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Parental supportive and intrusive directives during dyadic interactions in relation to concurrent skills of preterm
and full-term toddlers at age 2 years

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Abstract

This study investigates whether parental supportive (following) and intrusive (redirecting child's attention) verbal directives are influenced by parent gender and birth status, and whether any associations between parental supportive/intrusive directives and developmental outcomes are moderated by birth status. Seventeen preterm and 31 full-term toddlers took part with both parents. Parental directives were coded using transcriptions of dyadic free-play interactions. Toddlers' cognitive, language, and social-emotional skills were assessed via the Bayley-III scales and executive function skills were measured via parental report. 2x2 mixed design ANOVAs showed no significant effect of parent gender, birth status, or interaction, on parental directives. Moderation analyses demonstrated significant associations between fathers', but not mothers', intrusive directives and toddlers' cognitive and expressive language scores for preterm, but not full-term, toddlers. Although parents of preterm and full-term toddlers used similar supportive/intrusive directives, fathers of preterm toddlers who exhibited poorer expressive language and cognitive skills used more intrusive directives.

Keywords: preterm, toddlers, directiveness, mothers, fathers, parent-child interaction

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Introduction

Preterm children (< 37 weeks of gestation) tend to exhibit poorer neurodevelopmental abilities compared to term-born children. Specifically, they are at greater risk of poorer cognitive and socio-emotional functioning (Gueron-Sela et al., 2015; Hadfield et al., 2017; O'Brien et al., 2023), receptive and expressive language difficulties (Zimmerman, 2018), and higher levels of executive dysfunction (Van Houdt et al., 2019) relative to their term-born peers. However, there is vast within-group diversity regarding their developmental profiles (Sansavini et al., 2011), indicating the role of contributing factors, such as parent-child interaction, on their developmental trajectories.

The diathesis-stress theory highlights that vulnerable children (e.g., preterm) may be more susceptible to negative environmental experiences (e.g., poor quality of parent-child interaction) than their peers (Monroe & Simons, 1991). However, differential susceptibility theory suggests that vulnerable children may be more susceptible not only to negative but also positive environmental experiences (e.g., high quality of parent-child interaction) (Belsky & Pluess, 2009). Therefore, preterm children's developmental skills may be more positively influenced by protective factors (e.g., parental sensitivity) and more adversely influenced by risk factors (e.g., parental intrusiveness) compared to term-born children. While some findings have aligned with the differential susceptibility theory (Gueron-Sela et al., 2015), others support the diathesis-stress model (Hadfield et al., 2017; O'Brien et al., 2023).

The transactional model (Sameroff, 2009) suggests that the quality of parent-child interaction, such as parental directiveness, may be influenced by children being born preterm and may be differentially associated with preterm and term-born children's development. However, the limited research that has examined directiveness in parent-child conversations following preterm and full-term birth (Bang et al., 2020; Landry et al., 2000) has yielded mixed findings. Some studies report negative associations with typically developing children's outcomes (Hoff, 2006; Paavola-Ruotsalainen et al., 2018; Tulviste & Tamm, 2023), while others have reported positive associations in the early years (Landry et al., 2000).

Further, directive speech has primarily been characterised as verbal instructions, commands, or prohibitions directed toward the child for nonverbal actions, which may be relatively simple (semantically/syntactically) and may not provide optimum learning opportunities (Hoff, 2006; Hoff et al., 2024; Landry et al., 2000; Tulviste & Tamm, 2023). The current study employs a more fine-grained definition of

verbal directives that includes all parental utterances, not only prohibitions but also suggestions, questions, and comments, that seek to direct the child's attention, behaviour, and/or activity by following (supportive) or redirecting (intrusive) the child's focus based on Masur et al. (2005), Flynn and Masur (2007). Research has shown that maternal supportive directiveness is positively, and intrusive directiveness is negatively, associated with typically developing infants' vocabulary development (Masur et al., 2005; Rantalainen et al., 2022), especially in the first year (Paavola-Ruotsalainen et al., 2018).

However, aligned with the differential susceptibility theory, one recent study reported that preterm, but not full-term, toddlers benefit from maternal supportive, rather than intrusive, directiveness (Younesian et al., 2021). Since preterm toddlers tend to show reduced activity levels (De Schuymer et al., 2011; Salerni et al., 2007), attention difficulties, in particular sustaining attention difficulties in interaction (Ataman-Devrim et al., 2024), they may benefit from verbal directives, specifically when parents follow their attention (Younesian et al., 2021). The aim therefore is to examine parental supportive/intrusive verbal directives in relation to toddlers' concurrent development and to explore differential associations based on birth status.

Parental directiveness with preterm and full-term children and developmental outcomes

The quality of parental verbal interactions is dynamically influenced by a host of child characteristics, including child's language ability and developmental status (Quigley et al., 2019; Toscano et al., 2022). Preterm toddlers are at higher risk of poorer language abilities (Barre et al., 2011) and a more passive interaction style (De Schuymer et al., 2011; Salerni et al., 2007), and in turn their parents may exhibit a more controlling/directive interaction style (Korja et al., 2012; Toscano et al., 2022). While some research has shown that parents of preterm children are more controlling/directive (Bang et al., 2020; Forcada-Guex et al., 2006; Loi et al., 2017; Toscano et al., 2020) and use more directive speech than parents of full-term children (Bang et al., 2020), one study reported no difference between the samples regarding maternal directiveness at age 2 and 3.5 years (Landry et al., 2000).

The majority of research has been based on mother-child interactions and limited research has included fathers, especially fathers of preterm children (McMahon et al., 2019; Toscano et al., 2022). Some research with typically developing infants has demonstrated that fathers tend to use more directives (incorporating verbs) than mothers (Leaper et al., 1998; Nandy et al., 2021; Tamis-LeMonda et al., 2012), although one recent study found no difference (Hoff et al., 2024). We recently reported that fathers tend to redirect their toddlers' attention more than mothers, regardless of child's birth status (Ataman-Devrim et al., 2024). Further, no differences have been

found in sensitivity and intrusiveness between fathers of preterm and full-term toddlers at 2 years (Hall et al., 2015; McMahon et al., 2019). Thus, this study explores both mothers' and fathers' verbal directiveness.

Parental directives produced in parent-child interaction may contribute to variability in the developmental trajectories of preterm children (Bang et al., 2020). While some research has shown that parental controlling/intrusive interaction style is adversely associated with preterm infants' development (Forcada-Guex et al., 2006; Loi et al., 2017; Toscano et al., 2022), a recent study showed that maternal directiveness is positively associated with preterm infants' executive function skills (Van De Weijer-Bergsma et al., 2016). However, these studies used global rating scales, and some did not differentiate between supportive and intrusive directiveness (Van De Weijer-Bergsma et al., 2016), which may be related to the mixed findings.

Parental contingent linguistic input may be especially useful for infants who find it difficult to establish sustained attention (Schroer & Yu, 2022). For example, mothers of children with developmental delays were found to use less supportive and more intrusive directives compared to mothers of typically developing children at 3 years, and maternal intrusive directiveness was negatively associated with later social and adaptive abilities for children with developmental delays, but not for typically developing children (Green et al., 2014). Similarly, preterm, but not full-term, toddlers' language skills were positively associated with supportive directiveness and negatively associated with intrusive directiveness at 2-3 years (Younesian et al., 2021). Therefore, parental directives that follow (rather than redirect) their attention may help preterm toddlers to maintain their attention and in turn contribute to their development.

Landry et al. (2000) found similar patterns between maternal directiveness (without differentiating as supportive or intrusive) and developmental trajectories of preterm and full-term children. Specifically, maternal directiveness at 2 years predicted better cognitive and responsiveness skills at 3.5 years, and maternal directiveness at 3.5 years was negatively associated with socio-cognitive outcomes at 4.5 years in both samples (Landry et al., 2000). Accordingly, these effects may be time-sensitive and children may benefit from directiveness during the first two years.

The current study

Given the contradictory findings and the gaps in the literature, this study performs an analysis of parental verbal directives during naturalistic parent-toddler interactions and explores (1) whether there are differences between mothers' and fathers' use of supportive and intrusive directives towards preterm compared

to full-term toddlers, and (2) whether any associations between parental supportive and intrusive directives and concurrent developmental outcomes are moderated by the child's birth status (preterm vs full-term).

Methods

Participants

The sample consisted of 96 parent-toddler dyads; specifically, 17 preterm ($M_{\text{chronological age}} = 26.85$ months, $SD = 3.85$; $M_{\text{adjusted age}} = 24.72$ months, $SD = 3.39$; 12 boys) and 31 full-term ($M_{\text{chronological age}} = 24.07$ months, $SD = 1.45$; 13 boys) singleton toddlers with their mothers ($N = 48$) and fathers ($N = 48$). Preterm toddlers' gestational age ranged between 24 weeks to 35 weeks 4 days ($M_{\text{gestational age}} = 30.67$ weeks, $SD = 3.94$). All parents were cohabiting, Caucasian, speaking in English, and from middle-to-high socio-economic status. No significant differences were detected between preterm and full-term samples in terms of child's sex, parental age, and parental education ($p > .05$). Although preterm toddlers' chronological age was significantly higher than full-term toddlers' ($U = 371.50$, $p = .02$), child adjusted age was not significantly different between the samples ($p > .05$). Sample details were reported in a previous publication (Ataman-Devrim et al., 2024).

A power analysis (G*Power 3.1) suggests that the sample size has adequate power to detect a medium effect size ($\alpha = .05$, $f = .25$), using a two-way mixed design analysis of variance (.80) and a moderation analysis (.75) as planned (Faul et al., 2009).

Procedure

This research was conducted in accordance with American Psychological Association (APA) standards. Ethical approval was obtained from the local ethics committee of the university and the collaborating maternity hospital in Ireland. All parents were informed about the study and completed a written consent form.

Parents of all full-term toddlers and some preterm toddlers ($N = 13$) were recruited via advertisements in our research lab's social media pages, posters/pamphlets in crèches and in the university, or information circulated as a part of a home visiting programme. In addition, four preterm toddlers' families, who had formerly taken part in a hospital-based study, consented to take part in this developmental follow-up study following an approach from us via phone or email.

Participants visited the Infant and Child Research Lab at Trinity College Dublin. First, a box of age-appropriate toys (e.g., Mr Potato Head, cars, blocks) were given to mothers and fathers for five-minute free play sessions with their children, separately. They were instructed to play as they usually do at home. Dyadic free play sessions with mothers and fathers were counterbalanced (starting with either the mother-toddler or the

father-toddler dyad). Free play sessions were videorecorded using Mangold INTERACT software (Mangold International, Arnstorf, Germany). Second, Bayley-III developmental assessments (Bayley, 2006) were administered in the lab environment by the first author or another trained researcher. Questionnaires were completed by the parents of full-term infants and some preterm infants ($N = 4$) in the lab. Due to the global pandemic (COVID-19), some parents of preterm infants ($N = 13$) were sent online questionnaire links via Qualtrics (Qualtrics, Provo, UT). All parents were debriefed and thanked for their participation and the children were given a participation certificate at the end of their visit.

Measures

The Bayley Scales of Infant and Toddler Development-III (BSID-III). The BSID-III (Bayley, 2006) is a standardised tool to assess child developmental outcomes which has adequate concurrent and predictive validity. It takes 30 to 90 minutes to complete the assessment depending on child's age and ability. Toddlers' cognitive and language (receptive and expressive) skills were measured through play based behavioural assessments and socio-emotional skills were assessed via the parental questionnaire. The cognitive scale evaluates children's cognitive functioning such as object relatedness, sensory motor development, and memory. Items include completing different jigsaw puzzles and arranging objects in different colours and sizes. The language scale has two subscales: receptive language subscale, measuring children's vocabulary understanding, and expressive language subscale, assessing children's verbal communication abilities. For receptive language, items include asking the child to follow some instructions, and to point to specific objects/actions from the book. For expressive language, items include asking the child to name specific objects/actions from the book. The socio-emotional scale measures children's self-regulation abilities and their capacities to establish relationships and to communicate needs. As indicated by the Bayley manual, preterm toddlers' age is corrected up to 24 months (but not later) to standardise their raw developmental scores. Composite and scaled (standardised) scores are computed based on the standardisation tables depending on the child age. A mean composite score of 100 and a standard deviation of 15 (mean scaled score of 10 and standard deviation of 3) are used to compare toddlers' developmental skills with their peers of the same age. Higher composite/scaled scores indicate better cognitive and language skills (Bayley, 2006).

Behavior Rating Inventory of Executive Function-Preschool Version (BRIEF-P). The BRIEF-P (Gioia et al., 1996) is a parental questionnaire assessing children's executive function difficulties. It includes 63 items

measuring five domains, namely, inhibit, shift, working memory, emotional control, and plan/organise. A global composite score, where a higher score indicates higher levels of executive dysfunction, is calculated based on these domains. A mean composite score of 50 and a standard deviation of 10 are used to compare toddlers' executive function skills with their peers of the same age. Composite scores of 65 or higher indicate significant executive function difficulties (Gioia et al., 1996).

Parental speech. All vocalisations during dyadic mother-toddler and father-toddler free play interactions were transcribed verbatim at the utterance level using the Codes for the Human Analysis of Transcripts (CHAT) by trained research assistants (MacWhinney, 2000). Utterances refer to uninterrupted speech units which begin and/or end with a pause, change in grammatical structure and/or intonation. All research assistants were trained by a senior transcriber (the second author) and then practised transcribing trial samples. After these trial samples were verified by the senior transcriber, they transcribed the interactions in the current study's samples. For reliability and accuracy purposes, the senior transcriber checked all the transcripts by watching the interaction videos. After that, the final version of the transcripts was used to code using the Computerised Language Analysis (CLAN) programme (MacWhinney, 2000). To be consistent in all interactions, exactly five minutes of free play (300 seconds) was coded in all transcripts. Total number of parental utterances were calculated using the MLU (Mean Length of Utterance) function of the CLAN programme.

Parental directives. Parental speech during the interaction was coded in terms of directiveness using a coding scheme adapted from Green et al. (2014) based on Masur et al. (2005) and Flynn and Masur (2007). First, parents' directive utterances were identified. Imperatives (e.g., commands, prohibitions), comments, questions, and suggestions were coded as directive utterances if the utterance directed the child's attention, behaviour, and/or activity (e.g., "*watch!*", "*back to Mummy*", "*this way*", "*you get the cars for me*", "*ready steady go!*", "*play again?*", "*can you count to five?*"). Second, parents' directive utterances were classified in relation to the focus of the child's attention at that moment. The coder simultaneously watched the interaction videos, identified the child's focus of attention/activity, and categorised each directive parental utterance as one of two mutually exclusive types. Supportive directive utterances refer to the child's ongoing activity/behaviour or an object or objects with which the child is currently engaged or focussed on (i.e., following the child's attention). Intrusive directive utterances refer to an aspect of the child's environment or an object in the child's environment with which they are currently not engaged or focussed on (i.e., redirecting the child's attention away from the object or activity with which the child is engaged, or directing/leading the child's attention or behaviour in a new direction) (Table 1).

The first author coded all the interaction videos for directiveness, and a second coder (the third author) coded a randomly chosen 25% of the mother-child and father-child interactions in both samples. Intra-class Correlation Coefficient (ICC) analyses were computed in SPSS Version 29 (IBM Corp., Armonk, NY, USA) and the ICC scores indicated good inter-rater reliability between the coders (ICC scores of supportive directives = .85, ICC scores of intrusive directives = .95). Coders were not blind to child's birth status as the first coder (the first author) collected the data and the second coder (the third author) supervised the process.

Table 1. Examples of supportive directive and intrusive directive utterances

Code	Examples
Directiveness	
Supportive Directive	Child is playing with Mr. Potato Head: P: "Put this piece there!" P: "You have got to put it here." P: "Up here." P: "The next one" P: "Can you put this piece here?" P: "Do you want to put them in there?" P: "You show me which one goes here."
Intrusive Directive	Child is playing with Mr. Potato Head: P: "Look here, see the bunny!" P: "Oh, what do we have here?!" (showing another toy) P: "Will you read this book?" P: "Do you want to catch the ball?" Or the child is not engaged in any activities: P: "Do you want to play with Mr. Potato Head?" P: "Look at the cars!" P is calling the child's name

Note. P, parent

Results

Descriptive statistics and toddlers' development

All analyses were carried out using SPSS version 29 (two-tailed, $\alpha = .05$). Descriptive data showing preterm and full-term toddlers' developmental scores are presented in Table 2. First, assumptions of parametric tests were checked. Second, either independent samples t-test or Mann-Whitney U tests were conducted as appropriate to investigate differences between preterm and full-term toddlers' developmental outcomes. No significant differences were found between preterm and full-term toddlers' cognitive scaled scores, expressive language scaled scores, or social-emotional composite scores. However, full-term toddlers had significantly higher receptive language scaled scores and significantly lower executive dysfunction scores (lower global executive composite score) than preterm toddlers, indicating that preterm toddlers had poorer receptive language and executive function skills than full-term toddlers (Table 2).

Table 2

Descriptive statistics corresponding to the measures of toddler development

Variables	Preterm			Full-Term			Test Statistics
	Mean	SD	Min-Max	Mean	SD	Min- Max	
Cognitive	8.76	3.49	1-14	10.39	2.36	6-15	$t(46) = 1.92, p = .062$
Receptive	9.86	4.13	3-17	13.16	2.58	8-17	$t(43) = 3.28, p = .002^{**}, d = 1.06$
Expressive	9.86	5.23	1-18	12.00	2.57	4-16	$U = 153.50, p = .116$
Social-emotional	100.45	16.04	80-130	110.40	16.58	85-140	$t(34) = 1.67, p = .103$
Executive dysfunction	52.50	9.73	37-67	44.28	8.23	33-64	$t(35) = -2.68, p = .011^*, d = -.94$

Note. Cognitive, cognitive scaled score; Receptive, receptive language scaled score; Expressive, expressive language scaled score; Social-emotional, Social-emotional composite score; Executive dysfunction, global executive composite score. Significant findings were shown in bold. * $p < .05$, ** $p < .01$

Table 3

Parental language characteristics in preterm and full-term toddlers' interactions with their mothers and fathers

Variables	Preterm		Full-term		Main Effects						Interaction		
	Mother	Father	Mother	Father	Birth Status			Parent Gender			Birth Status x Parent Gender		
	(<i>N</i> = 17)	(<i>N</i> = 17)	(<i>N</i> = 31)	(<i>N</i> = 31)									
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2
# total utterances	91.65 (26.89)	93.65 (37.14)	102.23 (30.36)	90.29 (26.01)	.23	.636	.01	1.05	.310	.02	2.07	.157	.04
# supportive directives	26.88 (16.13)	28.06 (17.93)	31.87 (13.43)	28.45 (16.05)	.44	.510	.01	.22	.645	.01	.91	.346	.02
# intrusive directives	5.24 (7.66)	7.41 (10.83)	4.23 (5.94)	4.87 (5.57)	1.18	.280	.03	.96	.334	.02	.28	.598	.01
% supportive directives	.28 (.12)	.29 (.10)	.31 (.08)	.30 (.12)	.57	.456	.01	.00	.95	.00	.19	.665	.00
% intrusive directives	.05 (.07)	.07 (.08)	.04 (.05)	.06 (.09)	.50	.484	.01	2.29	.137	.05	.06	.813	.00

Note. #, Number of; %, Proportion of

Parental supportive and intrusive directives with preterm and full-term toddlers

To examine differences in parents' supportive and intrusive directives between the groups, first, the proportion of utterances that are supportive directives (parent's total number of supportive directive utterances divided by their total number of utterances) and intrusive directives (parent's total number of intrusive directive utterances divided by their total number of utterances) were calculated (Table 3). Second, parametric test assumptions were checked using Shapiro-Wilk test for normality and Levene's test for homogeneity of variance. Although Shapiro-Wilk test statistics were significant for some variables, Levene's test statistics were not significant and indicated equal variances between the groups ($p > .05$). Since ANOVA is robust against violations of normality assumption, in particular when there is homogeneity of variance between the groups (Blanca et al., 2017), parametric tests were computed.

A series of one-way ANOVAs was conducted to investigate the influence of demographic variables (child sex, parental education, parental age) on the study variables (frequency and proportion of supportive and intrusive directives), with mothers and fathers, separately. None of the demographic variables had a significant effect on the study variables ($p > .05$). Thus, they were not included in any further analyses (Bivariate correlations among the variables were reported in the supplementary material).

Next 2x2 mixed-design ANOVAs were conducted where the within-subjects variable is parent gender (Mother vs Father), and the between-subjects variable is birth status (Full-term vs Preterm). Neither an interaction nor main effect was detected on any study variables, suggesting both the frequency and the proportion of supportive and intrusive directives were similar between the groups (Table 3).

The moderating role of birth status

Further, a series of regression analyses were conducted using SPSS macro PROCESS v4.2 (Hayes, 2018) to examine whether birth status (full-term vs preterm) moderated any associations between parents' proportion of supportive and intrusive directives and concurrent child cognitive, language, socio-emotional, and executive function skills (separately for each domain outcome). Assumptions were checked for all variables and logarithmic transformations were computed where the normality assumption was violated (i.e., $p < .05$, for Shapiro Wilk test statistics).

No significant interaction effects were observed between the proportion of mothers' supportive or intrusive directives and birth status on toddlers' developmental outcomes ($p > .05$). Significant interaction effects were observed only between the proportion of fathers' intrusive directives (but not supportive directives)

and birth status on toddlers' cognitive, expressive language, and executive function scores (Table 4). Regarding toddlers' cognitive and expressive language skills, the interaction between fathers' intrusive directives and birth status was positive, statistically significant, and accounted for 35% and 38% of the variance, respectively. Regarding toddlers' executive function, the interaction between fathers' intrusive directives and birth status was negative, statistically significant, and accounted for 29% of the variance (Table 4).

Table 4

Significant interactions (bootstrapped based on 5000 samples)

Model	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	R^2	<i>F</i>	<i>p</i>	LLCI-ULCI
Model 1 (DV: Cognitive)					.35	7.89	.00**	
Paternal ID (%)	-.01	.07	-.12	.90				-.14 to .13
Birth status	-1.45	.38	-3.82	.00**				-2.21 to -.68
Interaction	-.36	.11	-3.28	.00**				-.59 to -.14
Model 2 (DV: Expressive)					.38	8.47	.00**	
Paternal ID (%)	-.04	.07	-.60	.55				-.19 to .10
Birth status	-1.79	.47	-3.81	.00**				-2.74 to -.84
Interaction	-.42	.13	-3.81	.00**				-.69 to -.15
Model 3 (DV: EF)					.29	4.57	.01*	
Paternal ID (%)	-3.16	1.57	-2.01	.05				-6.36 to .04
Birth status	29.81	10.19	2.93	.01*				9.08 to 50.55
Interaction	6.32	2.87	2.20	.04*				.47 to 12.16

Note. DV, Dependent Variable; ID, Intrusive Directive; Cognitive, cognitive scaled score; Expressive, expressive language scaled score; EF, global executive composite score. Logarithmically transformed scores were used for the proportion of paternal ID, cognitive and expressive language scaled scores (Shapiro Wilk; $p < .05$). Significant results were presented in bold. * $p < .05$, ** $p < .01$

As the results suggest that the associations between fathers' intrusive directives and child cognitive, expressive, and executive function skills depend on the child's birth status (preterm vs full-term), further investigation was conducted to explore how these interactions occur. Conditional effect tests showed that the association between fathers' intrusive directives and toddlers' cognitive scores was significant for preterm, ($b = -.37$, $SE = .09$, 95 % CI, -.55 to -.19, $t = -4.18$, $p = .00$), but not full-term toddlers, ($b = -.01$, $SE = .07$, 95 % CI, -

.14 to .12, $t = -.12$, $p = .90$) (Figure 1). Similarly, conditional effects demonstrated that the association between fathers' intrusive directives and toddlers' expressive language scores was significant for preterm, ($b = -.47$, $SE = .11$, 95 % CI, -.69 to -.24, $t = -4.16$, $p = .00$), but not full-term toddlers, ($b = -.04$, $SE = .07$, 95 % CI, -.19 to .10, $t = -.60$, $p = .55$) (Figure 2). However, despite the significant interaction ($p = .04$), conditional effects showed that the association between fathers' intrusive directives and toddlers' executive function scores was not significant either for preterm, ($b = 3.15$, $SE = 2.40$, 95 % CI, -1.74 to 8.04, $t = 1.31$, $p = .20$), or full-term toddlers ($b = -3.16$, $SE = 1.57$, 95 % CI, -6.36 to .04, $t = -2.01$, $p = .053$), suggesting inconclusive results regarding fathers' intrusive directives and toddlers' executive functions.

Results indicated that the association between the proportion of fathers' intrusive directives and toddlers' cognitive and language scores was significant (separately) only for preterm toddlers, suggesting that fathers used a higher proportion of intrusive directives with their preterm toddlers who exhibit poorer cognitive and expressive language skills (Figure 1, Figure 2).

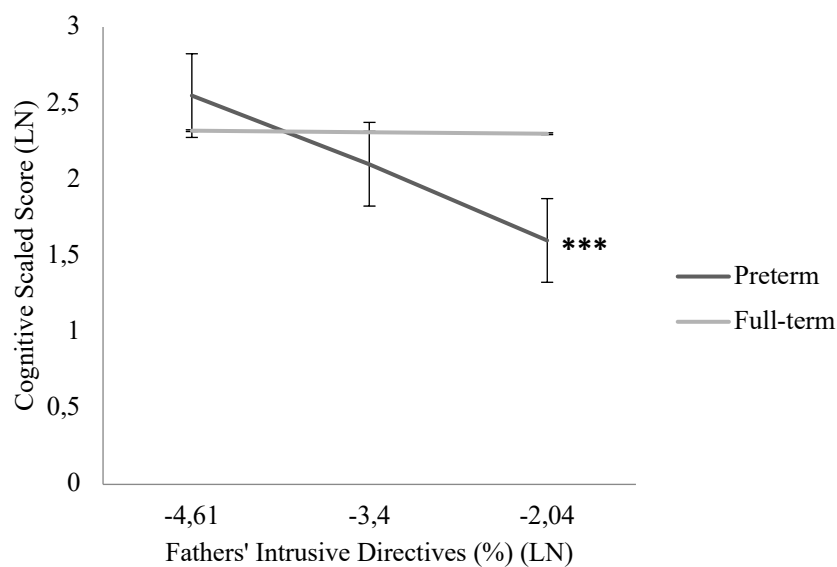


Figure 1. The conditional effect of fathers' intrusive directives on toddlers' cognitive skills *Note.* Error bars represent standard error. LN, logarithmically transformed, *** $p < .001$.

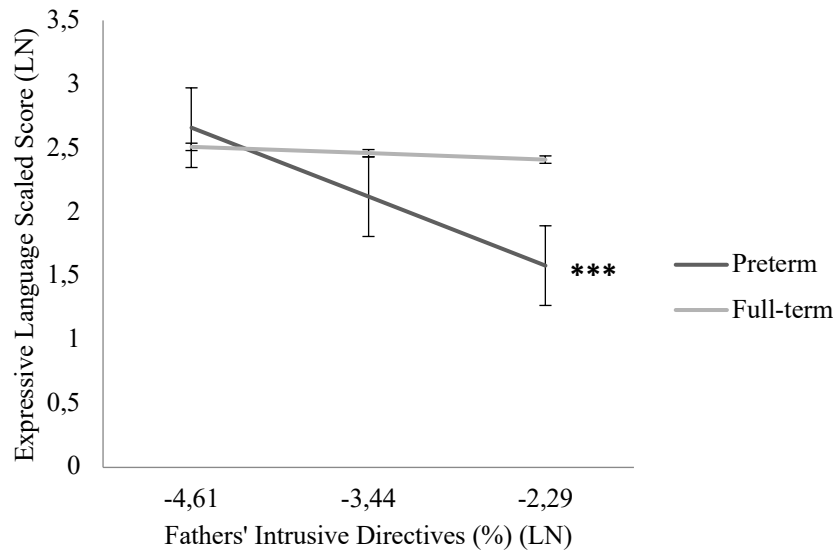


Figure 2. The conditional effect of fathers' intrusive directives on toddlers' expressive language skills

Note. Error bars represent standard error. LN, logarithmically transformed, *** $p < .001$.

Discussion

This study performed a fine-grained analysis of parental verbal directives during dyadic free play interactions with mothers and fathers, separately. Specifically, it explored if parents' use of supportive and intrusive directives in their speech towards their toddlers vary as a function of parent gender (mother vs father) and child's birth status (preterm vs full-term), and whether any associations between parental supportive and intrusive directives and toddlers' concurrent cognitive, language, socio-emotional, and executive function skills are moderated by the child's birth status.

Toddlers' development

Preterm toddlers exhibited poorer receptive language and executive function skills than their term-born peers in this sample. Results aligned with previous research indicating language difficulties (Barre et al., 2011) and poorer executive functioning (Van Houdt et al., 2019) following preterm birth compared to full-term birth in the early years.

Parental supportive and intrusive directives with preterm and full-term toddlers

No differences were found between parents' directives in their speech towards preterm vs full-term toddlers, in contrast to previous research suggesting more controlling/directive interaction style with preterm

children compared to term-born children (Bang et al., 2020; Forcada-Guex et al., 2006; Loi et al., 2017; Toscano et al., 2020). Specifically, mothers of preterm and full-term toddlers used similar frequencies and proportions of supportive and intrusive directives in their speech during naturalistic interactions. This finding accords with Landry (2000), indicating no differences with respect to maternal directiveness with preterm and full-term toddlers at 2 and 3.5 years of age. It also supports the findings of a recent meta-analysis (Bilgin & Wolke, 2015), suggesting similar maternal sensitivity towards preterm and term-born children. Moreover, fathers of preterm and full-term toddlers used similar supportive and intrusive directives in their speech. This result is in line with previous research suggesting no differences in paternal sensitivity and intrusiveness with preterm and full-term children (Hall et al., 2015; McMahon et al., 2019).

Further, no significant effect of parent gender was detected on parental directives (either supportive or intrusive, regardless of the child's birth status), supporting Hoff et al. (2024), as opposed to previous research suggesting that fathers tend to use more directive speech than mothers (Leaper et al., 1998; Nandy et al., 2021; Tamis-LeMonda et al., 2012). This result may be associated with a dyadic free play context, and differences may be observed in different contexts, such as structured play activities where parents are requested to play with a specific toy and/or triadic (mother-father-child) interaction context (Nandy et al., 2021). Overall, these findings point to similarities rather than differences between maternal and paternal verbal behaviours during interactions with their toddlers (Fagan et al., 2014).

Moderating effect of birth status on parental supportive and intrusive directives and toddlers' concurrent developmental skills

Different associations were observed between parent's use of supportive and intrusive directives and toddlers' developmental outcomes depending on the child's birth status. Specifically, fathers, but not mothers, of preterm toddlers, who exhibited poorer cognitive and expressive language skills, used intrusive directives more often in their interactions. This association was not observed during the interactions of fathers or mothers of full-term toddlers. Therefore, these results accord with previous research indicating that maternal and paternal speech/interaction features may be differentially related to typically and atypically developing infants' development.

Specifically, negative associations between fathers' use of intrusive directives and preterm, but not full-term, toddlers' cognitive and expressive language scores align with previous findings (Green et al., 2014; Younesian et al., 2021). It may be argued that preterm toddlers, especially those who exhibit poorer

development, tend to engage in interactions with their fathers less frequently relative to their mothers (Quigley et al., 2019), and hence their fathers may use more intrusive directives to engage the toddlers' attention, as transactional model of development emphasises (Sameroff, 2009). Also, it could be speculated that fathers are less attuned to the child's receptive language ability as mothers tend to be the primary caregiver and to be aware of the words that their toddlers understand, even if they do not produce them. As expressive language skills are more apparent, fathers may tailor their speech according to their child's expressive language ability. This also accords with the concept of developmental sensitivity (Vallotton et al., 2024) which argues that parents adapt to changes in their infants' signals and reply to them according to the infants' needs. Fathers may be doing this more than mothers because they tend to be more demanding play partners (Vallotton et al., 2020) and challenging linguistic partners (Tamis-LeMonda et al., 2012).

Further, this finding may provide supporting evidence for the diathesis stress model, suggesting that vulnerable infants may be more adversely affected by negative environmental experiences (such as intrusive directiveness) than non-vulnerable infants (Monroe & Simons, 1991). Also, this finding underscores the importance of differentiating parental directive speech as supportive (following the child's attentional focus) and intrusive (redirecting it) with respect to its positive/negative associations with child development, especially in the context of preterm birth.

Although negative associations were found between paternal intrusive directives and preterm toddlers' developmental outcomes, no significant positive associations were observed between either mothers' or fathers' use of supportive directives and preterm toddlers' developmental skills, in contrast to previous studies (Green et al., 2014; Younesian et al., 2021). Therefore, these results do not support the differential susceptibility theory (Belsky & Pluess, 2009). It is, nevertheless, important to note that the current study examined the associations between parental directive speech and toddlers' concurrent skills. Longitudinal studies may demonstrate further/different associations.

Strengths and limitations

The present study advances our understanding of the associations between parental directiveness and preterm and full-term toddlers' linguistic and nonlinguistic skills taking into account the significance of following or redirecting of the child's ongoing attentional focus during naturalistic interactions. This study includes not only mothers but also fathers and investigates similarities and differences in their speech/interaction style and differential associations with toddlers' developmental outcomes. It conducts a micro-level

investigation (rather than applying global rating scales) using free play interactions in a controlled environment (i.e., a semi-naturalistic lab). Further, it uses both standardised assessments by trained researchers and parental reports to measure toddlers' development.

However, a number of study limitations must be acknowledged. First, the small sample size limits the statistical power of the analyses, and the cross-sectional design restricts the causal interpretations of the results. Second, our preterm sample is heterogeneous in terms of their neonatal characteristics, such as gestational age ranging from 24 weeks to 35 weeks. Although no significant associations were found between gestational age and the proportions of maternal and paternal verbal directives in the present study (see the supplementary table), future research considering/controlling the effects of neonatal risk factors on the quality of parent-preterm child interaction may enhance the findings. Also, the current samples are homogeneous in terms of family characteristics, such as English speaking and cohabiting families coming from a WEIRD (Western, Educated, Industrialised, Rich, Democratic) culture. Third, some preterm families participated in this study during the pandemic, and this might have an impact on their behaviours. Therefore, these results can be considered as indicative findings for future studies.

Conclusion

In spite of limitations, the present study showed that mothers and fathers use similar supportive and intrusive directives in their speech towards preterm and full-term toddlers during naturalistic interactions. Fathers but not mothers of preterm toddlers who show poorer expressive language skills and lower levels of cognitive functioning tend to use more intrusive directives during interactions. Findings highlight that associations between parental directives following/redirecting the child's ongoing attentional focus and child developmental skills may be moderated by the child's birth status. These initial exploratory findings underscore the bidirectional nature of parent-child interaction. Also, they emphasise the importance of the quality of interaction with not only mothers but also fathers and imply that maternal and paternal directives may differentially contribute to variability in the developmental outcomes of preterm and full-term toddlers. These results inform clinicians/practitioners about the contributing role of parent-child interaction on preterm toddlers' development. Findings warrant further detailed investigations with both parents regarding the concurrent and longitudinal links between parental directiveness and toddlers' development.

Statements and Declarations

Competing interest: None declared.

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