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METHODS ARTICLE

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The Parent Play Questionnaire: Development of a parent questionnaire to assess parent–child play and digital media use

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Abstract

We introduce the Parent Play Questionnaire (PPQ), a parent-report measure designed to assess frequency of parent–infant play, parents' attitudes towards play with their infant, and infants' use of digital media. We describe measure development and empirical data across three samples of parent–infant dyads (total *N* = 414, offspring aged 0.3–2.5 years). Three latent factors explain the PPQ, corresponding with theoretically defined subscales. Summary scores showed good internal consistency and normally distributed results. Weak to moderate correlations were found between the frequency and attitude play scales, and with standardized measures of family social and emotional characteristics. Overall, frequency of digital media use was not correlated with play or broader family variables. Results suggest that the PPQ will be a useful tool for researchers interested in assessing parent–child play during early childhood.

KEYWORDS

digital media use, infancy, measurement, parenting, parents, play

1 | INTRODUCTION

Play is a self-directed, intrinsically motivated, and fun activity, which is ubiquitous and spontaneous among humans (Gray, 2009;Whitebread, Basilio, Kuvalja, & Verma, 2012). Throughout the 20th century, psychologists, philosophers, anthropologists, and clinicians sought to define the importance of play for child development, converging on the conclusion that it facilitates child learning (e.g., Piaget & Cook, 1952;Smilansky, 1968;Vygotsky, 1 967;Winnicott, 1971). Researchers have demonstrated associations between child play and physical, cognitive, social, and emotional development, examining many different forms of play across all stages of child development (e.g., Ginsburg, 2007;Singer, Golinkoff, & Hirsh-Pasek, 2006).

Parents are implicated as primary sources of influence on child play, especially during early development when children are dependent on their parents and use play as a means to learn about their environment (Garner & Bergen, 2015). As such, parent involvement in play may have an important role in child development. Parent attitudes and behaviours towards play are heterogeneous across cultures and societies, with group differences in the extent to which parents cultivate, accept or curtail play. As such, parents differ in how much time they spend engaging with child play, the types of play activities they engage with and the quality of their contribution to child-led play (Brocklebank, Bedford, & Griffiths, 2014;Herschell, Calzada, Eyberg, & McNeil, 2002;Roopnarine, 2011). Recent decades have seen a widespread shift in the nature of child play. Many children spend less time engaged in unstructured free play and increasing time indoors, engaging with digital media or adult-led activities (Anderson & Pempek, 2005;Ginsburg, 2007;Gleave, 2009;Radesky, Schumacher, & Zuckerman, 2015;Valentine & McKendrck, 1997;Whitebread et al., 2012). Although concerns have been raised about changes in children's play, robust research into the impact on child development and the role of parents in these changes is limited.

To enable further research, we present the first standardized, parent-report questionnaire to assess parent–child play. We focus on play during infancy, the period of child development encapsulating the first two years of life. Exploratory and sensorimotor play develop during infancy, followed by the emergence of symbolic play and reciprocal social games, all of which become more complex as infants develop language and higher cognitive abilities (Garner & Bergen, 2015). We examine parent attitudes towards parent–child play during infancy, the frequency of their play together and frequency of infant digital media use. Measuring digital media use in children will, we think, be important as we attempt to understand potential impacts on parent–child play and child development more broadly.

1.1 | Existing research on parent–child play

Existing research on parent–child play is derived predominantly from observational studies assessing the *quality* of parent–child play. Correlations between many aspects of child development and early parent play quality have been presented, including studies of parent directing, guiding, scaffolding, limiting, and responding to the child during play. For example, parents' play sensitivity (characterized by sensitive, cooperative, and gently challenging behaviours) has been correlated with child attachment security in three-year-olds (Bureau et al., 2017). Mothers' references to objects within episodes of joint attention during play with one-year-olds has been correlated with child vocabulary (Tomasello & Farrar, 1986) and parents' supportive engagement in play has been correlated with child cognitive and language development (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). One-year-olds may also engage in more advanced play (e.g., functional use of objects) when with their mother compared with when alone, especially during episodes of joint attention (Bigelow, MacLean, & Proctor, 2004).

Beyond observational studies, intervention studies have provided evidence supporting a causal influence of parent–child play on child developmental outcomes. For example, an intervention encouraging parents to engage in positive playful interactions with infants found long-term associations with offspring cognitive, social and internalizing outcomes (Gertler et al., 2014). Additionally, clinical parenting programmes aimed at facilitating positive parent–child interactions through child-led play (i.e., allowing the child to choose toys and following their lead) have been shown to promote

positive attachment and reduce child problem behaviours (Herschell et al., 2002;Kaehler, Jacobs, & Jones, 2016). Although observational and intervention-based research designs provide valuable insight into links between parent–child play and child development, they are also costly and time intensive, commonly resulting in small, unrepresentative samples. These studies are often focused on narrow time windows, limiting their information about everyday play in naturalistic settings. Furthermore, observation methods cannot inform on parent attitudes, feelings or beliefs, which may enrich our understanding of parent–child play practices and their importance for child outcomes. To address these issues, we sought to design a parent-report questionnaire that is cheap and easy to administer remotely among large samples.

In preparation for measure development, we conducted a search of published literature and scales from large cohort studies, where questionnaire data collection is the norm. We found no scales designed to evaluate parent–child play per se. We found a handful of stand-alone questionnaire items designed to examine the frequency of parent–child play, but none for parent attitudes towards child play. The available items were limited in scope and were not standardized between cohorts. We found very few publications using these items. In the U.K. Millennium Cohort Study for example, frequency of parent–child play was assessed using a single parent-report item for children at the age of three and six items for children at the age of five (Kroll, Carson, Redshaw, & Quigley, 2016). Published data showed that fathers' engagement in creative play was inversely correlated with prospective child behavioural problems. Mothers' time spent playing with five-year-old children was associated with social factors including parent ethnicity, employment, education, age at child's birth, lone parent status, and number of dependent children (Brocklebank et al., 2014). In the Avon Longitudinal Study of Parents and Children (Boyd et al., 2013), parents reported on their time spent singing and reading to their infant; visiting the park; and allowing their infant to be noisy, play with messy objects and build towers or other creations. Data were used in composite scores to assess parenting traits, but not parent–child play specifically (e.g., Opondo, Redshaw, Savage-McGlynn, & Quigley, 2016;Roulstone, Law, Rush, Clegg, & Peters, 2010). In summary, we found that a standardized scale to evaluate parent–child play would be a valuable contribution to the research field, facilitating new research on individual differences in parent–child play with young children, particularly in the context of increasing levels of digital play.

1.2 | Parent–child play and digital media use

Modern technology is embedded in the daily lives of children. Many children now watch television and use mobile touchscreen devices daily, including in the first years of life (Anderson & Pempek, 2005;Taylor, Monaghan, & Westermann, 2018;Vandewater et al., 2007). Of concern to some have been indications that opportunities for child play are displaced by rapidly increasing access to digital media, with fewer unstructured and creative parent–child interactions, particularly those involving sensorimotor and social play (Radesky et al., 2015). The American Academy of Pediatrics advise that for children under two years, 'adult interaction with the child during media use is crucial' (AAP Council on Communications & Media, 2016), although the World Health Organization recommends no screen time for children under two (WHO, 2019). However, the evidence-base to support concerns surrounding digital media use in young children is limited.

To date, research on digital media use among young children has relied upon small samples and been disproportionately focused on television exposure and negative implications. One study found that young children falling outside versus inside the AAP media use guidelines did not experience differences in their time spent reading or being read to, or engaging in outdoor play (Vandewater et al., 2007). However, television viewing time *was* associated with reduced time engaging with parents and in creative play (Vandewater, Bickham, & Lee, 2006). Meta-analytic findings show evidence for negative, concurrent associations between television exposure and quality of parent–child interactions (Kostyrka-Allchorne, Cooper, & Simpson, 2017). Specific to play, one group observed a reduction in quantity and quality of parent–child play in the presence of background television (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009). A negative, prospective association between background television exposure and infant vocabulary has been reported, mediated by lower maternal speech quantity and quality during play (Masur, Flynn, & Olson, 2016). Lower levels of parent-toddler

verbalization and collaboration have been observed when reading electronic versus print books (Munzer, Miller, Weeks, Kaciroti, & Radesky, 2019) and specific design features of tablet devices and children's apps have been shown to inhibit parent scaffolding during tablet play (Hiniker, Lee, Kientz, & Radesky, 2018).

By contrast to research linking infant digital media use to negative outcomes, a smaller literature exists on the rich learning opportunities provided. For example, the use of video calls for face-to-face interactions has been linked to toddlers' language acquisition (Roseberry, Hirsh-Pasek, & Golinkoff, 2014) and well-designed digital media may give parents ideas and content for playful activities (Radesky et al., 2015). The availability of digital media within homes has rapidly increased, but robust research to understand implications for families with young children is scarce. By including items about infant digital media use in our new measure of play, we aim to facilitate research on how this technology use may be associated with parent–child play, for better or worse.

1.3 | The Parent Play Questionnaire

There are several ways to conceptualize and measure parent–child play, requiring multiple measurement tools and designs to provide a quality evidence base. Here, we develop the first standardized questionnaire of parent–child play and show that it demonstrates good psychometric properties. We address an important gap in the field of play research and make a novel contribution to accommodate the needs of researchers. The Parent Play Questionnaire (PPQ) can be remotely administered to parents, completed on a large scale, at low cost. We collect novel data on everyday play experiences, to complement existing research on play behaviours in observation settings and intervention studies. The focus is on the first years of life, when offspring are dependent on parents and play to learn about their environment. Scales assess *Frequency of Parent–child Play*, *Parent Attitudes Towards Play*, and *Frequency of Digital Media Use*, to explore associations between parent–child play and technology use in families with young children. We examine correlations between these scales and existing standardized questionnaires indexing family social and emotional characteristics, to explore convergent validity of the PPQ.

2 | METHOD

2.1 | Participants

Data were drawn from three independent samples of English-speaking parents participating in research studies based at King's College London and the University of Sussex, conducted between 2016 and 2018. In each study parents were invited to complete the PPQ for their infant (mean age across studies = 1.5 years, *SD* = 0.34). We present empirical data from each study to assess replicability of PPQ results across independent groups. For the sake of clarity in this article, we refer to the samples from each study as *Samples 1*, *2*, and *3*. Participant demographics are outlined in Table 1 alongside comparable 2017 census data for England and Wales. Where possible, census data are displayed for mothers of young children, given that over 80% of the participating parents were mothers. Chi-square tests of independence were used to compare demographic data in each sample with the displayed census data. Significantly more infants with ethnicity rated as White British or White Other were included in our samples compared with the British population in general. A range of families were represented across the samples in terms of socioeconomic status (indexed by parent educational attainment, employment status and lone parent status). Parent age was not collected from participants in *Sample 1*. All parents in *Sample 2* were below the average age for first time mothers in Britain (28 years; Ghosh, 2019). Parent age in *Sample 3* was representative of the national population for mothers with young infants.

The 157 parents in *Sample 1* were the first to pilot the PPQ. Participants were community volunteers recruited by researchers at King's College London, using targeted posts in online community parenting groups, university e-mail circulars, and posters placed in local nurseries and other locations frequently visited by parents of infants (e.g., library,

TABLE 1 Sample demographics

		Sample 1 (*n* = 157)	Sample 2 (*n* = 161)	Sample 3 (*n* = 96)	2017 census data for England and Wales
Age range (years, M/SD)					
	Child	0.3 – 3.0 (1.3/0.4)	1.0 – 2.3 (1.3/0.3)	1.0 – 2.5 (1.5/0.3)	--
	Parent	Unknown	20 – 25 (23.0/0.9)	18 – 49 (32.7/5.7)	**32**[†]
Parent relationship to child (%)					
	Mother	94	81	98	--
Child sex (%)					
	Female	45	53	51	**49**[‡]
Child Ethnicity (%)					
	White British/Other White	89*	96*	93*	**71**[‡]
Parent highest educational attainment (%)					
	Undergraduate degree or higher	88*	17*	68*	**42**[§]
	2 + A level, 4 + AS level	6	27	19	**21**[§]
	5 + GCSE A*-C, 1 A level, 2–3 AS level	5	36	7	**20**[§]
	Less than 5 GCSE A*-C	1	20	6	**8**[§]
Parent employment status (%)					
	Employed	72ns	58*	64ns	**66**[¶]
	Student or in work training	4	6	2	--
	Stay at home parent	23	32	32	**27**[¶]
	Unemployed or unable to work	1	4	2	**3**[¶]
Family composition (%)					
	Lone parent family	3*	30*	Unknown	**22**[±]
	One child family	53ns	72*	45ns	**45**[±]

*$p < .05$, ns not significant, compared with 2017 census data using chi-square test of independence.

[†]For mothers with a child aged 1.5 years, based on standardized mean age of mother for all births (30.5 years; Ghosh, 2019).

[‡]For live births (Ghosh, 2019).

[§]For adults aged 21 to 64 years who were not enrolled in education (Clegg, 2017).

[¶]For mothers aged 16 to 64 years with youngest child aged 0 to 2 years (Glastonbury, 2017).

[±]For all families with dependent children (Knipe, 2017).

soft play café). All parents took part anonymously, completing the PPQ as part of an hour-long, online questionnaire battery. Parents provided quantitative and qualitative feedback on the PPQ items. Feedback items assessed whether parents enjoyed answering the questions and whether questions felt relevant to them (using 4-point Likert scales), with a textbox for further comments or feedback (using raw text). Qualitative and quantitative data from *Sample 1* were used to inform development of the PPQ for subsequent, concurrent use with *Samples 2* and *3*. The 161 parents in *Sample 2* were recruited by researchers at King's College London as part of the Children of the Twins Early Development Study (Ahmadzadeh et al., 2019). Again, these parents completed the PPQ as part of an hour-long questionnaire battery. The 96 parents in *Sample 3* were community volunteers recruited by researchers at the University of Sussex, using the same methods as for *Sample 1*. These parents completed the PPQ online as part of a 30-min questionnaire battery.

2.2 | Measures

2.2.1 | PPQ scales construction

The *Frequency of Parent–child Play* scale was designed to assess how frequently parents had played with their infant in the past two weeks (Table 2A). Eight items were developed to broadly cover all types of parent–child play appropriate for infants, based on a comprehensive review of the play literature. Parents responded using a six-point frequency scale. A ninth item indexing 'Messy play' was removed for *Samples 2* and *3*, due to very low endorsement by participants in *Sample* 1. One 'quality control' item was included for *Samples 1* and *2*, asking participants to select a specified response for use as a proxy measure of participant attention and validity of responses (e.g., 'This is a quality control question: please select 'Never''). Data from three participants in *Sample 1* and five participants in *Sample 2* were excluded from this subscale due to selecting an incorrect answer to this question.

In *Samples 2* and *3* we piloted additional stand-alone items asking parents to directly estimate the average amount of time that they had spent playing with their child each day during the past two weeks, on both 'work or study days' and 'free days' (0-30 min, 30-60 min, 1-2 hr, 2-4 hr, more than 4hr). Items were included to assess differences in parent–child play time throughout the week, and whether parents' direct estimates of play duration were correlated with our eight-item scale for *Frequency of Parent–child Play*.

The *Frequency of Digital Media Use* scale was designed to assess child exposure to television, computers, tablets, smart phones and games consoles in the past two weeks (Table 2B). Six items were designed by the authors and piloted in *Sample 1*, asking parents to report on both the frequency of child 'watching' and 'playing on' digital media devices on their own, with the parent, or with others. Items were scored along a five-point frequency scale in *Sample 1*, which was adapted to include six points for *Samples 2 and 3* (thereby matching the scale used for *Frequency of Parent–child Play*). Both qualitative and quantitative data from *Sample 1* indicated that the 'playing on' items were not age-appropriate for infants. The 'playing on' items were removed from the measure for *Samples 2* and *3*.

Fifteen items for three *Parent Attitudes towards Play* scales were originally conceived, to measure parent perceptions and behaviours during play with their child in the past two weeks (Table 2C). The authors designed four items to assess parents' involvement in play with their child; seven items related to parent enjoyment of parent–child play; and four items assessing the degree to which parents structured play with their child—to examine whether parents actively directed and organised playtime. Parents answered using a four-point Likert scale. Two quality control items were included for *Samples 1* and *2*, asking participants to select specified responses. Data from two participants in *Sample 1* and four participants in *Sample 2* were excluded from this subscale, due to their selecting an incorrect answer on either quality control item.

TABLE 2 PPQ item list with question text and response scales

(A) Frequency of parent–child play
"thinking back over the past two weeks please indicate how often you have played with your child in the following ways…"
Never (1), Less than once a week (2), Once or twice a week (3), Several times a week (4), Once or twice a day (5), Several times a day (6)
1. Active physical play—for example, lifting or swinging your child, rough and tumble
2. Gentle physical play—for example, tickling, moving child's limbs, playing finger games such as 'this little piggy'
3. Play with toys—for example, grasping/holding/shaking toys, putting rings on a stack, building blocks
4. Pretend games—for example, make a toy dog bark, talk on toy telephone, move a wooden block as if it is a car
5. Turn-taking play without toys/other objects—for example, peek-a-boo, pat-a-cake, 'where's baby's eyes?', 'I spy'
6. Play with books—for example, pointing to pictures in books and magazines, reading to your child
7. Noisy play—for example, banging saucepans, child instruments
8. Singing—for example, singing nursery rhymes
(B) Frequency of digital media use
"Some children spend time watching programmes or videos. We are interested in how common this is for young children. Thinking back over the past two weeks, please indicate how often your child has…"
Never (1), Less than once a week (2), Once or twice a week (3), Several times a week (4), Once or twice a day (5), Several times a day (6)
1. Watched programmes or videos on a TV/computer/tablet/smart phone with you?
2. Watched programmes or videos on a TV/computer/tablet/smart phone with someone else?
3. Watched programmes or videos on a TV/computer/tablet/smart phone on their own?
(C) Attitudes towards play (indexing parent involvement, enjoyment, and structure)[†]
"Below are a number of statements about how some parents play with their child. Please indicate how often you have behaved in the same way in the past two weeks…"
Never (1), Sometimes (2), Often (3), Always (4)
1. I am too busy to play with my child when he/she wants to play with me *(involvement)*
2. When my child wants to play with me, I encourage him/her to play with toys alone so that I can get on with other jobs *(involvement)*
3. Some days go by without me having had any time to play with my child *(involvement)*
4. If my child wants to play with me, I stop what I'm doing right away and play with him/her *(involvement)*
5. I avoid playing with my child when I've had a long day *(enjoyment)*
6. Playing with my child can be a chore *(enjoyment)*
7. It is much more convenient when my child enjoys playing on his/her own, without needing me to join in *(enjoyment)*
8. I avoid playing with my child when I have other jobs that need doing *(enjoyment)*
9. I take any opportunity to play with my child *(enjoyment)*
10. I look forward to playing with my child *(enjoyment)*
11. When my child loses interest in a game we are playing, I try to engage him/her in a new game *(enjoyment)*
12. I decide what we play with/how we play *(structure)*
13. I provide toys that challenge my child to develop skills *(structure)*
14. I schedule time to play with my child each day *(structure)*
15. I let my child decide what we play with/how we play *(structure)*

[†]Items are listed in order of subgroup for clarity but were presented in a mixed order in the questionnaire.

2.2.2 | Convergent validity

Parent–child play has previously been assessed using observational measures, but the PPQ has been designed to collect data remotely, without the need for participants and researchers to meet. To our knowledge, there are no existing standard questionnaire measures of parent–child play that could have been used for PPQ criterion validity assessment. Instead, questionnaire measures of family social and emotional characteristics were drawn from *Samples 1* and *2*, to examine PPQ convergent validity. Measures collected in *Sample 3*, the smallest sample, were non-overlapping with *Samples 1* and *2*; therefore *Sample 3* is excluded from these analyses.

Measures of parenting beliefs, behaviours and feelings were selected as constructs most closely related to the PPQ. Parent's beliefs about caring for an infant child were collected using the two-subscale Baby Care Questionnaire (20 items; Winstanley & Gattis, 2013) and the 'perceived parenting impact' subscale (five items) from the Parental Cognitions and Conduct towards the Infant scale (PACOTIS; Boivin et al., 2005). Parent's feelings about their child and experiences as a parent were measured using the Parenting Daily Hassles scale (12 items; Crnic & Greenberg, 1990), Parent Feelings Questionnaire (seven items; Deater-Deckard, 2000), and "perceived parenting self-efficacy" PACOTIS subscale (six items). Parenting behaviours were self-reported using the "hostile-reactive behaviours" PACOTIS subscale (seven items) and the Parent–Infant Caregiving Touch Scale (11 items; Koukounari, Pickles, Hill, & Sharp, 2015). The reliability and validity of these measures has been described in detail elsewhere. All use a five-point Likert scale, except the Baby Care Questionnaire which uses a four-point scale. Average item scores were derived for each measure, excluding anyone missing data on >50% of the items. We give Cronbach's α for each measure in our data below.

We selected additional parent-report measures that tap other constructs theoretically associated with parent–child play and/or digital media use. These measures were included to further explore PPQ convergent validity, not for hypothesis-testing research. Hostility and warmth in the marital relationship were assessed using the Behaviour Affect Rating Scale (22 items, seven-point Likert scale; Cui, Lorenz, Conger, Melby, & Bryant, 2005). Parents' depressive symptoms in the past week were assessed using the Edinburgh Postnatal Depression Scale (10 items, four-point Likert scale; Cox, Holden, & Sagovsky, 1987); and difficult child temperament using the 13-month 'fussiness' subscale of the Infant Characteristics Questionnaire (11 items, seven-point Likert scale; Bates, Freeland, & Lounsbury, 1979). Again, average item scores were used for each measure, excluding anyone missing data on >50% of the items. It is reasonable to assume that the PPQ frequency and attitude scales would be negatively correlated with measures indexing poor relationship quality, depression, and difficult infant temperament in families. Child age was included to examine convergent validity of the digital media use scale, because media use is known to increase with child age (Vandewater et al., 2007).

2.3 | Data analysis

The following analyses were conducted after data collection was complete across all three samples, using STATA version 15. To study the structure of our proposed PPQ scales, we ran exploratory factor analyses (EFA) with oblique promax rotation (to allow factors to be correlated with one another, as recommended by Osborne, 2015) separately in each sample. As such, we examined whether similar factor structures were revealed across independent samples. Next, a confirmatory factor analysis (CFA) was conducted in each sample, then in all samples together, informed by the EFA results. We fitted models to variance–covariance matrices, using the full information maximum-likelihood approach to deal with the 6% of cases with any missing data, to maintain power and avoid bias associated with listwise deletion (Enders, 2010).

Latent factor results informed composition of final summary scales for use in further research. Internal consistency is reported for each summary scale. Pairwise correlations were examined between PPQ summary scales and standardized questionnaires of family social and emotional characteristics, to explore PPQ convergent validity

in each sample. The correlation analyses were exploratory, not intended to generate conclusions but to justify relevance of the constructs assessed by the PPQ. We omitted significance tests to avoid over-interpretation of our results, following advice laid out by Kraemer (2019) on the importance of distinguishing exploratory versus confirmatory results (i.e., hypothesis generating vs. hypothesis testing).

Study data are not publicly available due to privacy/ethical restrictions. Data access is available to researchers on request, subject to a data sharing agreement.

3 | RESULTS

3.1 | Factor structure

Results from the EFA in each sample indicated that items designed for *Frequency of Parent–child Play* and *Frequency of Digital Media Use* loaded broadly as expected onto unique latent factors (Table 3). Items designed to assess *Parent Attitudes towards Play* did not load onto the conceptually designated subscales (involvement, enjoyment, and structure), but rather, loaded mostly onto a single factor with item-level results varying slightly across samples. Items with the least consistent loadings across samples were those from the conceptually derived 'structure' subgroup (attitude items 12, 13, 14, and 15). These items either formed a separate factor from other attitude items (*Sample 1*) or were split between factors or did not load above 0.3 on any factor. Conceptually, these items differed from others in the attitudes scales because they did not index a strictly positive or negative attitude towards parent–child play, but were designed to assess whether parents actively direct and organize playtime. For these reasons we removed the 'structure' subgroup entirely and reran our factor analyses in each sample. Results show that the remaining 11 attitude items (indexing involvement and enjoyment) loaded mostly onto a single factor across all three samples (Table 4).

Subsequent CFA models comprised three correlated factors, with each item free to load on only one allocated factor. Model fit was reasonable in *Samples 1* and *2* (CFI = .86/.88, RMSEA = .06/.05) but less so in *Sample 3*, the smallest sample (CFI = .81, RMSEA = .07). We ran a final model using data from all samples combined, yielding acceptable model fit (CFI = .91, RMSEA = .05). Estimated loadings for items in each factor were significant and generally high across all CFA results (Table S1). Variance–covariance matrices are listed for all models in Table S2. In the final CFA (all samples combined), latent factors for *Frequency of Parent–child Play* and *Parent Attitudes towards Play* were significantly correlated at .44. Neither were correlated with the *Frequency of Digital Media Use* latent factor. Overall correlation patterns were consistent in each individual sample CFA (Table S1), although in *Sample 1* a weak negative correlation was found between the attitudes and digital media use factors ($r = -.28$, $p < .01$); and in *Sample 3* a weak positive correlation between frequency and digital media use factors ($r = .28$, $p = .03$). Tests for invariance of parameters showed that most factor loadings did not differ significantly across samples, nor did the latent factor variances and covariances (Table S3).

3.2 | Creation of summary scales

Both EFA and CFA results indicated that three latent factors adequately explained the covariance structure of the PPQ. Based on these results, we created three PPQ summary scales. Good internal consistency was found for items in each subscale across all samples (Table 5). Mean scores were created for each subscale in each sample, excluding participants who were missing data on >50% of the items (the maximum number of participants removed from any scale was 10). Negative items were reversed coded for the *Parent Attitudes towards Play* subscale (items: 1, 2, 3, 5, 6, 7, and 8).

TABLE 3 Factor solutions obtained from exploratory analyses with oblique promax rotation in each sample

Item conceptual designation	*Sample 1 n* = 144				*Sample 2 n* = 150				Sample 3 *n* = 95			
	F1	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*
Frequency 1		**.52**			**.34**				.36		**−.46**	
Frequency 2		**.60**			**.54**				**.52**		−.43	
Frequency 3		**.51**			**.62**				**.62**			
Frequency 4		**.55**			**.70**				**.80**			
Frequency 5		**.55**			**.66**				**.54**			
Frequency 6		.33		**−.34**	**.55**		.30		**.58**			
Frequency 7		**.55**			**.44**				**.67**			
Frequency 8		**.55**			**.63**				**.63**			
Digital media 1			**.75**					**.69**				**.65**
Digital media 2			**.78**					**.70**				**.56**
Digital media 3			**.48**					**.47**				**.62**
Attitude 1 (I−)	**.62**					**.59**					**.52**	
Attitude 2 (I−)	**.50**					**.46**					*.26*	
Attitude 3 (I−)	**.53**				**−.36**					**.32**		
Attitude 4 (I+)	**−.52**						**.48**			*.28*		
Attitude 5 (E−)	**.41**					**.31**				**.60**		
Attitude 6 (E−)	**.39**					*.29*				**.55**		
Attitude 7 (E−)	**.42**					**.59**				**.64**		
Attitude 8 (E−)	**.51**					**.49**					**.65**	
Attitude 9 (E+)	**−.67**					−.36	**.60**			−.42	**−.47**	
Attitude 10 (E+)	**−.47**						**.48**			**−.67**		
Attitude 11 (E+)	**−.43**						**.44**			**−.43**		
Attitude 12 (S)				**.57**				*.29*			**.45**	
Attitude 13 (S)				**.38**			**.42**			**−.33**		
Attitude 14 (S)				*.26*			*.27*			**−.33**		
Attitude 15 (S)	**.35**			.34				**.36**			−.27	

Note: Table shows the rotated factor loadings for each item: bold, highest loading ≥ 0.30; light, other loading ≥0.30; italic, highest loading if none are ≥0.30.

Abbreviations: E, enjoyment; F, factor; I, involvement; S, structure; +, positive attitude; −, negative attitude.

As depicted in Figure 1a, *Frequency of Parent–child Play* summary scores indicated that most participants played with their child at least several times per week. Only data from *Sample 2* were heavily skewed (>1.0) towards reports of more frequent play. Participant estimates for the total duration of parent–child playtime during 'free days' (i.e., weekends or holidays) were moderately correlated with *Frequency of Parent–child Play* summary scores in both *Samples 2* and *3* (r = .42/.46, p < .001), although estimates for 'work or study' days showed weak correlations, only significant in *Sample 1* (r = .20/.20, p = .04/.10).

Figure 1b shows a wide distribution of results for *Frequency of Digital Media Use* summary scores. Distribution skewness was lower in *Samples 2* and *3*, for which we had adopted the six-point Likert scale. In total across all samples, 73% of parents reported that they watched digital media with their child at least once per week, and 36% at least once per day. About 30% of parents reported that their child watched digital media alone at least once

TABLE 4 Factor solutions obtained from exploratory analyses with oblique promax rotation in each sample, excluding four Attitude items

Item conceptual designation	*Sample 1 n* = 144			*Sample 2 n* = 150			*Sample 3 n* = 95			
	F1	*F2*	*F3*	*F1*	*F2*	*F3*	*F1*	*F2*	*F3*	*F4*
Frequency 1		**.60**		**.35**					**.60**	
Frequency 2		**.66**		**.56**					**.74**	
Frequency 3		**.50**		**.64**				.39	**.46**	
Frequency 4		**.48**		**.69**				**.57**	.44	
Frequency 5		**.51**		**.64**				**.41**		
Frequency 6		*.24*		**.56**				**.64**		
Frequency 7		**.54**		**.47**				**.60**		
Frequency 8		**.56**		**.63**				**.71**		
Digital media 1			**.77**			**.66**				**.67**
Digital media 2			**.77**			**.75**				**.55**
Digital media 3			**.53**			**.52**				**.62**
Attitude 1 (I−)	**.61**				**.48**		**.44**			
Attitude 2 (I−)	**.52**				**.48**		**.40**			
Attitude 3 (I−)	**.49**			**−.37**			**.44**			
Attitude 4 (I+)	**−.47**				**−.35**		*−.24*			
Attitude 5 (E−)	**.40**				**.31**		**.56**			
Attitude 6 (E−)	**.49**				*.27*		**.65**			
Attitude 7 (E−)	**.45**				**.56**		**.63**			
Attitude 8 (E−)	**.47**				**.53**		**.56**			
Attitude 9 (E+)	**−.71**				**−.68**		**−.60**		.32	
Attitude 10(E+)	**−.58**				**−.45**		**−.65**			
Attitude 11 (E+)	**−.37**				**−.32**		*−.26*			

Note: Table shows the rotated factor loadings for each item: bold, highest loading ≥0.30; light, other loading ≥0.30; italic, highest loading if none are ≥0.30.

Abbreviations: E, enjoyment; F, factor; I, involvement; S, structure; +, positive attitude; −, negative attitude.

TABLE 5 Cronbach's α for each PPQ subscale

Subscale	*Sample 1*	*Sample 2*	*Sample 3*
Frequency: eight items	.74	.78	.80
Digital Media: three items[†]	.73	.70	.63
Attitude: 11 items[‡]	.78	.69	.80

[†]Reported on a five-point scale in *Sample 1*, edited to six-point scale in *Sample 2* and *3*.

[‡]Excluded items showed poor internal consistency in all samples (.43, .26, 20).

per week, and 10% at least once per day. Only 5% of parents in *Samples 2* and *3* reported that their child never watched digital media ("Never" was not included in the response scales for *Sample 1*). Figure 1c indicates that most participants reported positive attitudes towards play with their child, with normally distributed results for the *Parent Attitudes Towards Play* summary scale.

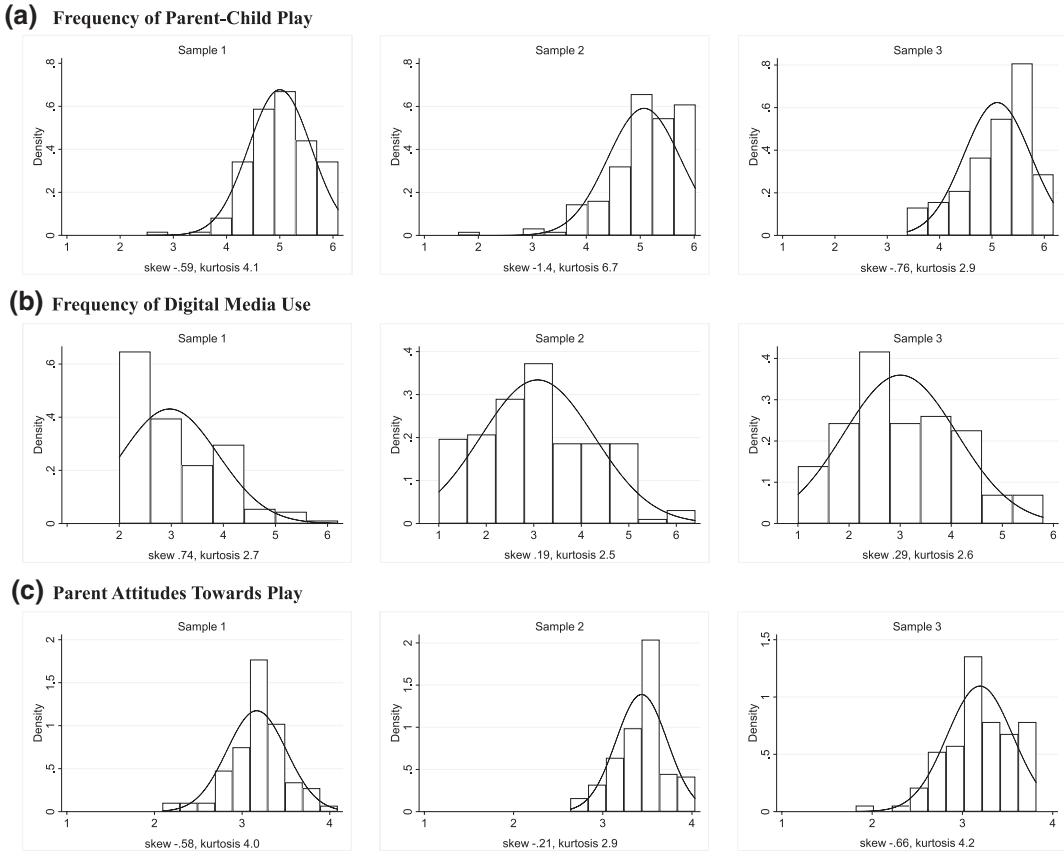

FIGURE 1 Distribution of total scores in each sample

Summary scales for *Frequency of Parent–child Play* and *Parent Attitudes Towards Play* were significantly correlated in all samples (Bonferroni adjustment was used with all correlations to correct for multiple testing; *Sample 1/2/3* r = .33/.24/.47, p < .01). Correlations between *Frequency of Digital Media Use* and *Frequency of Parent–child* Play were not significant (*Samples 1/2/3* r = −.07/.08/.23, p > .05). *Frequency of Digital Media Use* was significantly correlated with *Parent Attitudes towards Play* in *Sample 1* (r = −.21, p < .05), but not in *Samples 2* or *3* (r = −.04/.10, p > .05). Correlations between summary scores matched the pattern of results from CFA latent factor correlations (Table S1).

3.3 | Convergent validity

Pairwise correlations were examined between PPQ summary scales and standardized measures of family social and emotional characteristics (Table 6). These analyses were hypothesis free, performed to investigate whether PPQ scales associated with related constructs in *Samples 1* and *2*, as an indicator of convergent validity.

Overall, the PPQ attitude and frequency scales showed weak to moderate correlations with measures of parenting feelings and behaviours in both samples. These correlations were uniform in direction across samples. Correlations with parenting beliefs were lower or negligible for both the PPQ attitude and frequency scales. For parent relationship quality and depression symptoms, moderate correlations in the same direction across samples

TABLE 6 Pairwise correlations between PPQ subscales and standardized assessments of family social and emotional characteristics in *Sample 1/2*, with internal consistency shown for each assessment

	Attitude	Frequency	Digital media	Cronbach's α
Parenting—feelings				
Negative feelings towards child[§]	−.38/−.53	−.27/−.33	.11/−.01	.79/.86
Perceived parenting self-efficacy[‡]	.38/.41	.28/.23	−.06/.10	.73/.87
Intensity of parenting hassles[¶]	−.33/−.48	−.11/−.06	.17/.10	.78/.88
Parenting—behaviours				
Hostile/reactive[‡]	−.52/−.53	−.35/−.23	.10/.07	.81/.80
Parent–infant caregiving touch[±]	.22/.11	.23/.11	−.19/11	.84/.84
Parenting—beliefs				
Parenting structure beliefs[†]	−.06/.07	−.10/.16	−.12/.03	.91/.86
Parenting attunement beliefs[†]	.20/.10	.09/.18	.12/−.05	.89/.78
Perceived parenting impact[‡]	−.22/.12	−.19/−.08	.00/−.05	.67/.87
Marital relationship				
Perceived partner hostility[††]	−.32/−.36	.01/−.23	.11/−.05	.92/.92
Perceived partner warmth[††]	.41/.33	.13/.10	−.02/.02	.92/.92
Parent				
Depression symptoms[‡‡]	−.34/−.32	−.07/−.04	.07/−.02	.87/.90
Child				
Fussiness[§§]	−.16/−.35	−.01/−.01	.11/.01	.76/.87
Age	−.17/−.12	−.05/−.10	.30/.08	--

[†]Baby Care Questionnaire (Winstanley & Gattis, 2013).
[‡]Parental Cognitions and Conduct toward the Infant (Boivin et al., 2005).
[§]Parent Feelings Questionnaire (Deater-Deckard, 2000).
[¶]Parenting Daily Hassles (Crnic & Greenberg, 1990).
[±]Parent-Infant Caregiving Touch Scale (Koukounari et al., 2015).
[††]Behavior Affect Rating Scale (Cui et al., 2005).
[‡‡]Edinburgh Postnatal Depression Scale (Cox et al., 1987).
[§§]Infant Characteristics Questionnaire (Bates et al., 1979).

were found for the PPQ attitude scale, but not the frequency scale. Infant fussiness and age showed weak, negative correlations with the PPQ attitude scale in both samples, but correlations were again negligible for the frequency scale. All correlations with the PPQ Digital Media Use scale were small ($r < .20$), except for with child age in *Sample 1* ($r = .30$).[1]

4 | DISCUSSION

The PPQ is the first standardized measure to remotely assess parent–infant play, addressing an important gap in the field of play research and early child development. PPQ items were developed by researchers to show strong face validity, informed by qualitative and quantitative feedback from participants. Using three samples—a total of 414 parent–infant dyads—we describe steps taken to ensure PPQ content validity, providing empirical support for the PPQ three-subscale structure, with good internal consistency and normal distribution of summary scores. We show evidence for measure construct validity, as PPQ subscales indexing parent–child play frequency and

parent attitudes were correlated with existing measures of family social and emotional characteristics. Overall, the subscale indexing frequency of infant digital media use was not associated with PPQ frequency and attitude subscales, nor with other family social and emotional characteristics. Results suggest that the PPQ will be useful in a research context, addressing gaps in our knowledge about the correlates and consequences of early parent–child play.

4.1 | Frequency of parent–child play

All items in the *Frequency of Parent–child Play* subscale were endorsed as common forms of parent–infant play. The mean summary scores reflect both frequency and diversity in the types of parent–child play. Within our data, only scores from participants in *Sample 2*, which comprised young parents aged 20–25 years, were heavily skewed towards reports of more frequent and diverse play. This mirrors findings from the Millennium Cohort Study, where younger mothers (aged 14–24 years at child's birth) reported playing more frequently with their children compared with older mothers (Brocklebank et al., 2014). Data from *Samples 2* and *3* showed that parents' play frequency reports were more likely to reflect play on free days (weekends/holidays) versus workdays, reflecting that over 60% of participants were employed, studying or in work training. In future research we could go further, to ask about temporal changes in play frequency across the day, because different play types may vary in suitability at different times (e.g., active physical play being unhelpful at bedtime).

For PPQ latent factors and summary scales, we found weak to moderate correlations between *Frequency of Parent–child Play* and *Parent Attitudes towards Play*. This reflects that parenting attitudes and behaviours are related but distinct constructs, indexing what parents *feel* versus what they *do*. As such, both constructs should be useful in future research. The frequency subscale was correlated in the same direction across samples with validated measures of parenting feelings and behaviours, contributing evidence of convergent validity. However, correlations with parenting beliefs, marital relationship quality, parent depression symptoms, infant fussiness, and age were weak or negligible. New hypothesis-driven research will be needed to investigate further, considering whether family characteristics are more readily linked to parent attitudes towards play compared with play behaviour, and whether any non-uniform correlations between samples could reflect population demographic differences (e.g., parent age or socioeconomic status). Crucially, the PPQ subscale should first be tested for criterion validity, using a standardized observational measure of parent–child play frequency. The PPQ can then be used longitudinally, to examine prospective associations with child development, as previously suggested in the literature (e.g., Kroll et al., 2016).

4.2 | Parent attitudes towards play

The 11-item *Parent Attitudes Towards Play* subscale, originally designed to assess parent involvement in and enjoyment of parent–child play, showed good internal consistency and normally distributed summary scores across samples. Overall, participants reported positive attitudes towards play, rating playtime as enjoyable and time worthy. Correlations between PPQ attitude scores and other measures of family social and emotional characteristics provided strong evidence for convergent validity of this novel construct in two samples. As discussed above, new hypothesis-driven research is needed to further explore associations and consider possible implications for child development.

Construction of the *Parent Attitudes Towards Play* subscale was empirically driven and resulted in exclusion of four items designed to assess parent structuring behaviours during play with their infant (i.e., directing and organizing). In previous research these behaviours have been assessed using observational methods (e.g., Caldwell &

Bradley, 2003). It is perhaps unsurprising that our 'structure' items, relying most heavily on participant self-awareness, did not correlate well with each other or with other frequency and enjoyment items. New efforts are needed to develop self-reported items to measure such specific parent behaviours during play. Close reference to existing clinical and observational manuals may be useful. For example, Hanf-model training programmes target the parent's ability to engage in child-led play, by praising and playing along with the child's actions, avoiding questions, commands, and criticism (Herschell et al., 2002;Kaehler et al., 2016). Adapting these key points for a parent self-report measure of behaviours during play may be a good next step.

4.3 | Frequency of digital media use

Participant reports for child *Frequency of Digital Media Use* showed wide variability in all samples, highlighting differences in digital media use across families with young children. Despite this, very few infants were never exposed to digital media (5% of infants in *Samples 2* and *3*). In line with advice from the American Academy of Pediatrics (AAP Council on Communications & Media, 2016), infants watched digital media with their parent more frequently than they did on their own.

Questions remain as to the positive or restrictive implications of digital media use for parent–child play. Digital content may model teaching strategies and give parents ideas for playful activities, or possibly displace opportunities for parent–child unstructured, sensorimotor, social, and creative play (Radesky et al., 2015;Vandewater et al., 2006). Equally, time for digital media use may not overlap or interfere with child play time (Taylor et al., 2018;Vandewater et al., 2007). For both latent factors and summary scores, we found that frequency of infant digital media use was not associated with frequency of non-digital parent–child play in *Samples 1* or *2*, although results were suggestive of a weak association in *Sample 3*. Similarly, parent attitudes towards play were weakly correlated with frequency of child digital media use in *Sample 1*, but not in *Samples 2* and *3*. Sample differences may reflect moderation by demographic variables, although supplementary analyses revealed invariance of latent factors across samples.

The frequency of infant digital media use was not predictive of other parenting measures across samples, marital relationship quality, nor parent and infant emotional phenotypes. The only prediction found was for child age in *Sample 1* (N.B. child age range was greater in *Sample 1* vs. *Sample 2*), with older children engaging in more frequent digital media use, as is well established in existing research (Vandewater et al., 2007). Further research on media use in families will be important, considering positive and negative implications for child learning, examining the family system across time and including siblings where possible. For older children it will be important to examine their choices, content, and context surrounding digital media usage.

4.4 | Strengths and limitations

Our analyses are strengthened by use of three independent samples, including parents of infants with a broad age range, representing families diverse in terms of socioeconomic status and parent age. We show empirical support for PPQ subscale structure across samples. We explore correlations between PPQ subscales and other standardized measures of family social and emotional characteristics, to assess convergent validity. We find broadly consistent results across two independent samples, yielding data to inform future hypothesis-driven research. As in all research there are limitations to consider. The data were drawn from three independent studies with varied methodology, so we could not always conduct the same tests across samples. Relating to sample generalizability, we have only included U.K.-based families, predominantly with mothers who were not ethnically diverse and, in two samples, highly educated. Our results may not apply cross-culturally and cannot inform on the effects of parent gender in relation to parent–child play. Further information on measure validity is needed, assessed using

a standardized measure of parent–child play. In our data, shared method variance may have inflated associations between PPQ subscales and other variables, with self-reports also prone to social desirability biases. We were unable to test whether parents considered all playful behaviours with their child when completing the PPQ, drawing on experiences of both intentional and spontaneous play moments.

5 | CONCLUSION

Play behaviours facilitate child learning, with parents particularly involved during early child development. Until now, research on parent–child play has been confined to observational methods, with no standardized tools to remotely assess parent perceptions or day-to-day play behaviours. There has been limited research on the impact of digital media use on parent–child play among families with young children. In response, we developed the PPQ, the first parent-report questionnaire to assess parent–child play and digital media use. Data show clear empirical factor structure across three independent samples, yielding three subscales with good internal consistency and normally distributed results, which we expect to be of use in new research. PPQ test-retest reliability now needs to be conducted and results compared with data from an existing standardized parent–child play assessment. In further research it will be useful to develop items indexing parent structuring behaviours during play, which were not included in the final PPQ, and to further examine the family-factors influencing infant digital media use. Longitudinal use of the PPQ will eventually be crucial in research, used alongside observational and experimental methods, helping us to better understand the importance of parent–child play during child development.

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CONFLICT OF INTEREST

The authors report no conflict of interest.

DATA AVAILABILITY STATEMENT

Study data are not publicly available due to privacy/ethical restrictions. Data access is available to researchers on request, subject to a data sharing agreement.

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ENDNOTE

[1] We omit significance tests from our results because analyses were not hypothesis-testing. Significance levels are a function of effect size and sample size. Depending on the complete sample size for each pairwise correlation, effect sizes approximately above/below .15/−.15 would be significant in each sample, or .30/−.30 when using Bonferroni adjustment to correct for multiple testing.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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