Cognitive Development 47 (2018) 124–132

Contents lists available at ScienceDirect

Cognitive Development

journal homepage: www.elsevier.com/locate/cogdev

Inductive reasoning, food neophobia, and domain-specificity in preschoolers

Camille Rioux[a,b,*], Lucas Leglaye[c], Jérémie Lafraire[c]

[a] Max Planck Institute for Human Development, Max Planck Research Group Naturalistic Social Cognition, Lentzallee, 94, Berlin, 14195, Germany
[b] Aix Marseille Université, PSYCLE EA3273, 13621 Aix en Provence, France
[c] Center for Food and Hospitality Research, Paul Bocuse Institute, Chateau du Vivier BP 25, Ecully, 69130, France

ARTICLE INFO

Keywords:
Preschoolers
Food rejection
Categories
Inductive reasoning
Domain-specificity

ABSTRACT

The present study aimed at unravelling the previously reported negative relationship between inductive reasoning performance and the intensity of food rejection tendency (namely food neophobia and pickiness) in preschoolers. More precisely, the objective of the present study is to determine whether the previously reported correlation between poor inductive reasoning performance and high food rejection score is restricted to the food domain only or extends to other domains (e.g. the artefact domain).

To address these questions, we tested 109 preschoolers (*mean age* = 46.90 months). A food rejection score was computed beforehand with a hetero-assessment scale for each subject. Then, the children were asked to perform an induction task followed by a discrimination task on food and artefact stimuli. Results revealed that neophobic children were characterized by poorer induction performance in both the food and the artefact domain compared to their neophilic counterparts. In addition, our results support the hypothesis that inductive reasoning on food stimuli exhibits some sign of domain-specificity. We conclude that the results of the present study pave the way to evidence-based interventions in public health tailored to the specificities of preschoolers' early food categories.

1. Introduction

The view that human beings are only endowed with domain general reasoning abilities they could use on any cognitive task whatever its structure and its content has been seriously challenged over the past decades. Indeed, originated in the pioneer work of Chomsky (1980), Fodor (1983) and Marr (1982) the idea that we are equipped with specialized and constrained learning mechanisms dedicated to particular domains of knowledge has received a great deal of attention for a variety of both theoretical and empirical reasons (Hirschfield & Gelman, 1994, pp. 3–36 for an overview). Among these reasons, hypothesizing domain-specific constrains on learning mechanisms appeared as the key to solve the problem of induction (i.e., the same experience is potentially relevant to extremely diverse inductions, Gelman, 1990). Indeed one way to make the problem of induction easier is to put domain specific constraints on the learning mechanisms to narrow the range of inputs a specific mechanism is sensitive to, and narrow the range of possible interpretations of these inputs (Keil, 1981). Since the problem of induction has to be addressed when it comes to investigate conceptual development in children, many domains of knowledge have been deeply and fruitfully scrutinized over the past decades (e.g., the domain of physics or number, Spelke & Kinzler, 2007). However, despite the wealth of research on domain specificity,

* Corresponding author at: Max Planck Institute for Human Development, Max Planck Research Group Naturalistic Social Cognition, Lentzallee, 94, Berlin, 14195, Germany.

E-mail addresses: rioux@mpib-berlin.mpg.de (C. Rioux), jeremie.lafraire@institutpaulbocuse.com (J. Lafraire).

https://doi.org/10.1016/j.cogdev.2018.05.001
Received 14 December 2017; Received in revised form 7 May 2018; Accepted 7 May 2018

certain very plausible candidates to the status of specific domains of knowledge have been under-researched so far.

1.1. Domain specificity and the food domain

The food domain partly felt out of the scope of the domain approach. Perhaps one of the reasons why it has been partly neglected is because food items are borderline cases with respect to the distinction between natural kinds and artifacts (Rumiati & Foroni, 2016) which has been, on the contrary, extensively studied (Gelman, 2004, 1988). In the following sections, we will briefly review both theoretical and empirical reasons to fill this research gap.

First there is a theoretical reason to consider the food domain as a specific domain of knowledge. Indeed, a domain of knowledge is generally characterized as an adaptation to a range of phenomena that presented problems in the ancestral environment (Sperber & Hirschfeld, 2004) and it is argued that the information in the brain is represented in domains that are important for the survival and fitness of individuals (Mahon & Caramazza, 2011). Interestingly, there was such a problem related to human foraging behavior: the omnivore dilemma. As insightfully stated by Rozin (1976), "trying new foods is at the core of omnivorousness (.. .) so is being wary of them". In a nutshell, after weaning children need to enlarge their dietary repertoire to satisfy their nutritional needs. They must therefore continually sample new food resources as they move away from maternal milk. However, this search for variety can prove hazardous, as new substances may be toxic, and a single mistake in this search could potentially lead to death, and thus hinder fitness (associated with evolutionary success; Dawkins, 1976). Therefore determining which foods are edible and which ones are toxic in a local environment has been an essential task throughout human evolution and may have shaped the way we process information in the food domain (Wertz & Wynn, 2014a, 2014b).

Corroborating this hypothesis, one important empirical finding in the food domain is that children from the age of 2 to 3 years attend to information about color or texture, rather than shape, when discriminating between edible and inedible substances or between different kinds of foods, and also when it comes to generalize novel word and properties to food versus artifacts (Lavin & Hall, 2001; Macario, 1991). Moreover, a recent study has shown that humans tend to rely on color to categorize natural foods according to their energetic value (Foroni & Rumiati, 2017; Foroni, Pergola, & Rumiati, 2016). More precisely, subjects were biased toward attributing significantly less energy to greener food than red food, even when actual calorie content was controlled for. More reddish nuances in natural food items (e.g., fruits) do generally indicate higher energy or greater protein contents (Foroni et al., 2016), therefore being able to identify food items by color would constitute an evolutionary advantage. Furthermore, a recent study conducted by Rioux, Picard, and Lafraire (2016) shed new light on the nature of the contribution of color cues to food categorization in preschoolers. In a discrimination task involving super-ordinate categories (vegetable vs. fruit) color *typicality* impacted the children's discrimination performances (performances were better for typically colored than for atypically colored food items). Thus, the contribution of color cues in the food domain seems at least twofold: certain colors do serve as proxies of energy density but also convey information regarding the typicality of certain food items which in turn may foster or hinder food categorization at least in preschoolers.

These pieces of evidence suggest that color has a special predictive validity in the food domain. The range of inputs food categorization is sensitive to, is constrained in that food categorization may exhibit some specific color-dependence not observable in other domains. One of the ambitions of the present study is to determine whether this is also the case of inductive reasoning about food (H1).

1.2. The relationship between food categories and food rejection

One feature of a domain of knowledge is that it is generally a stable answer to a recurring and complex problem in the ancestral environment (Sperber & Hirschfeld, 2004). The main problem connected to foraging is the omnivore dilemma. We have seen in the previous section that a categorization system constrained to be more sensitive to color information is one response to this adaptive problem. It underpins crucial functions such as discriminating between edible versus non-edible substances, and generalizing for instance the edibility property to exemplars of the same food category (see Murphy, 2002, p.3 for an interesting thought experiment). However, even if we acknowledge that the specific food categorization system and the capacities it underpins constitute a response to the omnivore problem, it grasps only one horn of the dilemma. Indeed, a protective system against the ingestion of potentially dangerous substances (berries and plants in the hunter-gatherer environment) is also needed. Food rejection, particularly food neophobia, has been presented as such a protective and therefore adaptive mechanism (Gigerenzer & Goldstein, 2011; Rozin, 1979). The notion of food rejection encompasses two distinct, though correlated, dimensions: food neophobia and food pickiness (Lafraire, Rioux, Giboreau, & Picard, 2016; Rioux, Lafraire, & Picard, 2017a). Food neophobia is generally defined as the reluctance to eat novel food (Birch & Fisher, 1998; Pliner & Hobden, 1992) whereas food pickiness concerns both familiar and unfamiliar food items (Taylor, Wernimont, Northstone, & Emmet, 2015). Food rejection has been presented as one of the strongest psychological barriers to a diversified diet, as it mostly targets fruits and vegetables (Dovey, Staples, Gibson, & Halford, 2008; Falciglia, Couch, Gribble, Pabst, & Frank, 2000).

An interaction between food rejection and the food categorization system has been empirically revealed recently. A first experiment conducted with children from 3 to 5 years of age, revealed that the intensity of food rejection was negatively correlated with children's performances on a food categorization task (Rioux et al., 2016). Such a negative correlation has been observed also between the intensity of food rejection and preschooler's performance on an induction task on food stimuli (Rioux, Lafraire, & Picard, 2017b). Regarding the direction of the causal arrow, the authors suggested that we could be facing a vicious circle. Food rejection may hinder the development of the food categories. Reciprocally, a child with poor conceptual knowledge about food encounters