specifically selected for, but because they are connected to other traits that have been selected for. Relatedly, it is useful to note that Hirschfeld (1996) and Kurzban et al. (2001) refer to modules as characterized by the massive modularity hypothesis (Carruthers, 2006), rather than Fodor's (1983) notion of a module. For more on both of these points, see e.g. Tooby and Cosmides (1992) and Buss, Haselton, Shackelford, Bleske, and Wakefield (1998).

solved adaptive problems having to do with interactional discriminations and behavioral prediction" (Gil-White, 2001, p. 515): in the ancestral social environment, "interaction with out-group members [would have been] costly because of coordination problems due to different norms between ethnic groups" (Gil-White, 2001, p. 515). So, the ability to track ethnies allowed early humans to lower the "frequency of fruitless interactions across ethnic boundaries" (Machery & Faucher, 2005, p. 1213). According to Gil-White, then, racial categorization is a byproduct of this ethnicity module, because skin color, hair type, and other morphological properties can be interpreted as ethnic markers by our minds (though they are not necessarily fully reliable as such). In short: according to Gil-White (2001), race-encoding is a byproduct of an ethnicity module, whose primary function is to track ethnic groups.

For present purposes, there are two key points about these accounts that need to be noted. First, all three of these accounts agree on the claim that there is no "race module" in the mind that has evolved to track races and racial membership as such. Instead, they all propose to explain the facts of racial cognition by seeing the latter as underwritten by a mental module that has another primary function—i.e. one that has not primarily been selected for detecting racial membership—but which leads to racial cognition as a byproduct. Where the accounts differ is in the nature of this module.

Second, in virtue of the fact that these accounts are learning accounts, they will, in principle, make a disjunctive prediction about racial cognition in infancy.[5] On the one hand, and most straightforwardly, these accounts can predict that young infants will not think in

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[5] A quick remark about nativism and learning is useful here. These accounts combine nativist and empiricist elements: they posit the existence of innate structures that facilitate the learning of certain facts—namely, facts about the prevailing coalitions, social groups, or ethnies.

racial terms at all: 3-month olds, for example, may be thought to lack the data (and perhaps the cognitive abilities) with which to track coalitions, essentialized social groups, or ethnies, and hence should not be expected to have racial concepts. On the other hand, these accounts can predict that, if infants do have the data (and perhaps the cognitive abilities) with which to track coalitions, essentialized social groups, or ethnies, they will racially categorize, form racial preferences, etc. for the same reasons that adults do. In short: these accounts predict that infants *either* do not think in racial terms at all, *or* that they think in racial terms for the same reasons that adults do.

We think the most plausible reading of these accounts is that they favor the first of these disjuncts: the purpose of these accounts is to make sense of the evolution of racial cognition among mature human beings—that is why they appeal to factors (social living with non-kin, competitive interactions with other human groups, etc.) that plausibly have shaped the evolution of the thought processes of adult humans. Certainly, we think that the most *charitable* interpretation of these accounts is that they favor the first of these conjuncts.

For this reason, it becomes clear that, as far as these accounts are concerned, the above findings concerning infant racial cognition are a bit of a puzzle. It is just not clear why we should expect infants to think in racial terms at all: if racializing evolved to facilitate the demands of (near-) adult human social living, it is not clear why infants would racialize. Note also that we cannot appeal here to the idea that these accounts would predict that infants merely collect the data on which mature racial cognition draws. This may well be true—a point to which we return in section 5 below—but this kind of data collection, by itself, should either lead to the absence of racial cognition in infancy (as the data are still in

the process of being collected, as it were), or it should lead to the same kinds of racial preferences and categorizations that we find with adults. However, as we make clearer in the next section, neither of this is the case. Hence, another account is needed that explains the disposition towards (apparently) racial cognition specifically of infant humans. The next section spells out and defends such an account.

4. Race encoding in early infancy as a byproduct of a facial familiarity tracker

We think that a plausible explanation of the nature of early racial cognition can be found in the idea that that it is the result of the operation of a (probably evolutionarily relatively ancient) facial familiarity tracking mechanism.[6] To bring this out, note the following three points.

First, in general, newborns and young infants prefer looking at faces or face-like objects or configurations over non-faces or non-face-like objects or configurations (Cassia, Simion, & Umiltaà, 2001; Fantz, 1963; Goren, Sarty, & Wu, 1975; Hoehl & Peykarjou, 2012; Johnson, Dziurawiec, Ellis, & Morton, 1991; Johnson & Morton, 1991; Maurer & Young, 1983; Mondloch et al., 1999; Valenza, Simion, Cassia, & Umilta, 1996). For instance, Mondloch et al. (1999) found that newborns' visual preferences are influenced both by the visibility of a given stimulus and its resemblance to a human face. Equally, they found that

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[6] A version of this idea is also being hinted at in Pascalis and Kelly (2009), D. J. Kelly et al. (2005), Bar-Haim et al. (2006), and Sangrigoli and De Schonen (2004) (among others). However, these other publications are first and foremost experimental papers, and they do not spell out in any detail an account of the evolution of infant racial cognition.

6-week-old infants demonstrate a visual preference for schematic face structures over non-face structures.[7]

There are some obvious reasons for why such a preference for seeing faces might have evolved. Human infants are extremely dependent on adult human help and care (Boyer & Bergstrom, 2011; Churchland, 2011; Hrdy, 1979; Pascalis & Kelly, 2009; Scarr & Salapatek, 1970; Simion & Di Giorgio, 2015); given the fact that humans are also primarily visual creatures (Marr, 1982), this makes it plausible that there is a lot of adaptive value in a tendency to attend to face-like structures (Alvergne et al., 2009; Baron-Cohen, 1995; Bruce & Young, 2012; Leopold & Rhodes, 2010; Pascalis & Kelly, 2009). In particular, doing so allows infants to locate and communicate with possible sources of help and care. This is also supported by the fact that a similar preference for seeing faces has been documented in a number of other species, all of which are predominantly visually orienting organisms whose offspring are heavily dependent on adult help: for example, this preference for seeing faces has been found in Japanese macaques (Kuwahata, Adachi, Fujita, Tomonaga, & Matsuzawa, 2004), gibbons (Myowa-Yamakoshi & Tomonaga, 2001), and sheep (Kendrick, da Costa, Leigh, Hinton, & Peirce, 2001).

Second, note that infants prefer familiar faces over unfamiliar faces (e.g. D. J. Kelly et al., 2005). As they get older and obtain more experiences with faces, infants prefer not just faces to non-faces, but also familiar faces to non-familiar faces (Bar-Haim et al., 2006; Hayden, Bhatt, Joseph, & Tanaka, 2007; D. J. Kelly, Liu, et al., 2007; D. J. Kelly et al., 2005;

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[7] Further relevant here are the findings concerning "face blindness" (see, e.g., Damasio, Damasio, & Van Hoesen, 1982; Farah, Wilson, Maxwell Drain, & Tanaka, 1995), which also suggest that humans track faces in a way that is quite different from how they track other shapes and objects. Moreover, a face selective electrophysiological activity has been observed in event-related potential (ERP) studies, which is particular to human face stimuli and has been observed neither for animal faces (de Haan, Pascalis, & Johnson, 2002) nor for objects (Rossion et al., 2000).

Rennels & Davis, 2008; Sangrigoli & De Schonen, 2004; Simion & Di Giorgio, 2015; Sugden, Mohamed-Ali, & Moulson, 2014).

The evolution of this preference plausibly was driven by the adaptive value of tracking potential caregivers: not all human adults are equally likely to provide help to a human infant—e.g. this might be more likely for kin than for non-kin (Boyer & Bergstrom, 2011; Churchland, 2011; Hrdy, 1979; Kaminski, Dridi, Graff, & Gentaz, 2009; Pascalis & Kelly, 2009; Scarr & Salapatek, 1970; Simion & Di Giorgio, 2015). In turn, this suggest that the more frequently an infant sees a face, the more likely it is that this face belongs to a member of the group of its caregivers—and thus, the more adaptive it is to attend to this face in the future. This reasoning is supported by several lines of evidence. For example, Quinn, Yahr, Kuhn, Slater, and Pascalis (2002) found that 3-month-old infants prefer to look at faces that match the gender of their primary caregiver (see also Field, Cohen, Garcia, & Greenberg, 1984).[8] Also, Rosa Salva, Farroni, Regolin, Vallortigara, and Johnson (2011) found that newly hatched chicks attend towards patterns similar to the head region of their caretakers. What these findings show is that the dependent offspring of a number of visually orienting organisms develop a preference for looking at faces that match those of their caretakers in significant ways.

Third and relatedly, there is reason to think that human infants do not just track familiar face *tokens*, but also familiar face *types*. Put differently: they assess how similar a given face is to the set of faces that they see often. So, for example, as the findings of Quinn

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[8] Interestingly, Quinn et al. (2008) further found that racial facial preferences trump gender-based facial preferences: 3-month-old Caucasian infants who were reared by Caucasian caregivers were shown to prefer female over male Caucasian faces, but did not show any preference of female over male Asian faces. See below for more on this.

et al. (2002) make clear, infants type caregivers by gender (at least).[9] To understand this better, though, it is important to note that "similarity" is not an objective notion: as such, there is no fact of the matter how similar two faces are to each other. The similarity among any two things is purely a matter of the similarity measure used—and there are many such measures (Sober, 2000, chap. 6). We return below to the question of what, exactly, the features are that should be seen to underlie the similarity measures used by infants; for now, it is just important to note that the fact that infants track familiar face *types* as well as familiar face *tokens* implies that infants *somehow* assign faces into similarity classes.

The evolutionary reason for this tendency to create similarity classes of faces—i.e. to track familiar face types as well as tokens—is not fully clear, but may have something to do with allowing for more efficient storage of important face-related information, or for quick inferences as to which unfamiliar faces to attend to. For example, if it is in particular kin that are important for providing help to an infant, and if kin look somewhat similar in their facial features, then being able to track that similarity can be adaptive, as it would allow an infant to predict whether a novel face is likely to be kin or not—and thus, whether it is likely to provide help or not (see also Field et al., 1984; Kaminski, Gentaz, & Mazens, 2012). Fortunately, for present purposes it is not greatly important to specify this reason in detail, and so we will not discuss it further here.[10]

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[9] This is also supported by the Liu et al. (2015) studies: although 3-month-old infants look longer at own-race faces, 9-month-olds look longer at other-race faces. This suggests that infants' visual preferences shift from familiarity preferences (for own-race faces) to novelty preferences (for other-races) as they grow up. This is in line with previous work with nonface objects, which demonstrated that infants have a tendency to shift their preferences from a familiar to a novel stimulus with increasing exposure to the familiar stimulus (Houston-Price & Nakai, 2004). Underlying these findings is thus the fact that infants group faces into "familiar" and "unfamiliar" classes.

[10] There is some comparative psychological evidence that is worth mentioning here, though. Sugita (2008) conducted a deprivation study with Japanese macaques who were separated from their parents and reared by

Combining these three points leads to the following. There is reason to think that human infants are born with a "facial familiarity tracker"—"FFT" in what follows. (Given the fact that this mechanism has likely evolved due to its allowing infants to attend to potential caregivers, we could also call it "caregiver tracker".)[11] This is a mechanism that (a) directs attention to face-like structures in the environment, (b) directs attention especially to familiar faces, and (c) determines whether a given face is "familiar" by comparing it to known faces using some kind of similarity metric.[12] Further, there are some good reasons to think that this FFT is a relatively ancient adaptation for obtaining help from caregivers (see also Kaminski et al., 2009; Pascalis & Kelly, 2009).

Acknowledging the existence and nature of the FFT is important, as it can be seen as a possible—and, as we argue momentarily, plausible—source of racial cognition in infants. So, racial facial preferences (in particular) could simply stem from many infants' large amount of experience with own-race faces and lack of experience with faces from other-races (see also Bar-Haim et al., 2006; D. J. Kelly et al., 2005; Sangrigoli & De Schonen, 2004). This can be made clearer by noting the following.

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human caregivers who wore masks—i.e. they had no exposure to any faces for 6-24 months. The monkeys, before they were being allowed to see a face, showed a preference for human and monkey faces in photographs, and they were able to individuate human faces as well as monkey faces. After the deprivation period, they were exposed to either human or monkey faces for a month. After this exposition, the monkeys demonstrated preference for the category of faces to which they were exposed over the other category (and they were able to discriminate individual faces only within their familiar category of faces). Therefore, this study indicates that these monkeys have a predisposition to group faces into similarity classes of "familiar" and "unfamiliar" (D. J. Kelly et al., 2009; Sugita, 2008). This thus speaks at least for the fact that generating similarity measures among faces has evolved a relatively long time ago.

[11] Note that this differs from the suggestion of, e.g., Pascalis and Kelly (2009) that the FFT evolved to track potentially dangerous others. Given the findings of, e.g., Quinn et al. (2002), Rosa Salva et al. (2011), and Kaminski et al. (2009), we think that it is more plausible to see the evolutionary function of the FFT as the tracking of potential caregivers, though this may be more of a difference in emphasis.

[12] There are various ways to measure similarity in faces: for example, using morphometrics, quantitative genetic studies, or faciometrics (see, e.g., Cox & Cox, 2000, for an overview). For present purposes, though, these details do not matter.

As newborns, infants lack enough data to group faces into similarity groups of familiar and unfamiliar faces: in order to tell which sorts of faces the infant sees a lot, it needs to have access to a number of different faces—for only then can it compute any kind of similarity metric between them. For this reason, it is not surprising that we do not see racial facial preferences in newborns.

However, as they grow older, infants do obtain the needed data: they gain experience with more different faces, and thus are able to group these faces into similarity classes of familiar and unfamiliar face types. Now, since (as noted earlier) there are no objective facts about similarity, any grouping of faces into similarity classes would be possible in principle. In practice, though, it appears that the similarity measure that infants rely on focuses on features that are also relevant for some contemporary racial classifications. Put differently, infants seem to assign a face to the "familiar" or "unfamiliar" category by assessing (among other things) whether the face is morphologically similar to known faces, with the morphological similarity considering, among other things, some currently accepted racial markers (such as skin pigmentation).[13] Three further points are important to realize about this account.

First, our claim is not that infants decide whether a face is familiar or not by considering its "racial features" *alone*—race is just one dimension in a multi-dimensional face-space (see Valentine, 1991; Valentine & Endo, 1992). Rather, our claim is that the infant compares a given face to known faces using a similarity measure that focuses on a

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[13] Here, it is important to recall that (a) racial classifications differ across time and space (e.g. "Irish" was a racial classification in the 19th Century in the US, and "Han Chinese" is a racial classification in contemporary China; see e.g. Roediger (1999, 2002) and Dikötter (1997, 2015), and (b) biologically, there is little to underwrite any of these racial classifications (Appiah, 1996; Haslanger, 2012; though see also Spencer, 2014).

certain set of morphological features which includes, among others, some currently accepted racial markers.[14] Thus, if an infant mostly sees faces from a given race, it will consider other faces of that race as more familiar than faces from a different race. If the infant often sees faces of many different races, however, this same similarity measure will lead to a different, non-racial class of "familiar" and "unfamiliar" faces. We return to this point below; for now, though, it is sufficient to note that we do not claim that infants only classify faces into the familiar vs. unfamiliar category by considering their racial features (or even that racial features are the major determinant of this classification).[15]

Second, one might wonder about why "racial" features (such as skin color)—rather than, say, whether there is a speck of dust on a person's cheeks—form *any* part of the basis of the similarity measure underlying the FFT. In response to this question, we note two points. On the one hand, the direction of causality between the similarity measure underlying the FFT and the nature of many contemporary racial classifications is not clear. In particular, it is plausible that much racializing happens along psychological fault lines of familiarity. When deciding whether to racialize a given group, we might well—though most likely subconsciously—consider whether this group corresponds to the output of our innate similarity measure for familiar faces. If so, then *any* of the similarity measures that could underlie the FFT would match racial classifications at least some of the time. (We return to this point in section 5.)

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[14] For further discussion of face-spaces, see Valentine (1991); Valentine and Endo (1992); Valentine, Lewis, and Hills (2016).

[15] This is further made implausible by the fact (noted earlier) that infants also consider the gendered features of faces to group them into similarity classes of familiar faces (Quinn et al., 2002).

On the other hand, for a set of facial features to be a good marker of potential caregivers, it has to be sufficiently invariable among the caregivers and sufficiently variable between caregivers and non-caregivers to be a reliable cue with which to distinguish one from the other (Alvergne et al., 2009; Green & Swets, 1966; Kaminski et al., 2009; Kaminski et al., 2012). Many potential facial features fail this test: for example, it is implausible to think that human populations ever faced conditions in which whether there is a speck of dust on a person's cheeks was a good indicator of who is a potential caregiver. By contrast, while we do not want to claim that features like skin color are *always* good markers with which to distinguish caregivers from non-caregivers, we do want to argue that they are at least potential such markers: they are sufficiently heritable and sufficiently easily detectable, at least in some cases, to differentiate caregivers from non-caregivers (Alvergne et al., 2009; Kaminski et al., 2009; Kaminski et al., 2012). This is enough to make it plausible that (so-called) racial facial features would be included in the set of features to attend to when constructing a similarity class of familiar faces.[16]

The third point to note about the FFT account of early racial cognition is that it can be seen as providing the evolutionary underpinnings of the widely accepted face-space accounts of perceptual narrowing (Valentine et al., 2016). These latter accounts are proximate: they note that infants seem to rely on a multi-dimensional face-space to classify faces. What the FFT account adds to this is the ultimate explanation that underlying this face-space is an evolved mechanism for tracking familiar faces that was most likely selected

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[16] This account is also supported by the work of Quinn, Lee, Pascalis, and Tanaka (2016), who have found that while 6-month-old White infants categorically represent the distinction between Black and Asian faces, 9-month-old White infants form a broader other-race category which includes both Black and Asian faces. This suggests that as infants get older, the race of their primary caregiver gets elevated as a marker of which sorts of faces should be included in the "familiar" group, while other "racial" differences get downgraded as bases for similarity groupings of familiar faces.

for allowing infants to attend to potential caregivers. In this sense, the FFT account deepens face-space accounts of racial perceptual narrowing by providing an ultimate, evolutionary explanation for the latter: one in terms of a mechanism that has evolved to track caregivers.

In short: the important point to note here is that we think it is very plausible that infants group faces into similarity classes of familiar and unfamiliar faces, and that there are some good reasons to expect that these similarity classes are at least partly based on features that match the features relevant for current racial classifications. So far, though, this merely shows that the existence and nature of the FFT *might* underlie infant racial cognition—why think that it *actually* does so? In response, we note three sources of support for the FFT-based account.

First, this account fits well to the empirical findings sketched in section 2, as well as to a number of other findings not yet sketched. In particular, as just noted, our account can easily make sense of the facts that (1) newborns do not show racial facial preferences, and (2) 3-month-olds do. Further, we can easily account for the fact that (3) racial facial preferences are quite labile, though less so as children get older. The reason for (3) is that, if racial preferences are just similarity judgments among what faces an infant is familiar with, then, as one changes the base of familiar faces—by exposing the child to more other-race faces—the sorts of faces that are classified as similar to each other changes. Moreover, it is true that, the bigger the base is—i.e. the older the child is—the longer the exposure to other-races needs to be to sway the initial similarity-judgments—after all, the base-line set of data is larger for older children. The same goes for the fact that (4) there is perceptual narrowing in facial recognition (which causes the "other-race effect"). The less experience an infant has with races of a given similarity-type, the less able it will be to discriminate

these faces from each other (D. J. Kelly et al., 2009; D. J. Kelly, Quinn, et al., 2007). Given that something similar holds for a number of other animals, this kind of perceptual narrowing should thus be seen to be a part of the nature of the FFT.

However, there are also several other findings that are well accounted for by the FFT-based account.[17] In particular, there is the fact that (5) if 3-month-old infants are living in a heterogonous racial environment in which they have regular exposure to individuals from other races as well as faces from their own-race, they do *not* demonstrate visual preferences for faces belonging to either group (Bar-Haim et al., 2006).[18] So, Bar-Haim et al. (2006) tested a group of Ethiopian infants who had been raised in an absorption center in Israel. These infants had exposure to both Ethiopian and Israeli adults, and they did not demonstrate preference for either African or Caucasian faces when presented simultaneously (Bar-Haim et al., 2006). Similarly, Gaither, Pauker, and Johnson (2012) found that monoracial Caucasian and Asian infants exposed to a racially diverse social environment do not seem to develop an other-race effect by 3 months. Indeed, they found that biracial 3-month olds even showed a *novelty preference* for Caucasian faces, and that they scan faces differently from monoracial children. Gaither et al. (2012), thus, conclude that their "data are consistent with a differential-experience model of face processing, which argues that cognitive specialization develops in infancy due to environment interactions and inputs during critical developmental time points" (p. 6). In short: the first

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[17] Here, it is also interesting to note that Heron-Delaney et al. (2017) found that Caucasian 3.5- and 6-month-old infants have a preference for upright Caucasian adult over Caucasian infant faces, but no preferences among upright Asian adult and infant faces. This preference is also well accounted for by the fact that these Caucasian infants were mostly familiar with adult Caucasian caregivers.

[18] Similarly, Pauker, Williams, and Steele (2016) found that contextual factors—both of the infants' cultural background and the experimental setting—influence their propensity towards racial categorization. Again, this is very much in line with our account here.

source of support for our account is that it can make sense of a wide variety of empirical findings concerning early racial cognition.[19]

The second source of support for the FFT-based account of early racial cognition comes from the fact that it predicts that infants employ racial categories in their thoughts *independently* of their tracking coalitions, essentialized social groups, or ethnies. This matters, as the latter prediction also has some empirical support. So, while it is true that Rhodes, Hetherington, Brink, and Wellman (2015) showed that 16-month-old infants are able to track social allegiances, Rhodes and Gelman (2009) found that young children do not essentialize racial cues. So, although young children are aware of racial markers, physical appearance-based categories, and social coalitions, and although they treat physical markers as indicative of race as inherited, they do not view racial features as having social significance; instead, children treat these cues as flexible and subjective markers of social categories (Kinzler, Shutts, Dejesus, & Spelke, 2009; Rhodes & Gelman, 2009; Shutts, Kinzler, Katz, Tredoux, & Spelke, 2011). Also, Kinzler and Spelke (2011) found that infants do not demonstrate *social* preferences, i.e. preferences about who to interact with, for own-race individuals.[20]

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[19] Relatedly, it is also worthwhile noting that our account makes some as yet untested predictions that can be used to further distinguish it from rivals. For example, our account predicts that infants growing up in a racially heterogeneous environment will still categorize humans into different groups—corresponding to the familiar and the unfamiliar—but that this categorization will be highly specific to the facial features of the caregivers these infants have been in contact with. For example, some infants growing up in racially heterogeneous environments might categorize heavily by gender, whereas others might categorize heavily by the presence or absence of facial ornaments (earrings etc.). While this prediction of relatively great diversity in facial preferences among infants growing up in racially heterogeneous environments has not yet been tested, we think it is noteworthy here, as it shows that our account is empirically fruitful.

[20] For example, they observed that 10-month-old infants accepted toys equally from own and other-race individuals. In fact, Kinzler and Spelke (2011) did not detect race-based social preferences until 5 years of age: even 2.5-year-old children gave toys equally to White and Black individuals. They did find that 5-to-6-year-old children expressed race-based social preferences in the same events. See below in section 5 for more on this.

Third and finally, the FFT-based account gains support from the fact that a mechanism similar to the FFT is widely accepted to be an evolutionarily relatively ancient part of our minds (and those of many other animals) (see, e.g., Kaminski et al., 2012; Pascalis & Kelly, 2009; Sugita, 2008). In turn, this implies that it should be taken seriously as a driver of racial cognition especially among young infants (who have had relatively little exposure to their wider social environment): it should *somehow* be taken into account in our theorizing about the development of racial cognition, and not simply be ignored.

All in all, therefore, we think that the FFT-based account provides a plausible explanation of the evolution and nature of racial cognition in early infancy. Importantly, furthermore, this account can be combined with the accounts of section 3 to yield a heterogeneous picture of human racial cognition in general. The next section makes this clearer.

5. The Heterogeneous Nature of Human Racial Cognition

It is crucial to note that the account presented in the previous section does not make the claim that humans *never* track social-groups, coalitions, or ethnies by relying on racial features. In fact, it does not even make the claim that much about human racial cognition is not well accounted for by the postulation of modules for tracking social groups, coalitions, or ethnies. Rather, all that we have argued for so far is that it is implausible and unnecessary to see *very young* children as using racial features to track social groups, coalitions, or ethnies. This, though, is consistent with there being another mechanism that

explains the existence of racial cognition *later in life*—both when it comes to facial preferences and when it comes to other psychological attitudes or ways of thinking.[21]

In particular, we think it is uncontroversial that, as infants get older, they learn lots of things from their social environment (what to wear, how to talk, etc.). Because of this, we think that it is very plausible that older children have the cognitive and evidential resources to track social groups, coalitions, or ethnies, and that doing this was selected for. Indeed, we think that the much-acknowledged fact that racial classifications are often heavily socially driven. For instance, Anzures, Quinn, Pascalis, Slater, and Lee (2013), Appiah (1996), and Haslanger (2012) give strong support to the idea that, among older humans, racial cognition is underwritten by the sorts of mechanisms suggested by Hirschfeld (1996), Kurzban et al. (2001), and Gil-White (2001) (even if they do not necessarily consider the last three in detail).

For this reason, we think that racial cognition needs to be seen to change its nature over time. While racial cognition in early infancy is just driven by familiarity, it gains another aspect in addition to this later in life. Graphically, this can be represented like this:

[Figure 1]

According to this figure, from about 3 months of age to sometime later in life, racial cognition is just a byproduct of the FFT. Infants, by this age, track races (to the extent that they do so at all) only in so far as they track familiarity in faces. However, later on in life,

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[21] Scherf and Scott (2012) also hint at a pluralist picture of racial cognition, but for very different reasons.

another cognitive system—such as a coalitions-tracking module—might well have enough information to become active. After that point, "racial" cognition will no longer be a product of just the FFT: another cognitive system also becomes active (and might in fact be the sole source of the racial cognition).[22]

There is much more that can and should be said about the nature of this later kind of racial cognition, and about the switch to it from the earlier, familiarity-driven kind.[23] However, for present purposes, the key point to note is just that the picture developed here is deeply *heterogeneous* in nature. That is, we think that it is plausible that (a) early racial cognition exists (in a way), but also that (b) it differs from later racial cognition and should be explained in a different manner. We think that this two-sided nature of racial cognition is important to emphasize: while it may *appear* that infants think in racial terms in a similar way to older humans, this is a mere surface similarity. Underneath these similarities lie major differences in the psychological mechanisms that bring about these forms of racial cognition. Indeed, a case can be made for the conclusion that infant racial cognition is not actually "racial" at all—the "racial" nature of their thoughts is really just a by-product of their tracking similarity groups of familiar faces. In short: we think that accepting our account of racial cognition in early infancy should lead to the appreciation that the nature of human racial cognition changes over time—away from cognitively relatively shallow familiarity tracking towards more cognitively complex social group tracking.[24]

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[22] See e.g. Lam, Guerrero, Damree, and Enesco (2011) on some of the changes in racial cognition around age 4.
[23] So, for example, Pauker, Xu, Williams, and Biddle (2016) have shown that the propensity for out-group racial stereotyping and for the essentializing of social groups in 4-year olds was culturally variable (greater in Massachusetts and lower in Hawaii). Thus, more research is needed to understand how, when, and in what contexts the switch from the FFT-based to a more complex form of racial cognition occurs.
[24] We also think this conclusion has some major policy implications (see, for example, Lee, Quinn, & Heyman, 2017; Lee, Quinn, & Pascalis, 2017, for how perceptual training—i.e. exposure to other race-faces in infancy—

However, it is critical to flag that we are not arguing that the FFT mechanism does not feed into racial cognition later in life. On the one hand, there is no reason to think that the FFT will cease to be operative in mature humans. For this reason, our account predicts that even adults can be expected to group faces into familiar and unfamiliar categories—a prediction that has some empirical plausibility (Zebrowitz, White, & Wieneke, 2008). On the other hand, as noted earlier, the FFT may well feed into the mechanisms underlying racial cognition in mature humans: for example, familiarity considerations may influence what sorts of coalitions, social groups, or ethnies we expect to encounter. Our point is just that racial cognition gets significantly enriched as humans mature: whereas it initially *just* consists of tracking familiar faces, it becomes more socially focused later in life. This, too, has some empirical support (Telzer, Humphreys, Shapiro, & Tottenham, 2013).

6. Conclusion

We have developed and defended a new account of early racial cognition: this account is centered on the operation of a facial familiarity tracker. Given this, we have shown how our account can be combined with the existing accounts of the nature of racial cognition to yield a heterogeneous picture of racial cognition, according to which early and later racial cognition are similar only on the surface, and in fact driven by radically different psychological mechanisms. In this way, we seek to (a) provide evolutionary biological underpinnings to the existing work on infant racial cognition, and (b) connect this work to

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would reduce implicit racial bias against other races). However, bringing these out in detail calls for a paper of its own.

the existing evolutionary psychological accounts of racial cognition. We thus hope to be able

to push forward our understanding of the evolution and development of racial cognition.

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