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BRIEF RESEARCH REPORT

Maternal parenting style and self-regulatory private speech content use in preschool children

Kendall Wall[1], Aisling Mulvihill[1], Natasha Matthews[1], Paul E. Dux[1] and Annemaree Carroll[2]

[1]School of Psychology, The University of Queensland, Brisbane, Queensland, Australia and [2]School of Education, The University of Queensland, Brisbane, Queensland, Australia
Corresponding author: Aisling Mulvihill; Email: a.mulvihill@uq.edu.au

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Abstract

Private speech is a tool through which children self-regulate. The regulatory content of children's overt private speech is associated with response to task difficulty and task performance. Parenting is proposed to play a role in the development of private speech as co-regulatory interactions become represented by the child as private speech to regulate thinking and behaviour. This study investigated the relationship between maternal parenting style and the spontaneous regulatory content of private speech in 3- to 5-year-old children ($N = 70$) during a problem-solving Duplo construction task. Sixty-six children used intelligible private speech which was coded according to its functional self-regulatory content (i.e., forethought, performance, and self-reflective). Mothers completed the Australian version of the Parenting Styles and Dimensions Questionnaire. Results revealed a significant positive association between maternal authoritative parenting and the frequency and proportion of children's forethought type (i.e., planning and self-motivational) utterances during the construction task. There were no significant associations between maternal parenting style and other private speech content subtypes.

Keywords: private speech; parenting; childhood; self-regulation

The relationship between maternal parenting style and self-regulatory private speech content use in preschool children

Since the influential work of Vygotsky (1934/1962), research has recognised private speech (PS) as an important self-regulatory tool through which children (Day et al., 2024; Fernyhough, 2008) and adults (Kray et al., 2008) self-manage their emotions, thinking, and behaviour. PS is speech that is directed to the self and is akin to thinking aloud. A central tenet of Vygotskian theory underscores the critical role of parent–child

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interactions in shaping children's PS for regulatory purposes (Sawyer & Stetsenko, 2018). PS is positioned as a socio-cultural regulatory tool that reflects internalised rules garnered from interactions with key adults, thus supporting the progression from interpersonal to intrapersonal regulation. Over the past three decades, a small body of literature has associated the nature of mother–child interactions with the amount of PS that children use, and occasionally the task relevance of PS content (Berk & Spuhl, 1995; Day & Smith, 2019; Winsler, 1998; Winsler et al., 1999). Noteworthy, there has been limited investigation into the relationship between maternal parenting style and the specific regulatory content of young children's PS. Recently, research suggests that specific features of regulatory PS content are associated with problem-solving accuracy (Mulvihill et al., 2021), motivation, and task persistence (Sawyer, 2017; Sawyer & Brooks, 2021). Given the role of parents in childhood regulatory outcomes (Piotrowski, et al., 2013; Williams et al., 2009), it is plausible that the quality of parent–child interactions may be integral to what children say to themselves as they plan, monitor, and appraise their own thinking and behaviour. Accordingly, the current study aimed to investigate the relationship between maternal parenting style and the specific self-regulatory content of preschool children's PS during a problem-solving task.

PS development

An extensive body of literature has established the developmental progression and regulatory role of PS use (Berk & Spuhl, 1995; Day et al., 2024; Frauenglass & Diaz, 1985; Krafft & Berk, 1998; Kray et al., 2008; Mulvihill et al., 2021; Winsler, 2009). Overt (i.e., out-loud) PS emerges in toddlerhood and increases in frequency over the preschool and early school years (Winsler, 1998). Subsequently, children demonstrate a decline in overt PS that is paralleled by increases in audible muttering and subvocal signs of inner speech, such as silent lip movements (Fernyhough & Alderson-Day, 2015). At age 4, the content of overt PS becomes more task-relevant and planning-orientated (Manfra & Winsler, 2006). These maturational shifts in PS form and content coincide with markers of cognitive and self-regulatory sophistication (Berk, 1986; Winsler & Naglieri, 2003).

Parenting, self-regulation, and PS

The parent–child interaction creates an environment where children can learn critical aspects of self-regulation. Herein, we consider the three commonly investigated parenting styles conceptualised by Baumrind (Baumrind, 1966, 1971, 1991; Baumrind et al., 2010): permissive, authoritarian, and authoritative. Permissive parents typically set few limits and avoid exercising control, while authoritarian parents exercise high control, low warmth, and strict discipline. Importantly, exposure to predominantly permissive or authoritarian parenting styles places children at greater risk of self-regulatory deficits, poor social skills, poor self-esteem, and lower cognitive performance (Christopher et al., 2013; Pinquart, 2017; Pinquart & Gerke, 2019; Piotrowski et al., 2013; Wischerth et al., 2016; Wong et al. 2021; Sommer, 2010; Thompson et al., 2003). By contrast, children exposed to an authoritative style characterised by responsive, warm, and encouraging interactions typically demonstrate strong self-regulatory skills, higher academic achievement; greater self-esteem, and prosociality (Karreman et al. 2006; Piotrowski et al., 2013; Piquart, 2016; Wong et al. 2021; Yeung et al., 2016). PS may present a socio-cognitive mechanism by which parenting styles can influence child regulatory outcomes. Researchers from a

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Vygotskian tradition consider PS to be a product of socially mediated ontogenesis that supports the shift from other- to self-regulation (Sawyer & Stetsenko, 2018). In this way, features of the parent–child interaction are represented by the child as PS and later internalised as inner speech to regulate thinking and behaviour (Kopp, 1982). Therefore, it seems plausible that features of children's PS use, specifically its self-regulatory content during problem-solving, may be associated with maternal parenting styles.

The extant research corroborates theoretical claims that parent–child interaction is associated with PS use in young children. The nature of this interaction style is captured via microanalytic measures of maternal scaffolding (Behrend, 1992; Berk & Spuhl, 1995; Winsler, 1998; Winsler et al., 1999), or global measures of maternal parenting style (Berk & Spuhl, 1995; Day & Smith, 2019). Irrespective of the measurement approach, there is consensus that mothers who exhibit responsive interaction styles with low levels of control have children who present with sophisticated markers of PS for regulation such as more task-relevant content (Berk & Spuhl, 1995; Day & Smith, 2019) and higher levels of PS internalisation (Berk & Spuhl, 1995; Winsler et al., 1999). In parallel, interaction styles characterised by a greater degree of negative control are associated with more task-irrelevant PS content and less PS internalisation (Berk & Spuhl, 1995; Winsler, 1998).

Research has identified that specific subtypes of PS content are important for children's self-regulatory engagement (Mulvihill et al., 2022), mastery motivation (Sawyer, 2017; Sawyer & Brooks, 2021), and task performance (Breyel & Pauen, 2023; Mulvihill et al., 2021). Recent research has categorised PS content according to Zimmerman's (2002) cyclical self-regulated learning model. Three distinct content subtypes reflect the process of planning (i.e., forethought content), monitoring (i.e., performance content), and appraisal (i.e., self-reflection) during task completion (see Table 1 for descriptions and examples). Preschool children were found to use more frequent forethought and self-reflective PS content when completing a difficult compared to an easy task (Mulvihill et al., 2022). Furthermore, a greater frequency of forethought PS content was positively associated with preschool children's construction accuracy (Mulvihill et al., 2021). Maternal interaction style has previously been associated with PS content according to a dichotomous marker of PS relevance (i.e., task-relevant or irrelevant). However, the relationship between maternal parenting style and specific regulatory content subtypes of children's intelligible overt PS is yet to be examined. Hence, the present study will investigate the relationship between parenting style and the regulatory content of PS in 3- to 5-year-old children as they verbally plan (i.e., forethought content), monitor (performance content), and appraise (self-reflective content) engagement in a problem-solving task.

Method

Participants

This study was conducted as part of the *Self Talk and Thinking in Preschool Aged Children* research project at The University of Queensland. Participants were 71 typically developing children aged 3–5 years old and their mothers. One parent-child pair was excluded from analyses due to noncompletion of the Parenting Styles and Dimensions Questionnaire (PSDQ). The final sample included 70 children (36 females) aged between 3 years 3 months and 5 years 9 months (M = 50.20 months, SD = 9.40) and their mothers. All 70 children were monolingual English-speaking, and six children had minor exposure to an additional language through parents or grandparents. The sample was biased towards

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Table 1. Content coding scheme adapted from Zimmerman's (2002; 2009) cyclical SRL model (Mulvihill, Matthews, Dux & Carroll, 2019)

Subtype	Content description	Sample utterances
Forethought	*Task analysis* • Statements indicating the task goal, rules, or reasoning about what is required to carry out the task • Planning statements of intention or commands that precede an action at any point during the task	*"I will put the trick pieces back in the box"*
	Self-motivation • Statements of self-belief about ability or outcome expectations at any point during the task • Statements demonstrating interest in the task at any point during the task	*"time to do the roof"* *"I can even do it when I'm not looking"* *"okay I know"* *"I love Duplo"*
Performance	*Self-control* • Explicit self-instructional statements during an action • Attention-focussing statements	*"put it here"* *"okay look and see"*
	Self-observation • Statements that self-record actions and observations about the task, environment, or events	*"I can lift it up"* *"it's a clock"*
Self-reflection	*Self-judgement* • Statements that evaluate task performance in relation to success and error at any point during the task	*"I got the right flower"* *"that's not right"*
	Self-reaction • Exclamations or statements demonstrating positive or negative affect towards an action or task outcome at any point during the task • Defensive withdrawal statements • Adaptive responses to adjust engagement	*"ooh yeah"* *"oh that's so hard"* *"that's okay its nearly done"*

socio-economic advantage ($M = 8.64$, $SD = 1.99$, range = 1st–10th decile) as per the Socio-Economic Indexes for Areas (Australian Bureau of Statistics, 2018), and all resided in the metropolitan region of Brisbane, Australia.

Procedure

Sessions were held in a child-friendly testing room. Each session began with a brief warm-up play interaction between the researcher and the child. Children then completed a problem-solving task whereby they replicated a Duplo construction. The construction was demonstrated once by the researcher, and then completed by the child individually. Child PS was recorded during independent task completion using a GoPro Hero 4 camera. Mothers were asked to complete the PSDQ (Robinson et al., 1995).

PS task

Duplo construction task. A Duplo construction task known to elicit PS in preschool children was selected (Mulvihill et al., 2021). This task comprised a Duplo garden consisting of 10 individual pieces and two distractor pieces, and a Duplo house consisting of 15 individual pieces and three distractor pieces (see Figure 1). Children were first

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Figure 1. Images of the Duplo construction task.
Note. Duplo garden replica (pictured left), front view of the Duplo house replica (middle) and top view of the Duplo house replica (right).

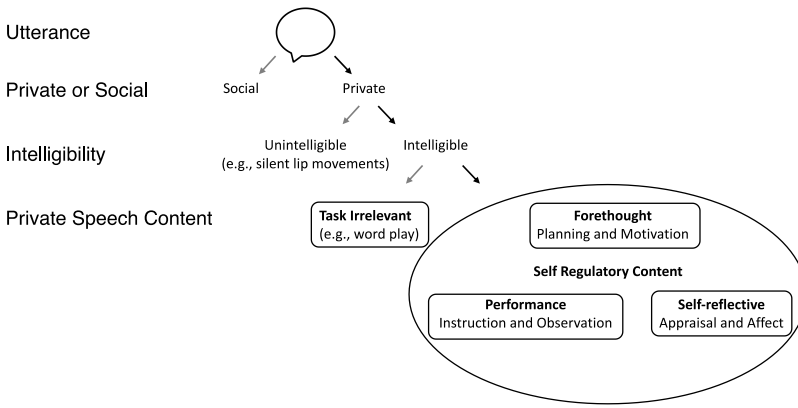

Figure 2. PS coding procedure.

presented with a complete structure of a Duplo garden and observed the researcher construct the same structure using the replica as a guide. The child then constructed this independently using the replica as a reference. Following this, the researcher demonstrated the construction of the Duplo house using a completed structure as a guide. The child then constructed the Duplo house structure independently using the replica as a reference. Task-based instructions were as follows, "Here is a Duplo garden/house. You need to build one exactly the same. First, I will build it for you. Next you will do it all by yourself." At the point of individual construction, the researcher distanced from the child. Children were not prompted to engage in PS use. When the child-directed speech to the researcher, she responded directly with minimal verbalisation and encouraged the child to persist. Child speech was recorded from the time the child touched the first block until they indicated they were finished either verbally (e.g., "done") or nonverbally (e.g., looked at the researcher and moved away from the completed task).

PS coding

Child speech was transcribed and coded from video footage of the PS task. See Figure 2 for a visual representation of the coding procedure.

Speech utterance. Utterances were defined by the presence of (a) a complete sentence, (b) a sentence fragment, (c) an independent clause, (d) a conversational turn, or (e) a

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string of speech separated from another by a period of at least two seconds (Winsler, 2009; Winsler et al., 2005).

Speech type. Utterances were classified as either private or social. Social speech was identified by (a) a gaze toward a person within one second of the utterance, (b) a conversational turn, (c) use of pronoun or name, or (d) intentional or physical touch of another person (Winsler et al., 2005). All other utterances were classified as PS.

PS intelligibility. Intelligible PS utterances included both overt and covert (e.g., whispers) utterances for which the content of the utterance could be understood.

PS content. Intelligible PS utterances were first classified according to task relevance (i.e., task-relevant or task-irrelevant), following which all task-relevant utterances were further categorised according to their self-regulatory content. Task-irrelevant utterances included (a) wordplay, (b) task-irrelevant affect expression, and (c) comments to others not present (Berk, 1986). Each task-relevant PS utterance was categorised according to a self-regulatory content coding scheme (see Table 1 for descriptors and examples) that included three distinct content subtypes: forethought, performance, and self-reflective. Forethought content includes a statement of (a) task goals or plans, or (b) motivational statements of self-belief, interest, or outcome expectations. Performance content includes a statement (a) self-instruction, (b) self-observation, or (c) attention-focussing statements. Self-reflective content is characterised by statements that (a) self-evaluate ongoing performance or (b) indicate a display of positive or negative affect towards the task or outcomes.

Reliability. To determine interrater reliability a trained research assistant coded 50% of the data from a random selection of 35 transcripts with access to the video recordings. Reliability metrics for the private and social speech distinction (96%, $\kappa = .87$), utterance intelligibility (100%, $\kappa = 1$), and PS content categorisation (83%, $\kappa = .68$) ranged from almost perfect to substantial agreement.

Measures

PS measures. For each social and PS measure, frequency per minute and proportion scores were calculated to account for variation in completion time and child verbosity. Frequency per minute was calculated for every participant by dividing the total utterances of each subtype by the time (in minutes) of task completion. For social speech and PS, the proportion score was calculated by dividing the total utterances of each subtype by the total utterances used. The proportion of unintelligible PS is calculated as a proportion of all PS utterances. The proportion of each PS content subtype (i.e., task-irrelevant, forethought, performance, self-reflection) was calculated by dividing the total utterances of each subtype by the total amount of intelligible utterances used. This proportional metric for each PS content subtype could only be calculated when a child used at least one intelligible PS utterance ($n = 66$).

PSDQ. Mothers completed the Australian-validated version of the PSDQ for preschool children (Robinson, 1996). This self-report measure captures Baumrind's (1971) typological classification of authoritative, authoritarian, and permissive parenting styles and is suitable for use with parents of preschool-aged children. Twenty-two items measured authoritative parenting ($\alpha = .84$), 18 items measured authoritarian parenting ($\alpha = .82$), and 8 items measured permissive parenting ($\alpha = .35$). For each item, mothers rated the frequency with which they used a specific parenting practice on a 5-point scale from 1 (never) to 5 (always). The questionnaire provided a separate score for each global

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dimension of parenting style, calculated using the arithmetic mean of the scale items. A higher score on any parenting style reflected a mother's tendency to use more practices relevant to that style.

The Australian PDSQ for preschool-age children was originally developed from a cross-cultural comparison of the original 62-item PDSQ (Robinson, 1995) from the United States. In the Australian sample 298 parents (191 mothers and 107 fathers) of preschool-aged children completed the questionnaire. The psychometric properties of the questionnaire were assessed specific to each cultural context and were consistent with Baumrind's (1971) three global parenting styles. Compared to the United States version, the Australian version had 5 fewer items for permissive parenting style. Of note, the internal consistency of the permissive parenting scale measured in this study is very low. Historically, the Australian version of PDSQ for preschool-age children has yielded low values of internal consistency for the permissive parenting scale (Robinson, 1996; Russell et al., 1998; Russell et al., 2003). This has also been found in other non-US locations, suggesting differing interpretations of the permissive style scale items cross-culturally (Olivari et al., 2013).

Table 2. Descriptive statistics of social and PS utterance variables

	No. of participants *(%)*	Median	*Range*	Mean	*SD*
Social and PS frequency					
Social speech p/m	61 *(87%)*	0.98	*0.00–7.20*	1.20	*1.20*
PS p/m	70 *(100%)*	4.72	*0.45–13.87*	5.49	*3.78*
Unintelligible PS p/m	60 *(86%)*	0.71	*0.00–4.84*	1.04	*1.04*
PS content frequency					
Task-irrelevant PS p/m	13 *(19%)*	0.00	*0.00–0.91*	0.07	*0.19*
Forethought PS p/m	56 *(80%)*	0.55	*0.00–3.73*	0.76	*0.81*
Performance PS p/m	61 *(87%)*	1.39	*0.00–7.53*	2.28	*2.18*
Self-reflective PS p/m	56 *(80%)*	0.46	*0.00–0.29*	0.79	*0.77*
Social and PS proportion					
Social speech	61 *(87%)*	0.15	*0.00–0.67*	0.19	*0.16*
Private speech	70 *(100%)*	0.85	*0.33–1.00*	0.81	*0.16*
Unintelligible private speech	60 *(86%)*	0.17	*0.00–1.00*	0.29	*0.31*
PS content proportion					
Task-irrelevant	13 *(19%)*	0.00	*0.00–0.13*	0.01	*0.03*
Forethought	56 *(80%)*	0.17	*0.00–1.00*	0.20	*0.17*
Performance	61 *(87%)*	0.57	*0.00–1.00*	0.55	*0.24*
Self-reflective	56 *(80%)*	0.20	*0.00–1.00*	0.24	*0.24*

Note. p/m = per minute, PS = private speech

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Results

Preliminary analyses

PS use. Table 2 specifies the median and range for the frequency per minute and proportion of each social and PS subtype, as well as the number of participants that used each subtype. A majority of PS variables were positively skewed (3 of 14 had a skew greater than 2.0, and 7 of 14 had a skew greater than 1.0). Therefore, nonparametric tests were employed for all further analyses.

The relation between child age (in months) and sex (0 = male, 1 = female), and all social and PS variables was investigated using partial Spearman rank correlations. The effect sizes and significance values are outlined in the supplementary materials in Tables S3 and S4. Child age was negatively correlated with the frequency per minute of social speech, r_s (70) = −.45, p <.001, and the proportional use of social speech, r_s (70) = –.44, p <.001. Child age was positively correlated with the proportional use of PS, r_s (70) = .43, p <.001. Older children used proportionately more PS than younger children. In contrast, younger children demonstrated a higher frequency per minute and proportional use of social speech than older children. Male children demonstrated more frequent PS utterances per minute than female children, r_s (70) = –.38, p =.001, especially utterances categorised as forethought, r_s (70) = –.42, p <.001, and performance-type content, r_s (70) = –.42, p <.001. Male children also used a higher proportion of performance-type utterances than female children, r_s (66) = –.27, p = .03. Female children demonstrated a higher proportion of unintelligible PS, r_s (70) = .29, p = .01, and self-reflective utterances, r_s (66) = .28 p = .02, than male children. Further analyses using social and PS variables were adjusted for age and sex.

Parenting styles. The mean and median scores of each parenting style as reported by mothers are outlined in Table 3. A 3×3×2 repeated measures ANOVA was conducted to investigate patterns in parenting style. The maternal-reported practices score for each parenting style (authoritative, authoritarian, permissive) was the repeated measure (i.e., within-subject factor), while child age (3, 4, 5 years) and child sex (female, male) were the between-subject factors. Results revealed an effect of parenting style whereby there was a significant difference in the scores of maternal-reported parenting practices relevant to each parenting style, $F(2, 128) = 755.69$, $p < .001$, $\eta_p^2 = 0.92$. Overall, authoritative parenting was the predominantly reported style, followed by permissive, and finally authoritarian. Post-hoc testing using Bonferroni correction revealed that mothers reported significantly more frequent authoritative practices than either permissive or authoritarian practices, all $p \leq .001$. Additionally, mothers reported significantly more permissive than authoritarian practices, p <.001. There was no between-subjects' effect of child age, $F(4, 128) = 2.07$, $p = .09$, $\eta_p^2 = 0.06$, or sex, $F(2, 128) = 1.82$, $p = .17$, $\eta_p^2 = .03$, on maternal-reported parenting practices. Finally, there was no interaction between parenting style, child age, and child sex $F(4, 128) = 0.72$, $p = .58$, $\eta_p^2 = 0.02$.

Table 3. Descriptive statistics of parenting styles

	Authoritative	Authoritarian	Permissive
Mean (*SD*)	4.18 *(0.35)*	1.77 *(0.33)*	2.26 *(0.35)*
Median (*range*)	4.23 *(3.32–4.73)*	1.72 *(1.11–2.56)*	2.25 *(1.63–3.25)*

Note. N=70

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Main analyses

Results, displayed in Table 4, revealed that children who ranked higher in both the frequency per minute and proportion of forethought content had mothers who ranked higher in practices relevant to authoritative parenting. The relationship between parenting style, social speech, PS, and the regulatory content of children's PS in the Duplo task was investigated in a series of partial Spearman rank correlations that were adjusted for child age (in months) and child sex (Spearman rank correlations without adjustments for age and sex are located in Supplementary Tables S3 and S4). Specifically, there was a significant moderate positive correlation between the proportion of forethought utterances and maternal-reported authoritative parenting practices, r_s (66) = .31, p = .014. Similarly, there was a small but significant positive correlation between the frequency of forethought utterances per minute and maternal-reported authoritative parenting practices, r_s (70) = .24, p =.045. The frequency per minute and proportional use of social speech, PS, unintelligible PS, task-irrelevant, performance, and self-reflective utterances were not significantly correlated with a parenting style.

Table 4. Partial Spearman correlations (adjusted for age in months and sex) between the frequency and proportion of PS content subtypes and the maternal-reported practices score for each parenting style

	Authoritative		Authoritarian		Permissive	
	r_s	p	r_s	p	r_s	p
Social and PS frequency p/m						
Social speech	.02	.88	−.03	.84	−.03	.84
PS	.06	.62	−.02	.88	−.14	.25
Unintelligible PS	.06	.62	.05	.72	−.02	.90
PS content frequency p/m						
Task-irrelevant	.06	.65	−.15	.21	.22	.08
Forethought	**.24***	**.045**	−.10	.41	−.24	.053
Performance	.02	.86	−.02	.90	−.12	.33
Self-reflective	.16	.20	.11	.36	−.07	.55
Social and PS proportion						
Social speech	−.09	.45	.02	.82	.11	.38
PS	.11	.36	.02	.83	.11	.36
Unintelligible PS	.12	.32	.06	.60	.04	.72
PS content proportion						
Task-irrelevant	.05	.66	−.17	.19	.19	.14
Forethought	**.31***	**.014**	−.18	.15	−.21	.10
Performance	−.22	.09	−.10	.44	.05	.68
Self-reflective	.10	.43	.18	.16	.07	.59

Note. N (frequency) = 70. N (proportion) = 66.
*p < .05. p/m is per minute. Significant correlations in **boldface**.

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Discussion

This study investigated the relationship between maternal-reported parenting style and the regulatory content of preschool children's PS elicited during a cognitively focussed problem-solving task. There was a significant small-to-moderate positive relationship between the maternal-reported authoritative practices and children's frequent and proportional use of forethought PS content (i.e., planning and self-motivational statements). There was no significant association between authoritative parenting practices and other regulatory PS content subtypes. Likewise, there was no significant relationship between the maternal-reported authoritarian or permissive practices and the frequency or proportional use of children's task-irrelevant or self-regulatory PS content subtypes. Beyond regulatory PS content, maternal parenting style was not associated with broader measures of speech use (i.e., private or social) and form (i.e., unintelligible PS) during Duplo construction.

PS as a tool for self-regulation in caregiving interactions

These findings corroborate previous research indicating that observed or reported authoritative maternal behaviours are associated with children's PS use. Albeit from a small body of research, a consistent finding is that authoritative maternal behaviours are associated with features of PS use that are considered developmentally mature and linked to positive regulatory outcomes, such as the use of more internalised or task-relevant PS (Berk & Spuhl, 1995; Day & Smith, 2019; Winsler et al. 1999). We extended this line of research and found that mothers self-reported parenting style is also associated with the self-regulatory content of children's talk to self. Specifically, mothers whose predominant parenting style is characterised by responsive, warm, consistent, and autonomy-supporting interactions have children who use more planning and self-motivational PS statements when problem-solving. Noteworthy, planning and self-motivational PS content has been associated with a regulatory response to increasing task difficulty and better task performance outcomes for preschool children (Mulvihill et al., 2021; Mulvihill et al., 2022). Unlike previous research (Berk & Spuhl, 1995), an authoritative parenting style was not associated with unintelligible PS which is considered a marker of progression towards inner speech. In Berk and Spuhl's (1995) study, this association was evident for 4-year-olds but not 5-year-olds, and therefore, this relationship may not be captured by the wider age range included in this study.

A collection of meta-analyses indicate that the nature of parent–child interaction is associated with children's self-regulatory outcomes (Karreman et al., 2006; Valcan et al., 2018; Wong et al., 2021). Landry et al. (2002) found that maternal scaffolding in the preschool years indirectly influences executive skills at 6 years by a direct relationship with language at 4 years. The current study suggests that children's PS content may provide a socio-linguistic mechanism whereby caregivers interactional style can support children's self-regulatory development. Vygotsky (1934/1962) originally hypothesised that children transition from interpersonal regulation with parents to self-regulation as they appropriate adult regulatory language as their own PS. Encouraging, autonomy-supporting interactions that are characteristic of authoritative parenting may indeed expose children to a rich dialogue featuring guiding and motivational content which is then accessible for self-guidance. By contrast, a parenting style that is either uninvolved, low in expectations, harsh, critical, inflexible, or demonstrates negative verbal control is unlikely to facilitate parent-child dialogue that elicits planning (e.g., I wonder if you can

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put the blue block on top of the green block?) or motivational statements (e.g., you can figure this out). Furthermore, authoritative parenting is sensitive and responsive to children's needs and likely operates within a child's zone of proximal development. In this sense, a caregiver sensitively provides relevant input at appropriate points in a child's learning but gradually withdraws to facilitate child autonomy and hence opportunity for regulatory PS. Interestingly, Winsler and colleagues (2006) found that mothers who were authoritative in their self-reported parenting style were more likely to allow their child use PS rather than reacting or getting directly involved in PS. Similarly, in typically developing children, maternal withdrawal during a collaborative Lego construction task was the strongest positive predictor of partially internalised PS during a subsequent child completed selective attention task (Winsler et al., 1998). These authoritative practices seem to be associated with mature markers of PS. Indeed, they may afford the child a supportive space to talk themselves through a task plan with motivational encouragement as opposed to relying on parental verbal control to progress through the task. Maternal authoritative parenting may provide optimal conditions for children's regulatory PS use that features frequent planning and self-motivational statements.

On the other hand, children who demonstrate use of verbal or nonverbal planning or self-motivational behaviours (e.g., I can do this), may elicit warm, autonomy-supporting interactions from their mother. In juxtaposition, a child who demonstrates emotionally reactive verbal content (e.g., I can't do it, this is too hard) may elicit less optimal parenting practices such as verbal or physical control. Indeed, the relationship between child temperament and parenting styles is considered bidirectional whereby child temperament may elicit parenting styles which in turn can affect children's social-emotional outcomes (Kiff et al., 2011; Laukkanen et al., 2014).

Future directions

This generalisability of this study is somewhat limited by sample features, low internal reliability for the permissive parenting dimension of the PSDQ, and the correlational nature of the research design. The sample reported an overall trend towards socio-economic advantage. Given the association between socio-economic status and child development outcomes (Bradley & Corwyn, 2002), findings may not be generalisable to mothers and children from lower socio-economic backgrounds. As is commonly indicated for higher socio-economic contexts, mothers reported more frequent parenting practices relevant to an authoritative parenting style compared to authoritarian and permissive styles. In a more diverse sample, there may have been a greater representation of parenting styles. For example, a more diverse sample inclusive of mothers from lower socio-economic backgrounds may capture a greater frequency of authoritarian and permissive parenting styles (Hoff et al. 2002; September, et al., 2016). Nonetheless, Russell (1998) also found that authoritative parenting was the predominant parenting style amongst 305 Australian families, suggesting that the self-reported parenting styles in the current sample may be representative of Australian parents more generally. Another limitation was that the paternal parenting style was not recorded. Although women continue to take primary responsibility for child caregiving activities (Australian Government, 2023; Bianchi, 2011), fathers' parenting practices are also associated with children's self-regulatory behaviours (Russell, 1998; Tavassolie et al., 2016). Finally, research has specified that the effect of parenting style on developmental outcomes differs cross-culturally (Nielsen, et al., 2017). Therefore, it is unknown whether the findings of this study translate across cultures. Further research is required to explore whether the

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identified relationship between authoritative practices and children's forethought PS content is similarly evident in fathers and across diverse socio-economic and cross-cultural contexts.

The Australian PDSQ was selected for this study given that it has been validated with Australian mothers of preschool children (Robinson, 1996) and has widespread acceptability as a measure of parenting style (Olivari et al., 2013). In the current sample, the Australian-PSDQ demonstrated good internal reliability for authoritative and authoritarian parenting styles but a low level of internal reliability for the permissive parenting style dimension (i.e., $\alpha = .35$). Historically, low reliability for the PDSQ permissive parenting style dimension appears to be an artefact of Australian and other non-US samples, suggesting differing cross-culturally interpretations of the permissive items (Olivari et al., 2013; Russell et al. 2003). Accordingly, the reported correlations between permissive parenting and PS content subtypes should be interpreted cautiously. A more reliable measure of permissive parenting is required to gain an insight into the relation between this style of parenting and PS self-regulatory content. Another limitation of the PDSQ is that it fails to measure an uninvolved/neglectful parenting style. Uninvolved/neglectful parenting is a style of parenting characterised by few demands, limited communication, and a lack of responsiveness to a child's emotional needs with negative implications for children's social-emotional development (Pinquart & Gerke, 2019). To gain a comprehensive understanding of the relationship between children's PS content and parenting styles, future research should seek to include a measure of uninvolved/neglectful parenting.

Parenting can be measured using both questionnaire and observational methods. The PDSQ provided a well-accepted global measure of parenting style (Olivari et al., 2013). However, questionnaire measurement may be subject to response bias whereby mothers may have selected socially desirable responses. This could explain mothers' tendency to report more authoritative practices than either authoritarian or permissive practices. To safeguard against response bias, future research could also measure parenting style observationally during mother and child interactions. Furthermore, observations of mother–child interactions afford opportunity for microanalytic measures of maternal scaffolding that can provide insight into precise features of maternal interaction associated with children's PS content use.

Finally, although the current correlational design offers valuable preliminary data and hypotheses, future longitudinal or intervention-based research may provide greater insight into the persistence and directionality of observed effects during early childhood. Although Vygotsky's theoretical stance on PS development and evidence for a causal relationship between parenting styles and child self-regulation hints at the possible direction of this relationship, it is not possible to comment on whether maternal parenting style affects PS content, or rather children's PS content and regulatory behaviours more broadly elicit a specific parenting style.

Conclusion

Broadly, this study lends further evidence to the association between parenting style and children's self-regulatory behaviours. The current findings support Vygotsky's hypothesis that parenting plays an integral role in the development of PS. Although previous research has indicated a relationship between parenting and broader features of PS such as its amount, form, and task relevance (Berk & Spuhl, 1995; Day & Smith, 2019; Winsler, 1998;

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Winsler et al., 1999), this study is the first to identify a relationship between mothers' parenting style and the specific regulatory content of children's PS. Children with mothers who reported more practices relevant to authoritative parenting used more forethought (i.e., planning and motivational) PS content in a problem-solving construction task. Engaging authoritative parenting practices may be one approach through which parents can encourage regulatory PS use in children that is planning focussed and self-motivational, although the directionality of this relationship requires further investigation.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/S0305000924000515.

Data availability statement. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Competing interest. All authors report there are no completing interests to declare.

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