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Relational uncertainty: Does parental perception of adopted children's academic success change over time?

Tamara Turski^a, Stephanie N. Del Tufo^{a,b,*}

^a College of Education and Human Development, University of Delaware, 16 W. Main Street, Newark, DE 19716

^b Interdisciplinary Neuroscience Graduate (ING) Program, University of Delaware

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ABSTRACT

While initial findings suggested that children who are adopted (adoptees) perform less well academically, this result is not consistent across the literature. To explain these, often conflicting, results, researchers acquired a lagging view, in which adoptees need to “catch up” to their non-adopted peers. According to the lagging view, those adopted at a younger age have less catching up to do than those adopted when they are older. However, the lagging view does not account for the period in which adoptees and their new families adjust to one another. A period that we refer to as relational uncertainty. This is particularly relevant as data on adoptees' academic performance is largely based on parent reports. The overarching goal of this study was to determine if parental perception of adoptees' academic achievement changed over time, after accounting for the impact of age of adoption. Using a nationally representative dataset, we found that after accounting for age of adoption the length of time that children resided in their adoptive homes predicted parental perception of academic performance. Specifically, after accounting for age of adoption, parental perception of adoptees' academic performance demonstrated early consistency followed by a significant decline. We also investigated if the relation, of those factors previously associated with parental perception of adoptees' academic performance, remained after variance was accounted for by both age of adoption and children's length of stay in their adoptive homes. Several previous factors (where the child lived pre-adoption and the socioeconomic status of their adoptive household) and child characteristics (sex and the first language the child learned to speak) demonstrated a continued association. Results indicate the need for a paradigm shift in how we view parent reports of adoptees' academic achievement, as well as the frequently reported factors surrounding adoptees' academic performance. The implications for how to support adoptees' academic achievement are discussed.

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1. Introduction

What can we do to help adoptees become academically successful? Imagine yourself being adopted into a new home, living in a new neighborhood, and attending a new school. Do you understand what is happening? Are you aware of the change that is taking place? Does your new family help you feel confident in your academic work? Between 2011 and 2020, 2,561,000 children entered foster care, 1,130,000 were waiting to be adopted, and 561,700 children were adopted (Children's Bureau, 2020). Adoptees attend new schools, live in new neighborhoods, and often simultaneously learn a new language. While much early research

into adoption focused on behavioral and psychological outcomes (Brumble & Kampfe, 2011), researchers have begun to focus on adoptees' academic achievement (e.g., Jacobs, et al., 2010).

Earlier investigations suggested that adoptees perform less well academically in both reading and mathematics (e.g., van Ijzendoorn et al., 2005). Yet, this result—adoptees having poorer academic performance—is not consistent across the literature. Several studies suggest that adoptees who come from under-stimulating environments “catch-up” cognitively, linguistically, and academically (e.g., O'Connor et al., 2000; Rutter et al., 1998). These differences are largely attributed to children's Age of Adoption (AoA) or considered the result of cognitive or linguistic differences that result from AoA (Glennen, 2014; Hawk et al., 2012). Specifically, children adopted at a younger age are perceived as having greater academic success (van Ijzendoorn et al., 2005) and cognitive abilities (Eigsti et al., 2011). However, this interpretation does not account for the period in which adoptees and their new families adjust to

* Corresponding author.

E-mail address: sdeltufo@udel.edu (S.N. Del Tufo).

one another. A period that we refer to as relational uncertainty. Here, we sought to determine if a period of relational uncertainty can be identified based on parental perception of adoptees' academic achievement.

1.1. Relational permanence and uncertainty

A key goal of adoption is achieving psychological or relational permanence (Brodzinsky & Smith, 2019). Relational permanence refers to a child's connection to family, often specifically to an adult parental figure; this includes a felt sense of safety in relationships with caregivers, feelings of security, trust, and nurturance (e.g., Brown, et al., 2006; Rolock & Pérez, 2018). Relational uncertainty refers to the period in which adoptees and their new families adjust to one another and proceeds relational permanence. Relational uncertainty has been documented in studies of children and young adults in foster care (McSherry & Malet, 2018; Pérez, 2017; Samuels, 2009). However, relational uncertainty has not yet been considered in the context of academic achievement. This period of relational uncertainty, in which children adjust to their adoptive families, is likely to impact both adoptees' academic achievement and parental perception of adoptees' academic achievement. The latter of which is particularly relevant as studies of adoptees' academic achievement are largely based on parental perception.

1.2. Parental perception of academic achievement

The importance of parental perception on children's academic achievement (e.g., Frome & Eccles, 1998) and on children's perception of their academic abilities (e.g., Wagner & Phillips, 1992) has been well-documented. Studies report that parents' perceptions of children's academic abilities are more predictive of children's beliefs in their abilities than measured indicators (e.g., grades; Frome & Eccles, 1998; McGrath & Repetti, 2000). Indeed, evidence shows that when children view themselves as less competent, they avoid demanding tasks and demonstrate a lack of persistence in work habits (e.g., Boggiano et al., 1988; Felson, 1984). Further, parental aspirations for children's education, such as post-secondary school attendance and school persistence, are significantly and positively related to their children's academic goal-setting (e.g., Bronstein et al., 2005).

Boyne et al. (1984) suggested that the reason late-placed adoptees do not acquire higher levels of education is that they do not expect to be academically successful or attend post-secondary school. Decker & Omori (2009) investigated the effect of AoA on adoptees who were now in their mid-thirties. They found that AoA had no long-term effects on adoptees' psychological well-being. However, children adopted at age 6 or older were less likely to receive a high school or post-secondary diploma. Further, parental perception of adoptees has been found to change over time across several studies and metrics (e.g., Pronchenko-Jain & Fernando, 2013; Knapp et al., 2013). Reports indicated that changes in parental perception of adoptees occurred the most following the first few years of adoption (e.g., Tan et al., 2017; Anderman et al., 2018). This change is likely to be greater for adoptees' that are adapting to a different country and culture. Next, we review what is known about the academic achievement of adoptees, highlighting the role that parental report has played throughout the literature.

1.3. Academic achievement of adopted children

Van IJzendoorn and colleagues' (2005) review remains the most comprehensive meta-analysis of adoptees' academic achieve-

ment; it includes 55 studies with primarily proximal measures of adoptees' academic achievement. In this meta-analysis, adoptees were compared to children who remained institutionalized, siblings of the adoptees that remained with their birth families, and non-adopted children in the adoptees' current environment. Results indicated that adoptees academically outperformed institutionalized peers and siblings who remained with their birth families. However, when compared to non-adopted children in their current environment, adoptees demonstrated less academic success. While the effects of adoption on academic achievement were not influenced by sex or type of adoption (domestic vs international), they were influenced by children's age at the time of adoption. As such, the authors concluded that the increase in academic problems reported in children adopted at older ages was due to the length of time children spent in their pre-adoption environments. This conclusion is likely drawn due to studies of understimulating pre-adoption environments (e.g., Hawk et al., 2012; Pollack et al., 2010), which may have included abuse or neglect (e.g., Colombo et al., 1992; McCall et al., 2014).

Of the 55 studies on adoptees' academic achievement in van IJzendoorn and colleagues' (2005) meta-analysis, only three were coded as including a direct measure. Of those, Fan et al. (2002) is a follow-up study focused on a discrepancy between two measures of adoption found within a single dataset. The discrepancy was found to result from "jokesters." These individuals falsely identified themselves as adopted on one of two measures. When jokesters were not included in the sample of adoptees, no difference was found between the grades of adopted and non-adopted children. Second, Lansford et al., (2001) relied upon parental report and child self-report of grades. Third, Leahy (1935) found that the mean and standard deviation of grades were identical in adopted ($n = 191$) and non-adopted ($n = 193$) school-aged children. Taken together, these results indicate no difference between direct measures of adopted and non-adopted children's academic achievement.

Since van IJzendoorn and colleagues' (2005) meta-analysis, several studies have reported the impact of AoA on academic achievement. These studies largely echo the need to consider relational uncertainty and reinforce the conclusion that the older children are when they are adopted, the less likely their academic achievement becomes. Indeed, Anderman et al. (2018) reported that parents of non-adopted children had significantly more confidence in their children's ability to earn a bachelor's degree than parents of domestically adopted children. In a retrospective study based on self-report, Decker & Omori (2009) found that children who were adopted at age six or older were significantly less likely to complete high school and post-secondary school than those adopted within the first 12 months of life. Further, Miller et al. (2009) found that more than half of the adoptees in their study (adopted between eight and 11 years old) received academic supports through an individualized educational plan. However, these same children had intelligence quotients, reading, spelling, and mathematics standardized assessment scores all within the average range. The authors attributed this discrepancy to environmental enrichment, which included social contact, proper meals, and the aforementioned academic supports. As such, rather than a negative effect on academic performance, Miller et al. (2009) interpreted their results to instead suggest that adoptees' who receive academic supports are more likely to catch up to their non-adopted peers. However, their interpretation does not take into account the length of time the child has resided in their adoptive home. Therefore, to understand studies on the academic achievement of adoptees we must consider the role of parental perception on adoptees' academic performance with regard to relational uncertainty.

1.4. Cognitive abilities and age of adoption

In contrast to studies of academic achievement, studies on the impact or interaction of AoA with cognitive abilities are based on a greater mix of measures, including standardized assessments, parent and teacher reports. This research has largely focused on 3 aspects of cognition: intelligence (e.g., van IJzendoorn & Juffer, 2005), executive function (e.g., Behen et al., 2008), and language (Scott, et al., 2011; Glennen, 2014). Research on adoptees' cognitive outcomes has primarily reported impairments at the time of adoption (see Scott, 2009 for review). Over time, however, the results become more mixed, with some studies reporting long-lasting diminished intelligence (Beckett et al., 2010), others report no AoA differences in intelligence (e.g., van IJzendoorn & Juffer, 2005), and still, others report that time spent in adoptive homes leads to improvement in intelligence (Helder et al., 2016; Colombo et al., 1992). In a longitudinal study of international adoptees, Helder et al. (2016) found that seven-year-old adoptees showed significant improvements in full-scale intelligence over three years. Similarly, Beckett et al. (2010) found that adoptees who endured institutional deprivation significantly increased cognitive development from ages 11–15. As such, in the adoption literature, continued cognitive development difficulties are sometimes referred to as delays, indicating that future improvement is expected.

Executive function is an umbrella term referring to cognitive processes linked to the prefrontal cortex in the brain (Diamond, 2013). Institutionalized children adopted later were less able to inhibit attention to irrelevant information (Eigsti et al., 2011), and impairment in executive function corresponded to the length of institutionalization (Behen et al., 2008). Pollak et al. (2010) compared two groups of children that resided with their adoptive families for a minimum of three years. The first group was adopted after 12-months of age and spent over 75% of their life institutionalized; the second group was adopted before eight months of age and had little or no institutionalized care. The children who were adopted later showed diminished visual attention and memory, while the children adopted earlier performed similarly to non-adopted children. This research suggests that institutionalized children's executive functions are particularly impacted by the AoA.

International adoptees have already begun first language (L1) development; their L1 reportedly persists despite many years of disuse (Oh et al., 2010) or discontinuation (Pierce et al., 2014). For example, Korean children adopted into non-Korean speaking households at less than 12-month-old were better able to identify Korean speech sounds (phonemes) in post-secondary language classes compared to students without prior Korean exposure (Oh et al., 2010). This is consistent with evidence demonstrating that even prior to six months of age children's phoneme perception is altered by language exposure (e.g., Kuhl et al., 1992).

AoA is associated with children's language development (Croft et al., 2007; Scott et al., 2011). Evidence suggests that language skills are rapidly acquired by adoptees at both younger (Glennen, 2014) and older ages (Snedeker et al., 2007). The *Linguistic Interdependence Hypothesis* posits that first and second language (L2) skills are interrelated, in that academic skills acquired in one language are likely to promote literacy development in the other language (Cummins, 1979, 2000). And, the *Threshold Hypothesis* suggests that students must acquire and maintain a threshold level of competence in one language for literacy skills to transfer to the other language (Cummins, 1979, 2000). Consistent with these prominent theories of cross-linguistic transfer, older adoptees seem to develop more fluent L2 skills once they have already acquired those skills in their L1 (Snedeker et al., 2007). In other words, children adopted at older ages have more L1 and general academic

knowledge, which can help them understand what is being asked of them in a L2 academic setting.

Research into adoptees' cognitive abilities demonstrated that intelligence, executive function, and language abilities are linked to AoA. Studies at the time of adoption report that younger adoptees have greater intelligence quotients and executive function compared to those adopted later. Yet, differences in intelligence decreased over time, particularly for institutionalized adoptees. Studies of language, however, suggest that being adopted at either a younger or older age confers a cognitive advantage. Children adopted at a younger age showed better phoneme integration, while children adopted at older ages were better able to take advantage of language transfer effects. Thus, when attempting to bridge the gap between research on AoA and academic achievement it is clear that children's previous environment and the length of time adoptees lived in their adoptive homes are critical factors to consider

1.5. The current study

The current study focused on the impact of adoption on parental perception of academic achievement. We hypothesized that parental perception of adoptees' academic achievement would change over time, even after accounting for AoA. To examine this change, we first investigated parental perception of adoptees' academic achievement predicted by their AoA. We expected that AoA would account for significant variance in parental perception of adoptees' academic achievement in both reading and mathematics. Second, after removing the variance accounted for by AoA, we determined if the length of time the child resided in their adoptive homes related to parental perception of adoptees' academic achievement. We hypothesized that parental perception of children's academic achievement in both reading and mathematics would change over time regardless of AoA. Next, we examined when changes in parental perception of adoptees' academic achievement occurred. We hypothesized a period of relational uncertainty, in which adoptive parents initially perceived adoptees as academically successful followed by a period in which they then perceived adoptees as less academically successful in both reading and mathematics.

After providing evidence that a period of relational uncertainty could be identified based on parental perception of adoptees' academic achievement, we investigated the impact of factors reported to be associated with adoptees' academic performance. We hypothesized that factors such as if children were adopted from outside of the United States, L1, and where they resided pre-adoption would continue to be associated with parental perception of adoptees' academic achievement.

2. Methods

2.1. Participants

The National Survey of Children's Health (CAHMI, 2007) was a telephone survey of households with children under 18 years of age. One child per household was randomly selected to be the subject of the interview. Children identified as adopted, who did not live with a biological parent, and who lived in a home where English was spoken were eligible for the National Survey of Adopted Parents (NSAP; Center for Disease Control and Prevention, 2007). The NSAP dataset included 2,089 surveys, designed to collect estimates of the health, characteristics, and well-being of adopted children and their families. This included information about pre-adoption experiences, as well as access and utilization of post-adoption supports and services. In the current study, adoptees under four years of age ($n = 362$) were excluded as questions regard-

ing their academic achievement were not part of the NSAP survey. Of the remaining 1,727 children (5–18 years), 70 participants were excluded due to parents indicating a lack of knowledge regarding their child's academic performance or a refusal to answer. Prior to assessment of missing values, the sample included 1,647 adoptees.

2.2. Measures

This study focused on the impact of specific aspects of adoption on parental perception of adoptees' academic achievement. As noted, the vast majority of studies on adoptees' academic achievement are based on parental reports. We considered several factors regarding adoption and child characteristics.

2.3. Academic achievement

Academic achievement was measured with two questions. Parents were asked, "How would you describe the child's school performance in reading and language arts?" and "How would you describe the child's performance in math?" Following the removal of responses (6) I don't know and (7) refused to answer, parental response choices included (1) Excellent, (2) Very Good, (3) Good, (4) Fair, and (5) Poor. To facilitate interpretation, data was inverted and zero-based. As a result, (0) indicated the parental response Poor, (1) indicated Fair, (2) Good, (3) Very Good, and (4) Excellent.

2.4. Adoption factors

Several factors regarding adoption were considered, including: type of adoption, country of adoption, socioeconomic status (SES) of the adoptive household, and where the child lived before adoption.

2.5. Type of adoption

Parents were first asked to report their relationship to the child. Individuals who reported that they were the child's mother or father were asked "Are you the child's biological, adoptive, step, or foster mother/father?" Children who were adopted by a step-parent and continued to live with a biological parent were excluded. Parents were then asked to report the type of adoption that occurred, response choices included, "international adoption", "foster adoption", and "private adoption." No responses were missing.

2.6. Country of adoption

Parents were asked, "Was the child adopted from another country?" They were given the option to respond: (1) Yes, (0) No, (6) I don't know, and (7) refused to respond. If parents responded that the child was adopted from another country (international adoption), they were asked: "From what country was your child adopted?" The released NSAP dataset contains only the collapsed categories: (1) China (Mainland), (2) Russia, (3) Guatemala, (4) South Korea, (5) other: Africa, (6) other: Asia, (7) other: Europe, (8) other: Central America, (9) other: South America, (10) other, (96) I don't know, and (97) refused to respond. For analysis purposes, data from participants who were not adopted internationally were coded as a final category (11) United States. No responses were missing. Prior to analysis, we further collapsed and coded the data into the categories (1) adopted from the United States and (0) adopted from a country outside of the United States.

2.7. Socioeconomic status

Parents were asked to report their household income and family members. These two variables were used to determine household poverty levels based on the United States Department of

Health and Human Services guidelines. If data for either of those two variables was missing, respondents refused to answer, or responded "I don't know" the variable was assigned a missing value. This resulted in 110 survey responses coded as incomplete. In the released NSAP dataset poverty levels were placed into five categories: (1) 0%–100% of the federal poverty level, (2) 100%–200% above the federal poverty level, (3) 200%–300% above the federal poverty level, (4) 300%–400% above the federal poverty level, and (5) 400% above the federal poverty level.

2.8. Pre-adoption residence

Parents were asked, "Before being placed with you, where did the child live?" Response choices included (1) a foster family, (3) birth parents, (4) with members of his/her family other than parents, (5) a group home in the United States foster care system, (7) an institution or orphanage, (8) a hospital or health clinic, (9) someplace else not mentioned, (96) don't know, and (97) refused to answer. While no data was missing, eight survey respondents answered "I don't know" and two "refused to answer."

2.9. Child characteristics

Several factors regarding characteristics of adoptees were considered, including: sex, L1, AoA, age placed in their adoptive homes, current age, and if the adoptees had any siblings in their adoptive household.

2.10. First language

Parents were asked, "What was the first language your child learned to speak?" The released NSAP dataset contained the collapsed categories: (1) English, (2) Chinese, (3) Russian, (4), Spanish, (5) other, (96) I don't know, and (97) refused to respond. A total of three participants responded "I don't know." Prior to data analysis, we further collapsed and coded the data into the categories (1) English and (0) not English. No responses were missing.

2.11. Age of adoption

Parents were asked, "When the adoption was finalized, how old was your child?" The released NSAP dataset contains the following collapsed categories: (1) 0 years, (2) 1 year, (3) 2 years, (4) 3 years, (5) 4–5 years, (6) 6–7 years, (7) 8–10 years, (8) 11 years and older, (96) I don't know, and (97) refused to respond. Nine responses were missing.

2.12. Age placed in the adoptive home

Parents were asked to report the age their adopted child was when first placed in their home. The released NSAP dataset contained the following collapsed categories: (1) 0 years, (2) 1 year, (3) 2–3 years, (4) 4–5 years, (5) 6–8 years, (6) 9 years and older, (96) I don't know, and (97) refused to respond. Seven responses were missing.

2.13. Current age

The age of the adoptee at the time of the interview was categorized as: (1) 0–2 years, (2) 3–4 years (3) 5–9 years (4) 10–12 years, (5) 13–14 years, (6) 15–17 years. No data was missing.

2.14. Length of stay

To account for the period in which adoptees and their new families adjust to one another we created a difference score. This captured the difference between the current age of the child and the

age at which the child was placed in their adoptive home. We refer to this variable as the “length of stay,” or the time in which an adoptee resided in their current home.

2.15. Presence of other children in the household

Parents were asked if their adopted child had any siblings. Specifically, parents were asked, “Do you [or your spouse/partner] have biological children?” and “Do you [or your spouse/partner] have adopted children other than the adopted child and the adopted child’s birth siblings?” Parental responses choices for both questions were: (0) No, (1) Yes, (6) I don’t know, and (7) refused to respond. No responses were missing.

2.16. Analytical plan

Our primary objective was to test the hypothesis that relational uncertainty can be identified based on parent report of adoptees’ academic achievement. We assessed if the length of time the child resided in their adoptive homes was related to parental perception of adoptees’ academic achievement, regardless of the AoA. Using this cross-sectional sample, we had two dependent parent reported measures of academic achievement: (1) reading and language arts [reading] and (2) mathematics. We began by running two Poisson regressions, one for each of the aforementioned dependent variables. In both regressions, AoA was the independent variable. We then extracted the residuals from each of the Poisson regressions. Correlation analyses confirmed that the relations between the dependent variables and their respective residualized variables were highly correlated. We then conducted quasipoisson regressions to assess if the length of time the child resided in their adoptive homes was related to the residuals (or remaining variance) unaccounted for by AoA. Thus, regardless of the AoA, we determined if the length of time the child resided in their adoptive homes was related to parental perception of adoptees’ academic achievement.

Next, we aimed to determine when relational uncertainty occurred. We conducted separate Kruskal-Wallis tests, one for each of the two residualized dependent measures of parental perception of academic achievement. *A priori* post-hoc testing was used to determine when differences in parental perception of adoptees’ academic performance occurred, following the first three years that children resided in their adoptive homes.

Finally, we aimed to understand which adoption and child factors impacted parental perception of adoptees’ academic achievement and which were subsumed by AoA. We conducted two hierarchical quasipoisson regressions, one for each residualized dependent measure of parental perception of academic achievement. In both hierarchical quasipoisson regressions, the first step included only the length of time the child resided in their adoptive homes. The second step included factors that have previously been associated with adoptees’ academic achievement: sex, type of adoption, placement pre-adoption, the country the child resided in prior to their adoptive homes, L1, presence of other children in their adoptive home, and SES of their adoptive home. Backward fitting model procedures were used to include all significant two- and three-way interactions. Thus, regardless of the AoA and beyond the variance accounted for by the length of time the child resided in their adoptive home, we determined the relation of adoption and child factors on academic achievement.

3. Results

All statistical analyses were performed in R (v. 3.6.2, www.r-project.org). Data was missing completely at random (*Little’s* = 22.6, *df* = 23, *p* = .485). Visual inspection revealed no grouping or unexpected distributions in the missing data (R package

Table 1
Demographics.

Characteristics	Sample	
	<i>n</i>	%
Sex		
Female	688	45.47
Male	825	54.53
Race		
Caucasian	722	47.72
African American/Black	247	16.33
Asian	172	11.37
Other ^a	372	24.59
Ethnicity		
Hispanic	197	13.02
Non-Hispanic	1316	86.98
SES		
0%–100% FPL	139	9.19
>100%–200% FPL	215	14.21
>200%–300% FPL	260	17.18
>300%–400% FPL	222	14.67
>400% FPL	677	44.75
Type of Adoption		
International	342	22.60
Foster	578	38.20
Private	593	39.19
Pre-adoption Residence		
Foster Family	363	23.99
Birth Parents	312	20.62
Kinship Foster Family	67	4.43
U.S. Group Home	87	5.75
Institution/Orphanage	225	14.87
Hospital/Health Clinic	375	24.79
Other	84	5.55
Siblings	700	46.27
L1		
English	1351	89.29
Not English	162	10.71
Adopted from the U.S.	1172	77.46

Notes. FPL = federal poverty level; L1 = first language; SES = socioeconomic status.

^a Includes American Indian, Alaskan Native, Native Hawaiian, Pacific Islander, multiple races, or unknown.

nanier; Tierney & Cook, 2018). After the deletion of 122 cases with missing values and 12 cases where parents responded “I don’t know” or “refused to answer,” 1,513 cases were available for analysis. Demographic information can be found in Table 1.

The dependent variables were parental perception of reading ($M = 2.69$, $SD = 1.30$) and mathematics ability ($M = 2.48$, $SD = 1.24$). Adoption factors included type of adoption (international, foster, or private), country of adoption (United States or another country), and where the child lived pre-adoption (foster family, with their biological parents, kinship foster family, a group home in the United States foster care system, an institution or orphanage, a hospital or health clinic, or someplace else not mentioned). Child characteristics included the child’s L1 (English or another language), the age they were placed in their current home (0 years, 1 year, 2–3 years, 4–5 years, 6–8 years, or 9 years and older), AoA (0 years, 1 year, 2 years, 3 years, 4–5 years, 6–7 years, 8–10 years, or 11 years and older), and if other children were present in the adoptive home (yes or no). Length of stay was calculated as the difference between the current age of the child and the age at which the child was placed in their adoptive home. Descriptive statistics regarding the length of stay distribution for AoA and the current age of the child can be found in Table 2.

3.1. Does parental perception of adopted children’s academics change over time?

The overarching goal was to determine if the length of time the child resided in their adoptive homes would be related to parental perception of adoptees’ academic achievement, regardless of AoA.

Table 2
Descriptive statistics.

Baseline characteristic	Sample		Length of Stay (years)	
	n	%	mean	SD
Age of Adoption (years)				
<1	536	35.43	9.99	4.17
1	240	15.86	9.27	4.33
2	125	8.26	8.70	4.43
3	108	7.14	8.70	3.91
4–5	172	11.37	7.76	4.15
6–7	132	8.72	6.77	4.53
8–10	118	7.80	7.77	3.79
>11	82	5.42	7.88	4.32
Current Age of Child (years)				
5–9	500	33.05	4.17	1.35
10–12	349	23.07	8.65	2.30
13–14	234	15.47	11.20	2.72
15–16	430	28.42	13.17	2.93

Notes. AOA = age of adoption; Length of stay is the difference between the current age of the child and the age at which the child was placed in their adoptive home.

First, Poisson regressions were used to residualize the data. The dependent variable was parental perception of academic achievement on a scale from 0 (poor school performance) to 4 (excellent school performance) for reading and mathematics, respectively. The independent variable was the age of the child when the adoption was finalized (i.e., AoA). AoA was significant in both the reading ($p < .001$) and mathematics ($p < .001$) models. In the reading model, for every increase in AoA, parents were 0.90 ($b = -0.102$, $SE = 0.02$) times less likely to perceive the adoptees' performance positively. In the mathematics model, for every increase in AoA, parents were 0.90 ($b = -0.104$, $SE = 0.02$) times less likely to perceive the adoptees' performance positively. While not the goal of the current study, our results are consistent with previous literature, suggesting that the older adoptees are at time of adoption the less likely they are to be perceived as academically successful. To determine if the length of time children resided in their adoptive homes impacted parental perception of academic performance, regardless of AoA, we extracted the Poisson regression residuals for both the reading and mathematics models.

Correlations were performed to ensure that an association remained between parental perception of reading and mathematics and their respective residualized variables. As would be expected, the results of the Shapiro-Wilk's normality tests were significant for both the residuals from the reading model ($W = 0.948$, $p < .001$) and the residuals from the mathematics model ($W = 0.953$, $p < .001$). Kendall's τ_b correlations confirmed that the relation between parental perception of reading and mathematics and their respective residualized variables were highly correlated (reading: $\tau_b = 0.885$, $p < .001$, mathematics: $\tau_b = 0.901$, $p < .001$).

We then conducted regressions to assess if the length of time the child resided in their adoptive homes was related to the residuals (or remaining variance) unaccounted for by AoA in the previous Poisson regressions. As noted, length of stay was the difference between the adoptees' age now and their age when they were placed in their current home. Given overdispersion in the models, quasipoisson regressions were conducted. Length of stay was significant in both the residualized reading ($p < .05$) and mathematics ($p < .001$) models. In the reading model, regardless of the child's AoA, for every increase in length of stay, parents were 0.98 ($b = -0.025$, $SE = 0.01$) times less likely to perceive their child's performance positively. In the mathematics model, regardless of the child's AoA, for every increase in length of stay, parents were 0.92 ($b = -0.081$, $SE = 0.01$) times less likely to perceive their child's performance positively. Our results, therefore, suggest that regardless of AoA, the length of time the child resided in their adoptive

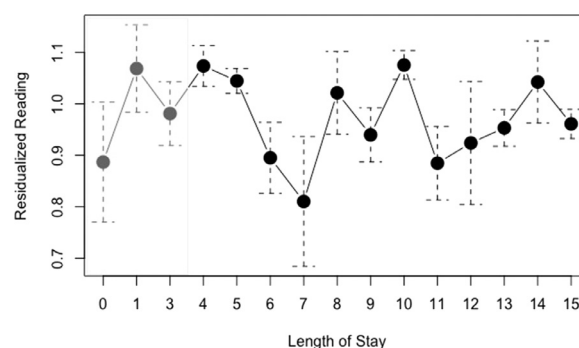


Fig. 1. Parental perception of reading is characterized by relational uncertainty, even after controlling for age of adoption. Residualized parental perception of reading is on the y-axis. Children's length of stay in their adoptive homes is on the x-axis. Error bars represent the standard error of the mean.

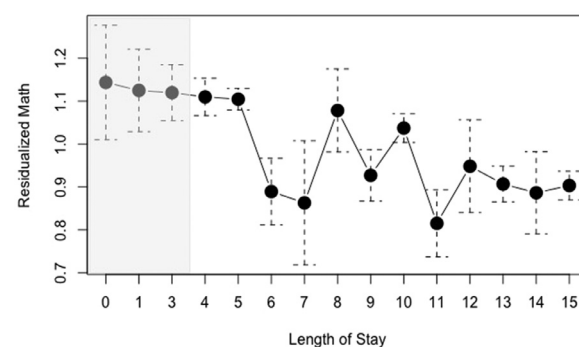


Fig. 2. Parental perception of mathematics is characterized by relational uncertainty, even after controlling for age of adoption. Residualized parental perception of mathematics is on the y-axis. Children's length of stay in their adoptive homes is on the x-axis. Error bars represent the standard error of the mean.

homes was related to parental perception of adoptees' academic achievement in both reading and mathematics.

3.2. Does relational uncertainty exist?

Next, we aimed to determine if and when relational uncertainty occurred. We hypothesized that adoptees would undergo a period of relational uncertainty—the period in which adoptees and their new families adjust to one another. Further, we hypothesized that this period would account for variance in parental perception of adoptees' academic performance, beyond what is accounted for by AoA. Adoptees' length of stay ranged from less than a year to fifteen years. Visual inspection confirmed that, as in previous studies, parental perception of both mathematics and reading was consistent during the initial zero to three-year timeframe. Thus, we focused only on the length of stay from three years to 15 years. We conducted two separate Kruskal-Wallis tests, one for each of the two residualized dependent measures of parental perception of academic achievement. Regardless of AoA, there was a significant difference in parental perception of reading ($\chi^2 = 29.444$, $df = 11$, $p < .001$; Fig. 1) and mathematics ($\chi^2 = 47.386$, $df = 11$, $p < .001$; Fig. 2). Alpha levels were FDR corrected for multiple comparisons (Benjamini & Hochberg, 1995). For reading, regardless of AoA, there was a significant difference in parental perception of children who resided in their adoptive homes from 4–6 years ($z = 2.744$), 4–7 years ($z = 2.485$), 4–13 years ($z = 2.791$), 6–10 years ($z = 2.585$), 10–11 years ($z = 2.661$), 10–13 years ($z = 2.658$), and 10–15 years ($z = 2.972$). For mathematics, regardless of AoA, there was a significant difference in parental perception of children who

Table 3
Residualized reading hierarchical regression model.

Variables	Estimate	SE	R	R ²	ΔR ²
Step 1:			0.053	0.003	
Length of Stay	-0.043***	0.012			
Step 2: Child & Adoption Factors			0.267	0.071	0.069
Sex (male > female)	-0.316***	0.080			
L1 (English > other)	0.111*	0.055			
Siblings	-0.007	0.025			
Adoption Type (Foster > International)	-0.287	0.398			
Adoption Type (Private > International)	-0.130	0.399			
Country of Adoption (US > Other)	00.174	0.396			
Placement Pre-adoption					
Birth Parents > Foster Family	-0.005	0.045			
Kinship Foster Family > Foster Family	-0.154*	0.073			
Group Home > Foster Family	-0.057	0.058			
Institution/Orphanage > Foster Family	-0.045	0.058			
Hospital/Health Clinic > Foster Family	-0.063	0.045			
Other > Foster Family	-0.063	0.060			
SES	0.022	0.028			
Sex X L1	0.174*	0.084			
SES X Placement Pre-adoption					
SES X Birth Parents > Foster Family	-0.013	0.037			
SES X Kinship Foster Family > Foster Family	0.020	0.065			
SES X Group Home > Foster Family	0.156*	0.065			
SES X Institution/Orphanage > Foster Family	-0.027	0.051			
SES X Hospital/Health Clinic > Foster Family	0.007	0.037			
SES X Other > Foster Family	-0.073	0.057			

Notes. SES=socioeconomic status. L1=first language; $p < .05^*$, $p < .01^{**}$, $p < .001^{***}$

resided in their adoptive homes from 4–6 years ($z=2.904$), 4–9 years ($z=2.728$), 4–11 years ($z=3.640$), 4–13 years ($z=3.662$), 4–15 years ($z=4.224$), 5–6 years ($z=2.661$), 5–9 years ($z=2.728$), 5–11 years ($z=3.463$), 5–13 years ($z=3.615$), 5–15 years ($z=4.398$), 10–11 years ($z=2.650$), 10–13 years ($z=2.347$), and 10–15 years ($z=2.882$). Results indicated that relational uncertainty is characterized by a drop in parental perception of adoptees' academic performance that occurs after four–five years and 10 years of living in their adoptive homes.

3.3. Which aspects of adoption differentiate academic achievement?

To investigate the impact of factors previously associated with parental perception of adoptees' academic achievement, beyond the variance accounted for by AoA and length of residence in their adoptive homes, we conducted two quasipoisson hierarchical regression analyses. One regression was conducted for each residualized dependent measure of parental perception of academic achievement. As in our previous analyses, the first step for both the reading and mathematics models included only the length of time the child resided in their adoptive homes. The second step included the previously associated child characteristics and adoption factors. Child characteristics included sex (male = 1, female = 0), L1 (English = 1, other = 0) and the presence of other children in the household (yes = 1, no = 0). Adoption characteristics included the type of adoption (international, foster, or private adoption), country of adoption (United States = 1, other = 0), where the child resided prior to being placed in their current home (foster family, birth parents, kinship foster family, a group home in the United States foster care system, an institution or orphanage, a hospital or health clinic, or someplace else) and SES. All continuous independent variables were z-scored prior to model inclusion. When compared, the residualized hierarchical models were significantly better fits (reading $p < .001$ [Table 3] & mathematics $p < .001$ [Table 4]) than the models with only length of stay included.

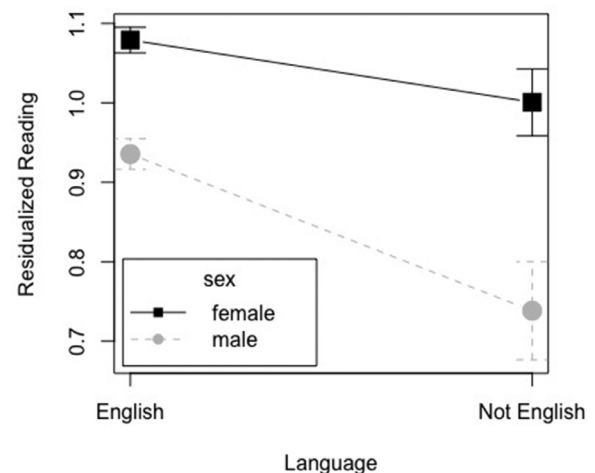


Fig. 3. Difference in parental perception of reading ability between male and female children whose first language was not English. Residualized parental perception of reading is on the y-axis. L1 is on the x-axis. Female adoptees are represented with black squares. Male adoptees are represented with gray circles. Error bars represent the standard error of the mean.

3.3.1. Reading

Regardless of AoA and beyond the variance accounted for by length of stay ($b=-0.043$, $p < .001$), there was a two-way interaction of sex and adoptees' L1 ($b=0.174$, $p < .05$). Results indicated a greater difference in parental perception of reading ability between male and female children who did not speak English as their L1 compared to children whose L1 was English (Fig. 3). Parental perception of reading was higher for female than male children ($b=-0.316$, $p < .001$), and higher for children whose L1 was English ($b=0.111$, $p < .05$). There was also a two-way interaction between SES and where the child lived pre-adoption. The ef-

Table 4
Residualized mathematics hierarchical regression model.

Variables	Estimate	SE	R	R ²	ΔR ²
Step 1:			0.053	0.003	
Length of Stay	-0.099***	0.012			
Step 2: Child & Adoption Factors			0.267	0.071	0.069
Sex (male > female)	-0.221*	0.093			
L1 (English > other)	0.049	0.065			
Siblings	0.011	0.028			
Adoption Type (Foster > International)	-0.398	0.437			
Adoption Type (Private > International)	-0.202	0.438			
Country of Adoption (US > Other)	0.252	0.435			
Placement Pre-adoption					
Birth Parents > Foster Family	-0.016	0.050			
Kinship Foster Family > Foster Family	-0.058	0.075			
Group Home > Foster Family	-0.014	0.064			
Institution/Orphanage > Foster Family	-0.057	0.060			
Hospital/Health Clinic > Foster Family	-0.053	0.052			
Other > Foster Family	-0.007	0.067			
SES	-0.113 [†]	0.062			
SES X Sex	0.282**	0.102			
L1 X Sex	0.170 [†]	0.097			
L1 X SES	0.117 [†]	0.064			
L1 X SES X Sex	-0.230*	0.106			

Notes. SES = socioeconomic status. L1 = first language; $p < .1^{\dagger}$, $p < .05^*$, $p < .01^{**}$, $p < .001^{***}$

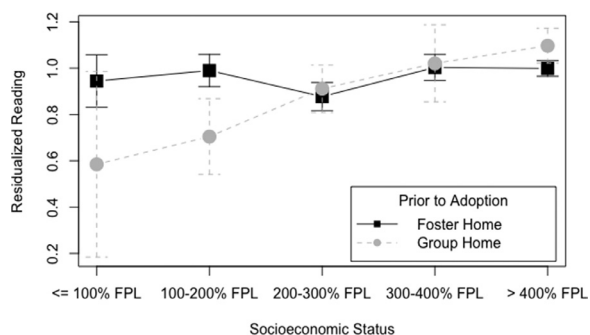


Fig. 4. Children who lived in group homes that were adopted into a family at a lower SES were perceived as worse at reading than those adopted from a foster family. Residualized parental perception of reading is on the y-axis. SES is on the x-axis. Black squares indicate adoptees who resided in a non-kinship foster home; gray circles indicate adoptees who resided in a group home. Error bars represent the standard error of the mean. FPL = federal poverty level.

fect was due to a difference between children who lived in group homes and those that lived with a foster family ($b = 0.156$, $p < .05$). Compared to those that lived with a foster family, children who lived in group homes, prior to adoption into a family at a lower SES were significantly more likely to be perceived as having poor reading performance than those adopted into a family at a higher SES (Fig. 4). Moreover, differences in where the child lived pre-adoption were found between adoptees in a kinship versus non-kinship foster family ($b = -0.154$, $p < .05$). This indicated that children were perceived as having greater reading performance when they resided with a non-kinship foster family.

3.3.2. Mathematics

Regardless of AoA and beyond the variance accounted for by length of stay ($b = -0.099$, $p < .001$), there was a three-way interaction of sex, L1, and SES ($b = -0.230$, $p < .05$). Results revealed that as SES decreased, males were more likely to be perceived as having poor mathematics performance compared to females, an effect driven by children who did not speak English as their L1 (Fig. 5). There was a two-way interaction of sex and SES ($b = 0.282$, $p < .01$) demonstrating that this relation held when data was collapsed across L1. There was also a significant effect of sex ($b = -$

0.221 , $p < .05$), indicating that parental perception of mathematics was greater for females than males.

4. Discussion

A multitude of studies found that early AoA leads to better outcomes (see Grotevant & McDermott, 2014 for review). This has led to a lagging view of adoption, in which adopted children need to “catch up” to their non-adopted peers (Miller et al., 2009; O’Connor et al., 2000). Embedded within this view is the notion that children with an early AoA have less catching up to do than those with a later AoA. While the lagging view accounts for some differences found between adopted and non-adopted children, it does not account for differences in parental perception of adoptees’ academic achievement. To be clear, the current paper does not dispute that AoA contributes to parental perception of adoptees’ academic achievement. We, in fact, replicate the association between AoA and parental perception of adoptees’ academic achievement. Instead, we provide evidence that this view does not account for parental perception of adoptees’ academic achievement during relational uncertainty—the period in which adoptees and their new families adjust to one another. Evidence that is particularly relevant as studies of adoptees’ academic achievement are largely based on parent report (van Ijzendoorn & Juffer, 2005) and have clear educational implications.

This study is the first to identify and examine the impact of relational uncertainty on parental perception of adoptees’ academic achievement. Using a nationally representative sample, two key findings emerged. First, regardless of AoA, relational uncertainty accounts for parental perception of adoptees’ academic achievement. Second, regardless of AoA and after accounting for relational uncertainty, several factors continued to account for additional variance in parental perception of adoptees’ academic achievement. We discuss these findings in turn.

4.1. Relational uncertainty

We found that regardless of AoA, length of stay in adoptive homes accounted for unique variance in parental perception of adoptees’ academic achievement. If adoptees simply needed to catch up to their non-adopted peers, as the lagging view suggests, we would have found an upward trend in parental percep-

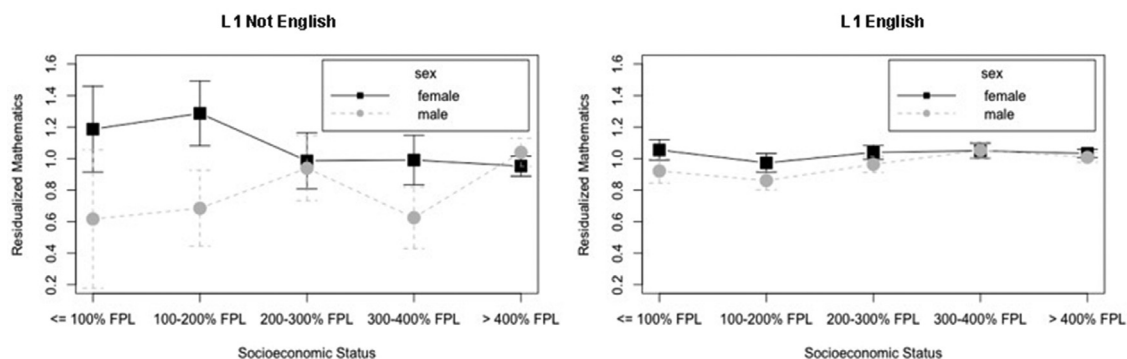


Fig. 5. Males whose first language was not English, adopted into a home at lower SES were perceived as worse at mathematics. Residualized parental perception of mathematics is on the y-axis. SES is on the x-axis. Black squares represent females; gray circles represent males. Error bars represent the standard error of the mean. FPL = federal poverty level.

tion of adoptees' academic achievement (van Ijzendoorn & Juffer, 2005). In other words, as adoptees caught up to their non-adopted peers, parental perception of adoptees' academic achievement would have increased. Instead, we found that regardless of AoA, parental perception of adoptees' academic performance is characterized by a drop that occurs after four–five years and 10 years of living in their adoptive homes. Our results suggest that not only does relational uncertainty exist but also that this period of adjustment acts independently from AoA on parental perception of adoptees' academic achievement. Further, given the distribution in AoA, results neither highlight a developmentally difficult time for parents and children nor a specific grade-level difficulty. Thus, providing academic supports for children immediately after adoption is likely not enough. Educators should anticipate a period of relational uncertainty, where parental perception of adoptees' academic performance will drop.

4.2. Factors linked to the academic performance of adopted children

Among the factors previously linked to adoptees' academic achievement, we found sex to be statistically significant. Specifically, females were perceived as more academically successful than males in both reading and mathematics. Our results align with Burrow et al. (2004) who found that during adolescence, females reported significantly better school grades, fewer learning problems, and higher academic expectations than males regardless of if they were adopted. Moreover, females outperform males academically in reading (e.g., Ready et al., 2005) and mathematics (e.g., Ding et al., 2006). As such, regardless of AoA and after taking into account length of stay in their adoptive homes, sex differences found in parental perception of adoptees' academic performance reflect previous studies on adopted and non-adopted children.

We further found that the difference in parental perception of academic achievement between female and male adoptees was exacerbated if the adoptees' L1 was not English, regardless of AoA and after taking into account adoptees' length of stay. While Dalen & Theie (2019) found no significant differences in perception of academic achievement between adopted and non-adopted elementary school children, language skills were found to explain significant variance in academic achievement. Moreover, their previous work found that diminished or delayed communication is reported by parents of international adoptees (Dalen & Theie, 2012, 2014). Thus, it appears that parental perception of adoptees' academic performance is linked to sex differences and exacerbated by children's ability to communicate in the dominant sociocultural language.

4.3. Factors linked to parental perception of mathematics performance

In the United States, families that adopt are more likely to be socioeconomically stable (Werum et al., 2018). Yet, differences in SES are evident in our sample (see Table 1). We found that SES exacerbated the difference in parental perception of mathematics achievement between male and female children. This result was robust to differences in AoA; this interaction between SES and sex remained evident even after taking into account the length of time the child resided in their adoptive home. And, the interaction was not subsumed by the three-way interaction between SES, L1, and sex. Prior studies report that children in households at higher SES are perceived as more successful at mathematics (e.g., Basque & Bouchamma, 2016). Further, parents of non-adopted children report more confidence in their children's ability to reach academic milestones than parents of adoptees (Anderman et al., 2018). As such, the relation between SES and sex found in parental perception of adoptees' mathematics performance are consistent with and extend the literature.

4.4. Factors linked to parental perception of reading performance

Beyond adoptive families being more likely to be socioeconomically stable (Werum et al., 2018), adoptive homes' SES is well linked to adoption context (e.g., Bimmel et al., 2003; van Ijzendoorn et al. 2005). In the current study, we found an interaction between SES and adoption context. The interaction was driven by adoptive homes at lower SES. Specifically, we found parental perception of adoptees' reading achievement was lower for children who, prior to adoption into a socioeconomically disadvantaged home, lived in group homes rather than with a foster family. During foster care placement children are considered in state custody (Children's Bureau, 2020). State limitations are placed on the number of children who can reside in a United States foster home at one time; typically, foster homes house a smaller number of children than group homes (Children's Bureau, 2020). In many studies, foster care placement is collapsed into a single variable (e.g., Bimmel et al., 2003). Yet, group home and kinship foster family settings result in adoption (or reunification) at a slower rate than children placed in a foster home with no biological relatives (Courtney & Wong, 1996). Here, we found that those in a kinship foster family were more likely to be perceived as struggling with reading than children in a non-kinship foster family. Thus, parental perception of adoptees' reading was greater when children were in a non-kinship foster family pre-adoption, regardless of AoA and after taking into account adoptees' length of stay.

4.5. Limitations

Despite the strength of using a nationally representative sample to study adoptees' academic achievement, some limitations should be noted. Chiefly, the study focuses on parental perception. While this was an intentional choice, to demystify the previous literature on the academic achievement of adoptees, there are two primary issues to consider regarding measures of parental report. First, measures of parental report often suffer from social desirability bias—the tendency to want to project a favorable image, particularly with regard to socially accepted standards of behavior (e.g., Chung & Monroe, 2003). Second, academic achievement is influenced by parental perception. For example, during adolescence, parental perception has a greater influence on children's academic self-perception than grades (e.g., Frome & Eccles, 1998). Therefore, parental perception itself has a bidirectional effect on academic achievement.

Another limitation lies in the cross-sectional sample. Because the sample was cross-sectional, not longitudinal, it was not possible to assess if relational uncertainty occurs twice or once but at different time points. If a drop in parental perception of adoptees' academic performance occurs twice, this would indicate that adoptees and their adoptive families go through two periods in which they adjust to one another. Alternatively, external factors may influence if relational uncertainty occurs either after four–five years or after 10 years of living in their adoptive home.

4.6. Future directions

While beyond the scope of the current study, measuring the academic achievement of adoptees is perhaps best addressed with metrics of both parental perception and student achievement. If adoptees' academic performance does not differ from their non-adopted peers, yet differences are found in parental perception of academic achievement, then educational intervention targeting parental perception of older adoptees' academic achievement may be needed to increase educational attainment. However, it has been almost 90 years since Leahy (1935) found no difference in the academic performance of adopted versus non-adopted children. It is possible that today, adoptees' academic performance does differ from their non-adopted peers, paralleling more recent reports of parental perception of academic achievement. In this case, adoptees would likely be best served by educational interventions targeting both their academic achievement and parental perception. At the very least, work is needed to disentangle the complexities of adoptees' academic achievement.

Further, few studies have examined adoption longitudinally. While Decker & Omori (2009) shed much-needed light on the educational attainment of adoptees, it is critical that longitudinal studies on adoptees and their families be conducted. These studies would provide critical information as to which supports are needed, for whom, and when academic supports would be the most likely to facilitate adoptees' long-term academic success.

5. Conclusion

Differences in parental perception of adoptees' academic achievement cannot be accounted for by the lagging view of adoption. While AoA does contribute to parental perception of adoptees' academic achievement, our findings suggest that rather than adoptees lagging behind in academics, academic achievement is impacted by relational uncertainty. Our results also provide support for how specific aspects of adoption differentially affect parental perception of adoptees' academic achievement, regardless of AoA and after accounting for the length of time children reside in their adoptive homes. The results of this study call

for a paradigm shift in how we view the frequently reported factors that impact parental perception of adoptees' academic performance. Our results also highlight the need to understand what educational resources parents and adoptees need to transverse relational uncertainty.

Author contributions

Tamara Turski: Conceptualization, Methodology, Software, Formal analysis, Writing – original draft, Stephanie N. Del Tufo: Conceptualization, Methodology, Software, Formal analysis, Writing – review & editing, Supervision.

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