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Longitudinal and Concurrent Associations between Parental Mind-mindedness and Children's Social Competence in the First Three Years of Life

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Abstract

Mind-mindedness (MM), the parental proclivity to perceive children as individuals with their own thoughts and feelings, has repeatedly demonstrated longitudinal positive associations with the development of various social skills in children (e.g., theory of mind). However, little research has been conducted to the direct association between MM and the practical application of these skills in daily-life social interactions (i.e., social competence). This study aimed to gain a better understanding of the role of MM in the development of children's social competence, by examining both the longitudinal and concurrent associations between MM and children's social competence. Appropriate and non-attuned MM were observed during parent-child interactions at 3 months (MM3) and 30 months (MM30), involving participants from the TRacking Adolescents' Individual Lives Survey-The Next Generation (TRAILS NEXT) cohort. Children's social competence was assessed at 30 months (SOC30) through parent reports. Hierarchical multiple regression analyses demonstrated, in contrast with expectations, a significant negative association between appropriate MM3 and SOC30. No significant findings were found for the association between non-attuned MM3 and SOC30, and the concurrent effects of MM30 did not have an additional impact over and above the longitudinal effects of MM3. Although the findings of this study must be interpreted with caution due to limitations (e.g., missing data), they suggest that the association between MM and social competence may not be as direct as the association between MM and specific social skills. Future research should focus on investigating mediating variables that may explain the (unexpected) association between MM and social competence.

Samenvatting

Mind-mindedness (MM), de ouderlijke neiging om kinderen te zien als individuen met hun eigen gedachten en gevoelens, heeft herhaaldelijk longitudinale positieve associaties aangetoond met de ontwikkeling van verschillende sociale vaardigheden bij kinderen (bijvoorbeeld theory of mind). Weinig onderzoek is echter gedaan naar de directe associatie tussen MM en de praktische toepassing van deze vaardigheden in dagelijkse sociale interacties (oftewel sociale competentie). Dit onderzoek had als doel een beter begrip te verkrijgen van de rol van MM in de ontwikkeling van de sociale competentie van kinderen, door zowel de langdurige als gelijktijdige associaties tussen MM en de sociale competenties van kinderen te onderzoeken. Gepaste en niet-afgestemde MM werden geobserveerd tijdens ouder-kind interacties op 3 maanden (MM3) en 30 maanden (MM30), met participanten van de TRacking Adolescents' Individual Lives Survey-The Next Generation (TRAILS NEXT) cohort. De sociale competenties van kinderen werden beoordeeld op 30 maanden (SOC30) door ouder rapportages. Hiërarchische meervoudige regressieanalyses toonden, in tegenstelling tot verwachtingen, een significant negatieve associatie tussen gepaste MM3 en SOC30. Geen significante bevindingen zijn gevonden voor de associatie tussen niet-afgestemde MM3 en SOC30, en het gelijktijdige effect van MM30 had geen extra impact bovenop het longitudinale effect van MM3. Hoewel de bevindingen van dit onderzoek voorzichtig geïnterpreteerd dienen te worden wegens beperkingen (zoals ontbrekende data), suggereren ze dat de associatie tussen MM en sociale competenties mogelijk niet zo direct is als de associatie tussen MM en specifieke sociale vaardigheden. Toekomstig onderzoek dient zich te richten op het onderzoeken van mediërende variabelen die mogelijk de (onverwachte) associatie tussen MM en sociale competentie kunnen verklaren.

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Introduction

Mind-mindedness (MM) refers to caregivers' proclivity to treat infants as individuals with a mind of their own (Meins, 1997). For over two decades, research has repeatedly demonstrated positive associations between parental MM during infancy and later developmental outcomes for toddlers, preschoolers, and school-age children (McMahon & Bernier, 2017). In particular, MM plays a crucial role in the development of children's emotion understanding, mental-state language, perspective-taking, and theory of mind (Aldrich et al., 2021). Despite the consistent evidence suggesting that MM contributes to the development of various social skills, the extent to which the effect of MM during infancy influences children's social competence (i.e., the practical application of these skills in daily-life social situations) remains unclear. Therefore, this study aimed to contribute to the existing knowledge gap by investigating both the longitudinal and concurrent associations between parental MM assessed at 3 and 30 months, and children's social competence at 30 months.

The first three years of a child's life are widely recognised as a critical period for development, prompting numerous studies in this area (Jeong et al., 2021). Of particular interest is the interaction between caregivers and children, as research has consistently shown that it plays a vital role in promoting healthy neurophysiological, physical, and psychological development among children (World Health Organization, 2004). For example, caregiver-child interaction within the first years of life has been positively associated with children's emotion regulation (Jeon et al., 2013; Olson et al., 1990; Rothenberg et al., 2019), cognitive development (Lanjekar et al., 2022), language development (Dodici et al., 2003; Safwat & Sheikhany, 2014), and prosocial behaviour (Ferreira et al., 2016; Wu et al., 2016). Therefore, it is crucial to investigate potential factors that contribute to the beneficial effects of caregiver-child interactions. Once the significant elements of this interaction are identified, early interventions based on this understanding can actively contribute to enhancing child development (Jeong et al., 2021). A specific aspect of this interaction that has been extensively studied, and has demonstrated positive associations with several child outcomes is MM (McMahon & Bernier, 2017).

The construct of MM was first introduced by Meins (1997) as an addition to the attachment theory, developed by Bowlby (1969) and expanded upon by Ainsworth et al. (1971). The attachment theory is frequently used to explain the importance of a secure relationship between young children and their caregiver in relation to positive (developmental) outcomes for a child throughout life (Ranson & Urichuk, 2008). In establishing a secure attachment, the caregiver's state of mind regarding attachment has been consistently proven to

be the most significant factor (van IJzendoorn, 1995; Verhage et al., 2016). Parental sensitivity is considered as an important mediating factor between the caregiver's state of mind and child attachment, however van IJzendoorn (1995) found that sensitivity alone could only partially explain this relation; he referred to this as the so-called transmission gap (Verhage et al., 2016). Meins (1999) suggested MM, as a more specific component of sensitivity, to possibly bridge the transmission gap.

According to Meins (2013), MM is defined as "caregivers' tendency to treat their young children as individuals with minds of their own, and enables caregivers to 'tune in' to what their infants may be thinking or feeling" (p. 530). Although MM and sensitivity share certain commonalities, and display a positive intercorrelation, they also exhibit distinct characteristics and fundamental distinctions (McMahon & Bernier, 2017). To elaborate, MM is considered to be more specific and more explicit compared to sensitivity as MM is measured by parents' verbal representation of their child's internal state (Meins, 2013; Meins et al., 2001). Parents can provide such representations by verbalising possible feelings or thoughts that occur in their child's mind. These verbalised representations are referred to as mind-related comments (Meins & Fernyhough, 2015). When mind-related comments accurately correspond to the child's internal state or the ongoing situation, this is considered appropriate MM. However, if parents misinterpret the situation or fail to attune to their child's needs and emotions, it is referred to as non-attuned MM (Meins & Fernyhough, 2015). Research conducted by Meins et al. (2001) demonstrated that appropriate MM and non-attuned MM are distinct constructs, each having an independent effect. Parents commonly demonstrate higher levels of appropriate MM compared to non-attuned MM (McMahon & Bernier, 2017).

Research indicates that the demonstration of higher levels of appropriate MM by parents during infancy facilitates the development of more secure attachment relationships (Meins et al., 2001, 2012) as well as positively impacts children's later cognitive, language, emotional, and social development (Aldrich et al., 2021). Among these developmental domains, the association between appropriate MM and children's social cognition appears to be particularly strong (Aldrich et al., 2021). Previous studies have consistently shown positive associations between appropriate parental MM and essential social skills in children, such as empathy and emotion understanding (Centifanti et al., 2016), use of mental-state language (Lundy & Fyfe, 2016), perspective-taking, and theory of mind (ToM; Meins et al., 2002, 2003). These findings suggest that when parents verbalise their child's thoughts and feelings from a young age, it seems to contribute to the recognition and understanding of the child's own emotions. Additionally, it fosters an understanding of emotions in others and may even lead to

the adoption of different perspectives, ultimately contributing to the development of a more advanced ToM (Meins et al., 2002). Positive longitudinal associations between appropriate MM and ToM have been found for both toddlers (Laranjo et al., 2010) and (pre)schooled children (Kirk et al., 2015; Laranjo et al., 2014; Lundy, 2013; Meins et al., 2002, 2003, 2013a).

While the current body of literature consistently reports positive longitudinal associations between appropriate MM during infancy and the subsequent development of specific social skills in children, limited attention has been given to the association between parental MM and the practical application of these skills in daily-life social situations, referred to in this study as *social competence*. Although an academic definition of social competence remains elusive (Dodge et al., 1986), it generally refers to the capacity to engage in effective interactions with others within social contexts (Fabes et al., 2006). With regards to young children, social competence is the ability to establish and maintain positive relationships with peers and adults, communicate effectively, resolve conflicts, and make decisions that take into account the feelings and perspectives of others (Junge et al., 2020). To express such behaviour, children may use the previously mentioned individual social skills, such as ToM, which have already demonstrated a significant association with MM. However, the direct association between parental MM and children's social competence has only been investigated by Colonnesi et al. (2019).

Within their study, the longitudinal associations between parental MM measured at 4, 12, and 30 months, and social competence in children at 4.5 years of age were examined (Colonnesi et al., 2019). A significant negative association for non-attuned MM at 12 months was found, indicating that frequent use of non-attuned mind-related comments by parents at 12 months predicted lower social competence in children aged 4.5 years. Interestingly, in contrast to the previous research findings, no significant association was found between appropriate MM or non-attuned MM assessed at 4 months, and social competence (Colonnesi et al., 2019). Consequently, the predictive value of parental MM for children's social competence remains unclear, emphasising the need for further investigation. A deeper understanding of the association between parental MM and children's social competence can contribute to the existing knowledge gap and help to formulate specific recommendations for interventions targeting early parent-child interactions. Thus, the first aim of this study was to examine the longitudinal association between parental MM and children's social competence.

Another important caveat in the literature is that studies have not yet researched the possible concurrent effect of MM on child outcomes. This is surprising, because multiple studies have demonstrated a strong temporal stability between early and later maternal MM,

indicating that mothers who displayed higher levels of appropriate MM during infancy were also more likely to show higher levels of appropriate MM towards their preschool-aged children (Meins et al., 2003, 2011). However, this high level of temporal stability has only been observed in studies that utilised observational measures for infants and later representational measures (i.e., parental interviews) for older children. Kirk et al. (2015) examined the temporal stability of MM using only observational measures and found a temporal stability of appropriate MM over a 10-month period. This temporal stability of MM opens up the question whether associations between MM during infancy and later child outcomes may (partly) be driven by the concurrent effects of MM. Therefore, the second aim of this study was to examine the concurrent associations between parental MM and children's social competence over and above the potential longitudinal effect of early MM.

To gain a better understanding of the role of parental MM in the development of children's social competence in the first three years of life, the aim of this study was twofold: 1) examining the longitudinal associations between parental MM and children's social competence, and 2) examining the concurrent associations between parental MM and children's social competence over and above the potential longitudinal effect of early MM. The first research question was stated as follows: *What is the association between parental mind-mindedness, observed during parent-child interaction at 3 months, and children's social competence at 30 months old?* It was hypothesised that a significant negative association between non-attuned parental MM at 3 months (MM3) and children's social competence at 30 months (SOC30) would be found, consistent with the findings of Colonnesi et al. (2019). In contrast, a significant positive association was expected between appropriate MM3 and SOC30. Although the study of Colonnesi et al. (2019) did not find this association, earlier studies on the associations between early appropriate MM and the later development of individual social skills have repeatedly demonstrated positive associations (Centifanti et al., 2016; Kirk et al., 2015; Laranjo et al., 2010, 2014; Lundy & Fyfe, 2016; Meins et al., 2002, 2003, 2013a). Therefore, it is not unlikely to expect a significant positive association between appropriate parental MM3 and SOC30 in the present study.

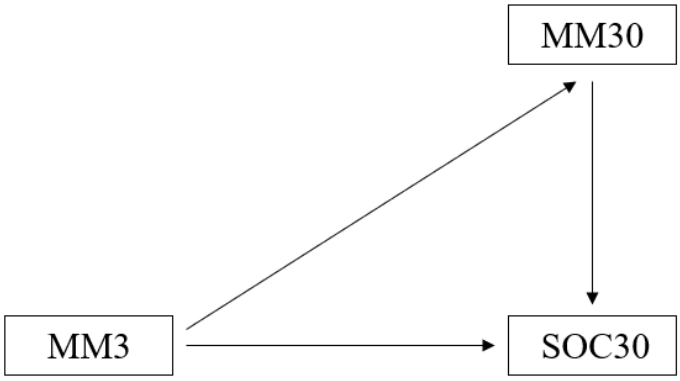
To expand upon the existing literature, this study controlled for the possible concurrent effects of MM. Therefore, a second research question was proposed: *To what extent is the potential association between parental mind-mindedness at 3 months and children's social competence at 30 months old (partially) explained by the concurrent effect of mind-mindedness at 30 months old?* Based on the assumed temporal stability between MM3 and MM30, significant associations between MM30 and SOC30 were expected, in the same directions as

MM3. Furthermore, it was not unlikely to expect that the longitudinal associations between MM3 and SOC30 were (partially) explained by the concurrent effects of MM30.

By answering these research questions, this study aimed to contribute to the existing knowledge gap regarding the role of parental MM in the development of children's social competence as it is one of the first to provide insights in this association. Additionally, this study sought to formulate specific recommendations based on the findings for professionals involved in designing interventions focused on early parent-child interaction. In Figure 1, a conceptual model for the proposed research questions is illustrated.

Figure 1

Conceptual Model



Methods

Sample and Procedure

The present study is part of the TRacking Adolescents' Individual Lives Survey (TRAILS). In 2001, TRAILS began following more than 2000 children who were recruited through primary schools in the three Northern provinces of the Netherlands, as part of a large-scale prospective cohort study examining factors that influence mental health and social development during the transitional period from adolescence to young adulthood (Huisman et al., 2008). As the TRAILS participants reached an age where they might start a family, an intergenerational spin-off study called TRAILS-The Next Generation (TRAILS NEXT) was established in 2015 to investigate the development of the offspring (Hartman et al., 2022). Original participants of TRAILS who become pregnant, or whose partner becomes pregnant, are contacted via email to potentially participate in the TRAILS NEXT study. According to the latest cohort update, TRAILS NEXT included 368 children of the original TRAILS parents (Hartman et al., 2022). For more detailed descriptions of the study designs and recruitment processes for both TRAILS and TRAILS NEXT, please refer to Oldehinkel et al. (2015) and Hartman et al. (2022), respectively.

For the present study, only data from TRAILS NEXT was used. Data collection within TRAILS NEXT occurs over four measurement waves (T_1 to T_4). During pregnancy and the first three months after childbirth (T_1), parents completed a weekly diary. Home visits were conducted when children reached the ages of 3 months (T_2), 30 months (T_3), and 4.5 years (T_4). During these visits, research assistants administered several questionnaires and interviews, and conducted video observations. The variables of interest for the present study were measured at T_2 and T_3. Therefore only data from these measurements were used. For the present study, a subsample was selected based on the availability of transcribed and coded video observations at T_2. This subsample included 139 unique parent-child dyads. It is important to note that the design of TRAILS NEXT permitted parents to participate with multiple children. Consequently, for eleven families more than one child was included. Overall, the subsample consisted of 86 distinct children (35 female, 35 male, and 16 with missing data) and 139 parents (68 female, 61 male, and 10 with missing data). Information from both parents was available for 55 distinct children, while 33 had information from only one parent.

Ethical Considerations

The TRAILS NEXT study has received ethical approval from the Dutch Central Committee on Research Involving Human Subjects (NL47782.042.14). Additionally, informed consent was obtained from all parents prior to their participation in TRAILS NEXT.

Measures

Parental MM

Parental MM was assessed when children were 3 and 30 months using the observational measure as described in the coding manual by Meins and Fernyhough (2015). Video recordings of parent-child interactions were collected during a ten-minute free-play session at participants' homes. Parents were instructed to engage in play with their child using age-appropriate toys provided by the research assistants, simulating their usual interaction at home. The video recordings were first transcribed and then coded to determine the level of parental MM. This study followed the transcription and coding manual provided by Meins and Fernyhough (2015). The methodology and examples presented below are also derived from this manual.

Every utterance made by both the parent and the child during the video observations was transcribed verbatim. Individual utterances were identified based on pauses of one second or semantic discontinuities within the utterances. The identification of individual comments made by the parents enabled the researchers to categorise each comment as either mind-related or not mind-related. Comments were classified as mind-related when the parent explicitly verbalised the internal mental state of the child, by addressing desires or preferences (e.g., "you like playing with dolls"), cognitions (e.g., "you really think this through"), emotions (e.g., "you're sad today") or epistemic states (e.g., "you're playing games with me now, aren't you?") that the child might have or experience. Comments where parents were utilising the child's voice to articulate the child's intentions or thoughts were also classified as mind-related comments (e.g., "mom, don't be silly"). Comments that were too general and therefore did not represent the child's internal state (e.g., "that's a nice doll"), or comments that addressed a child's physical state (e.g., tired, hungry) instead of an internal mental state, were classified as not mind-related. After identifying the mind-related comments, the researchers assessed their appropriateness by reviewing the video observations. Comments made by the parent that appeared to be congruent with the child's internal state (e.g., "you like this toy", when the child displayed clear interest by attentively looking at and playing with the toy) were classified as appropriate. Additionally, comments that linked current activities of the child to similar events in the past or future, or those in which the parent spoke in the voice of the child, were also considered appropriate. Comments that seemed incongruent with the child's internal state (e.g., "you like this toy", when the child rejected the toy by pushing it away) were classified as non-attuned.

The final scores for appropriate MM and non-attuned MM were calculated as a proportion of comments out of the total number of comments made by the caregiver during the

interaction. Proportion scores allow for controlling differences in parental verbosity (Meins & Fernyhough, 2015). Higher proportion scores indicate relatively higher levels of appropriate or non-attuned MM shown by parents during the observation. For data analysis, both parental MM assessed at T_2 (appropriate MM3 and non-attuned MM3) and T_3 (appropriate MM30 and non-attuned MM30) were used as independent variables. The T_2 data was transcribed and coded in two previous studies, of which the details of this process and inter-reliability can be found in Appendix A. In the present study, T_3 data was transcribed and coded. All researchers received uniform training and guidelines from a trained researcher at the University of Groningen to ensure uniformity and reliability. Furthermore, all coders assessed a "golden standard" case, which had to meet sufficient criteria before proceeding with the actual data. To determine inter-rater reliability, 10% of transcripts were double-coded and the Intraclass Correlation Coefficient (ICC) was used. Inter-rater agreement was excellent for both the proportion score of appropriate mind-related comments (ICC = .96) and the proportion score of non-attuned comments (ICC = .90), as well as for the proportion score of the total number of comments (ICC = .96) and the total number of comments by parents (ICC = .98), following the guidelines outlined by Cicchetti (1994).

Children's Social Competence

Children's social competence was assessed using a shortened version of the Infant-Toddler Social and Emotional Assessment (ITSEA). The ITSEA is a clinical tool designed to assess social-emotional and behavioural problems in children aged 12 to 36 months (Carter & Briggs-Gowan, 2006). Within TRAILS NEXT, a subset of twelve items from the ITSEA was selected (see Appendix B). These twelve items represent the subscales "Empathy" (item 1 t/m 7) and "Prosocial Peer Relations" (item 8 t/m 12) which belong to the "Competence" domain of the ITSEA. An online questionnaire was used to administer the ITSEA to each parent separately at T_3. Parents were asked to rate their child's behaviour observed over the past month using a three-point scale, ranging from *not true/rarely* (0), to *somewhat true/sometimes* (1), and *very true/often* (2). Subsequently, a total raw score for all twelve items was computed to represent children's social competence at 30 months of age (SOC30). Higher SOC30 scores indicate higher levels of perceived social competence as reported by parents, while lower scores indicate lower levels.

The ITSEA demonstrates good psychometric properties (Carter & Briggs-Gowan, 2006). Internal consistency is evaluated as good for the Competence domain (α = .89-.90) and acceptable for the Empathy subscale (α = .78-.79), while the Prosocial Peer Relations subscale shows slightly lower internal consistency (α = .61-.68). Test-retest reliability is moderate for

the Competence domain (r = .76) and good for both the Empathy subscale (r = .84), and Prosocial Peer Relations subscale (r = .79). Inter-rater agreement ranges from moderate to good for the Competence domain (ICC = .79), Empathy subscale (ICC = .83), and Prosocial Peer Relations subscale (ICC = .74). Furthermore, the ITSEA demonstrates solid criterion-related and construct validity (Carter & Briggs-Gowan, 2006). In the present study sample, Cronbach's alpha was used to assess internal consistency of the total twelve items. The results showed an internal consistency of α = .68 (subscale Empathy: α = .67 and subscale Prosocial Peer Relations: α = .46).

Demographic Variables

Baby sex (0 = female, 1 = male) obtained at T_2 was included as a potential control variable to account for generally higher ratings of social competence for girls compared to boys (Hukkelberg et al., 2019; Rose & Rudolph, 2006). Furthermore, demographic variables for the descriptive analysis obtained through online questionnaires included the age of the child determined at T_2 and T_3, as well as the age at childbirth, monthly income, and educational level of the parents, determined at T_2.

Statistical Approach

All statistical analyses were performed using IBM SPSS (Version 29.0). First, Little's MCAR test was conducted to assess patterns of missing data. Second, several assumptions were tested. The distributional characteristics of all study variables were examined through visual inspection of kurtosis and skewness. Specifically, the assumption of normality for the dependent variable (SOC30) was assessed using the Shapiro-Wilk test. The assumption of no multicollinearity was examined through collinearity statistics such as variance inflation factor (VIF) and tolerance. The independence of residuals was evaluated using the Durbin-Watson test. Homoscedasticity, linearity, and normal distribution of residuals were examined through visual inspection of (scatter)plots. The potential influence of outliers was assessed using Cook's distance. Third, a descriptive analysis was conducted using general descriptives, independent and paired t-tests, and Pearson correlations.

Finally, hierarchical multiple regression analyses were performed to examine the longitudinal and concurrent associations between parental MM (independent variables) and SOC30 (dependent variable). Appropriate MM was normally distributed and included as a continuous variable. Non-attuned MM was highly right-skewed and therefore transformed into a binary variable. This transformation created a new distribution that distinguished between parents who made any non-attuned mind-related comments during the observation (coded as 1) and parents who made zero non-attuned mind-related comments (coded as 0). Creating this

binary variable enhanced a more meaningful distinction, facilitating a clearer interpretation of the impact of non-attuned MM on SOC30. In the regression model, baby sex would be added as a first step to account for any sex-related differences, if differences were found in the study sample regarding the social competence of boys and girls. Subsequently, parental MM3 was entered in the next step, followed by parental MM30 in the final step. Separate hierarchical multiple regression analyses were performed for appropriate and non-attuned MM.

Results

Data Checks

Missing Data and Multiple Imputation

In the present study, a substantial amount of missing data was observed, as indicated in Table 1. The non-significant result of Little's MCAR test (p = .463) indicated that the missing data was most likely missing completely at random (MCAR) and unrelated to observed and unobserved data (van Ginkel et al., 2020). Among the initial 139 parent-child dyads, only 39 dyads had complete information available, making them suitable as complete cases for data analysis. Consequently, the study's sample size was very small. To increase both the sample size and representativeness of the sample, *Multiple Imputation* (MI) was performed (Schafer & Graham, 2002). MI is a statistical technique that generates multiple plausible imputations for missing values, creating different datasets with imputed values for missing data points (van Ginkel et al., 2020).

Table 1

Missing Data

Variable	*n* (%)	Missing (%)
Baby sex	122 (87.8)	17 (12.2)
Appropriate MM3	139 (100)	0 (0)
Non-attuned MM3	139 (100)	0 (0)
Appropriate MM30	61 (43.9)	78 (56.1)
Non-attuned MM30	61 (43.9)	78 (56.1)
SOC30	82 (59.0)	57 (41.0)

In the present study, only the variables used in the main analyses were imputed, following the recommended approach by Woods et al. (2021) assuming MCAR. Specifically, the missing values for MM30 and SOC30 variables were imputed in 20 different datasets. The variable baby sex was intentionally not imputed due to a relatively low proportion of missing data, and the lack of meaningful interpretation for imputing multiple plausible values for sex. The MM3 variables were excluded from imputation as their availability determined the subsample, resulting in no missing values for these variables. For the imputation of MM30 proportions, any negative imputed values were recoded into zero, as it is not possible to have fewer than zero mind-related comments. A total of 35 parent-child dyads were excluded from

the MI process due to the absence of any available data at T_3. These dyads were identified as drop-outs, and their exclusion was necessary to ensure the integrity of the imputation procedure and subsequent data analysis. Consequently, a sample of 104 complete cases remained after the MI process was completed.

Assumptions Check

From the Shapiro-Wilk test conducted on the dependent variable SOC30, it was found that the original data had a *p*-value of .08, suggesting that the variable SOC30 in the original dataset was normally distributed. However, 13 out of the 20 imputed datasets had *p*-values lower than .05, indicating a violation of the assumption of normality in the imputed data. The assumption of no multicollinearity was not violated in both the original and imputed data, as indicated by the findings of VIF and tolerance. The largest VIF values were 1.00 (appropriate MM) and 1.04 (non-attuned MM) in the original data and 1.07 in the imputed data (imputation 2, appropriate MM). As the average VIF and tolerance for both regression analyses were around 1, absence of multicollinearity was assumed (Daoud, 2017). From the Durbin-Watson test, it was concluded that the assumption of independence of errors in both regression analyses was met, as indicated by values close to two (Field, 2009). In the original data, the Durbin-Watson values were 2.07 (appropriate MM) and 1.99 (non-attuned MM). Across the imputations, the values ranged from 1.54 (imputation 9, appropriate MM) to 1.87 (imputation 8, appropriate MM), suggesting no significant serial correlation or dependence among the residuals. The assumptions of linearity and homoscedasticity have been met as indicated by the scatterplot included in Appendix C. Variations can be observed in the histograms and P-P plots for both the original data (see Appendix D) and the different imputations, suggesting a potential violation of the assumption of normally distributed errors. Cook's distance revealed that the maximum Cook's distance in the original data were .14 for both appropriate and non-attuned MM, while the highest value among the 20 imputations was .20 (imputation 8, appropriate MM). These findings suggest that, despite the presence of outliers (identified as cases with a standardised residual less than -2 or greater than 2), they did not have a substantial effect on the regression analysis (Cook & Weisberg, 1982). To conclude, not all assumptions were met and therefore the results from this study must be interpreted with caution.

Descriptive Statistics and Correlations

Table 2 presents an overview of the descriptive statistics for both the original data and the combined results of the imputed datasets, referred to as pooled data.

Table 2

Descriptive Statistics

	Original Data			Pooled Data
Variable	*M or %*	*SD*	Range	*M or %*
Child				
Sex (% males)	53.8%	-	-	47.2%
Age at T_2 (months)	3.49	.55	2.43-4.59	3.35
Age at T_3 (months)	31.89	1.59	29.36-36.04	32.23
SOC30 [a]	15.74	3.40	7.00-22.00	15.13
Parent				
Sex (% males)	50.0%	-	-	43.3%
Age at childbirth (years)	28.72	6.17	22.06-50.76	28.07
Appropriate MM3	.034	.02	.000-.089	.036
Non-attuned MM3 [b]	.008	.01	.000-.055	.009
Appropriate MM30	.019	.01	.000-.051	.020
Non-attuned MM30 [b]	.005	.01	.000-.034	.006

Note. Proportion scores of MM are presented with three decimal places due to their small magnitudes, as rounding to two decimal places does not provide sufficient insight. Furthermore, only mean scores are presented for the pooled data since it already reflects the mean of all 20 imputations, therefore standard deviations and ranges are unavailable.

[a] All ITSEA items were imputed, and the variable SOC30 was constructed based on the total sum score of these items.

[b] This table displays the means and standard deviations of the proportion scores for non-attuned MM. However, in the regression analysis a binary variable for non-attuned MM was used.

As presented in Table 2, the sample characteristics are comparable between the original and pooled data. The majority of parents reported vocational education (31% original, 29% pooled data) and higher vocational education (49% original, 35% pooled data) as their highest level of achievement. Net monthly income varied considerably among individual parents, ranging from less than 300 euros to more than 3.000 euros per month. The majority of parents had a monthly income between 2.101 and 2.400 euros (15% original, 16% pooled data). All participants were either Dutch or Frisian speakers.

A significant difference was found in the levels of MM demonstrated by parents at 3 months compared to 30 months. In the pooled data, the average proportion score of both appropriate MM3 (t = 5.22, p = <.001) and non-attuned MM3 (t = 2,16, p = .032) was significantly higher than MM30. In the original data, a statistically significant difference was found for appropriate MM3 (t = 3.92, p = <.001) in comparison to MM30, but not for non-attuned MM (t = 1.46, p = .077). At both measurement points, parents demonstrated more appropriate MM than non-attuned MM. On average, parents made more non-attuned comments towards boys than towards girls when the children were 3 months old. A significant difference between boys and girls was observed in the pooled data (t = 1.98, p = .048), while trend-level significance was observed in the original data (t = -1.92, p = .063). Proportion scores for appropriate MM3 and both appropriate and non-attuned MM30 did not differ between boys and girls in both the original and pooled data. No significant difference in mean SOC30 scores was found between boys and girls in both the original (t = .85, p = .399) and pooled data (t = -.30, p = .768).

Correlation tables between the variables of interest can be found in Table 3 and 4. No significant correlation was found between MM3 and MM30. Furthermore, no significant correlations were found between parental MM and SOC30. However, trend-level significance was observed for the correlation between appropriate MM3 and SOC30 (p = .087 original, p = .072 pooled data). A significant positive correlation, unrelated to the main focus of the present study, was discovered between baby sex and non-attuned MM3. However, this correlation was only observed in the original (p = .016) and not in the pooled data (p = .125).

Table 3

Correlation between Study Variables (Appropriate MM)

	Original Data				Pooled Data			
Variable	1	2	3	4	1	2	3	4
1. SOC30	-				-			
2. Baby sex	-.15	-			.03	-		
3. Appropriate MM3	-.23	.10	-		-.16	.12	-	
4. Appropriate MM30	-.19	-.15	.13	-	-.15	-.08	.12	-

Table 4

Correlation between Study Variables (Non-attuned MM)

	Original Data				Pooled Data			
Variable	1	2	3	4	1	2	3	4
1. SOC30	-				-			
2. Baby sex	-.15	-			.03	-		
3. Non-attuned MM3	-.04	.36*	-		-.04	.12	-	
4. Non-attuned MM30	-.01	.03	.24	-	.15	.08	.14	-

*$p < .05$.

Hypotheses Tests

Since no significant correlation was found between baby sex and SOC30, and no significant difference was found for the mean SOC30 scores between boys and girls, the variable baby sex was not included as a control variable in the hierarchical multiple regression analysis. Therefore, only MM3 and MM30 were entered into the model. The results of the analyses for both appropriate and non-attuned MM are presented in Table 5 and 6. The analyses were conducted on both the complete cases (original data, $n = 39$) and the imputed data (pooled data, $n = 104$).

Table 5

Hierarchical Multiple Regression Analysis (Appropriate MM)

	Original Data				Pooled Data		
	B	SE B	β	t	B	SE B	t
Step 1							
Constant	16.85	1.04			16.73	.81	
Appropriate MM3	-32.36	26.02	-.20	-1.24	-44.95	18.96	-2.37*
Step 2							
Constant	17.81	1.33			17.45	1.05	
Appropriate MM3	-31.36	25.91	-.19	-1.21	-41.86	19.55	-2.14*
Appropriate MM30	-51.91	44.91	-.19	-1.16	-42.72	40.22	-1.06

Note. It is not able to present the standardised coefficient (β) for pooled data.

*$p < .05$.

Table 6

Hierarchical Multiple Regression Analysis (Non-attuned MM)

	Original Data				Pooled Data		
	B	SE B	β	t	B	SE B	t
Step 1							
Constant	16.13	.70			15.64	.67	
Non-attuned MM3	-.99	1.12	-.14	-.88	-1.00	.87	-1.15
Step 2							
Constant	16.02	.80			14.99	.90	
Non-attuned MM3	-1.06	1.16	-.15	-.91	-1.13	.90	-1.26
Non-attuned MM30	.32	1.45	.05	.28	1.37	1.07	-1.29

Hypothesis 1

To examine the longitudinal associations between parental MM and SOC30, parental MM3 was entered in Step 1. The analysis revealed a significant negative association between appropriate MM3 and SOC30 in the pooled data (B = -44.95, SE = 18.96, t = -2.37, p = .018). R^2 values ranged from 0.04 (imputation 16) to 0.09 (imputation 12), suggesting a minimum of 4.0% and a maximum of 9.0% of the variance in SOC30 was explained by appropriate MM3 in the imputed data. However, in the original data no significant associations were found between appropriate MM3 and SOC30 (B = -32.36, SE = 26.02, t = -1.24, p = .221). For the association between non-attuned MM3 and SOC30, no significant associations were found in both the original (B = -.99, SE = 1.12, t = -.88, p = .383) and pooled data (B = -1.00, SE = .87, t = -1.15, p = .252).

Hypothesis 2

To explore the concurrent effects of parental MM on SOC30 over and above the longitudinal effects of MM3, parental MM30 was added in Step 2. The addition of MM30 did not change the negative significant association that was found between appropriate MM3 and SOC30. Furthermore, the addition of MM30 did not reveal a significant model for predicting SOC30 in both the original (B = -51.91, SE = 44.91, t = -1.16, p =.255) and the pooled data (B = -42.72, SE = 40.22, t = -1.06, p = .291). Similarly, no significant associations were found for the addition of non-attuned MM30 in both the original (B = .32, SE = 1.45, t = .28, p = .780) and pooled data (B = 1.37, SE = 1.07, t = -1.29, p = .201).

Discussion and Conclusion

To gain a better understanding of the role of parental MM in the development of children's social competence during the first three years of life, this study aimed to examine both the longitudinal and concurrent associations between parental MM and children's social competence. Regarding the longitudinal effects of parental MM3, a significant negative association was found between appropriate MM3 and SOC30. However, no significant results were found for non-attuned MM3 and the concurrent effects of MM30 over and above the longitudinal effects of MM3. An unexpected finding, that could potentially open up new avenues of research, was the significant correlation between non-attuned MM3 and baby sex.

The first hypothesis, which stated a significant positive effect for appropriate MM3 and a significant negative effect for non-attuned MM3 on SOC30, was rejected. Contrary to expectations, a significant negative association between early appropriate MM and children's later social competence was found. This suggests that within the study sample, lower scores were reported for the social competence of children during toddlerhood when their parents demonstrated higher levels of appropriate MM during infancy. However, this negative association was only significant in the imputed data, not in the original data. Therefore, this finding should be interpreted with caution. Unlike the present study, Colonnesi et al. (2019) did not find a significant association between early appropriate MM and children's later social competence. However, there are some methodological differences between the two studies that might have contributed to the contrasting results. First of all, Colonnesi et al. (2019) assessed children's social competence at 4.5 years, whereas the present study measured this at 30 months. Furthermore, there is a notable difference in the method used to assess children's social competence. While both studies relied on parental reports, the present study used the ITSEA, whereas Colonnesi et al. (2019) used the Social Competence and Behaviour Evaluation-30 (SCBE-30) and Children Social Behaviour Questionnaire (CSBQ). Thus, Colonnesi et al. (2019) incorporated behavioural problems and social difficulties to adjust their total scores of social competence. A second, more theoretical explanation that may help clarify the unexpected results of this study is the lack of potential mediating factors. While previous research has consistently demonstrated direct positive associations between appropriate parental MM during infancy and the subsequent development of various social skills in children, such as empathy and emotion understanding (Centifanti et al., 2016), use of mental-state language (Lundy & Fyfe, 2016), perspective-taking and ToM (Meins et al., 2002, 2003), the findings of the present study, combined with the findings of Colonnesi et al. (2019), might suggest that this association does not directly translate into a direct (positive) association

between appropriate parental MM and social competence, i.e., the practical application of these skills during real-life social interactions. Apparently, additional factors are at play which might mediate the association between parental MM during infancy and children's later social competence. Factors that have been mentioned in the operationalisation of social competence (Dodge et al., 1986; Fabes et al., 2006; Semrud-Clikeman, 2007; van Dam et al., 2003) and might play a mediating role, include environmental factors (e.g., family dynamics and social networks), parental factors (e.g., parenting style and parental involvement), social modelling (e.g., behaviour of significant role models), personal characteristics (e.g., temperament), and the presence of a social system where the child can practise their social skills (e.g., siblings or peers at a daycare centre). Since this study is limited in determining specific factors contributing to the observed negative association between early appropriate MM and children's later social competence, this study could only speculate about possible explanations for the negative association that was found. For example, it might be possible that certain parental behaviours associated with appropriate MM, while fostering the development of specific social skills, inadvertently restrict children's practical application of these skills. Perhaps parents that demonstrate more appropriate MM are also more likely to quickly intervene or take over certain (challenging) social situations in which a child could practise such behaviour. As a result, children are unable to gain real-life social interactive experiences that teach them how to apply these skills in everyday life. However, this explanation for the negative association between early appropriate MM and children's social competence remains speculative. Other contributing factors should also be considered.

No significant association was found between non-attuned MM3 and SOC30, suggesting that, within the study sample, differences in social competence scores during toddlerhood cannot be attributed to whether or not parents demonstrated non-attuned MM during the observations at child-age 3 months. This aligns with the literature that did not find a significant association between non-attuned MM and social skills, such as ToM (Kirk et al., 2015; Meins et al., 2002, 2013a). However, a significant negative association was expected since the only study which actually examined the association between parental MM and children's social competence found this. To elaborate, Colonnesi et al. (2019) reported a significant negative association between non-attuned parental MM at child-age 12 months and children's social competence at 4.5 years old (B = -0.24, $p < 0.05$). However, in line with the findings of the present study, Colonnesi et al. (2019) did not report a significant association between non-attuned MM assessed at 4 months and children's social competence. These findings suggest that non-attuned MM may play a smaller role in the development of a child's

social competence than expected, or that the effects of non-attuned MM may become more prominent at a later age when, for example, when the child's understanding is further developed.

This study did not find evidence for significant associations between MM30 and SOC30. Furthermore, it was found that MM30 did not contribute to the variance in children's social competence over and above the longitudinal effects of MM3, thus rejecting the second hypothesis. In conclusion, no concurrent effects of MM were found for children's social competence and the associations between early MM and children's later social competence do not appear to be (partly) explained by later MM. Significant associations for the concurrent effects of MM over and above the longitudinal effects were anticipated, considering the observed temporal stability between early and late MM in previous studies (Kirk et al., 2015; Meins et al., 2003, 2011) and the significant effect of early appropriate MM on later social skills (Aldrich et al., 2021). Unexpectedly, in the present study no significant correlation was found between MM3 and MM30. Which means that, within this study sample, higher levels of appropriate or non-attuned MM demonstrated by parents at 3 months were not related to higher levels of appropriate or non-attuned MM at 30 months. However, the result regarding the concurrent effects of MM must be interpreted within the context of an important limitation of the present study. To elaborate, the method used in this study to assess MM30 is considered less valid when applied to children older than 12 months (Fishburn et al., 2022; Meins & Fernyhough, 2015). Fishburn et al. (2022) et al. hypothesised that the use of MM to represent the internal state of the child may seem unnecessary in older children, as their verbal and motor development enables them to express their own desires more effectively. Following this line of reasoning, our findings that significantly lower levels of MM were demonstrated by parents at 30 months compared to 3 months makes sense. Thus, there is a possibility that MM towards older children may be expressed differently, see Fishburn et al. (2022) for a more comprehensive study on this subject. In conclusion, late MM could potentially have different effects than those measured in the present study and therefore remains important to investigate further.

An intriguing finding, outside of the research objectives, was the significant positive correlation between baby sex and non-attuned MM3. This finding indicates that within the study sample, parents were more likely to demonstrate non-attuned MM when interacting with their 3-month-old sons compared to their daughters. This finding highlights the potential for further exploration, as limited research exists on the specific child characteristics that influence MM shown by parents (Aldrich et al., 2021). In line with the present study, Meins et al. (2013b)

found no differences in appropriate MM levels observed for 8-month-old boys and girls. However, due to the scarcity of studies investigating non-attuned MM (McMahon & Bernier, 2017), no literature for the association between non-attuned MM and sex of the child exists. If future research can confirm that boys are, from a very early age, exposed to more non-attuned MM than girls, this may be important to better understand previously reported differences in social development between boys and girls (Hukkelberg et al., 2019; Rose & Rudolph, 2006). An important consideration when interpreting the aforementioned results of this study is that parental MM was assessed exclusively at child-ages 3 and 30 months. Consequently, the study provided a snapshot of parental MM and may not fully reflect the overall extent of MM experienced by the child during their early developmental years.

Strengths and Limitations

This study has several strengths. First, this study builds on previous knowledge of the positive impact of MM on the development of important social skills (such as ToM), by being one of the first to examine if MM is also related to the practical application of these skills during real-life social interactions, i.e., children's social competence. The findings of this study indicate that there seems to be a notable distinction between possessing certain social skills and effectively applying them in practical real-life situations. Second, while previous research only focused on longitudinal associations between MM and child outcomes, the present study accounted for any concurrent effects of MM on social competence. It showed that this does not appear to (partly) explain the longitudinal association. Third, this study has made efforts to enhance its ecological validity by utilising the observational method within the home setting, involving both fathers and mothers (Laflamme et al., 2022; McMahon & Bernier, 2017) to provide an as accurate as possible representation of the amount of MM to which children are exposed to in daily life. Furthermore, the excellent inter-rater agreement achieved during the coding process enhances the likelihood of a true depiction of MM (McMahon & Bernier, 2017), further strengthening the study's findings.

However, it is important to interpret the findings of this study within the context of certain limitations. In addition to the previously mentioned difficulties with the assessment of MM at 30 months of age, the most important limitation was the substantial amount of missing data. Out of 139 unique parent-child dyads, less than a third of the dyads had complete data. Because such a small sample size limits the representativeness of the study population, as well as the statistical power (Schafer & Graham, 2002), MI was used which is a reliable way to impute data (Schafer & Graham, 2002; Sterne et al., 2009). Although MI does not provide an exact representation of the actual values in the sample and relies on certain patterns within the

existing data, the likelihood of bias as a result of MI is considered to be minimal (see van Ginkel et al. (2020) for a comprehensive explanation). Additionally, to minimise bias, this study has diligently followed various guidelines (Sterne et al., 2009; van Ginkel et al., 2020; Woods et al., 2021), met the assumption of MCAR, and conducted all analyses using both the complete cases and the imputed data, yielding largely similar results. Another limitation of this study is the assessment of children's social competence, which relied on parental ratings, introducing the potential for subjective bias (Miller et al., 2017). Consequently, the obtained scores for children's social competence primarily reflect the parents' subjective perception rather than providing an objective representation of the children's actual social competence. Since both MM and SOC30 are based on what a parent reports or demonstrates, it is possible that an unwanted relationship exists here (e.g. parents demonstrating higher levels of non-attuned MM might face challenges in accurately assessing their child's social competences), which could potentially have influenced the results of the study. Furthermore, the internal consistency in the present study sample was evaluated as questionable ($\alpha = .68$) which suggests that the construct of social competence could have been measured more optimally by using other questionnaires or employing objective measurement methods such as observations. However, the study by Carter et al. (1999) has shown a significant agreement between mothers' ratings of their children's social competence on the ITSEA and their observed behaviour in laboratory settings, suggesting a certain degree of validity in parental ratings. It is worth noting that Colonnesi et al. (2019) also employed parental ratings in their study, enabling meaningful comparisons between the two studies.

Suggestions for Future Research and Implications

Suggestions for future research include collecting a larger dataset and eliminating the need for data imputation, thus enabling more direct generalisation of the results to the general population (Schafer & Graham, 2002). Furthermore, future research should focus on investigating mediating variables, such as individual characteristics (e.g., temperament) and other parental (behavioural) factors (e.g., parents providing practice situations). Examining these mediating factors will enable a more nuanced understanding of the underlying processes, shedding light on why the association between appropriate MM during infancy and later social competence may be unexpected or more complex than initially thought. Future researches exploring the concurrent effects of MM should employ adjusted methods for assessing MM in older children, as recommended by Fishburn et al. (2022). Moreover, an objective measurement method such as observations could be used to assess children's social competence. Lastly, this study has opened up a relatively new research field, which future

research can build upon by investigating the association between specific child characteristics (such as gender) and levels of demonstrated MM by parents.

While it is challenging to provide specific recommendations for practical implications based on the findings of this study, valuable insights have been gained that could potentially guide interventions with further research. One notable finding suggests the importance of considering not only promoting individual social skills, but specifically focusing on the practical application of these skills in real-life social interactions. Furthermore, this study draws attention to the potential existence of gender differences that may manifest early in a child's life. While further research is needed to fully understand these differences, it suggests that there might be a need for increased awareness and exploration of effectively reading and responding to the internal mental state of boys by parents and maybe even teachers or other caregivers.

This study has contributed to the literature as one of the pioneering studies examining both the longitudinal and concurrent associations between parental MM and children's social competence. Furthermore, this study has shed light on important aspects such as the potential bridge between theoretical social skills and their practical application in daily-life social interactions. Lastly, it has raised awareness of the possibility of gender differences in parent-child interactions. These findings provided a foundation for future research to build upon and continue to expand our knowledge in order to improve children's social development, ultimately contributing to their overall well-being.

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Appendix A

Transcribing and Coding Process of T_2 Data

During previous projects, the T_2 data, which involved measuring MM at 3 months, was coded by two different trained research teams. The majority of the videos (n = 84, 60%) underwent coding using a computer software called “The Observer”. This software coded verbal expressions in real-time, categorising them as either mind-related or not, and also assessed the appropriateness of these comments, resulting in categorical data. Within this set of videos, 20% were double-coded, leading to a strong agreement between raters regarding the frequency of mind-related comments ($\kappa = .86$). The remaining T_2 data (n = 55, 40%) underwent transcription and coding in a similar manner as the T_3 data, as explained in the method section. For this subset of data, the inter-rater reliability was determined using the Intraclass Correlation Coefficient (ICC), with 20% of the data being double-coded. The reliability was found to be excellent for the proportion score of appropriate mind-related comments (ICC = .83), the proportion score of inappropriate comments (ICC = .95), and the proportion score of the total number of comments (ICC = .92), following the guidelines established by Cicchetti (1994).

Appendix B

Used ITSEA Items

Table B1

Used ITSEA Items in Dutch and the Original ITSEA Items

Subscale	Item	Dutch item	Original ITSEA item	Section	Item
Empathy	1	Probeert uw kind u op te vrolijken als u van slag bent?	Tries to make you feel better when you're upset.	B	51
	2	Probeert uw kind het goed te maken als hij/zij zich heeft misdragen?	Tries to "make-up" for misbehaving.	B	57
	3	Is uw kind zich bewust van de gevoelens van anderen?	Is aware of other people's feelings.	B	63
	4	Probeert uw kind te helpen als iemand zich pijn heeft gedaan, geeft bijv. speelgoed?	Tries to help when someone is hurt (for example, gives a toy).	A	22
	5	Is uw kind bezorgd of overstuur wanneer iemand zich pijn heeft gedaan?	Is worried or upset when someone is hurt.	B	56
	6	Praat uw kind over gevoelens van anderen, bijvoorbeeld 'mama boos'?	Talks about other people's feelings (for example, "mommy mad").	C	4
	7	Maakt uw kind grapjes of doet dingen om u (hard) aan het lachen te maken?	Jokes or gives you things to make you smile or laugh.	B	73
Prosocial Peer	8	Vraagt uw kind vriendelijk om dingen tijdens het spelen met andere kinderen?	Asks for things nicely when playing with children.	D	3
Relations	9	Speelt uw kind goed met andere kinderen? (uitgezonderd broer of zus)?	Plays well with other children (not including brother or sister).	A	19
	10	Kan uw kind zijn/haar beurt nemen en geven wanneer hij/zij met anderen speelt?	Takes turns when playing with others.	D	1
	11	Heeft uw kind ten minste één lievelingsvriendje (een kind)?	Has at least one favorite friend (a child).	D	4
	12	Speelt uw kind vadertje en moedertje ('huisje') met andere kinderen?	Plays "house" with other children.	D	7

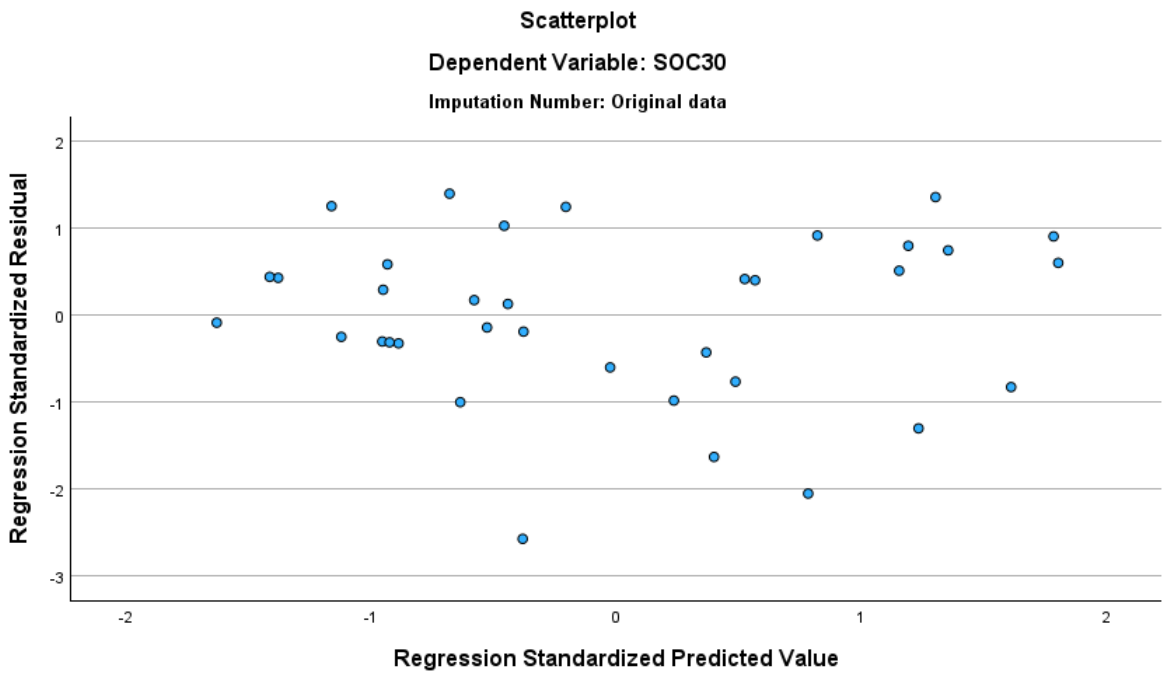
Appendix C

Scatterplot for Assumptions of Linearity and Homoscedasticity (Appropriate MM)

In Figure C1 a plot of *ZRESID against *ZPRED for the relationship between appropriate MM and SOC30 in the original data is presented. The assumptions of linearity and homoscedasticity were not tested for non-attuned MM as this is a binary variable. Scatterplots for the imputed data (20 datasets) are available upon request.

Figure C1

Scatterplot SOC30 (original data)



Appendix D

Histograms and P-P Plots to Test Normality of Residuals

This Appendix presents histograms and P-P Plots to test for normality of the residuals in the original data. Histograms and P-P plots for the imputed data (20 datasets) are available upon request.

Figure D1

Histogram SOC30 for Appropriate MM

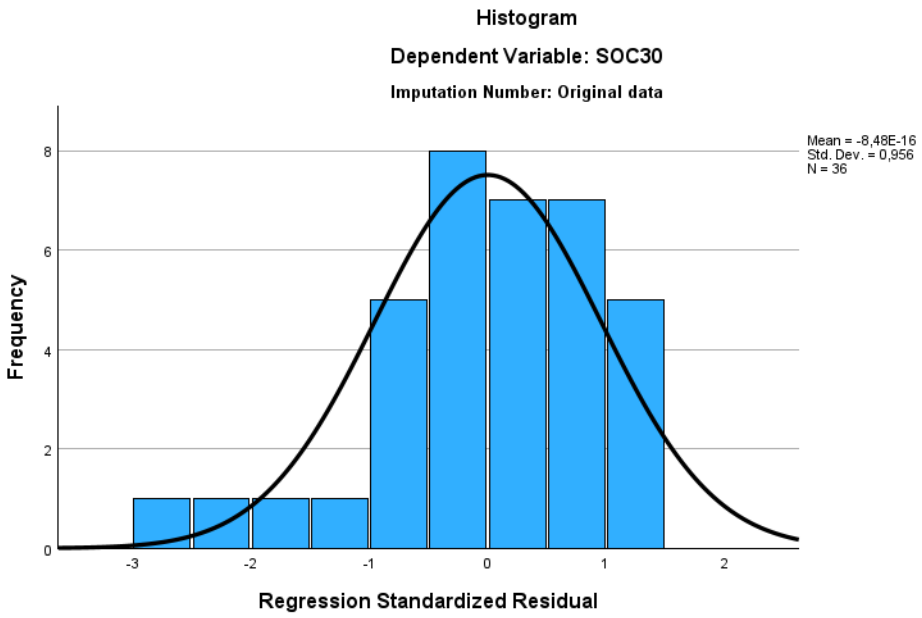


Figure D2

P-P plot SOC30 for Appropriate MM

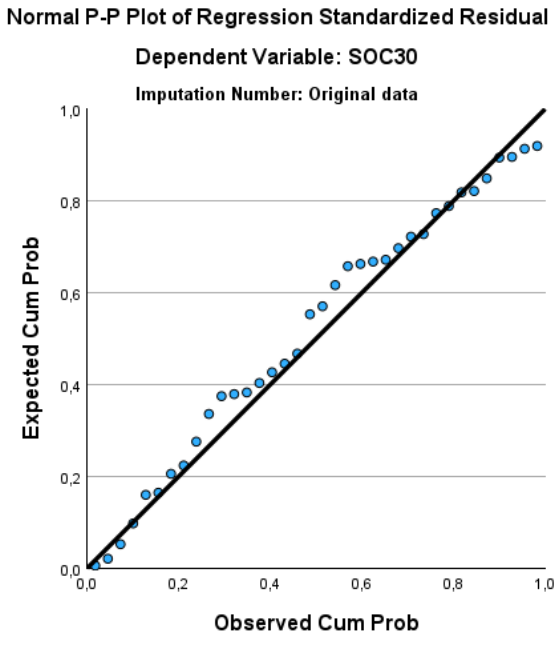


Figure D3

Histogram SOC30 for Non-attuned MM

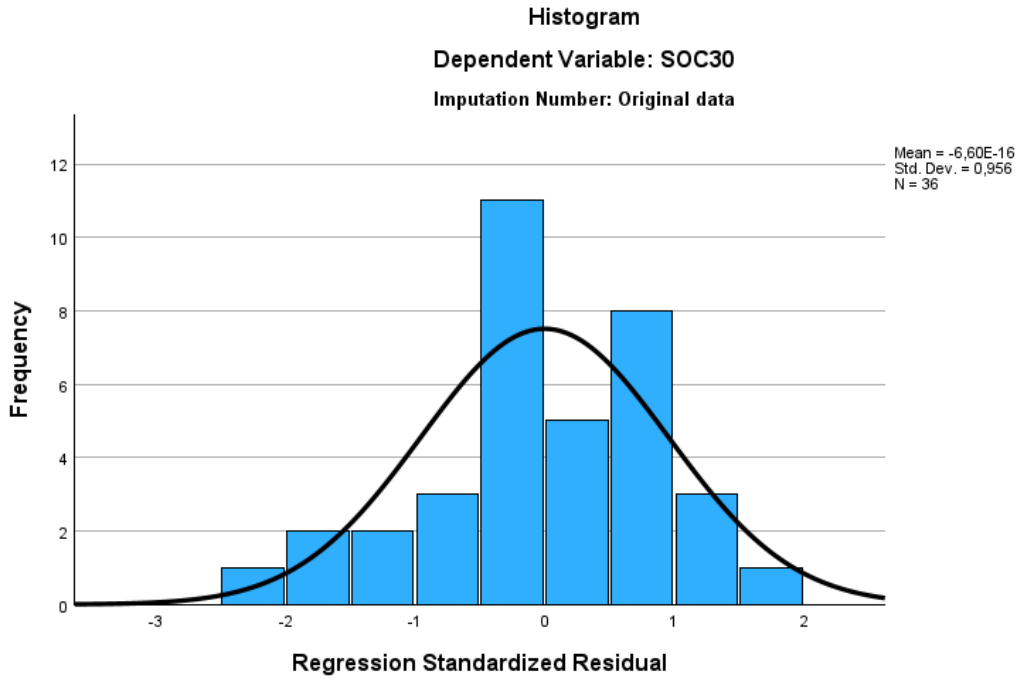


Figure D4

P-P plot SOC30 for non-attuned MM