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## **Maternal warmth and toddler development: Support for transactional models in disadvantaged families**

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### **Abstract**

**Background:** Studies support cognitive and social domains of development as entwined in childhood, however there is a paucity of investigation into the nature of the mother-child relationship within a reciprocal interdependence framework. Further, the focus on these processes within families from impoverished communities using frequent assessments in early childhood has been limited. **Objectives:** To identify 1) the directional associations between toddler’s communication ability and social competence, 2) support for the mediational role of maternal warmth in these associations, and 3) support for transactional models between toddler outcomes and maternal warmth in disadvantaged communities in Ireland. **Methods:** Participants included 173 toddlers and their families enrolled in a prenatally commencing prevention programme. Toddler’s communication and social competence were assessed at 12, 18, 24 and 36 months and maternal warmth at 6 and 24 months. Cross-lagged models were estimated examining multiple paths of associations simultaneously. Direct and indirect paths of maternal warmth were also examined. **Results:** Bi-directional associations were found between communication ability and social competence from 12 to 24 months but not thereafter. Maternal warmth did not significantly mediate these associations, however support of a transactional model was found with social competence. **Conclusions:** The results support early positive associations between better communication ability and social competence in the first two years, however suggest that these associations are no longer present by the third year. The role of maternal warmth in fostering social competencies is important for toddlers and equally important is toddler’s level of social competence in eliciting increased maternal warmth.

**Keywords:** Social competence; communication ability; early development; maternal warmth; transactional model

## **Introduction**

Early experiences in infancy and the toddler years, which largely constitute parent-child interactions, may have sustaining impacts on children's development of communication abilities and social skills. There is a well-documented body of literature examining the differential associations of parenting behaviours and children's development in both communicative (e.g., language) and social domains, with positive and negative associations supported (Aunola & Nurmi, 2005; Barnett, Gustafsson, Deng, Mills-Koonce, & Cox, 2012; Fraley, Roisman, & Haltigan, 2012; Knafo & Plomin, 2006). In particular, harsh or hostile parenting behaviours have been negatively associated with children's long-term language and social behavioural development (e.g., Pungello, Iruka, Dotterer, Mills-Koonce & Reznick, 2009; Wang, Christ, Mills-Koonce, Garrett-Peters & Cox, 2013; Weiss, Dodge, Bates & Pettit, 1992). Arguably, these associations stem from parental modelling and/or the creation of an environment that interferes with the child's learning through guided discovery and their zone of proximal development (Cochran & Brassard, 1979; Vygotsky, 1986).

Studies examining the associations with positive parenting behaviours, such as parental warmth, that foster children's social competence or communication abilities have been receiving growing attention (Barnett et al., 2012; Daniel, Madigan & Jenkins, 2015; Knafo & Plomin, 2006; Landry, Smith, Swank, & Miller-Loncar, 2000; Miller-Loncar, Landry, Smith, & Swank, 2000; Smith, Landry & Swank, 2000). With the same underlying mechanisms of association, parental warmth may act as a model of positive, compassionate and appropriate behavioural response styles that children are able to incorporate into their own behavioural repertoire. Further, parental warmth may reinforce a nurturing environment that

Parenting, Communication and Social Competence facilitates the zone of proximal development through increased scaffolding opportunities such as more back and forth turn taking during dyadic interactions.

### **Challenges within the Literature**

Despite the growing amount of studies in the area of parental warmth and children's outcomes, there are three outstanding limitations in the literature. First, transactional models of parent behaviour-child development remain largely ignored. With few exceptions, studies focused on the directional associations from children's development to parental behaviour are scarce (e.g., Barnett et al., 2012; Combs-Ronto, Olson, Lunkenheimer & Sameroff, 2009; Daniel, Madigan & Jenkins, 2015; Smith, Calkins, Keane, Anastopoulos & Shelton, 2004; Wang, Christ, Mills-Koonce, Garrett-Peters & Cox, 2013). A majority of these studies have focused on disruptive child behaviour and parental hostility or harsh parenting rather than positive child development and positive parenting. Within a dyadic relationship between parent and child, research must at minimum consider the assumption of reciprocal interdependence (i.e., the cognitions, emotions or behaviours of one will affect those of the other and vice versa) (Cochran & Brassard, 1979; Kelley, Holmes, Kerr, Reis, Rusbult, & Van Lange, 2003; Kuczynski, Pitman, & Mitchell, 2009). Thus, we can assume that children's development across both communication and social domains are likely associated with consequent parental response and behaviour.

Second and relatedly, there has been an underrepresentation of families from low socio-economic backgrounds within studies considering transactional models between parent and child. This is an important issue in the context of reciprocal interdependence given the risks and negative impacts of low SES for child development via parental well-being (e.g., Bradley & Corwyn, 2002). For example, lower SES is often associated with poorer communication related outcomes and increased difficulties with socially competent behaviours in childhood. Within successful dyadic interactions, exchange comes in the form of both giving and receiving. A toddler who never gives back during exchanges due to limited communication ability or poor social competence (possibly resulting from a poverty of stimulus in the environment) may create a drain for the parent. An accumulation of this drain may result in less maternal giving during future dyadic interactions (Cochran & Brassard, 1979). Economic disadvantage may

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exacerbate the situation in low SES families if the mother is already feeling a sense of drain resulting from her economic situation. Thus, the associations between toddler's outcomes and resulting parenting behaviour may present in unique ways, with varying degree of strength of association, in low SES as compared to middle or high SES families. Finally, given that the first five years of life are a sensitive period for brain development whereby environmental experiences imprint upon infants' brain and impact on future developmental outcomes, studies that examine transactional models would be best placed to start examining the dyadic parent-child relationship from infancy onwards.

### **Emerging Communication Abilities and the Link with Social Competence**

In this study we focused on the associations between toddler's communication ability and social competence. Communication is an encompassing construct as it occurs at many levels (e.g., auditory, sensory, visual, tactile) and is comprised of multiple subsets of skill including communicative intention, joint-attention, language and behaviour (Bard, 1992; Hoff, 2006; Mundy & Gomes, 1998; Mundy et al., 2007). The emergence of communication skills starts almost immediately following birth through eye gaze and paralinguistic gestures, but it is not until around the tenth month that intention to communicate starts to develop (Hoff, 2006). Social competence reflects the degree to which children are able to effectively get on with others during interpersonal exchanges, along with the ability to develop positive relationships with others (Fabes, Gaertner & Popp, 2006). Notably, toddler's communication abilities may in part contribute to social competence given that socially competent behaviours are often rooted or dependent upon linguistic ability and an understanding of other's language. On the other hand, communication abilities are partially fostered through the amount and quality of feedback received during social exchanges with others.

### **Objectives**

The first objective was to examine the directional nature of associations between toddler's communication ability and social competence from 12 to 36 months. It was hypothesized that positive paths from better communication ability to increased social competence would be found (Rhee et al., 2012). We also expected to find support in the other direction, from early social competence to better communication skills (Fabes, Gaertner & Popp, 2006). The second objective was to examine the possible

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meditational role of maternal warmth in these associations. It was expected that maternal warmth would mediate the bi-directional associations between communication ability and social competence given the influence of maternal warmth on both outcomes independently (Daniel, Madigan & Jenkins, 2015; Smith, Landry & Swank, 2000). The final objective was to examine transactional models of toddler's communication ability and social competence with maternal warmth. Grounded in a theoretical framework of reciprocal interdependence, we expected to find significant associations between toddler's early communication ability and social competence and consequent levels of maternal warmth (Barnett et al., 2012).

## Methods

### Participants

This study used data from children and their families enrolled in the Preparing for Life (PFL) programme in Ireland. The PFL programme is a prenatally commencing early intervention, concentrated in several disadvantaged communities with high rates of unemployment, welfare dependency and low levels of education. The programme was designed to increase children's school readiness skills across five different domains of development. A more detailed description of the programme and evaluation is outlined in Doyle, Fitzpatrick, Rawdon & Lovett (2015). Additionally, stratification procedures and sample characteristics for all participating families have been extensively documented (Doyle, 2013). Inclusion in the present study was based on two criteria: families that were randomly assigned to the two treatment arms of the programme, and who were enrolled in the study when the infant was six months, resulting in a sample of 172. The University College Dublin and the maternity hospital ethics committees granted ethics approval for the overall study procedures. Written informed consent was obtained from all subjects prior to randomisation. The trial was registered with controlled-trials.com (trial number: ISRCTN04631728) and was conducted and reported in conformity with CONSORT guidelines. Demographic characteristics for the current sample are included in Table 1.

**[Please insert Table 1 here]**

### Measures

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Communication: The Ages and Stages Questionnaire (ASQ; Squires, Potter & Bricker 1999) is a measure of toddler's risk for developmental delays across five domains (communication, gross and fine motor, problem solving, and personal-social). Mothers completed the ASQ at 12, 18, 24, and 36 months. Only the communication subscale was used in this study. At 12 months, the items focused on the infant's ability to engage in gestures, babbling, and vocalisations, in addition to their listening and understanding abilities. At 18 months, items build upon the toddler's listening and understanding abilities, in addition to assessment of verbal production. In line with later developmental milestones, the items at 24 and 36 months assessed verbal production and labelling of items, word combinations, sentence construction and the infant's language understanding. The mother responded by indicating if her child exhibits the behaviour *regularly* (10), *sometimes* (5), or *not yet* (0). The communication score represented the sum of all six items, resulting in a possible range of 0 to 60 with higher scores indicative of more advanced communication. Cronbach's alphas were reported as .65, .68, .75, .69, at 12, 18, 24 and 36 months, respectively (Squires, Potter & Bricker, 1999).

Social Competence: The Brief Infant-Toddler Social and Emotional Assessment (BITSEA; Briggs-Gowan & Carter, 2006), normed for toddlers 12 to 36 months, was used to assess toddler's social competence. Eleven items comprised the competence subscale, which assessed dimensions of social competencies such as prosocial behaviours, social relatedness, compliance, and play skills. Items were rated on a three-point scale (i.e., 0 = *not true/rarely* to 2 = *very true/often*), and were summed to create the competency score where higher scores were indicative of higher social competency. Cronbach's alphas at 12, 18, 24, and 36 months were .65, .64, .64, and .71, respectively.

Maternal Warmth: The Parental Cognition and Conduct Toward the Infant Scale (PACOTIS; Boivin et al., 2005), measuring parents' perceptions about parenting roles and practices across five domains (self-efficacy, perceived parental impact, hostile-reactive behaviours, overprotection, and parental warmth), was assessed at 6 and 24 months. The parental warmth subscale was utilised in this study, which included five items (e.g., "I take really great pleasure in 'talking' (babbling, using baby-talk) with my child"). As mothers completed these questionnaires we herein refer to the parental warmth scale as maternal warmth. Mothers rated items on an 11-point scale for how often they thought, felt or engaged

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in the particular behaviours with their child. The maternal warmth score represented an average of the responses to each of the five items, resulting in a score ranging from 0 to 10 where a higher score indicated greater warmth. Cronbach's alphas at 6 and 24 months were .78 and .65 respectively. Missing data for individual items on each of the scales were imputed using the mean plus a random residual value. This method was employed as replacement using only the group mean may lead to under-estimation of the variance (Little & Rubin, 2002).

**Defensive Responding:** The Parenting Stress Index, Short Form (PSI-SF; Abidin, 1995) was completed by mothers when infants were 6 months. The PSI-SF is comprised of three subscales that assess parental distress, parent-child dysfunctional interaction and difficult child. Items were rated on a 5-point scale from strongly disagree to strongly agree. Within each subscale there are specific items to assess defensive responding of the parent. These items are used as a validity measure for social desirability bias. Scores of 10 or less can be indicative of social desirability bias in responding. Cronbach's alpha for this scale was .78.

## Statistical Approach

Cross-lagged modeling techniques were utilised given the advantages provided by their ability to test multiple directional paths of association simultaneously. Paths of associations included in the models are auto-regressive (i.e., stability of constructs), cross-lagged (i.e., predictive lagged associations across time) and concurrent. Since the cross-lagged paths are estimated from residual variance after accounting for initial associations at baseline, a reduced bias in observed effects of the cross-lagged paths have been argued (Selig & Little, 2012). Additionally, we examined indirect and direct paths of association in testing for mediating and transactional effects of maternal warmth.

Cross-lagged models were estimated using Mplus version 7.4 (Muthén & Muthén, 1998-2015). To account for skewness in the data, we used maximum likelihood estimation with robust standard errors (MLR), which is a more robust estimator for non-normally distributed data. As a measure of effect, standardized betas ( $\beta$ ) are provided. Model fits included chi-square, the root mean square error of approximation (RMSEA; Browne & Cudeck, 1992), the comparative fit index (CFI; Bentler, 1990) and the standardized root mean square residual (SRMR; Browne & Cudeck, 1992). A RMSEA of equal to or



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less than 0.06 has been suggested as representing a good model fit (Hu & Bentler, 1999). With respect to the CFI, equal to or greater than 0.95 has been suggested as a good model fit (Hu & Bentler, 1999), and equal to or lesser than 0.05 represents a good model fit for the SRMR.

### Results

As the present study used families assigned to two treatment arms within the PFL programme, we first ran independent sample t-tests on all variables to ensure no group differences. No statistically significant group differences were found for communication ability, social competence, or maternal warmth between 6 and 36 months (results available upon request). Regardless, group assignment was controlled for in all models. The descriptive statistics for toddler's communication ability and social competence are presented in Table 2 and bivariate correlations are presented in Table 3. All correlations were in the expected direction whereby toddlers with better communication abilities were rated as more socially competent.

**[Please insert Table 2 here]**

**[Please insert Table 3 here]**

#### **Cross-lagged Model of Communication Ability and Social Competence:**

The study hypotheses were three-fold. First, we expected to find support for a reciprocal model between toddler's communication ability and their social competence across the 24-month period of development. We first ran a bivariate cross-lagged model with communication ability and social competence only, controlling for treatment group. The fit indices revealed an excellent model fit to the data,  $\chi^2(18) = 23.29, p = .179$ ; RMSEA = .041; RMSEA CI<sub>90</sub> = 0.008-0.084; SRMR = .045; CFI = .98. The results are presented in Figure 1. Auto-regressive paths from 12 to 36 months were all statistically significant for both communication ability ( $\beta = .24, p = .005, \beta = .52, p < .001$ , and  $\beta = .52, p < .001$ , respectively) and social competence ( $\beta = .36, p < .001, \beta = .61, p < .001$ , and  $\beta = .44, p < .001$ , respectively). Statistically significant concurrent associations between communication and social competence were found at 12 and 18 months ( $\beta = .43, p < .001$  and  $\beta = .23, p = .009$ , respectively). The concurrent paths at 24 and 36 months however were not statistically significant ( $\beta = .15, p = .072$  and  $\beta = .14, p = .186$ , respectively). Finally, cross-lagged associations revealed statistically significant bi-

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directional paths from 12 to 24 months. That is, good communication abilities at 12 months were associated with increased social competence at 18 months ( $\beta = .27, p < .001$ ), and in turn higher social competence at 18 months was associated with better communication ability at 24 months ( $\beta = .27, p < .001$ ). Additionally, higher social competence at 12 months was associated with better communication ability by 18 months ( $\beta = .34, p < .001$ ). No other significant cross-lagged paths were found thereafter. Communication ability at 18 months was not associated with social competence at 24 months ( $\beta = .01, p = .891$ ), nor was communication ability at 24 months associated with social competence at 36 months ( $\beta = .10, p = .233$ ). In addition, social competence at 24 months was not significantly associated with communication ability at 36 months ( $\beta = .06, p = .494$ ). Treatment condition was not statistically significant for either communication ability ( $\beta = -.01, p = .916$ ) or social competence ( $\beta = .09, p = .266$ ).

**[Please insert Figure 1 here]**

### **Mediation and Transactional Model: Maternal Warmth**

Second, it was hypothesized that maternal warmth would mediate the associations found between communication ability and social competence. Additionally, transactional associations between early toddler outcomes and later measures of maternal warmth were expected. Maternal warmth at six and 24 months were added to the model to test these assumptions. Model results are presented in Figure 2. The fit indices for this model also revealed an excellent fit to the data,  $\chi^2(27) = 37.36, p = .088$ ; RMSEA = .048; RMSEA CI<sub>90</sub> = 0.000-0.082; SRMR = .044; CFI = .97. All statistically significant paths (auto-regressive, concurrent, and cross-lagged) found in the bivariate model remained statistically significant with similar effect sizes. For example, the auto-regressive paths for communication ability were  $\beta = .25, p = .004$ ,  $\beta = .52, p < .001$  and  $\beta = .53, p < .001$ , respectively. For social competence the auto-regressive paths were  $\beta = .37, p < .001$ ,  $\beta = .62, p < .001$  and  $\beta = .41, p < .001$ , respectively. Concurrent paths at 12 and 24 were  $\beta = .43, p < .001$  and  $\beta = .24, p = .005$ , respectively. These paths were not statistically significant at 24 and 36 months (i.e.,  $\beta = .14, p = .085$  and  $\beta = .10, p = .407$ , respectively). Statistically significant cross-lagged paths included communication at 12 months to social competence at 18 months (i.e.,  $\beta = .27, p = .001$ ), social competence at 12 months to communication at 18 months (i.e.,  $\beta = .34, p < .001$ ) and social competence at 18 months to communication at 24 months

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(i.e.,  $\beta = .27, p = < .001$ ). Once again the cross-lagged paths from communication at 18 months was not associated with social competence at 24 months ( $\beta = .01, p = .906$ ), nor was communication at 24 months with social competence at 36 months ( $\beta = .12, p = < .173$ ). Further, social competence at 24 months was not significantly associated with communication at 36 months ( $\beta = .04, p = < .663$ ). Treatment condition was once again not statistically significant for either communication ability ( $\beta = -.00, p = .974$ ) or social competence ( $\beta = .08, p = .317$ ).

With respect to maternal warmth, the model revealed a statistically significant auto-regressive path between six and 24 months (i.e.,  $\beta = .32, p = < .001$ ). No statistically significant direct paths of association were found between maternal warmth at six months and toddler's communication or social competence at 12 months (i.e.,  $\beta = .09, p = .273$  and  $\beta = .05, p = .495$ , respectively). No indirect paths of communication from 18 to 36 months via maternal warmth at 24 months (i.e.,  $\beta = -.01, p = .447$ ) or social competence from 18 to 36 months via maternal warmth at 24 months (i.e.,  $\beta = -.01, p = .538$ ) were found. Further, no indirect paths between communication at 18 and 24 months to social competence at 36 months via maternal warmth at 24 months (i.e.,  $\beta = -.01, p = .455$ ) or social competence at 18 and 24 months to communication at 36 via maternal warmth at 24 months (i.e.,  $\beta = -.01, p = .537$ ) were found. However, toddler's social competence at 18 months was significantly associated with increased maternal warmth at 24 months ( $\beta = .33, p = < .001$ ). In turn, maternal warmth at 24 months was significantly associated with toddler's social competence at 36 months ( $\beta = .24, p = .002$ ), supporting a transactional model between social competence and maternal warmth.

**[Please insert Figure 2 here]**

## Sensitivity Analysis

Given that the measures used in this study rely on maternal report, we also ran a sensitivity analysis. In this analysis we reran the model excluding the 30 mothers who scored 10 or less on the defensive responding scale of the PSI-SF ( $N = 142$ ), which is indicative of social desirability responding. The model fit the data well,  $\chi^2(27) = 36.08, p = .111$ ; RMSEA = .049; RMSEA  $CI_{90} = 0.000-0.087$ ; SRMR = .045; CFI = .98. All paths of association in the first model remained statistically significant with similar effect sizes suggesting that the results presented are robust. Please refer to Appendix A.

The aim of the current study was to better understand the directional nature of associations between social competence and communication ability in toddlers, during the time when both skills are starting to emerge. We also aimed to uncover whether maternal warmth mediated these associations and whether support for transactional models between toddler's outcomes and maternal warmth would be supported in low SES families.

**Toddlers Communication and Social Competence:**

The statistically significant auto-regressive paths from 12 to 36 months suggest that there is early continuity of communication abilities and social competencies across this two-year period, with the strength of associations increasing over time. Concurrent associations were also statistically significant at 12 and 18 months suggesting an early influence of these outcomes on each other. These findings were not surprising given that theoretically, good communication skills, such as listening and understanding, should be embedded in the ability to engage in socially competent behaviours during interactions with others (Gallagher, 1993; Marshall et al., 1996). This position is also in line with the significant cross-lagged path found from better communication ability at 12 months to higher parent-rated social competence at 18 months. We also found support for the inverse cross-lagged path from social competence at 18 months to better communication ability. This direction of effect was significant both at 12 to 18 months and 18 to 24 months. It has been suggested that toddlers are able to build their communication abilities as a result of frequency and exposure to quality interactions with others, often adults in their immediate family (Manolson, 1992). Thus, toddlers who exhibit more social competence during these interactions may receive more frequent back and forth turn taking opportunities, in addition to higher quality feedback, both of which are paramount to developing early communication abilities (Manolson, 1992). This may then explain the significant cross-lagged paths in this direction.

Surprisingly, the concurrent associations and cross-lagged paths between communication and social competence were not statistically significant at 24 and 36 months. While there is continuity of variables over time (as is demonstrated by the auto-regressive paths), one possible explanation for the lack of statistically significant findings at the later ages may reflect the change in specific skill focus of

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the ASQ. For example, the items at 12 and 18 months are more generally focused around communicative intent, verbal production and receptive skills (i.e., listening and understanding). At 24 and 36 months however, there is a shift towards more language-focused items and more specifically, both expressive and receptive skills. The associations between early combined expressive/receptive, expressive or receptive skills only and markers of social competence yield mixed results (Barnett et al., 2012; Girard, Pingault, Doyle, Falissard & Tremblay, in revision; Rhee et al., 2013), which may reflect the varying constructs of communication/language ability used. Additional studies targeting the same constructs of communication/language longitudinally and the associations with social competence to better understand the discontinuity of associations after the second year are needed.

### **Transactional rather than Mediation: Maternal Warmth**

The second and third aims of the study were to examine possible mediation and transactional associations between maternal warmth and toddler's communication and social competence in low SES families. In the present study, no support was found for maternal warmth as a mediator in the associations. It is possible that this is in part the result of the timing of assessments. That is, the associations found between communication and social competence were observed between 12 and 24 months, not thereafter. Maternal warmth was collected at 6 and 24 months. At 6 months, it was only possible to test for direct effects on child outcomes given the temporal order of variables. Mediation of maternal warmth was tested at 24 months using child outcomes at 18, 24, and 36 months, however given that communication and social competence were no longer statistically significant from 24 to 36 months, this may partially explain the non-significant findings. Of interest, maternal warmth was not significantly associated with toddler's communication ability, as is commonly found in samples of middle- to high-class SES families (e.g., Barnett et al., 2012), which may have also contributed to the null findings.

While mediation was not supported, a transactional model of toddler's social competence and maternal warmth between 18 and 36 months was found. The results supported a positive effect of toddler's social competence at 18 months with increased maternal warmth at 24 months and in turn higher social competence at 36 months. Toddlers who are more socially competent are likely better able to engage and remain focused during dyadic interactions consequently resulting in higher quality and more

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enjoyable interactions for the ‘other’, in this case the mother. It is possible that higher quality interactions promote more satisfaction for the mother, which then may increase her desire to engage in more nurturing and caring behaviours during activities with the toddler. This study finding is of interest in the context of the sample characteristics. For example, close to two thirds of the mothers in the current sample were single during pregnancy, over half of them were not employed during pregnancy and only 3.5% of mothers had a higher-level education. Thus, toddler’s level of social competence may be of particular importance to the behavioural response styles of low SES mothers whose resources (personal or financial) are limited and who may already be experiencing high levels of drain as a result. For example, no statistically significant association was found from toddler prosocial behaviour to maternal warmth across the 18 to 54 month period in a high SES sample where 94.5% of mothers were in two-partner families with a mean annual income of over 75,000 Canadian dollars (Daniel, Madigan & Jenkins, 2015). This suggests that the associations may present differently in families that experience high levels of economic disadvantage.

Despite the difference in findings between low and high SES families for toddler social competence to maternal warmth, the role of parental behaviour serving as a model for toddler’s behaviour has been well supported (e.g., Daniel, Madigan, & Jenkins, 2015). When toddlers are exposed to higher levels of warm, caring, and empathetic behaviours, it is not uncommon for them to adopt similar types of behaviours into their own repertoire, whether from low or high SES backgrounds, such as was found in this study. The transactional associations between toddler’s social competence and maternal warmth in the present study suggest that mother-toddler relationships are active and changing. Attention must be given to a better understanding of the reciprocal influences of both mother and toddlers’ social-emotional well being on the other, particularly in lower SES samples.

### **Limitations:**

While this study utilised multiple waves of data collected frequently in early development in communities marked by high disadvantage and economic deprivation, the results need to be interpreted in the context of a few limitations. First, the participants in the current study were sampled from two treatment arms in the larger Preparing for Life (PFL) programme targeting disadvantaged communities

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with high rates of unemployment, welfare dependency and low levels of education. Given the specific characteristics of the sample (e.g. greater deprivation) coupled with having received treatment to promote school readiness skills, the results are likely not generalizable to other populations such as families from higher social advantage. Thus the conclusions must be considered preliminary. Second but relatedly, the participants taking part were receiving different levels of treatment as is detailed in Doyle (2003). Despite the lack of significant differences between groups on all child outcomes and parental warmth, and in addition to further controlling for treatment group within the models, it may still be possible that the different treatment arms had unobservable effects on participating families. Finally, all measures used relied on parent report. While parent reports have been well-validated tools for assessing both social skills and communication ability in early childhood (Squires, Nickel & Bricker, 1990), reporting bias may be present. Further, from a statistical perspective, using only parent report creates issues with shared method variance, which can result in both over- and under estimation of findings. The results of our sensitivity analysis revealed that the model results were robust and that maternal defensive responding did not appear to bias model results. Nevertheless, replication using a multi-informant approach is needed. While our results reveal interesting associations within the context of an emerging body of literature, they need to be interpreted as preliminary at this stage.

### **Overall Conclusions:**

Despite the limitations, our results point to the reciprocal nature of associations between communication ability and social competence between 12 and 24 months in deprived families. Targets of programming, be it prevention or intervention, may do well to focus on the quality of dyadic parent-child interactions that toddlers are exposed to. Scaffolding techniques that allow toddlers to explore their environment while discovering ways to successfully navigate exchanges with others may reinforce positive development of both communication ability and social competence. Further, the transactional paths between toddler's social competence and maternal warmth add to the literature by supporting the interdependence hypothesis and suggesting that, not only do parents exert influential impacts upon toddler's development, but that toddler's social competence can exert positive influences on levels of maternal warmth. The positive implications of this finding must however be evaluated in light of the

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potential negative implication, such that toddlers with limited social competence skills may receive lower levels of maternal warmth during dyadic interactions. Additional studies are needed that examine the impacts of toddler's socio-emotional development and a variety of parental behaviours to better understand the full range of implications.

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**Table 1** *Demographic Characteristics of Mothers' at Baseline (pregnancy)*

(N = 172)	
<b>Employment:</b>	
Employed at baseline	71 (41.0%)
<b>Marital Status:</b>	
Single	105 (60.7%)
Married/cohabitating	66 (38.2%)
Legally separated	1 (0.6%)
<b>Ethnic Group (% non-Irish):</b>	8 (4.7%)
<b>Highest Academic Qualification:</b>	
Third Level	6 (3.5%)
<b>Maternal Age:</b>	25.7 (6.01)
<b>Social Housing (yes):</b>	95 (54.9%)
<b>First Time Mother (yes):</b>	84 (48.6%)

Note: Third level education refers to having a Primary degree (third level Bachelor degree)/professional qualification/degree or a Postgraduate qualification. This would be comparable to a university or graduate degree in the US education system. The category of 'single' in marital status includes mothers who have a partner but who are living alone.

**Table 2** *Toddler's Communication Ability and Social Competence Scores between 12 and 36 Months*

Age		Communication	Social Competence
12 Months	Mean (SD)	50.03 (10.61)	15.12 (3.48)
	Min-Max	10 – 60	4 - 22
18 Months	Mean (SD)	45.52 (13.51)	17.73 (3.03)
	Min-Max	5 – 60	6 - 22
24 Months	Mean (SD)	53.04 (12.26)	18.27 (2.70)
	Min-Max	5 – 60	6 - 22
36 Months	Mean (SD)	52.67 (8.61)	18.81 (2.77)
	Min-Max	20 – 60	9 - 22

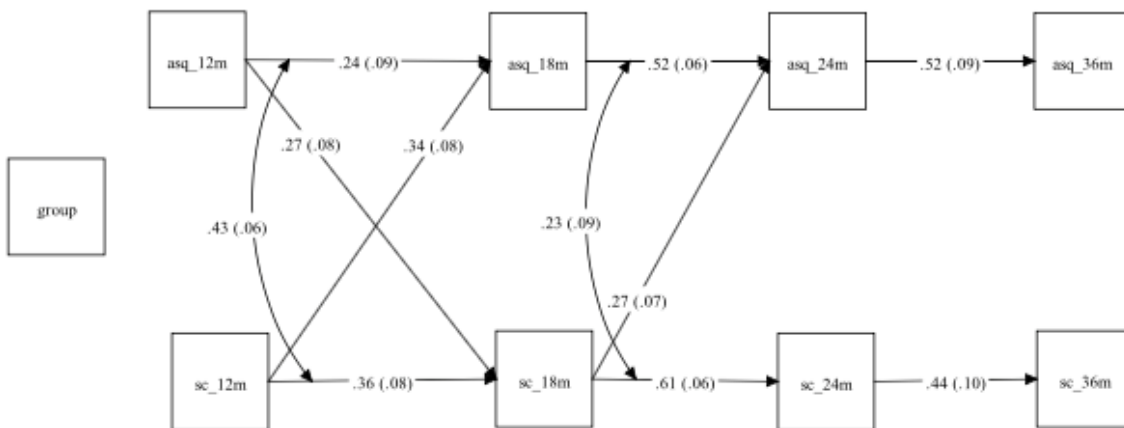
Note: Communication ability was assessed using the Ages and Stages Questionnaire. Social competence was assessed using the Brief Infant Toddler Social Emotional Assessment.

**Table 3** *Bivariate Correlations: Toddler's Communication Ability and Social Competence*

	Communication 12 months	Communication 18 months	Communication 24 months	Communication 36 months	Maternal Warmth 6 months	Maternal Warmth 24 months
Social competence 12 months	$r = .55^{***}$	$r = .50^{***}$	$r = .38^{***}$	$r = .30^{***}$	$r = .05$ $p = .587$	$r = .17^*$
Social competence 18 months	$r = .43^{***}$	$r = .51^{***}$	$r = .54^{***}$	$r = .39^{***}$	$r = .10$ $p = .277$	$r = .21^*$
Social competence 24 months	$r = .33^{***}$	$r = .33^{***}$	$r = .43^{***}$	$r = .30^{***}$	$r = .00$ $p = .911$	$r = .09$ $p = .317$
Social competence 36 months	$r = .30^{***}$	$r = .28^{***}$	$r = .31^{***}$	$r = .33^{***}$	$r = .14$ $p = .103$	$r = .21^{***}$
Maternal Warmth 6 months	$r = .07$ $p = .457$	$r = -.04$ $p = .661$	$r = -.05$ $p = .599$	$r = .09$ $p = .282$		$r = .36^{***}$
Maternal Warmth 24 months	$r = -.05$ $p = .560$	$r = -.07$ $p = .449$	$r = -.03$ $p = .697$	$r = .09$ $p = .286$	$r = .36^{***}$	

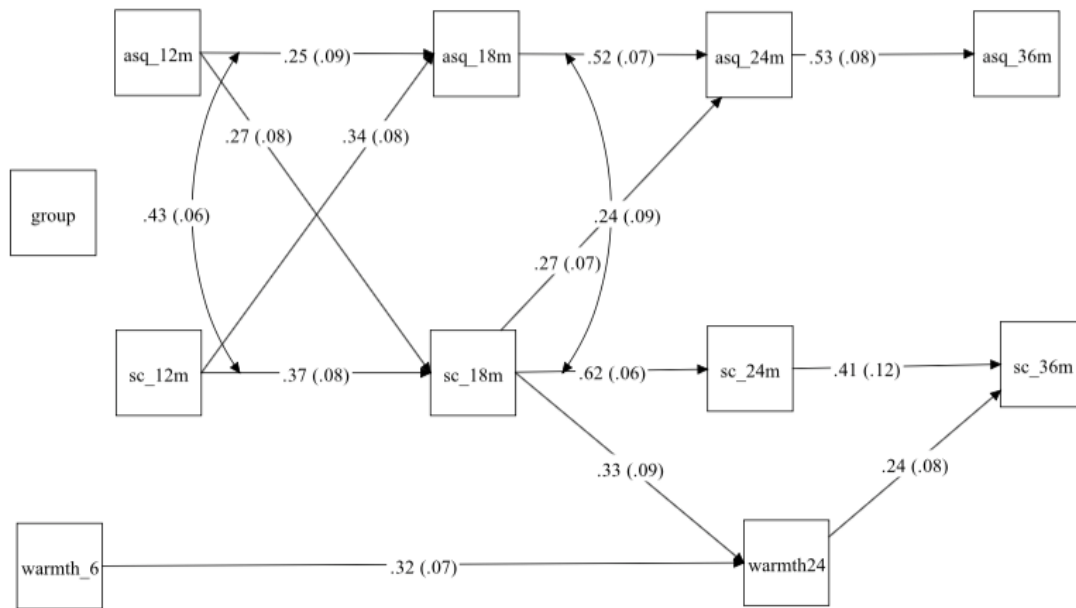
Note: Communication ability was assessed using the Ages and Stages Questionnaire. Social competence was assessed using the Brief Infant Toddler Social Emotional Assessment. \*\*\* denotes significant at the  $p = <.001$  level and \* denotes significant at the  $p = .050$  level (2-tailed).

**Figure 1** *Cross-Lagged Model: Toddler's Communication ability and Social Competence between 12 and 36 months*



Note: Cross-lagged model examining the direction of associations between communication ability (denoted by 'asq\_') and social competence (denoted by 'sc\_') between 12 and 36 months (N = 172). Standard errors presented within brackets. Only significant paths are presented for visual simplicity. Treatment status (denoted by 'group') was controlled for but not significant within the model.

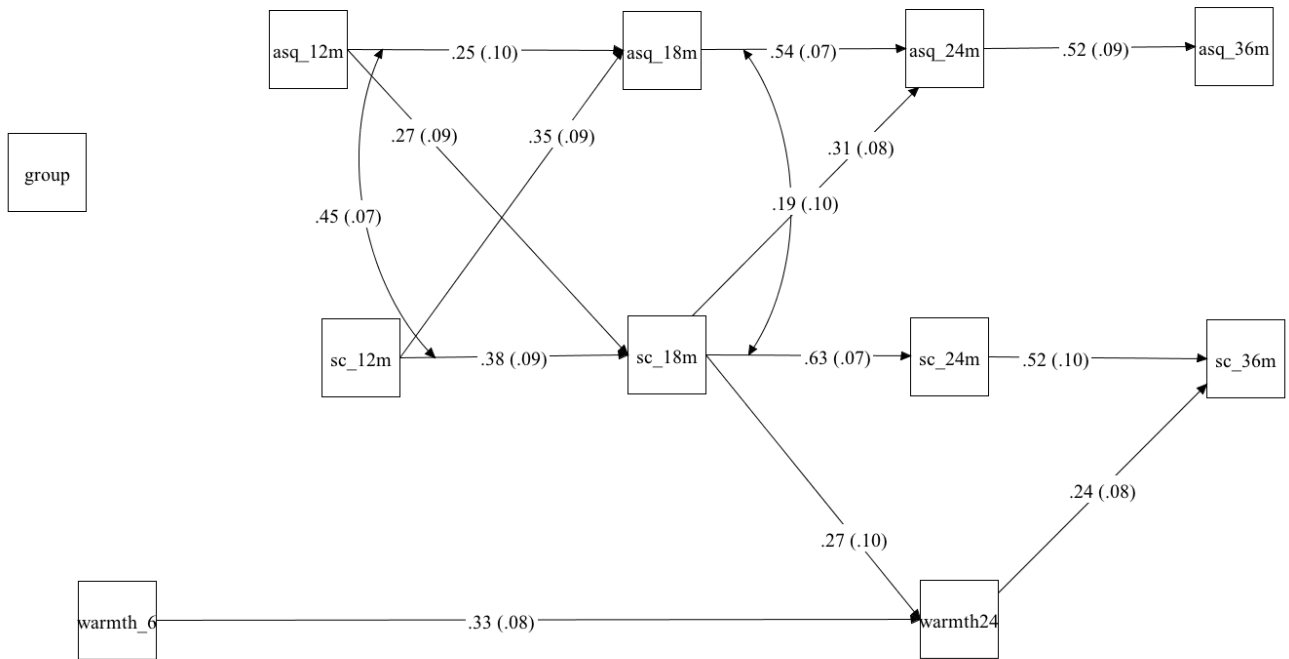
**Figure 2** *Transactional Model: Maternal Warmth, Toddler's Communication Ability and Social Competence between 12 and 36 months*



Note: Cross-lagged model examining both direct and indirect paths of maternal warmth at 6 and 24 months (denoted as 'warmth\_') in the longitudinal bi-directional associations between communication ability (denoted by 'asq\_') and social competence (denoted by 'sc\_') between 12 and 36 months (N = 172). Only direct paths, not indirect paths, with maternal warmth were statistically significant. Standard errors presented within brackets. Only significant paths are presented for visual simplicity. Treatment status (denoted by 'group') was controlled for but not significant within the model.



**Appendix A: Sensitivity Analysis**



Note: Cross-lagged model examining both direct and indirect paths of maternal warmth at 6 and 24 months (denoted as 'warmth\_') in the longitudinal bi-directional associations between communication ability (denoted by 'asq\_') and social competence (denoted by 'sc\_') between 12 and 36 months (N = 142). Standard errors presented within brackets. Only significant paths are presented for visual simplicity. Treatment status (denoted by 'group') was controlled in the model but was not statistically significant.