Food Neophobia: a Barrier to The Development of Categorization and Executive Functions

Damien Foinant (dfoinant@institutlyfe.com)
Institut Lyfe Research Center, Ecully, France
LEAD – Centre National de la Recherche Scientifique UMR-5022, Université Bourgogne Europe, Dijon, France

Jean-Pierre Thibaut (jean-pierre.thibaut@u-bourgogne.fr)
LEAD – Centre National de la Recherche Scientifique UMR-5022, Université Bourgogne Europe, Dijon, France

Jérémie Lafraire (jlafraire@institutlyfe.com)
Institut Lyfe Research Center, Ecully, France
Laboratoire CHArt, Cognitions Humaine et ARTificielle, EPHE - PSL, École Pratique des Hautes Études - Paris Sciences Lettres, Campus Condorcet, Aubervilliers, France

Abstract

The majority of evidence on the relations between young children's levels of food neophobia (the fear of novel food), categorization abilities and executive functions is cross-sectional, leaving the direction of causality unclear. This study aimed to examine the bidirectional relations between children's food neophobia, categorization performance and strategies, and executive functions (working memory, inhibition and cognitive flexibility) longitudinally. Children (n = 113; M age = 48.30 months at Time 1) were assessed at two time points over the course of a year of schooling. Controlling for age, early levels of food neophobia significantly predicted lower subsequent categorization performance and executive functions. No significant evidence was found to support the reverse directionality; neither categorization performance, strategies, nor executive functions at Time 1 predicted subsequent levels of food neophobia. The findings provide longitudinal evidence that neophobia hinders the development of categorization and executive functions abilities.

Keywords: neophobia; cognitive development; categorization abilities; executive functions; cross-lagged analysis

Introduction

In domains where uncertainty is confounded with risk (e.g., social interactions, spatial exploration, or eating), novelty can trigger fear and avoidance, a response known as neophobia (Crane et al., 2020). This tendency is particularly pronounced in the food domain during early childhood (Dovey et al., 2008; Lafraire et al., 2016), as it reduces the risk of ingesting harmful substances (Rozin, 1976, 1990). However, while neophobia serves an adaptive protective function, it can also limit dietary variety by preventing children from incorporating new food resources (Cole et al., 2017; Nicklaus & Monnery-Patris, 2018). As a result, the past three decades have seen growing efforts to better understand food neophobia (Karaağaç & Bellikci-Koyu, 2023; Reilly, 2018) and inform effective interventions (Appleton et al., 2016; Lafraire et al., 2016).

However, it is only recently that developmental research has begun to explore how food neophobia relates to children's emerging cognitive abilities. A growing body of empirical works suggests that higher levels of food neophobia are negatively associated with the key cognitive processes of categorization (Pickard et al., 2021; Rioux et al., 2016, 2018a) and executive functions (EF; Foinant et al., 2022a, 2024a).

However, the current evidence base is largely cross-sectional, leaving the direction of causality unclear. The present work aims to disentangle this complex relation by investigating the causal direction between food neophobia and these cognitive mechanisms in young children. Through a longitudinal study, we examine the reciprocal relation between food neophobia and the development of categorization and EF over a year of schooling.

Categorization is a fundamental cognitive mechanism that enables the organization of entities into groups (Vauclair, 2004). Without this ability, each item would be perceived as novel, making it impossible to generalize its properties (e.g., assuming that because one carrot is edible, other carrots will be as well; Murphy, 2002). Correlational research has revealed significant associations between children's food neophobia and both their categorization performance (Foinant et al., 2024a; Pickard et al., 2023; Rioux et al., 2016, 2018a) and strategies (i.e., to favor certain types of errors when one type is associated with a greater risk; Foinant et al., 2021, 2022b).

In their seminal work, Rioux and colleagues (2016) assessed the performance of 2- to 6-year-old children to discriminate between vegetables and fruits using a forced-choice task. They found that children with higher levels of food neophobia were less accurate in categorizing foods. In a subsequent study, the authors observed that neophobic children tended to rely more heavily on perceptual features, such as color or shape, rather than using taxonomic relations, to generalize novel properties (Rioux et al., 2018a).

Recent research suggests that this association extends beyond mere performance to the strategies employed during categorization (Foinant et al., 2021). Using the Signal Detection Theory (SDT; Macmillan & Creelman, 2004) to dissociate categorization performance from strategies, which change based on perceived risks associated with different responses, Foinant and colleagues (2022b), found that food neophobia was negatively correlated with preschoolers' ability to discriminate between edible and perceptually similar non-edible substances (e.g., an orange vs. a basketball). Additionally, neophobic children were more likely to incorrectly classify edible foods as inedible, reflecting an overly cautious strategy to categorization.

These findings have led some scholars to conceptualize food neophobia primarily as a categorization problem (Harris, 2018; Rioux et al., 2018b; Rioux, 2020). This perspective suggests that children who struggle to recognize or categorize a given food as familiar or edible are more likely to exhibit neophobic tendencies.

In D. Barner, N.R. Bramley, A. Ruggeri and C.M. Walker (Eds.), *Proceedings of the 47th Annual Conference of the Cognitive Science Society*

Alternatively, the reverse hypothesis, that neophobia may impede the development of categorization abilities, is equally plausible. Conceptual knowledge, that supports categorization, is fundamentally shaped by an individual's interactions with their environment and novel stimuli (Borghi et al., 2017; Fisher et al., 2015; Gelman & Markman, 1987). However, by avoiding novel experiences, neophobic tendencies may limit children's opportunities to acquire knowledge in the food domain.

According to the cyclical model proposed by Rioux and colleagues (2016), food neophobia may negatively affect a child's ability to categorize foods, while poor categorization skills, in turn, reinforce neophobic tendencies, creating a self-perpetuating cycle.

Recent findings on the significant negative association between children's food neophobia and EF (Foinant et al., 2022a, 2024a) suggest that the fear of novelty may be linked to an inability adapting to new contexts, rather than solely a deficit in categorizing objects within them. EF encompasses higher-order cognitive processes, including the ability to hold, manipulate, and retrieve novel information in working memory, inhibit prepotent responses, and flexibly adjust thinking and behavior in response to changing environmental demands (Blair, 2002; Diamond, 2013; Miyake et al., 2000; Miyake & Shah, 1999). Collectively, EF are essential for processing and adapting to novelty.

Existing correlational research has revealed a nuanced relation between children's EF and their food neophobia. Specifically, cognitive flexibility has consistently shown a negative correlation with food neophobia, whereas the relations between neophobia and inhibition, as well as working memory, remains less clear (Foinant et al., 2022a, 2024a). For instance, Foinant and colleagues (2024a) observed different patterns across two studies: in the first study, both flexibility and working memory were correlated with food neophobia, while in the second study, involving slightly younger children, flexibility and inhibition were the key correlates.

Given that children with high levels of food neophobia exhibit rigidity in their eating habits and struggle to adapt to changes in their food routines, neophobia could be interpreted as a deficit in EF (Foinant et al., 2022a). For example, neophobic children often demonstrate reluctance to try new foods and consistently seek out familiar options, rejecting previously accepted foods due to changes in sensory information (e.g., taste, texture, mode of presentation, or cooking) or eating contexts (such as food consumed at lunch rather than dinner or at someone else's house; Rioux et al., 2017; Williams et al., 2005). These findings suggest that limitations in EF may hinder a child's ability to adapt to changes in eating routines, leading them to consistently demand the same foods, in the same context, and with the same presentation.

Corroborating this directional hypothesis, Zohar and colleagues (2020) found that EF measured at 3 years of age significantly predicted picky eating (which include the rejection of novel foods) five years later. However, their regression analysis did not account for children's previous levels of picky eating, and since EF were assessed only at baseline, the alternative hypothesis, that picky eating may influence the development of EF, could not be examined.

However, chronic food neophobia could lead to future EF issues in children through, at least, two distinct pathways. First, food neophobia may indirectly affect EF by reduced dietary quality and variety, particularly the intake of fruits and vegetables (Fletcher et al., 2017; Perry et al., 2015), which have been linked to better EF development (see Cohen et al., 2016 and Egbert et al., 2019 for reviews). Second, since food neophobia predicts neophobia in other domains (Hursti & Sjödén, 1997; Moding & Stifter, 2016), excessive avoidance driven by neophobia can limit opportunities for engaging in novel and challenging activities, which are crucial for practicing and strengthening EF (Barker et al., 2014; Diamond & Lee, 2011).

The current study

The objective of this study was to investigate the causal relations among neophobia, categorization performance and strategies (as conceptualized in SDT, following the approach of Foinant et al., 2022), and EF from ages 4 to 5.

While past studies have often examined EF subcomponents (e.g., working memory, inhibition, and cognitive flexibility) as distinct skills, recent research suggests that EF in early childhood may be best conceptualized as a unitary construct (Garon et al., 2008; Willoughby et al., 2016). Accordingly, and in line with previous work (e.g., Welsh et al., 2010; Wolf & McCoy, 2019), this study operationalizes EF as a single construct. Moreover, this approach has the advantage of reducing measurement error and limiting the number of estimated parameters (Baribeau et al., 2022; Kline, 2016; Little, 2013), which is particularly beneficial for studies with small sample sizes, such as the present one.

Following the cyclical model proposed by Rioux and colleagues (2016), we hypothesized that categorization performance and EF would predict neophobia, while neophobia, in turn, would predict subsequent categorization performance and EF. While not the primary focus of this study, given prior evidence demonstrating the importance of EF in categorization performance (Blaye & Jacques, 2009; Foinant et al., 2024a; Lagarrigue & Thibaut, 2025), we hypothesized that early EF would predict categorization performance outcomes. Due to the lack of prior research, no specific hypothesis was formulated regarding the relation between EF and categorization strategies.

Method

Participants

To our knowledge, no longitudinal studies have examined the associations between food neophobia and either categorization abilities or EF. The closest study to date investigated whether EF predicted picky eating (Zohar et al., 2020), which, although a different disposition (Rioux et al., 2017), includes the rejection of novel foods. Accordingly, our power analysis estimates were based on the effect size of .044 reported in their study. To detect a similar effect size with a power of .80 at an α-level of .05, a sample of 178 children would be required.

176 children participated in the initial assessment of this two-wave longitudinal study. A 30% dropout rate occurred at Time 2 (T2; $n = 53$). Additionally, 10 participants were excluded from the study: 4 due to missing data at Time 1 (T1), three due to unwillingness to participate, one due to a different procedure at

T2 compared to T1, one due to an atypical development diagnosis, and one due to the parent's failure to complete the food neophobia questionnaire at T2. The final sample comprised 113 children who completed both waves of data collection (50 girls: T1, M = 48.30 months, SD = 7.20; T2, M = 57.34 months, SD = 7.18).

Informed consent was obtained from the school and each participant's legal guardian/next of kin. Children provided verbal assent before commencing any procedures. Participants retained the right to withdraw from the study without consequence. The study was approved by the ethics committee of the local University (ref. 2023-02-02-004).

We reported all data exclusions. The study's design and analysis were preregistered. Supplemental online materials, data and analyses are available on OSF: https://osf.io/5utgb/.

Materials and procedure

The procedures and measures were identical across both time points. Children were assessed individually in their preschool on the food categorization task and the three EF tasks. The order of task presentation was randomized for each child.

Food neophobia To assess each child's level of food neophobia, caregivers completed the six-item neophobia subscale of the Child Food Rejection Scale (Rioux et al., 2017) at both T1 and T2. Responses were rated on a five-point Likert scale ranging from "Strongly disagree" (1) to "Strongly agree" (5). A sample item from the neophobia scale is "My child rejects a novel food before even tasting it." The food neophobia scale exhibited good internal consistency at both T1 (α = .865) and T2 (α = .843). Food neophobia scores were normalized, resulting in a range from 0 to 1.

Food categorization We adapted the forced-choice categorization task from Rioux et al. (2016) to introduce asymmetrical error costs. Specifically, misses, failing to reject a food item from a forbidden category, were framed as riskier than false alarms, or incorrectly rejecting an acceptable item. This design allowed us to assess not only how accurately children categorized foods, but also their strategies to favor one type of error over the other.

This task employed pictures of 7 common vegetables and 7 fruits in both typical and atypical color variations (e.g., a green and yellow zucchini). To ensure ecological validity, the selection of stimuli was informed by an analysis of the school canteens' menus to identify commonly served foods. The images depicted the foods as they are typically served in the canteen (e.g., zucchini slices).

To minimize the influence of children's own food preferences or consumption habits on the task, we employed a puppet named "Feppy" (Foinant et al., 2021). The categorization task comprised two phases: practice and test.

Initially, children were instructed: "Meet Feppy, my friend! I need your help to feed him. Feppy can't eat **vegetables**/*fruits*. Look, he ate **green beans**/*banana*, he threw up and got sick because **green beans**/*banana* **are**/*is* a **vegetable**/*fruit*, and Feppy can't eat them. You will place all **vegetables**/*fruits* in this box (pointing to the box depicting a sick Feppy). But anything that isn't a **vegetable**/*fruit*, Feppy can eat. Look, he can eat **banana**/*green beans* because they are not **vegetables**/*fruits* (pointing to the box depicting a healthy Feppy). Anything that is not a **vegetable**/*fruit* goes in this box. Do you understand? Can you show me where all **vegetables**/*fruits* go? Can you show me where anything that is not a **vegetable**/*fruit* goes?" Two pictures of Feppy were placed in front of the respective boxes: one depicting Feppy sick after eating **green beans**/*banana* and the other showing a healthy Feppy after eating **banana**/*green beans*. These Feppy images were adapted from Foinant et al. (2021).

To ensure understanding, children completed six practice trials with feedback (3 vegetables and 3 fruits) presented in a randomized order. Before starting the test phase, the game rules were reiterated. In the test phase, the experimenter presented each card without naming it in a randomized order and asked, "Can Feppy eat this or not?" No feedback was provided during the test phase. The conditions (i.e., vegetables and fruits) were counterbalanced across participants.

Executive functions This study assessed the three core EF identified by Miyake et al. (2000): working memory, inhibition, and cognitive flexibility. Prior research using a broad range of EF tasks, similar to those employed in the present study, has demonstrated acceptable to excellent convergent validity and test-retest reliability (Howard & Melhuish, 2017).

To assess children's working memory, we administered the Forward Digit Span (FDS; Blankenship et al., 2019). Children were instructed to verbally repeat sequences of numbers in the order presented by the experimenter. The procedure included two 2-digit practice trials, followed by test trials that began with 2-digits and increased by one digit after each successful response. The task was terminated after two consecutive failures at the same span length.

To assess inhibition, we used the version of the Day-Night task (DN; Gerstadt et al., 1994) adapted by Simpson and Riggs, (2005). The experimenter explained that they would play a "silly game" involving two pictures: a car and a boat. The experimenter showed the child each picture and asked them to name it. Subsequently, the experimenter instructed the child to say "car" when shown the boat picture and "boat" when shown the car picture. Children were explicitly instructed not to say "car" when shown the car or "boat" when shown the boat. A four-trial training session (order ABAB) with feedback was conducted. For example, if the child said "car" when shown the boat, the experimenter confirmed the correct response. However, if the child responded "car" when shown the car, the experimenter provided corrective feedback, stating that they were supposed to say "boat." During the test session, the child was presented with 16 cards, presented in the same pseudorandom order (ABBABAABBABAABAB). No feedback was provided during the test session.

Cognitive flexibility was assessed using the Dimensional Change Card Sort task (DCCS; Zelazo, 2006). Children were initially presented with 2 target stimuli: a blue rabbit and a red boat. They were instructed to sort a series of 6 test stimuli (3 red rabbits and 3 blue boats) by color. After correctly sorting five out of six images, children proceeded to the next step. In the second step, children were required to sort 6 new test stimuli by shape. After correctly sorting five out of six images in this step, they moved on to the final, more challenging phase. The final phase involved sorting 12 test cards, each with or without a border. Children were instructed to sort the cards by color if they had a border and by shape if they did not. There were 6 cards with a border and 6 without.

Scores for each task were calculated as the proportion of items correct, ranging from 0 to 1.

Statistical analysis

For the categorization task, participants were assigned a Hit score (the probability of correctly classifying food items that Feppy cannot eat) and a False alarm score (the probability of classifying food items that Feppy can eat as inedible). Using the Hit and False alarm scores, SDT was employed to calculate a categorization performance index (*A’*) and a strategy index (*B’’*; see Grier, 1971; Snodgrass & Corwin, 1988; Stanislaw & Todorov, 1999). The *A’* index, ranging from 0 to 1, reflects discriminability: 0.50 indicates chance-level performance, while 1 signifies maximum discriminability. The *B’’* index, ranging from -1 to +1, reflects response bias: -1 indicates a risk-averse strategy (tendency to classify stimuli as inedible), and 1 indicates a risk-taking strategy (tendency to classify stimuli as edible).

To ensure our categorization task effectively captured differences in categorization performance (*A’*) and strategies (*B’’*) as a function of neophobia, it underwent a pretesting phase with a sample of 121 children aged 3 to 6 years who were not part of the longitudinal study (61 girls: $M = 60.78$ months, $SD = 10.22$). Pearson’s correlation analyses confirmed the expected significant negative associations between children’s food neophobia and both categorization performance (*A’*; $r = -.203$, $p = .026$) and strategies (*B’’*; $r = -.203$, $p = .025$).

To investigate the longitudinal associations among food neophobia, EF, categorization performance (*A’*), and strategies (*B’’*) at T1 and T2, the present study employed a cross-lagged model. To control for the influence of age on our main variables, standardized residuals were computed for each measure, controlling for age at both T1 and T2. This approach addressed age-related effects across both measurement points, rather than only at baseline (Esrey et al., 1990).

To select our best-fitting model, we followed the formal model selection approach described by Garrido et al. (2022). Multiple candidate models were compared using the Akaike Information Criterion corrected for small sample sizes (AICc), with the lowest AICc value indicating the best-fitting model.

The final selected model included two latent factors representing EF at T1 and T2. Each latent factor was constructed using the residuals of working memory, inhibition, and cognitive flexibility scores, after controlling for age at the respective time points. The model includes autoregressive paths for food neophobia, EF, categorization performance (*A’*) and strategies (*B’’*). It also incorporated cross-lagged paths, with food neophobia at T1 predicting both EF and categorization performance (*A’*) at T2, EF at T1 predicting categorization performance (*A’*) at T2, and categorization performance (*A’*) at T1 predicting categorization strategies (*B’’*) at T2. Additionally, the model accounts for covariances between T2 variables and between corresponding indicators across time points. This structure allows us to examine the longitudinal relations between food neophobia, EF and categorization indices while accounting for their previous states and potential interrelations.

Model fit was assessed using the following criteria: Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) values greater than .90, and Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) values less than .08 (Hu & Bentler, 1999; Kline, 2016). The model was estimated using Maximum Likelihood estimation method with the *lavaan* package (Rosseel, 2012) in R Version 4.2.1 (R Core Team, 2021).

Results

Descriptive statistics and bivariate correlations between all study variables are presented in Table 1.

The cross-lagged model demonstrated a good fit to the data: CFI = .934, TLI = .895, RMSEA = .062, 90%CI = [.016, .096] and SRMR = .089.

As shown in Figure 1, food neophobia, EF, and categorization performance (*A’*) demonstrated significant stability across time ($\beta = .740$, $SE = .063$, $p < .001$; $\beta = .960$, $SE = .329$, $p < .001$; $\beta = .173$, $SE = .085$, $p = .049$, respectively), while categorization strategies (*B’’*) did not ($\beta = .172$, $SE = .091$, $p = .058$).

The model revealed that food neophobia at T1 significantly and negatively predicted both EF ($\beta = -.195$, $SE = .071$, $p = .029$) and categorization performance (*A’*; $\beta = -.263$, $SE = .087$, $p = .003$) at T2. No evidence was found for the reverse effects; neither categorization performance, strategies, nor EF at T1 significantly predicted food neophobia at T2. Notably, the magnitude of the two cross-lagged associations did not differ significantly ($W(1) = 0.98$, $p = .323$), suggesting that food neophobia may hinder the development of both categorization performance and EF in a similar manner.

Furthermore, our findings revealed that EF at T1 significantly predicted categorization performance (*A’*; $\beta = .321$, $SE = .225$, *p*

Table 1: Descriptive statistics and bivariate correlations at the two time points

	Variable	*M* (*SD*)	1	2	3	4	5	6	7	8	9	10	11
1	Food neophobia T1	.398 (.238)											
2	*A’* T1	.665 (.153)†	-.377***										
3	*B’’* T1	- .010 (.261)	-.194*	.019									
4	FDS T1	.409 (.152)	-.033	.246**	-.027								
5	DN T1	.744 (.295)	-.121	.201*	.014	.333***							
6	DCCS T1	.507 (.263)	-.399***	.373***	.001	.353***	.289**						
7	Food neophobia T2	.390 (.227)	.750***	-.262**	-.167	-.063	-.133	-.300**					
8	*A’* T2	.747 (.147)†	-.386***	.363***	.155	.162	.249**	.393***	-.360***				
9	*B’’* T2	- .034 (.313)	.098	-.208**	.157	-.031	-.119	-.125	.111	-.134			
10	FDS T2	.453 (.130)	-.226*	.270**	.103	.619***	.151	.411***	-.286**	.221*	-.032		
11	DN T2	.793 (.241)	-.183	.300**	.098	.265**	.398***	.249**	-.115	.266**	-.116	.112	
12	DCCS T2	.595 (.250)	-.208*	.243**	.104	.417***	.323***	.404***	-.174	.374***	-.097	.442***	.270**

Note. A’, *B’’*, FDS, DN and DCCS respectively stand for categorization performance, categorization strategies, Forward Digit Span (working memory), Day-Night (inhibition) and Dimensional Change Card Sort (cognitive flexibility). † categorization performance at both T1 and T2 was significantly above chance guessing. * $p < .05$, ** $p < .01$, *** $p < .001$.

= .024) at T2. This finding suggests that higher EF scores may support the development of better categorization abilities.

Finally, categorization performance (*A'*) at T1 significantly predicted categorization strategies (*B''*; β = -.205, *SE* = .091, *p* = .024) at T2, suggesting that children with better initial categorization abilities may develop more liberal categorization strategies over time. Children who demonstrate strong categorization abilities early on may become more confident in their ability to distinguish between meaningful signals and noise. This increased confidence may lead them to adopt more liberal strategies when faced with uncertain decisions, such as deciding whether a stimulus is edible or not.

Discussion

The primary aim of this study was to examine the pattern of associations between preschoolers' neophobia and cognitive development across two time points. Specifically, we investigated whether and how food neophobia predicted categorization performances, strategies and EF, whether categorization and EF predicted prospective neophobia, and how categorization and EF related to one another. Our results revealed evidence for small to moderate unidirectional relations from neophobia to both categorization performance and EF, highlighting its key, albeit negative, role in young children's cognitive development.

Our findings revealed that while young children's categorization performance and EF demonstrated stability over time, food neophobia emerged as a moderate predictor of their development. Notably, food neophobia predicted unique variance in categorization performance outcomes, with an effect size approximately one and a half times the magnitude of previous categorization skills ($\beta_{A'T1}$ = .173; $\beta_{NeophobiaT1}$ = -.263). This substantial predictive power suggests that children's neophobia may hinder the development of categorization skills.

Importantly, the predictive effect of neophobia on categorization performance persisted even when controlling for EF, suggesting that its impact extends beyond the alternative hypothesis of full mediation by EF. This finding aligns with previous research by Foinant et al. (2024a), which demonstrated that neophobia directly affects categorization performance independently of EF's indirect effects. These results highlight the unique contribution of neophobia to categorization development, warranting further investigation into its underlying mechanisms.

A plausible hypothesis is that neophobia hinders categorization performance by limiting children's opportunities to develop conceptual knowledge. Conceptual knowledge supports finer distinctions within initially undifferentiated concepts, ultimately leading to more accurate categorization (Galotti et al., 2022; Gelman, 2003; Gentner & Hoyos, 2017; Keil, 1992; Murphy, 2002; Oakes & Madole, 2003). Much of this knowledge is acquired through everyday interactions with real-world events and objects (Borghi et al., 2017; Fisher et al., 2015; Gelman & Markman, 1987). By avoiding novel objects and experiences, neophobic children may miss opportunities to acquire new knowledge or deepen their existing understanding. This avoidance could significantly hinder the development of more refined and accurate categorization abilities, as well as the broader conceptual knowledge required to navigate and understand the world around them.

An alternative hypothesis is that food neophobia does not influence conceptual development directly but rather affects children's understanding of the rhetorical structure of the task. Our decision to assess children's ability to categorize fruits and vegetables by asking whether a character could eat them was intended not only to measure categorization performance but also to capture their strategies, in the face of varying perceived risks associated with different types of errors. While the complexity of these instructions could influence performance, as in the classic case of Piaget's conservation tasks (Gelman, 1969, 1978; Mehler & Bever, 1967), this explanation seems unlikely: children's performance was already significantly above chance by age four, and prior studies using simpler instructions have consistently demonstrated associations between food neophobia and categorization performance (Rioux et al., 2016, 2018a; Pickard et al., 2021, 2023). Nevertheless, it remains worth exploring whether food neophobia is related to cognitive processes involved in interpreting the rhetorical structure of tasks, such as Theory of Mind or metacognitive skills, which may mediate its influence on categorization.

Our findings also revealed that food neophobia significantly and negatively predicted EF outcomes, with an effect approximately one-fifth the magnitude of the EF autoregressive effect (β_{EFT1} = .960; $\beta_{NeophobiaT1}$ = -.195). This result aligns with a hypothesis similar to that proposed for categorization performance: neophobia may hinder EF development through experiential avoidance. Optimal EF development requires regu-

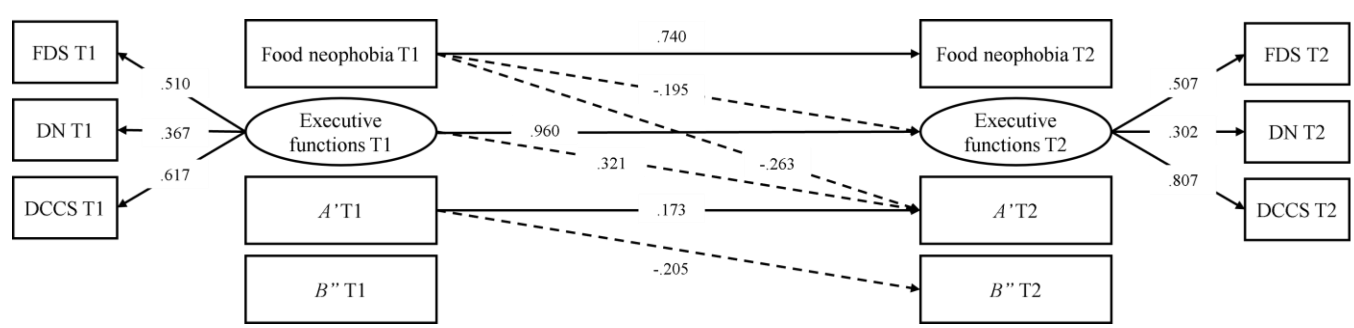

Figure 1: Standardized Path Coefficients. Solid lines represent regressive effects and dotted lines represent cross-lagged relations. Only significant paths are displayed. Direct measures are shown as squares and latent variables are shown as ovals.

Note. Model fit statistics: CFI = .934, TLI = .895, RMSEA = .062, 90%CI = [.016, .096] and SRMR = .089. *A', B''*, FDS, DN and DCCS respectively stand for categorization performance, categorization strategies, Forward Digit Span (working memory), Day-Night (inhibition) and Dimensional Change Card Sort (cognitive flexibility).

lar activation, maintenance, and challenge (Diamond & Lee, 2011). Engaging in diverse and novel activities provides critical cognitive stimulation for strengthening EF (Barker et al., 2014). However, neophobic individuals, by consistently avoiding new experiences, may inadvertently limit these opportunities, thereby constraining the development of their EF.

An alternative hypothesis that warrants further attention is the role of diet quality in the development of EF. A systematic review conducted by Cohen and colleagues (2016; see also Egbert et al., 2019) highlights the positive influence of healthier dietary habits on children's EF. In contrast, food neophobia is often associated with less healthy eating patterns, including reduced consumption and variety of fruits and vegetables and increased intake of discretionary foods (Knaapila et al., 2015; Perry et al., 2015). This pattern suggests that children with high levels of food neophobia may lack essential nutrients critical for cognitive development. Future research should examine whether diet quality mediates the relation between food neophobia and EF development.

These findings regarding the unidirectional relation between food neophobia and EF may seem to contradict the results of Zohar et al. (2020), who found that EF at 3 years of age predicted picky eating at 8 years of age. However, it is important to note that the authors did not examine the effects of baseline EF on picky eating assessed at 5 years of age. This raises the possibility that the relationship between EF and the maintenance of food neophobia may only become evident over longer developmental periods than those examined in our study. Longitudinal studies that track children across extended developmental periods are needed to provide a more comprehensive understanding of the dynamic interplay between EF and food neophobia.

Indeed, one significant limitation of this study is the collection of data at only two time points. Future research should aim to follow children over a longer duration, ideally beginning before the age of two to capture the onset of food neophobia and continuing throughout the preschool years, when neophobia is believed to peak (Dovey et al., 2008). Such a longitudinal approach would enable researchers to examine whether EF plays a maintenance role in food neophobia and confirm its significant yet partial mediating role in the relationship between neophobia and categorization performance (Foinant et al., 2024a). Further, given that our findings indicate that EF predicts categorization outcomes, additional research is needed to better understand the dynamic interactions between these cognitive mechanisms.

Another limitation of the present study is the use of the same measures at each time point. While this approach allowed for direct comparisons across time, it may have limited the sensitivity of static measures to detect subtle changes and developmental growth in these variables. Future research should consider employing adaptive measures that are better suited to capture developmental changes and individual growth trajectories.

Additionally, our study had a 30% dropout rate, limiting the overall sample size. A larger sample would not only enhance statistical power but also allow for more nuanced analyses, such as estimating additional parameters to assess whether neophobia differentially predicts specific EF components.

Moreover, since food neophobia has been shown to predict other forms of neophobia (e.g., Moding & Stifter, 2016) and is associated with the development of domain-general cognitive mechanisms such as EF, an important question is whether its influence on categorization extends beyond the food domain. Our study focused on food because neophobia represents a universal protective disposition (Białek-Dratwa et al., 2022; Dolgopolova et al., 2015) that typically arises in situations where uncertainty is entangled with risk (Crane et al., 2020). Food carries inherent and enduring dangers, such as poisoning, which make accurate categorization particularly vital in this domain. Nonetheless, emerging evidence suggests that the influence of food neophobia on categorization may generalize to other domains such as natural kinds and artifacts (Foinant et al., 2024b; Rioux et al., 2018b). However, no such effect has been found in tasks measuring domain-general visual categorization ability, *o*, which involve abstract stimuli lacking real-world significance (Gauthier & Fiestan, 2023). Taken together, both theoretical perspectives and emerging empirical evidence suggest that neophobia may influence categorization primarily in domains where errors carry some form of intrinsic value or risk (e.g., "Is it edible?", "Is this a dangerous animal?" or "Can this object hurt me?"). To further test this idea, it would be informative to compare children's categorization in tasks involving abstract, symbolic stimuli versus meaningful, risk-relevant ones.

Lastly, our study exclusively tested children's categorization skills using a forced-choice paradigm. While this approach enabled us to compute both performance and strategy indices based on SDT, it may limit the generalizability of our findings. Previous research indicates that food neophobia negatively impacts children's performance on various category-based skills beyond those assessed in our study (Pickard et al., 2023; Rioux et al., 2018a). Future research should investigate whether our findings regarding the predictive role of neophobia on categorization performance extend to other paradigms, such as category learning (Sloutsky & Fisher, 2004), inductive reasoning (Gelman & Markman, 1987), or analogy tasks (Thibaut et al., 2010, Pickard et al., 2021). By exploring a broader range of cognitive tasks, researchers can gain a more comprehensive understanding of how food neophobia influences various aspects of cognitive development.

Despite these limitations, the results of this study highlight the significant and detrimental impact of neophobia on the development of higher-order cognitive mechanisms essential for children's future success. Categorization is foundational in various academic fields, including biology, psychology, physics, and chemistry (Coppens et al., 2021). It also supports critical cognitive processes such as abstraction, analogy-making, inference, and theory construction (Gelman & Meyer, 2011). Furthermore, a substantial body of research has demonstrated that well-developed EF are associated with successful goal attainment across multiple life domains (Blair & Razza, 2007; Dunn, 2010; Eakin et al., 2004; Gathercole et al., 2004; Prince et al., 2007). Understanding how neophobia hinders cognitive development is therefore crucial. Given its influence on both categorization abilities and EF, it is vital to encourage neophobic children to engage in diverse, novel, and stimulating experiences that foster their cognitive growth.

Acknowledgments

This work was supported by the BAGEL project co-founded by the ANR-21-PRRD-0047-01 and the Institut Lyfe Research Center. We thank the children, their parents and schools for their contributions. The authors thank Charline Ravier, Maria-Clara Duarte-Oliveira, Pauline Fibaque, Mélody Hannoah, Sabrina Boulkour, Matteo Gandolini and Carol Coricelli for their help in collecting the data. The authors have no conflicts of interest to declare.

References

Appleton, K. M., Hemingway, A., Saulais, L., Dinnella, C., Monteleone, E., Depezay, L., Morizet, D., Armando Perez-Cueto, F. J., Bevan, A., & Hartwell, H. (2016). Increasing vegetable intakes: Rationale and systematic review of published interventions. *European Journal of Nutrition*, *55*(3), 869–896. https://doi.org/10.1007/s00394-015-1130-8

Baribeau, D. A., Vigod, S., Brittain, H., Vaillancourt, T., Szatmari, P., & Pullenayegum, E. (2022). Application of Transactional (Cross-lagged panel) Models in Mental Health Research: An Introduction and Review of Methodological Considerations. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, *31*(3), 124–134.

Barker, J. E., Semenov, A. D., Michaelson, L., Provan, L. S., Snyder, H. R., & Munakata, Y. (2014). Less-structured time in children's daily lives predicts self-directed executive functioning. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00593

Białek-Dratwa, A., Szczepańska, E., Szymańska, D., Grajek, M., Krupa-Kotara, K., & Kowalski, O. (2022). Neophobia—A Natural Developmental Stage or Feeding Difficulties for Children? *Nutrients*, *14*(7), Article 7. https://doi.org/10.3390/nu14071521

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist*, *57*(2), 111–127. https://doi.org/10.1037/0003-066X.57.2.111

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development*, *78*(2), 647–663. https://doi.org/10.1111/j.1467-8624.2007.01019.x

Blankenship, T. L., Slough, M. A., Calkins, S. D., Deater-Deckard, K., Kim-Spoon, J., & Bell, M. A. (2019). Attention and executive functioning in infancy: Links to childhood executive function and reading achievement. *Developmental Science*, *22*(6), e12824. https://doi.org/10.1111/desc.12824

Blaye, A., & Jacques, S. (2009). Categorical flexibility in preschoolers: Contributions of conceptual knowledge and executive control. *Developmental Science*, *12*(6), 863–873.

Borghi, A. M., Binkofski, F., Castelfranchi, C., Cimatti, F., Scorolli, C., & Tummolini, L. (2017). The challenge of abstract concepts. *Psychological Bulletin*, *143*(3), 263–292. https://doi.org/10.1037/bul0000089

Cohen, J. F. W., Gorski, M. T., Gruber, S. A., Kurdziel, L. B. F., & Rimm, E. B. (2016). The effect of healthy dietary consumption on executive cognitive functioning in children and adolescents: A systematic review. *British Journal of Nutrition*, *116*(6), 989–1000. https://doi.org/10.1017/S0007114516002877

Cole, N. C., An, R., Lee, S.-Y., & Donovan, S. M. (2017). Correlates of picky eating and food neophobia in young children: A systematic review and meta-analysis. *Nutrition Reviews*, *75*(7), 516–532. https://doi.org/10.1093/nutrit/nux024

Coppens, L. C., Postema, C. E. S., Schüler, A., Scheiter, K., & van Gog, T. (2021). Development of Attention and Accuracy in Learning a Categorization Task. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.544135

Crane, A. L., Brown, G. E., Chivers, D. P., & Ferrari, M. C. O. (2020). An ecological framework of neophobia: From cells to organisms to populations. *Biological Reviews*, *95*(1), 218–231. https://doi.org/10.1111/brv.12560

Diamond, A. (2013). Executive Functions. *Annual Review of Psychology*, *64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Diamond, A., & Lee, K. (2011). Interventions shown to Aid Executive Function Development in Children 4–12 Years Old. *Science (New York, N.Y.)*, *333*(6045), 959–964. https://doi.org/10.1126/science.1204529

Dolgopolova, I., Teuber, R., & Bruschi, V. (2015). Consumers' perceptions of functional foods: Trust and food-neophobia in a cross-cultural context. *International Journal of Consumer Studies*, *39*(6), 708–715. https://doi.org/10.1111/ijcs.12184

Dovey, T. M., Staples, P. A., Gibson, E. L., & Halford, J. C. (2008). Food neophobia and 'picky/fussy'eating in children: A review. *Appetite*, *50*(2–3), 181–193.

Dunn, J. R. (2010). Health behavior vs the stress of low socioeconomic status and health outcomes. *JAMA*, *303*(12), 1199–1200. https://doi.org/10.1001/jama.2010.332

Eakin, L., Minde, K., Hechtman, L., Ochs, E., Krane, E., Bouffard, R., Greenfield, B., & Looper, K. (2004). The marital and family functioning of adults with ADHD and their spouses. *Journal of Attention Disorders*, *8*(1), 1–10. https://doi.org/10.1177/108705470400800101

Egbert, A. H., Creber, C., Loren, D. M., & Bohnert, A. M. (2019). Executive function and dietary intake in youth: A systematic review of the literature. *Appetite*, *139*, 197–212.

Esrey, S. A., Casella, G., & Habicht, J.-P. (1990). The use of residuals for longitudinal data analysis: The example of child growth. *American Journal of Epidemiology*, *131*(2), 365–372. https://doi.org/10.1093/oxfordjournals.aje.a115506

Fisher, A. V., Godwin, K. E., Matlen, B. J., & Unger, L. (2015). Development of category-based induction and semantic knowledge. *Child Development*, *86*(1), 48–62.

Fletcher, S., Wright, C., Jones, A., Parkinson, K., & Adamson, A. (2017). Tracking of toddler fruit and vegetable preferences to intake and adiposity later in childhood. *Maternal & Child Nutrition*, *13*(2), e12290.

Foinant, D., Lafraire, J., & Thibaut, J.-P. (2021). Strength or nausea? Children's reasoning about the health consequences of food consumption. *Frontiers in Psychology*, *12*, 1119.

Foinant, D., Lafraire, J., & Thibaut, J.-P. (2022a). Relationships between executive functions and food rejection dispositions in young children. *Appetite*, *176*, 106102. https://doi.org/10.1016/j.appet.2022.106102

Foinant, D., Lafraire, J., & Thibaut, J.-P. (2022b). Tears for pears: Influence of children's neophobia on categorization performance and strategy in the food domain. *Frontiers in Nutrition*, *9*. https://www.frontiersin.org/articles/10.3389/fnut.2022.951890

Foinant, D., Lafraire, J., & Thibaut, J.-P. (2024a). Individual differences in categorization development: The mediation of executive functions and factual knowledge, the case of food. *Developmental Psychology*, *60*(10), 1785–1800. https://doi.org/10.1037/dev0001785

Foinant, D., Lafraire, J., & Thibaut, J.-P. (2024b). Preschoolers' Neophobia Influences Category-based Abilities Beyond the Food Domain. *Proceedings of the Annual Meeting of the Cognitive Science Society*, *46*(0). https://escholarship.org/uc/item/2rq7f936

Galotti, K. M., Hauge, K. L., Leppink-Shands, C., Umscheid, V. A., & Villanueva, J. (2022). Accio Knowledge: Children's Knowledge Acquisition in the Domain of Harry Potter. *The American Journal of Psychology*, *135*(1), 97–108. https://doi.org/10.5406/19398298.135.1.08

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin*, *134*(1), 31–60. https://doi.org/10.1037/0033-2909.134.1.31

Garrido, M., Hansen, S. K., Yaari, R., & Hawlena, H. (2022). A model selection approach to structural equation modelling: A critical evaluation and a road map for ecologists. *Methods in Ecology and Evolution*, *13*(1), 42–53. https://doi.org/10.1111/2041-210X.13742

Gathercole, S. E., Pickering, S. J., Knight, C., & Stegmann, Z. (2004). Working Memory Skills and Educational Attainment: Evidence from National Curriculum Assessments at 7 and 14 Years of Age. *Applied Cognitive Psychology*, *18*(1), 1–16. https://doi.org/10.1002/acp.934

Gauthier, I., & Fiestan, G. (2023). Food neophobia predicts visual ability in the recognition of prepared food, beyond domain-general factors. *Food Quality and Preference*, *103*, 104702. https://doi.org/10.1016/j.foodqual.2022.104702

Gelman, R. (1969). Conservation acquisition: A problem of learning to attend to relevant attributes. *Journal of Experimental Child Psychology*, *7*(2), 167–187. https://doi.org/10.1016/0022-0965(69)90041-1

Gelman, R. (1978). Cognitive Development. *Annual Review of Psychology*, *29*(Volume 29, 1978), 297–332. https://doi.org/10.1146/annurev.ps.29.020178.001501

Gelman, S. A. (2003). *The essential child: Origins of essentialism in everyday thought*. Oxford University Press, USA.

Gelman, S. A., & Markman, E. M. (1987). Young children's inductions from natural kinds: The role of categories and appearances. *Child Development*, 1532–1541.

Gelman, S. A., & Meyer, M. (2011). Child categorization. *Wiley Interdisciplinary Reviews. Cognitive Science*, *2*(1), 95–105. https://doi.org/10.1002/wcs.96

Gentner, D., & Hoyos, C. (2017). Analogy and Abstraction. *Topics in Cognitive Science*, *9*(3), 672–693. https://doi.org/10.1111/tops.12278

Gerstadt, C. L., Hong, Y. J., & Diamond, A. (1994). The relationship between cognition and action: Performance of children 312<math><mtext>3</mtext><mtext>1</mtext><mtext>2</mtext></math>–7 years old on a stroop- like day-night test. *Cognition*, *53*(2), 129–153. https://doi.org/10.1016/0010-0277(94)90068-X

Grier, J. B. (1971). Nonparametric indexes for sensitivity and bias: Computing formulas. *Psychological Bulletin*, *75*(6), 424–429. https://doi.org/10.1037/h0031246

Harris, G. (2018). 10 - Food neophobia: Behavioral and biological influences: Neophobia at 20 months: A visual categorization problem? In S. Reilly (Ed.), *Food Neophobia* (pp. 193–217). Woodhead Publishing. https://doi.org/10.1016/B978-0-08-101931-3.00010-0

Howard, S. J., & Melhuish, E. (2017). An Early Years Toolbox for Assessing Early Executive Function, Language, Self-Regulation, and Social Development: Validity, Reliability, and Preliminary Norms. *Journal of Psychoeducational Assessment*, *35*(3), 255–275. https://doi.org/10.1177/0734282916633009

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hursti, U.-K. K., & Sjödén, P.-O. (1997). Food and General Neophobia and their Relationship with Self-Reported Food Choice: Familial Resemblance in Swedish Families with Children of Ages 7–17 Years. *Appetite*, *29*(1), 89–103. https://doi.org/10.1006/appe.1997.0108

Karaağaç, Y., & Bellikci-Koyu, E. (2023). A narrative review on food neophobia throughout the lifespan: Relationships with dietary behaviours and interventions to reduce it. *The British Journal of Nutrition*, *130*(5), 793–826. https://doi.org/10.1017/S0007114522003713

Keil, F. C. (1992). *Concepts, Kinds, and Cognitive Development*. MIT Press.

Kline, R. B. (2016). *Principles and practice of structural equation modeling, 4th ed* (pp. xvii, 534). Guilford Press.

Knaapila, A. J., Sandell, M. A., Vaarno, J., Hoppu, U., Puolimatka, T., Kaljonen, A., & Lagström, H. (2015). Food neophobia associates with lower dietary quality and higher BMI in Finnish adults. *Public Health Nutrition*, *18*(12), 2161–2171.

Lafraire, J., Rioux, C., Giboreau, A., & Picard, D. (2016). Food rejections in children: Cognitive and social/environmental factors involved in food neophobia and picky/fussy eating behavior. *Appetite*, *96*, 347–357. https://doi.org/10.1016/j.appet.2015.09.008

Lagarrigue, Y., & Thibaut, J.-P. (2025). Successful comparisons in novel word generalization: Executive functions or semantic knowledge? *Journal of Experimental*

Child Psychology, *252*, 106130. https://doi.org/10.1016/j.jecp.2024.106130

Little, T. D. (2013). *Longitudinal structural equation modeling* (pp. xxii, 386). Guilford Press.

Macmillan, N. A., & Creelman, C. D. (2004). *Detection Theory: A User's Guide*. Psychology Press.

Mehler, J., & Bever, T. G. (1967). Cognitive capacity of very young children. *Science (New York, N.Y.)*, *158*(3797), 141–142. https://doi.org/10.1126/science.158.3797.141

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology*, *41*(1), 49–100. https://doi.org/10.1006/cogp.1999.0734

Miyake, A., & Shah, P. (Eds.). (1999). *Models of Working Memory: Mechanisms of Active Maintenance and Executive Control*. Cambridge University Press. https://doi.org/10.1017/CBO9781139174909

Moding, K. J., & Stifter, C. A. (2016). Temperamental approach/withdrawal and food neophobia in early childhood: Concurrent and longitudinal associations. *Appetite*, *107*, 654–662.

Murphy, G. L. (2002). *The big book of concepts*. MIT Press.

Nicklaus, S., & Monnery-Patris, S. (2018). 13—Food neophobia in children and its relationships with parental feeding practices/style. In S. Reilly (Ed.), *Food Neophobia* (pp. 255–286). Woodhead Publishing. https://doi.org/10.1016/B978-0-08-101931-3.00013-6

Oakes, L. M., & Madole, K. L. (2003). Principles of developmental change in infants' category formation. *Early Category and Concept Development*, 132–158.

Perry, C. P., Keane, E., Layte, R., Fitzgerald, A. P., Perry, I. J., & Harrington, J. M. (2015). The use of a dietary quality score as a predictor of childhood overweight and obesity. *BMC Public Health*, *15*(1), 1–9.

Pickard, A., Thibaut, J.-P., & Lafraire, J. (2021). Strawberries and Cream: The Relationship Between Food Rejection and Thematic Knowledge of Food in Young Children. *Frontiers in Psychology*, *12*, 280.

Pickard, A., Thibaut, J.-P., Philippe, K., & Lafraire, J. (2023). Poor conceptual knowledge in the food domain and food rejection dispositions in 3- to 7-year-old children. *Journal of Experimental Child Psychology*, *226*, 105546. https://doi.org/10.1016/j.jecp.2022.105546

Prince, M., Patel, V., Saxena, S., Maj, M., Maselko, J., Phillips, M. R., & Rahman, A. (2007). No health without mental health. *Lancet (London, England)*, *370*(9590), 859–877. https://doi.org/10.1016/S0140-6736(07)61238-0

R Core Team. (2021). R: A language and environment for statistical computing. *R Foundation for Statistical Computing, Vienna, Austria*. https://www.R-project.org/

Reilly, S. (2018). *Food Neophobia: Behavioral and Biological Influences*. Woodhead Publishing.

Rioux, C. (2020). Food neophobia in childhood. *Handbook of Eating and Drinking: Interdisciplinary Perspectives*, 413–432.

Rioux, C., Lafraire, J., & Picard, D. (2017). The Child Food Rejection Scale: Development and validation of a new scale to assess food neophobia and pickiness among 2- to 7-year-old French children. *Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology*, *67*(2), 67–77. https://doi.org/10.1016/j.erap.2017.01.003

Rioux, C., Lafraire, J., & Picard, D. (2018a). Food rejection and the development of food category-based induction in 2–6 years old children. *Journal of Cognitive Psychology*, *30*(1), 5–17. https://doi.org/10.1080/20445911.2017.1367688

Rioux, C., Lafraire, J., & Picard, D. (2018b). Visual exposure and categorization performance positively influence 3- to 6-year-old children's willingness to taste unfamiliar vegetables. *Appetite*, *120*, 32–42. https://doi.org/10.1016/j.appet.2017.08.016

Rioux, C., Picard, D., & Lafraire, J. (2016). Food rejection and the development of food categorization in young children. *Cognitive Development*, *40*, 163–177. https://doi.org/10.1016/j.cogdev.2016.09.003

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, *48*(2).

Rozin, P. (1976). The Selection of Foods by Rats, Humans, and Other Animals. In J. S. Rosenblatt, R. A. Hinde, E. Shaw, & C. Beer (Eds.), *Advances in the Study of Behavior* (Vol. 6, pp. 21–76). Academic Press. https://doi.org/10.1016/S0065-3454(08)60081-9

Rozin, P. (1990). Development in the food domain. *Developmental Psychology*, *26*(4), 555–562. https://doi.org/10.1037/0012-1649.26.4.555

Simpson, A., & Riggs, K. J. (2005). Inhibitory and working memory demands of the day-night task in children. *British Journal of Developmental Psychology*, *23*(3), 471–486. https://doi.org/10.1348/026151005X28712

Sloutsky, V. M., & Fisher, A. V. (2004). Induction and Categorization in Young Children: A Similarity-Based Model. *Journal of Experimental Psychology: General*, *133*(2), 166–188. https://doi.org/10.1037/0096-3445.133.2.166

Snodgrass, J. G., & Corwin, J. (1988). Pragmatics of measuring recognition memory: Applications to dementia and amnesia. *Journal of Experimental Psychology: General*, *117*(1), 34–50. https://doi.org/10.1037/0096-3445.117.1.34

Stanislaw, H., & Todorov, N. (1999). Calculation of signal detection theory measures. *Behavior Research Methods, Instruments, & Computers*, *31*(1), 137–149. https://doi.org/10.3758/BF03207704

Thibaut, J.-P., French, R., & Vezneva, M. (2010). The development of analogy making in children: Cognitive load and executive functions. *Journal of Experimental Child Psychology*, *106*(1), 1–19.

Vauclair, J. (2004). *Développement du jeune enfant: Motricité, perception, cognition*.

Welsh, J. A., Nix, R. L., Blair, C., Bierman, K. L., & Nelson, K. E. (2010). The development of cognitive skills and gains in academic school readiness for children from low-income families. *Journal of Educational Psychology*, *102*(1), 43–53. https://doi.org/10.1037/a0016738

Williams, K. E., Gibbons, B. G., & Schreck, K. A. (2005). Comparing Selective Eaters with and Without

Developmental Disabilities. *Journal of Developmental and Physical Disabilities*, *17*(3), 299–309. https://doi.org/10.1007/s10882-005-4387-7

Willoughby, M. T., Blair, C. B., & Family Life Project Investigators. (2016). Measuring executive function in early childhood: A case for formative measurement. *Psychological Assessment*, *28*(3), 319–330. https://doi.org/10.1037/pas0000152

Wolf, S., & McCoy, D. C. (2019). The role of executive function and social-emotional skills in the development of literacy and numeracy during preschool: A cross-lagged longitudinal study. *Developmental Science*, *22*(4), e12800. https://doi.org/10.1111/desc.12800

Zelazo, P. D. (2006). The Dimensional Change Card Sort (DCCS): A method of assessing executive function in children. *Nature Protocols*, *1*(1), 297–301. https://doi.org/10.1038/nprot.2006.46

Zohar, A. H., Pick, S., Lev-Ari, L., & Bachner-Melman, R. (2020). A longitudinal study of maternal feeding and children's picky eating. *Appetite*, *154*, 104804. https://doi.org/10.1016/j.appet.2020.104804