Developmental Profiles of Children's Spontaneous Lie-Telling Behavior

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Abstract

Lying emerges as a typical childhood behavior, but little is known about the frequency and types of lies that children tell in relation to age and theory of mind (ToM). This study explored the frequency and types of lies that children 3-14 years old ($N = 229$) told in their natural environments over two weeks, as reported by their parents. Results suggest that classes of lie-telling behavior emerge according to age and ToM: occasional liars (*those with few lies reported across categories*; 51%), instrumental liars (*lies primarily for material benefit*; 42%), and antisocial liars (*lies primarily to avoid personal consequences*; 7%). Children with lower ToM had a higher frequency of antisocial lies reported, which suggests the use of lie-telling as a problematic social behavior in children whose ToM lags behind their peers.

Keywords: children, lie-telling, development, theory of mind

- Age and theory of mind predicted the frequency and types of lies children tell at home
- Young children with high ToM had a lie-telling profile similar to older children
- Older children with low ToM told a high frequency of antisocial lies

Developmental Perspective on Children's Lie-Telling Behavior

Lying in both children and adults is a normative behavior in that most people tell lies, at least on occasion (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996; Kashy & DePaulo, 1996; Serota, Levine, & Boster, 2010). However, despite it being a common behavior, it is considered a reprehensible one that can have negative ramifications for social relationships (Bok, 1978; Talwar & Crossman, 2011). For some individuals it may become a maladaptive behavior, either due to telling many lies (Gervais, Tremblay, Desmarais-Gervais, & Vitaro, 2000; Stouthamer-Loeber & Loeber, 1986; Warr, 2007), or due to the types of lies that are being told, for example serious lies that involve transgressions or that could place an individual in danger (DePaulo, Ansfield, Kirkendol, & Boden, 2004).

Educators, clinicians, and parents are concerned with the development of lie-telling that becomes a serious behavioral problem and that places children's credibility in question. Indeed, there is some limited research to suggest that chronic lying is related to aggression, delinquency, and conduct problems in older children and adolescents (Achenbach & Edelbrock, 1979, 1981; Gervais et al., 2000; Ostrov, Ries, Stauffacher, Godleski, & Mullins, 2008; Rutter, 1967; Stouthamer-Loeber & Loeber, 1986; Warr, 2007). However, currently little is known about the types of lies that children tell in their daily lives and how these lies cluster to form profiles of lie-telling behavior that can suggest either normative development or a behavioral problem. To date, there has been no examination of the frequency of lie-telling and of the different types of lies told by children and adolescents to explore how types of lies may cluster in the same individual, despite the fact that this information may reveal whether children's lying patterns follow a typical developmental pathway or may be a risk factor for other antisocial behavior.

1.1 Lie-Telling and Theory of Mind

Researchers have shown that lie-telling emerges in the preschool years and is related to their emerging cognitive sophistication (Chandler, Fritz, & Hala, 1989; Ding, Wellman, Wang, Fu, & Lee, 2015; Evans & Lee, 2013; Lewis, Stanger, & Sullivan, 1989; Talwar & Lee, 2002a; 2008). Children's propensity and ability to tell convincing lies increase further into middle childhood and adolescence (Evans & Lee, 2011; Talwar & Lee, 2002a; 2008; for a review see Talwar & Crossman, 2011; 2012) and is still likely related to their cognitive abilities. In particular, theory of mind (ToM), the ability to manage information from another person's perspective, has been found to play a key role in the development of children's lie-telling (Evans, Xu, & Lee, 2011; Polak & Harris, 1999; Talwar & Lee, 2008; Talwar, Gordon, & Lee, 2007). Specifically, ToM has been found to be related to children's lie-telling in experimental settings (Talwar, Gordon, et al., 2007; Talwar & Lee, 2008; Williams, Moore, Crossman & Talwar, 2015), and may also be associated with their lie-telling tendencies in naturalistic settings.

Children's ToM may also be related to the types of lies they tell. Previous findings suggest that children with high ToM may also engage in more prosocial behavior (Caputi, Lecce, Pagnin, & Banerjee, 2012; Eggum et al., 2011; Williams et al., 2015), which may also be evident in their lie-telling through telling more prosocial lies (i.e., intended to benefit another individual) and fewer antisocial lies (i.e., intended to benefit themselves or even hurt another individual). At the same time, frequent lying in children and adolescents may be related to underlying immature cognitive abilities. This delay in cognitive development could result in the use of the more primitive strategy of lie-telling to manage their social environments following transgressive behavior (i.e., Rasmussen, Talwar, Loomes & Andrews, 2007; Talwar & Crossman, 2011; Talwar & Lee, 2002b). However, it is still not known how lying deviates from being part of

children's normal development to being a problem behavior for some children, nor about the role that ToM may play in these developmental trajectories of lie-telling behavior. To begin to understand this development, the first step is to explore how the frequency of lie-telling as a social strategy changes with age and ToM. Further, because lying in general tends to be perceived as a problem behavior in children, it is important to differentiate between the types of lies that children typically tell to understand better when and for whom lying is problematic.

1.2 Development of Lie-Telling

Children's lie-telling has primarily been studied using experimental paradigms that examine the likelihood that they will tell a lie to a researcher in a contrived scenario. The majority of these studies have examined children's lie-telling to conceal a transgression (e.g., Evans & Lee, 2013; Evans et al., 2011; Fu, Evans, Xu, & Lee, 2012; Talwar & Lee, 2002b), but a few have also explored other types of lies, such as lying to protect another or to be polite (e.g., Popliger et al., 2011; Talwar & Lee, 2002a; Talwar, Lee, Bala, & Lindsay, 2004; Talwar, Murphy, & Lee, 2007; Xu, Bao, Fu, Talwar, & Lee, 2010; Williams et al., 2015). Based on these paradigms, researchers have suggested that young children's first lies may be told primarily to achieve instrumental and interpersonal goals, such as to conceal a transgression (Lewis et al., 1989; Talwar & Lee, 2002b), but that with age, around middle childhood, they are increasingly likely to tell prosocial lies, such as to be polite (Popliger, Talwar, & Crossman, 2011; Talwar, Murphy, et al., 2007). Findings from experimental studies also suggest that between middle childhood and mid-adolescence, children's instrumental lie-telling may decrease (Evans & Lee, 2011). Overall, these findings suggest that there may be a developmental trajectory to the types of lies that children tell, however in general these studies examined only a limited age range in an experimental setting in which one lie, and only one type of lie (i.e., polite *or* instrumental),

was measured. Although laboratory-based studies have allowed for controlled examination of children's lie-telling abilities, they have not allowed for the measurement of the frequency of children's lies or the range of types of lies that children commonly tell in their daily lives, which is necessary to test whether there might be a developmental trajectory to the types of lies that children tell in their daily lives.

Related to lying behavior, Hartshorne and May's (1928) Doctrine of Specificity suggests that honesty is not a constant trait; rather, it depends on the social context of the interaction. That is, individuals are likely to lie for many different reasons, for example the severity of the consequences if the truth was discovered or the possible benefits that might result from lying (e.g., Ceci, Leichtman, & Putnick, 1992). In essence, this theory asserts that children cannot be classified into categories of honest children versus dishonest children because their honesty or dishonesty is dynamic according to the social context. However, in experimental designs this is often the case; children are categorized as a truth-teller or a lie-teller based on information that is available from one laboratory situation that may not accurately depict their lie-telling behavior on a daily basis. For example, experimental designs are not able to capture children's common uses of lie-telling as a strategy in their daily interpersonal interactions with those with whom they are familiar and have close relationships. To truly evaluate whether patterns emerge in children's lie-telling behavior, it is necessary to consider the frequency and types of lies that children tell across contexts, as suggested by the Doctrine of Specificity.

1.2.1 Types of lies that children tell at home

Children's spontaneous lie-telling in their natural environments has only been examined in two known studies. One study examined the frequency of deception among 40 children between 3 and 6 years of age in their homes using two 90-minute observation sessions by trained

research assistants (Wilson et al., 2003). These researchers found that children's lie-telling increased with age, between 3-6 years, similar to findings in experimental studies, and that the most common types of lies were told to avoid responsibility, gain control, or accuse a sibling. Another study used diaries to measure children's lies in their natural environments (Newton et al., 2000). Diary studies facilitate observation of children's lies over time without being intrusive or affecting children's behavior patterns. This study asked 24 mothers to keep a diary of their 3-4 year-old children's lie-telling behavior for three one-month periods over six months (Newton et al., 2000). They found that all of the children falsely denied a behavior at least once, all used an excuse to avoid a task, and all used an excuse for material gain. To our knowledge, this study was the only study to provide insight into children's lie-telling in their natural environments over a period of time using a parent-reported diary method. Thus, there is much to be learned about how children's strategic use of lie-telling in naturalistic settings develops over childhood and whether children can be sorted into classes of liars based on the frequency and types of lies they tell.

1.3 Current Study

The lies that children tell in their daily lives are directly relevant to developmental, clinical, and forensic settings because they reflect the reality of children's lie-telling behavior (Talwar & Lee, 2011; 2012), but as of yet there has been little research in this area. The current study explored the types and frequency of lies that children told over two weeks in their natural environments, as reported by their parents. This study also measured children's ToM in two laboratory tasks to compare to parents' reports of their children's lie-telling. Finally, given that ToM emerges in early childhood and continues developing into early adolescence, this age range

was the target range for our study to explore the relation between children's developing ToM, age, and their lie-telling behavior.

Expectations were that the overall frequency of lies would be highest in the youngest participants (i.e., ages 3-6), and decrease with age as children developed other communicative strategies for obtaining their social goals and were increasingly socialized to norms about lying as a socially discouraged behavior (i.e., Bok, 1978; Talwar & Crossman, 2011). We also anticipated that specific profiles of lying behavior would emerge based on the frequencies of the types of lies told, specifically that there would be developmental differences in classes of liars with young children telling more instrumental lies (i.e., Wilson et al., 2003) and older children telling more prosocial lies (i.e., Popliger et al., 2011), and that classes of liars would be related to ToM, with higher ToM being associated with more prosocial lies and fewer antisocial lies. Finally, we anticipated that a small percentage of children and adolescents would have atypical patterns of lie-telling that might suggest clinical problems with lying (i.e., Stouthamer-Loeber, 1986), for example more lies told to blame another person for the child's own transgressions.

Method

2.1 Participants

Participants were 229 children, 3-14 years old ($M = 7.06$ years, $SD = 2.89$ years), 61% male and 39% female (see Table 1) who were part of a larger ongoing program of study on children's deceptive behavior and family relationships. **As part of this research program, children's deceptive behavior with an experimenter and their deceptive behavior with a parent were studied to explore developmental trends in children's deception across a range of familiar and unfamiliar settings.** Younger children, ages 3-6 were oversampled because we anticipated they would have more variance in their ToM scores compared to older children, and wanted to

investigate the relation between varying levels of ToM and lies reported by parents. Parents were predominantly mothers (91.5%) and some fathers (8.5%) who recorded their children's lies. The three most common ethnicities reported were Canadian (61%), followed by French (8%), and Italian (6%). Similarly, the three most common levels of education obtained were Bachelor's Degree (39%), Master's (20%), and Diploma or College Degree (11%). Finally, the three most common reported household income levels were: greater than \$60,000 (51%), \$40,000 to \$50,000 (12%), and \$50,000 to \$60,000 (11%).

2.2 Measures

2.2.1 Theory of Mind

Two laboratory story tasks measuring first-order ToM and two story tasks measuring second-order ToM were used. For first-order ToM, Mark, Sally, and Andy paradigms were used, based on Wimmer and Perner (1983). One of the first-order stories described a boy who puts a chocolate bar away before going out to play, and his mother moves the chocolate bar without his knowledge. Participants responded to a control question to judge whether they understood the extent of the boy's knowledge about his chocolate bar, and a question measuring their first-order ToM understanding. If either question was not answered correctly, then they received no point for this story, but if both were correct, they received one point. The same scoring protocol was used for both first-order ToM stories, for a maximum score of two.

To measure second-order ToM, Grandpa's Present and the Ice Cream stories were used, adapted from Hogrefe et al. (1986) and Sullivan et al. (1994). In the Grandpa's Present story, two children, Simon and Mary, were given a chocolate bar from their grandfather and told to share. While Mary is out playing, Simon places the chocolate bar in his bag, but Mary watches him do this through the window. Children were asked whether Mary knew where the chocolate

bar was (control), where Simon had put the chocolate bar (control), whether Simon knew that Mary knew where the chocolate bar was (ToM), and where they think Simon thinks Mary will look for the chocolate (ToM). The second-order ToM stories measured children's ability to limit their knowledge to another individual's knowledge. For each story measuring second-order ToM, children were asked two control questions and two ToM-related questions. Similar to the first activity, children had to correctly answer the first control question to be able to receive the point for the first ToM question and had to answer correctly the second control question to receive the point for the second ToM question, to a maximum score of four. Children's first-order and second-order ToM were added together to generate a total score, with a maximum total score of six, which was used in the analysis. No ceiling effects were observed in any age group (Table 2).

2.2.2 Diary of children's lie-telling behavior

Parents were asked to keep a record of each lie that their child told over two weeks (Author et al., 2015), similar to the diary methods of Newton et al. (2000). As in Newton et al., several safeguards were used to ensure accuracy and reliability of reporting. For example, the researchers first explained the purpose of the diary reporting activity and provided examples of possible types of lies they might observe **to encourage parents to record a broad range of lies in their interaction log (see supplemental material for example instructions)**. This information was verbally explained and provided in a written package form for parents to increase information retention. Parents were also asked to record as much information about the event as possible and as shortly after the event as possible. **This information was used to facilitate coding of each of the deceptive interactions that parents recorded to determine if the interaction should be counted**

as a falsehood as well as the type of falsehood. Specifically, parents recorded a description of the lie-telling event, the mood of the interaction, the people involved, and the method of inquiry.

Before coding, the open-ended responses were reviewed with an initial coding scheme that used a numerical rating of possible types of lies according to extant literature (e.g. DePaulo, et al., 2004; Talwar, Crossman, Williams, & Muir, 2011). That is, types of lies that have been discussed in previous literature were combined into a coding scheme with a definition of each type of lie. After a review of the open-ended responses the coding scheme was finalized and no new codes emerged from the data that had not been pre-established in the initial coding scheme. Possible types of lies were lies that falsely assert non-involvement (coded as avoid punishment), lies to obtain material benefits (instrumental), lies that give a false impression about the child's identity (identity), lies told to falsely blame another (blame others), lies to protect themselves from psychological distress or relational conflict (protect self), lies to protect another from psychological distress (protect other), lies told to be polite (polite), and lies told in a story-telling or playful context such as claiming to be a fictional character or hyperbolic statements (in play) (see DePaulo et al., 2004; Talwar et al., 2011 for further description; see Supplemental Table 1 for examples of the lie types). When parents reported that their child told no lies on a particular day, a code of "no lies told" was assigned.

In some cases it was not possible to determine with certainty that an interaction reported by the parent was a lie based on the contextual information provided. For example, a child who had been ill told his parent that his "stomach hurt" and he "could not go to school." In such cases, the parent often expressed doubt or uncertainty about their child's statement in their interaction log. When it was not possible to determine based on the information provided

whether the interaction recorded was indeed a lie, the event was not counted as a lie and was assigned the “no lie told” code for verification by a second rater as described below.

The initial 20% of lies were coded by two raters (inter-rater reliability = 90% agreement for type of lie). Given the strong inter-rater reliability value in the initial 20%, the remaining 80% were coded by the first rater (Flatley Brennan & Hays, 1992). After all coding was complete, the same second rater reviewed the codes for any disagreement or discrepancies, which were then discussed with the first rater and resolved by agreement.

2.3 Procedure

Children ($n = 229$) participated in the ToM activity to measure their cognitive skills (among other activities in a larger study). Parents completed the demographic information form at the same time. After the activity, the diary reporting was explained to parents, who were asked to record each of the lies that their child told over a two-week period. At the end of the two weeks, parents were asked to bring in or mail the completed diaries. Parents were provided with a diary package that included a table to record lie-telling occurrences, an instruction sheet with information about how to record children's lies with examples of possible different types of lies, and an envelope with return postage. Of a possible total of 417 parent diaries, 229 were returned.

Results

To analyze children's lie-telling behavior, we conducted preliminary analyses including descriptive statistics for the number of children's lies reported, and correlational analyses among the frequencies of each type of lie, children's age, ToM scores, and gender. Next, we conducted a negative binomial poisson regression with a natural log function (used with count or frequency data because these data do not meet the assumption of normal distribution) using children's age

and ToM to predict the frequency of lies reported. Finally, we used a simultaneous latent class regression model (used to analyze classes in the data according to several categorical variables and to analyze the factors that predict those classes) to explore patterns in children's lie-telling behavior and determine whether children's age or ToM scores predicted these profiles of behavior.

Parents recorded 1638 of their children's lies in total. The mean number of lies recorded per child was 7.02 ($SD = 5.87$), and the median number of lies 6. Children 3-6 years had 8.19 lies ($SD = 6.50$) recorded, children 7-10 years had 5.62 lies ($SD = 4.77$) recorded, and children 11-14 years had 4.52 lies ($SD = 2.74$) recorded on average over two weeks (see Table 1). A correlation analysis indicated that age was correlated with the total number of lies reported, $r = -.259$, $p < .01$, which suggests that the number of children's lies reported decreased with age (Table 2).

There were no correlations between gender and total lies reported, suggesting no gender differences in the frequency of lies that parents reported. Consequently, gender differences were not explored further in the analyses. A preliminary inspection of ToM scores indicated that there was no ceiling effect in any of the age groups (Table 3).

3.1 Age Predicts Frequency of Lies

A poisson regression for count variables was conducted to examine whether age predicted parents' reports of the number of lies told over two weeks. Poisson regressions fall within generalized linear models and are appropriate to use with count or frequency data because these data do not meet the distributional assumptions of linear regressions (Cameron & Trivedi, 2013). Before testing the model, the outcome variable of total lies reported over two weeks was tested for equidispersion (Cameron & Trivedi, 1990). The regression-based test indicated that

the data was overdispersed. Consequently a negative binomial model of poisson regression was used (Hoef & Boveng, 2007). This model includes an extra parameter to account for error when the mean of the outcome is not equal to the variance (Gardner, Mulvey, & Shaw, 1995). We analyzed two models using negative binomial poisson regression: the first examined the main effects and the second included an interaction term. In the first model, age and total ToM were the predictors and the total number of lies was the outcome. The overall model was significant, $\chi^2(17, N = 220) = 49.91, p < .001$ ($d = 1.08$, 95% *CI* 0.78, 1.38), which supports that the frequency of children's reported lies significantly changes with age and ability to think from another's perspective. The test of model effects indicated that age, $\chi^2(11, N = 220) = 24.22, p = .012$, and total ToM, $\chi^2(6, N = 220) = 13.68, p = .033$ were significant predictors of the total number of lies reported (see Table 4 for model effects).

Specifically, children who were 3 years old had an incidence rate of 1.51 (derived from the exponentiated unstandardized *b* coefficients), which suggests that they were 51% more likely to have lies reported than children who were 14 years old. Overall, there was a trend toward less frequent lie-telling with age, with the exception of ages 6 and 7, where children told fewer lies than the oldest children (age 14) (see Table 5 for incidence rates). In terms of ToM, children with very low total ToM scores (score of 0) had a lie-telling incidence rate of 0.80 in comparison to children with very high total ToM scores (score of 6), which indicates that children with low ToM told approximately 20% fewer lies than children with high ToM (see Table 5).

The second model included the same predictors as the first model, with the addition of the interaction between age and ToM to predict the total number of lies reported. The overall model was significant, $\chi^2(47, N = 220) = 92.79, p < .001$ ($d = 1.71$, 95% *CI* 1.36, 2.06), supporting that the model with the interaction term contributed explanatory power to the

frequency of children's lies according to age and ToM. In the second model, age and ToM were no longer significant predictors according to the test of model effects (see Table 4), but the interaction of age and ToM was a significant predictor of the total number of lies reported, $\chi^2(30, N = 220) = 44.27, p = .046$. According to the interaction incidence ratios, parents were more likely to report the youngest children (3-4) telling more lies than the oldest children in the sample (12-14 years depending on the ToM category), across ToM scores. However, at age 5, this trend reversed for children with high ToM scores. Specifically, parents of 5-year-olds with high ToM scores were less likely to report their children telling lies than the oldest children in the sample who also had high ToM scores (ages 12-14 depending on the ToM score). At low ToM scores, the parents of the middle group of children (i.e., 7-10 years) were more likely to report their children telling lies than the oldest children who also had low ToM scores, but at high ToM scores, they were less likely to report their children telling lies in comparison to the oldest children in the sample with high ToM scores. Overall, the interaction between age and total ToM suggests that young children were likely to have more lies reported than older children at both high and low ToM scores, with the exception of 5-year-olds, who had fewer lies reported at high ToM scores, and the middle group of children who had fewer lies reported than older children at high ToM scores.

3.2 Latent Class Regression Model

A latent class analysis with polytomous qualitative outcome variables (Linzer & Lewis, 2011; 2013) was conducted to explore latent patterns in children's ($n = 220$) lie-telling behavior as reported by parents over two weeks. Latent class analysis yields two main sources of information: the estimated class population percentages and the conditional item response probabilities. The estimated class population percentages indicate the percentage of the sample

in each class. The item response probabilities indicate the likelihood of each variable score according to class, which is used to describe the composition of each group. Lies to avoid punishment, instrumental lies, identity lies, lies told to blame another, lies told to protect self, lies told in play, and polite lies were categorized into quartiles according to the frequency of lies that had been reported and coded by the researchers (same coding and inter-rater agreement as above). For example, children who were in the bottom quartile for the number of instrumental lies reported received a code of 1 for this variable, whereas children who were in the top quartile for the number of instrumental lies reported received a code of 4. Types of lies with a low variance in the distribution had only two or three categories, according to the best fit for the data. For example, polite lies and lies to protect others were dichotomized because only one quartile of participants were reported as having told these types of lies, thus the bottom three quartiles received a code of 1, and the top quartile received a code of 2. ToM scores were each increased by 1 to eliminate zeros in the analysis (necessary to conduct a polytomous LCA), which yielded a final score range of 1-7.

In latent class analysis, model decisions are based on a combination of statistical, information, parsimony, and interpretability (Collins & Lanza, 2010). In this analysis, models with one through 10 classes were explored for the best fit, and each latent class model was repeated ten times to determine a global maximum log-likelihood (Collins & Lanza, 2010). The statistical package Latent Class Analysis of Polytomous Outcome Variables (poLCA) (Linzer & Lewis, 2011) in R was used to conduct the analysis. To determine relative model fit, the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were used (Collins & Lanza, 2010). According to these information criteria, the two-class and three-class models were selected for strong statistical fit. Both the two-class and three-class models had the strongest

combined information criteria; the two-class model had an AIC of 2335.32 and a BIC of 2430.34, and the three-class model had an AIC of 2334.36 and a BIC of 2483.67. As a final comparison, we examined the interpretability of the models. The three-class model differentiated a third class of liars based on a higher frequency of antisocial lies, and this contributed to the interpretation of the results beyond the two-class model. Based on these criteria of statistical information, parsimony, and interpretability (Collins & Lanza, 2010), the three-class model was retained as the best-fitting model.

3.2.1 Three-class model. A latent class regression model was conducted simultaneously with the latent class analysis (i.e., “one-step”) to determine whether children’s age and ToM contributed to the probability of children’s latent class membership. Age in years and total ToM were entered as covariates to the three-class model. The three classes are described first, followed by the results of the latent class regression.

Class 1 had 51% of the population shares and represented the “occasional liars.” The occasional liars told the fewest number of lies across categories (see Table 6 for item-response probabilities), except for lies to protect others and polite lies. Of the three classes, occasional liars were the most likely to tell more other-oriented lies. However, the probability difference for other-oriented lies between the three classes was marginal.

Class 2 had an estimated 42% of the population shares, and was labelled the “instrumental liars.” Instrumental liars were characterized by the highest frequency of instrumental, identity and playful lies, and a moderate frequency of lies told across the other categories in comparison to the other classes. Instrumental liars were the least likely of the three classes to tell lies to protect others, however, the difference in item-response probability was minimal in this category.

Class 3 held 7% of the population shares, and was identified as the “antisocial liars” based on the item-response probabilities. Overall, the antisocial liars class was characterized by the highest frequency of lies to avoid punishment, blame others, and to protect the self, and a moderate frequency across the rest of the categories of lies. Antisocial liars were also the least likely of the three classes to tell polite lies, though the item-response probability was again minimal.

In a latent class regression, the first class is considered the neutral class, and the proceeding classes are compared to the neutral one. The regression analysis computes the log-ratio prior probability of belonging to the second or higher classes in comparison to the neutral class (Collins & Lanza, 2010). In this case, the occasional liars were the neutral class and instrumental and antisocial liars were compared to the occasional liars. The latent class regression results indicated that, in comparison to the occasional liars class, age, ToM, and the interaction between age and ToM significantly predicted children's likelihood of belonging to the class of instrumental or antisocial liars (see Table 7).

Results of the regression demonstrate that young children (age 4) with low ToM were 100% likely to belong to the class of instrumental liars (see Figure 1). As young children's ToM increased, the likelihood of them belonging to the instrumental liars group decreased to 50%. The likelihood of belonging to the class of occasional liars increased to 50% for young children with high ToM. Young children at any level of ToM had a 0% likelihood of belonging to the class of antisocial liars, which indicates the antisocial liars class was composed of older children.

Older children (age 11) with low ToM were 100% likely to be part of the antisocial liars class (see Figure 2). As older children's ToM increased, the likelihood of them belonging to the antisocial liars class decreased to 0% for children with the highest levels of ToM. Older children

with high ToM were between 90-100% likely to belong to the occasional liars class, and only 0-5% likely to belong to the instrumental liars class.

Discussion

4.1 Summary of Findings

Three distinct classes of lie-telling emerged in children's spontaneous daily behavior: occasional, instrumental, and antisocial. Both age and ToM affected the likelihood of membership in these classes, such that young children with low ToM were likely to belong to the instrumental liars group, and young children with high ToM were equally likely to belong to the instrumental and occasional liars group. Older children with low ToM were very likely to belong to the antisocial liars, but older children with high ToM were very likely to belong to the occasional liars group.

4.2 Developmental Patterns in Children's Lies

4.2.1 Developmental differences in lies told

Overall, children told an average of one lie every two days, and overall the frequency of children's lies decreased as they aged, suggesting that the frequency of lie-telling may be a developmental phenomenon. At the same time, our findings suggest there may be a non-linear developmental trend in the overall frequency of lie-telling. Specifically, we found that lie-telling was frequent among 3- to 5-year-olds, dropped in frequency from 6-7 years, increased again from 8-10 years, and then dropped again in early adolescence. These findings are somewhat surprising, and they highlight the need to consider children's lie-telling holistically, that is both the frequency *and types*, as in the classes of liars, because the types of lies may present a clearer developmental picture than an overall measure of frequency. For example, we might expect lies told in play to decrease around age 6, which may create a dip in lying frequency, and we might

also expect prosocial lies to increase around age 8 (e.g., Popliger et al., 2011), which may then cause a slight increase in lie frequency. By early adolescence, we again might expect instrumental lying to decrease, which may then create another dip in overall lying frequency. This is also consistent with previous experimental findings that children 8-16 years are less likely to lie to cover a transgression with age (Evans & Lee, 2011). Also, Stouthamer-Loeber and Loeber (1986) found that the prevalence of lying decreases with children's age, especially for children who only lie occasionally, which may represent a typical trajectory of lie-telling, as opposed to those who lie frequently, which may represent a problematic trajectory of lie-telling. Despite the fact that measuring children's lies from a third-person perspective likely becomes more difficult as they enter adolescence, whether due to skill or time spent with others, our findings suggest that lie-telling does follow a developmental trajectory that decreases in frequency as children enter adolescence. According to Arnett Jensen, Jensen Arnett, Feldman, and Cauffman (2004), this frequency likely continues to decrease as adolescents reach emerging adulthood, based on a self-report of the frequency of adolescent and emerging adults' lies told to parents. Our findings also suggest that the likelihood that children belonged to one of the three latent classes of lie-telling behavior—occasional, instrumental or antisocial liars—varied as children aged, suggesting that children's use of lying as a social strategy in their daily lives is likely related to their development.

4.2.2 Typical developmental trajectory of lying behavior

Based on the results of the latent class regression, we found that children's lying behavior likely follows a developmental trajectory from early childhood into early adolescence. Specifically, our findings suggest that young children tell many lies, but that these lies are primarily instrumental; told to avoid a task or obtain a material benefit. These lies may be

similar to lies told to avoid responsibility, as in Wilson et al. (2003), but encompass a larger scope of lies. This reflects the common use of lying as a social strategy to obtain personal benefit in early childhood. Conversely, the early adolescents in our sample told few lies overall, and they also had the highest probability of telling lies to protect others. This profile of lie-telling behavior corresponds with more socially-accepted lie-telling, like telling few lies (Serota, Levine, & Boster, 2010) and telling lies that protect others (Backbier, Hoogstraten, & Terwogt-Kouwenhoven, 1997; DePaulo et al., 2004). Thus, this profile of behavior could reflect a shift toward socially-accepted lie-telling behavior as early adolescents develop and are socialized to societal norms. These findings also present a clearer developmental picture of children's lie-telling in the context of the social environments that shape children's decisions to lie. The lies reported represent a wide range of motivational reasons (prosocial and self-oriented) and situational severity (breaking another's property and personal preferences), which provides information on children's lying in the social dynamism of their everyday lives.

We also found that ToM had a strong influence on the types of lies that children told. Although we did find a developmental trajectory of lying behavior based on age; in which young children told more lies that were primarily instrumental or self-serving, and early adolescents told fewer lies across types and had a higher probability of telling prosocial lies; the inclusion of their ToM as a variable highlighted some important findings. For example, children are generally proficient in first-order ToM by age 6 (Wimmer & Perner, 1983), as such we would expect young children (age 4 in the interaction depicted in Figure 1) would typically have a ToM score of approximately two to four, which would correspond to a basic first-order ToM. Thus, using Figure 1, a typical developmental trajectory for young children (age 4) who have an expected ToM score for their age is telling a high frequency of instrumental or self-serving lies.

However, children who had very advanced cognitive skills had an equal likelihood of being in the instrumental (i.e., expected class of lie-telling based on their age), or the occasional (i.e., expected class of lie-telling for *older children*) class, which suggests that ToM as a measure of cognitive ability may be the driving factor behind children's typical trajectories of lie-telling, and not simply their age. Similarly, based on the findings of Perner and Wimmer (1985) that most children are generally proficient in second-order ToM by age 10, we would expect that older children (age 11 in the interaction depicted in Figure 2) would typically have a ToM score of approximately six to seven, which would correspond to a proficient second-order ToM. As such, we would expect that a typical developmental trajectory for older children is telling fewer lies, with a higher probability of telling prosocial lies. One possibility that may explain why ToM has such a substantial impact on the types of lies that children tell is that their lying behavior may be based on their (in)ability to consider the thoughts and beliefs of others, thus relating back to the association between ToM and prosocial behavior (e.g., Caputi et al., 2012; Eggum et al., 2011).

4.2.3 Atypical developmental trajectory of lying behavior

We observed two patterns of atypical lie-telling in our sample. The first was young children who had an advanced ToM for their age. These children had an equal likelihood of being a member of the instrumental liars, which would be expected for a typical developmental level at that age, and the occasional liars class, which would be the expected class for older children at a typical developmental level. These findings suggest that young children who have advanced ToM are more likely to have a profile of lying behavior that is similar to that of early adolescents.

Conversely, the second atypical trajectory of lie-telling to emerge in our findings was the class of antisocial liars, which was characterized by higher frequencies of lies to avoid

punishment, blame others, and protect the self. This class was the smallest of the three classes at 7% of our sample, and older children with low ToM were the most likely (at 100% probability) to belong to this class. This suggests that children who lag behind in their ToM development are more likely to use lying for antisocial purposes. Again, this supports the positive relation between ToM and expected levels of prosocial behavior, except for the fact that these children evidenced low ToM and high antisocial behavior through the types of lies that they told. Although the types of lies and cognitive ability are not specified, previous research findings also support that a high frequency of lies is associated with problem behavior and delinquency (Gervais et al., 2000), especially for older children (Stouthamer-Loeber, 1986; Stouthamer-Loeber & Loeber, 1986; Warr, 2007). Gervais et al. also found a similar proportion of their sample of 6- to 8-year-olds, 7.1%, who deviated from expected frequencies of lie-telling, based on parent ratings of how frequently their children told lies. Our findings suggest that not only the frequency but the types of lies that these children tell deviates from a typical developmental trajectory of lying behavior. Also, our findings suggest that children's ToM is a primary factor in determining whether children will use lying as an antisocial strategy.

These findings have several broad implications for future research. First, there is a need to consider how the frequency and types of lies children tell change from early childhood into adolescence. This information can guide early intervention efforts with children who may show early signs of telling frequent antisocial lies, which is a risk factor for future antisocial behavior (Stouthamer-Loeber, 1986). Identifying typical trends in children's lie-telling will also help researchers and practitioners to identify atypical lying behavior, and perhaps do so at earlier ages than might be possible without this information. The results of this study suggest that additional

developmental factors beyond age, such as ToM, may be associated with profiles of children's lying behavior and this can inform future research and clinical work.

4.3 Future Directions

There are several caveats to consider when interpreting the results of this study. In the current study children's lie-telling behavior was measured based on parental diaries. It is possible that an observer's perspective may underestimate lie-telling, given that the inherent nature of lie-telling is to deceive another. This is one of the challenges of measuring lie-telling outside of experimental settings. However, of the possible observers, such as teachers or parents, parents have more consistent reports of their children's lie-telling behavior (Gervais et al., 2000; Stouthamer-Loeber, 1986), thus parents provided the observations of children's lie-telling over two weeks at home. Further, parents are less likely to observe each of their children's lies in environments other than home, like daycare, school, or when their children were with friends, and this may have varied according to the amount of time that parents spent with their child over the two-week duration. This is more likely to be true for the older children in our sample, who may have had access to a greater variety of environments where they could lie, thus the child's age could be a potential confound to the number of interactions reported by his or her parent. Regardless, even though many parents were not the sole caregivers of their children during the two-week observation period, they nonetheless reported lies that their children had told to a second parent, another caregiver, or while at school, which increased the accuracy of their observations. It is also possible that parents may have been more prone to detect certain types of lies, for example antisocial lies more than prosocial lies, or that they may have differentially detected lies according to their child's age, with younger children's lies possibly being easier to detect. Both of these possibilities may have affected the overall frequencies reported as well as

the frequency by type of lie, and are areas for further study. Future studies should consider children's own observations of their deceptive behavior, as has been the approach with adults (e.g., DePaulo et al., 1996; Kashy & DePaulo, 1996).

An additional caveat to our results is the exclusive use of false-location and second-order belief (epistemic states) story tasks. Although these measures have been used extensively with children (e.g., Hogrefe et al., 1986; Perner & Wimmer, 1985; Sullivan et al., 1994; Talwar & Lee, 2008; Wimmer & Perner, 1983), by adolescence most achieve proficiency with this measure. False-belief story tasks were exclusively used with our wide age-range to find a standard task that was the most developmentally appropriate for our age range. Further, the fact that we did have variation in children's scores and did not have a ceiling effect in the older group suggests that this measure was able to capture differences among participants. A consideration for future studies is to include advanced ToM measures when examining lie-telling and ToM in early adolescents to further explore this relation.

Finally, it is of interest to note that older children in our sample who had low ToM scores relative to their peers were highly likely to be antisocial liars, yet at the same time, findings with college students who have presumably high cognitive ability suggest that lying may be common in economic games (e.g., Anbarcı, Feltovich, & Gurdal, 2015). The differences in these findings highlight the need to consider the social context of lying behavior, for example whether the environment is socially competitive, whether the context is a game or in daily social interactions, and whether the perceived consequences for telling the truth are higher than those for lying, and are further argument for including multiple measures of lying behavior in future studies to better understand lying across contexts.

In summary, based on parent reports, we found that the majority of children were occasional liars, and that older children were highly likely to be occasional liars. Younger children with high ToM were equally likely to be occasional or instrumental liars, and older children with low ToM were highly likely to be antisocial liars. The results of this study suggest that children use lie-telling as a social strategy in their daily lives; first, they use frequent lie-telling as a social strategy to benefit themselves, and as their ToM develops, they shift into occasional lie-telling and telling more prosocial lies, which reflects a maturation in their lie-telling behavior. However, by early adolescence, children who lag behind in ToM development tell more antisocial lies, which likely reflects an immaturity of lie-telling as a social strategy and suggests that their lying may have become a problem behavior. Thus, overall, children's use of lying as a social strategy follows a developmental pattern that is associated with their ToM. Future studies could include supplemental measures of observation to strengthen the findings regarding the type and frequency of children's spontaneous lies told in their natural environments.

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Table 1

Characteristics of Children's Lies by Type and Age Group (N = 229)

Lie Type	3 to 6 (N = 135)		7 to 10 (N = 69)		11 to 14 (N = 25)		3 to 14 (N = 229)	
	M	SD	M	SD	M	SD	M	SD
Total lies	8.19	6.50	5.62	4.77	4.52	2.74	7.01	5.87
Avoid punishment	1.49	1.76	1.09	1.50	0.80	1.16	1.29	1.64
Instrumental	3.27	3.75	2.45	2.80	1.24	1.45	2.80	3.36
Identity	0.44	0.84	0.26	0.53	0.24	0.52	0.37	0.73
Hurt other	0.51	0.91	0.38	0.86	0.24	0.60	0.44	0.87
Protect self	0.39	0.64	0.35	0.70	0.28	0.46	0.36	0.64
Protect other	0.06	0.34	0.07	0.26	0.00	0.00	0.06	0.30
In play	1.82	2.49	0.39	0.77	0.08	0.28	1.20	2.09
Polite	0.02	0.15	0.00	0.00	0.00	0.00	0.01	0.11

Table 2

Correlation of Children's Lie Types, Age, and ToM (N = 229)

	Age	1	2	3	4	5	6	7	8	9
1. Avoid punishment	-.17*	-								
2. Instrumental	-.20**	.37**	-							
3. Identity	-.11	.12	.15*	-						
4. Blame others	-.13	.16*	.14*	.02	-					
5. Protect self	-.03	.17*	.20**	.08	.17**	-				
6. Protect other	.00	.14*	.16*	.09	-.05	.03	-			
7. In play	-.38**	.17**	.29**	.39**	.12	.04	-.01	-		
8. Polite	-.09	-.02	.20**	.05	-.06	-.01	-.02	-.07	-	
9. Total lies	-.26**	.59**	.83**	.41**	.30**	.31**	.17*	.61**	.11	-
10. ToM	.56**	-.17*	-.11	-.06	-.14*	-.09	-.02	-.22**	.07	-.17*

** $p < .01$, * $p < .05$

Table 3

Children's Total ToM Scores by Age Group (N = 220)

Score	3-6	7-10	11-14
0	3	1	0
1	12	0	0
2	28	1	1
3	37	6	0
4	26	21	4
5	15	25	9
6	5	15	11

Table 4

Model Effects for Poisson Regression Results Predicting Frequency of Lies (N = 220)

Predictors	<u>Model 1</u>		<i>d</i>	<i>95% CI</i>	<u>Model 2</u>		<i>d</i>	<i>95% CI</i>
	χ^2	<i>p</i>			χ^2	<i>p</i>		
Model	49.91	.000	1.08	0.78, 1.38	92.79	.000	1.71	1.36, 2.06
Age	24.22	.012	0.70	0.42, 0.98	11.91	.371	0.48	0.21, 0.75
ToM	13.68	.033	0.52	0.24, 0.79	11.68	.070	0.47	0.20, 0.75
Age*ToM	-	-	-	-	44.27	.046	1.00	0.71, 1.30

Table 5

Incidence Rate Ratios (IRR) for Frequency of Lies According to Age and ToM (N = 220)

Age	<i>b</i>	<i>SE</i>	95% <i>CI</i>		IRR
3	0.41	.414	-.40	1.22	1.51
4	0.43	.312	-0.18	1.04	1.53
5	0.20	.315	-0.42	0.82	1.22
6	-0.17	.332	-0.82	0.48	0.84
7	-0.13	.341	-0.80	0.54	0.88
8	0.02	.321	-0.61	0.65	1.02
9	-0.01	.322	-0.64	0.62	0.99
10	0.14	.327	-0.50	0.78	1.15
11	-0.31	.356	-1.01	0.38	0.73
12	-0.29	.423	-1.12	0.54	0.75
13	-0.34	.496	-1.31	0.63	0.71
14 ^a	0	-	-	-	1.00
<hr/>					
ToM					
0	-0.22	.367	-0.94	0.50	0.80
1	-0.12	.251	-0.61	0.38	0.89
2	-0.19	.197	-0.58	0.20	0.83
3	0.05	.183	-0.31	0.41	1.06
4	-0.11	.168	-0.44	0.22	0.89
5	-0.45	.162	-0.77	-0.13	0.64
6 ^a	0	-	-	-	1.00

^a Reference category

Note. Unstandardized *b* coefficients, standard error, confidence intervals, and incidence rate ratios for the main effects of age and ToM.

Table 6

Item-Response Probabilities from the Three-Class Latent Model (N = 220)

	Class 1 “occasional liars”	Class 2 “instrumental liars”	Class 3 “antisocial liars”
<i>Latent Class Prevalences</i>	51%	42%	7%
<i>Lie Category and Code</i>			
Avoid punishment			
1	0.52	0.33	0.22
2	0.32	0.23	0
3	0.17	0.43	0.78
Instrumental			
1	0.33	0.09	0.08
2	0.24	0.17	0.59
3	0.26	0.27	0.10
4	0.17	0.47	0.23
Identity			
1	0.77	0.71	0.74
2	0.23	0.29	0.26
Blame other			
1	0.86	0.59	0.51
2	0.14	0.41	0.49
Protect self			
1	0.77	0.66	0.54
2	0.23	0.34	0.46
Protect other			
1	0.93	0.99	0.94
2	0.07	0.01	0.06
In play			

Polite	1	0.81	0.29	0.51
	2	0.15	0.20	0.32
	3	0.04	0.50	0.17
	1	0.98	0.99	1
	2	0.02	0.01	0

Table 7

Latent Class Regression with Covariates Age and ToM (N = 220)

Variable	β	SE	t
Likelihood of belonging to Class 2 over Class 1 ^a			
Age	-15.70	0.33	-47.18***
ToM	-11.30	0.43	-26.41***
Age*ToM	2.19	0.06	34.95***
Likelihood of belonging to Class 3 over Class 1 ^a			
Age	10.51	0.69	15.28***
ToM	8.74	1.81	4.83***
Age*ToM	-1.86	0.09	-21.02***

^aReference category*** $p < .001$

Figure 1

Younger children’s latent class membership in relation to ToM

Figure 1. ToM and young children’s latent class membership. Younger children’s log-likelihood probabilities of belonging to each latent class of lie-telling behavior according to ToM.

Figure 2

Older children's latent class membership in relation to ToM

Figure 2. ToM and older children's latent class membership. Older children's log-likelihood probabilities of belonging to each latent class of lie-telling behavior according to ToM.