Turkish validation of the maternal responsiveness global rating scale in slow-to-talk toddlers

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ABSTRACT

Background. The relation between maternal responsiveness and language development has been shown in previous literature however it is difficult to evaluate responsiveness because of the difficulties involved when coding the specific patterns of parent-child interactions. The maternal responsiveness global rating scale is important because it requires less time and expertise from professionals and predicts the language outcome of children. The aim of the study was to adapt the Maternal Responsiveness Global Rating Scale into Turkish, thereby making it accessible to a variety of professionals, and creating a way to use this useful scale.

Methods. Twenty-seven 18- to 42-month old children who had been admitted to the Developmental Pediatrics outpatient clinic with concerns of speech delay and had received a diagnosis of language disorder with the standardized language test were included in the study. The general development and language development of each participant was evaluated using Denver II, Bayley-third edition and Pre-school Language Scale-5. After the translation study of the Maternal Responsiveness Global Rating Scale, video collecting and rating procedures and finally reliability and validity analyses were implemented.

Results. The results of this study demonstrated that the Turkish translation of the Maternal Responsiveness Global Rating Scale shows strong evidence of adequate reliability and validity and is a feasible tool to measure responsiveness in routine child health care practice for children with language delay.

Conclusions. This in expensive, easy-to-use and reliable tool may be recommended in order to identify which slow-to-talk toddlers and their mothers need early intervention and may be used by community-based practitioners and researchers in Turkey to support language development during early intervention stages.

Key words: maternal responsiveness, language development, Turkish validation.

Language acquisition is a fundamental domain of child development and one of the main concerns in early childhood due to the high frequency of its delay and adverse consequences. The prevalence of language delay is known to be as high as 20 % in pre-school children.[1] Persistent speech and language delay causes poor academic achievement, and behavioral, emotional and social maladjustment. Therefore early identification and intervention is a priority for all nations.[2]

It is widely accepted that the acquisition of language occurs through the interaction of biological and environmental factors. Within this context many studies have investigated the most significant predictive factors of language development.[2] Maternal responsiveness has been shown as a strong predictor of later language scores.[3] Since language learning is shaped by the experiences of a child, maternal responsiveness is an essential component of language development. Maternal responsiveness is identified as a kind of parenting behavior with ''the prompt, contingent and appropriate responses to a child's initiations''.[2] This pattern of parent-child interaction has been demonstrated to promote language development based on the reason

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that if a caregiver is more responsive, the child is more likely to be involved in learning new language skills.[3]

Maternal responsiveness overlaps with the social interaction context of child development, in which language development occurs especially through interactions between the child and caregiver. Responsiveness supports reciprocal conversation and stimulates language learning by allowing the child to initiate the interaction and then to receive suitable meaningful responses from the parent. This course also streamlines the working memory process and makes the child more receptive to new inputs.[3,4]

Another important role of maternal responsiveness for language development is that it provides joint attention.[5] Rather than redirecting the attention, focusing on a child's current interest is a good opportunity to maintain a language rich environment for a child. Previous literature has shown the positive relation between the duration of joint attention and language development in child-parent interactions.[5,6] The content of parental responses is also related to joint attention. Using developmentally appropriate language for a child's communicative acts meets their developmental needs and affects responsiveness as a result.[7]

Although the relation between maternal responsiveness and language development has been demonstrated in previous literature, it is difficult to evaluate responsiveness because of the difficulties involved when coding the specific patterns of parent-child interactions; it requires training, time and expertise. On the other hand, global rating systems are less complex; require little training and are less time-consuming with the rater's subjective estimates for a specific behavior pattern.[3,8]

The maternal responsiveness global rating scale is important because it requires less time and expertise from professionals and predicts the language outcomes of children. The scale was based on Marfo's description of maternal

responsiveness in 1992; ''The mother responds appropriately to the child's cues and signals, interests, and overt behavior''. Maternal behaviors should also be conducted in a developmentally appropriate way so as to be identified as responsive. In addition to maternal responsiveness, ''maternal directiveness'' which had been identified by Marfo as ''the extent to which the mother uses hints, requests, commands and other controlling behaviors or actions to get the child to do what she wishes and follow her lead'' has been considered and involved in the scale.[3,9]

In terms of the importance of the first 3 years of life, which involve rapid brain growth and constitute a sensitive period for neuronal plasticity; parental attitudes have a unique and powerful effect on developmental trajectories. Maternal responsiveness is an essential component of language development and predicts the language outcome of children.[3] This inexpensive, easy-to-use and reliable tool can be recommended even in busy clinics in order to identify which slow-to-talk toddlers and their mothers need early intervention. Moreover, it may be used by community-based practitioners and researchers in our country to support language development during the early intervention stages. However there is no valid measurement to evaluate maternal responsiveness specifically in Turkey.[10] Therefore the aim of the study was to adapt the Maternal Responsiveness Global Rating Scale into Turkish, thereby making it accessible to a variety of professionals, and creating a way to use this useful scale in our culture.

Material and Methods

Participants and Procedure

After receiving ethical approval (GO 16/499), the study was conducted at Hacettepe University Ihsan Dogramacı's Child Hospital, Division of Developmental Pediatrics. The study began after obtaining the approval of Penny Levickis who created the Maternal Responsiveness

Global Rating Scale[2,3] and, was conducted between August 2016 and January 2017. Twenty-seven 18- to 42-month- old children, who had been admitted to the Developmental Pediatrics outpatient clinic with concerns of speech delay and had received a diagnosis of language disorder with the standardized language test, were included in the study. The inclusion criteria were having no cognitive delay and no sensorial deficit (hearing and viewing). The exclusion criteria were a diagnosis of autism spectrum disorder, genetic, neurological and other chronic conditions. Each patient was examined by a developmental pediatrician and screened for eligibility for the study and the general development and language development of participants were evaluated using Denver II GTT[11], Bayley 3[12] and Pre-school Language Scale 5 (PLS-5).[13] After receiving written consent from their families, participants were requested to record videos while they were playing with their children following the instructions of the Maternal Responsiveness Global Rating Scale. During the study course the treatment and follow-up of the participants were continued in the Developmental Pediatrics outpatient clinic.

The translation study of the Maternal Responsiveness Global Rating Scale

The scale was translated into Turkish without any changes by two native speakers of Turkish. Turkish translations were examined by the study team and the most appropriate expressions were determined. The translation was then back-translated into English by two native speakers of English. The obtained scale was compared to the original scale by the study team, and the suitability of the translation and the similarity of meaning were discussed. Subsequently a definitive final translation was obtained.

Video collecting and rating procedure

Participants were instructed to follow the same procedure as in the original scale at their first appointment. All mothers were requested to play with their children for fifteen minutes

in their home environment, as they would normally, using one of the two sets of toys (farm or nurturing set). In the original scale a free-play with a standard set of farm and nurturing toys was videotaped by a research assistant in the home environment for fifteen minutes. In this study, a different technique was used in which the participants were requested to play with their own sets of farm and nurturing toys and to make the recording by themselves. The creator of the scale Penny Levickis approved this technical difference by noting that it could potentially deal with the issue of parents behaving differently when they knew they were being watched by the researcher, so this could be a benefit of the method which we have used. We also considered the idea of being able to reach more people by more professionals. After the collection of all videos, they were watched twice over with twenty-five day intervals by two blind researchers. Interrater and intrarater consistency was calculated in this way. It was scored using the 5-point Likert scale as in the original scale in which 1 is ''very low'' responsiveness and 5 is ''very high'' (Table I).

Evaluation tools

Maternal responsiveness was evaluated by the Maternal Responsiveness Global Rating Scale in pursuance of the aim of the study. It accounts for the frequency of developmentally appropriate and desirable maternal responses to a child's verbalization/gestures, as well as for less desirable maternal directive behaviors (attempts to redirect the child's attention from the current activity).[14] In one community-based sample with slow-to-talk toddlers, 246 parent-child interactions were randomly and blindly coded for specific maternal behaviors. A detailed overall score of maternal responsiveness was derived by summing the mean frequencies per minute of four individual behaviors.[2] The higher scores showed more maternal responsive behaviors; and subsequently The Maternal Responsiveness Global Rating Scale was developed using the 5-point Likert scale by 2 independent researchers blinded to the children's language scores. The global

Table I. Maternal Responsiveness Global Rating Scale.

Rating	Definition
1 = very low	Mother rarely responds in a developmentally appropriate way either verbally or non-verbally to any of Child's gestures or verbalizations AND Mother attempts to redirect Child's behaviour, rather than following Child's interests
2 = low	Mother responds occasionally in a developmentally appropriate way either verbally or non-verbally to Child's gestures or verbalizations AND/OR Mother spends more time attempting to redirect Child's behaviour than following Child's interest
3 = moderate	Mother spends some time responding in a developmentally appropriate way either verbally or non-verbally to Child's gestures or verbalizations, and some time ignoring them AND/OR Mother spends equal time following Child's interest and redirecting Child's behaviour
4 = high	Mother often responds in a developmentally appropriate way either verbally or non-verbally to Child's gestures or verbalizations AND/OR Mother spends more time following Child's interest than redirecting Child's behaviour
5 = very high	Mother frequently responds in a developmentally appropriate way either verbally or non-verbally to Child's gestures or verbalizations AND Mother does not attempt to redirect Child's focus from the current activity, but follows Child's interests

Note: Specification of extent of maternal directiveness: 'redirecting the child's behaviour' refers to redirecting the child's attention away from their current play and interests at that point in time. Source: Adapted from Marfo (1992: 224).

rating scale was compared with the detailed responsiveness scores in the same sample by Down et al.[14] and strong evidence of moderate correlation between the global and detailed ratings of maternal responsiveness with Pearson correlation coefficients ($r(242)=0.44$; $p< 0.001$) was found. Furthermore, a substantial inter-rater agreement (0.61-0.80) was indicated with Cohen' s kappa of 0.79 (84.6%).[2,3,14] The global rating scale is on a Likert scale from 1 to 5 with 1 being very low responsiveness and 5 being very high responsiveness. While this global rating scale provides a measure of responsiveness that is less demanding on the rater and saves substantial time.[3]

Mother-child interaction was evaluated with the Piccolo.[15] The Piccolo is used to score parent–child interactions with 10-minute video recordings. A Turkish adaptation was conducted by Bayoğlu et al.[10] involving Turkish mothers interacting with their children and good reliability and validity were demonstrated. In this study the subdomain of Responsiveness was used separately.

The general development of each child was evaluated with Denver II and Bayley-Third Edition Developmental Assessment Tests.

Denver-II- Developmental Screening Test was initially developed for the developmental screening of 0 to 6-year-old children by Frankenburg and Dodds.[16] The adapted Turkish version was used in the study.[11] The Bayley-Third Edition Developmental Assessment Test is one of the most frequently used developmental evaluation tools worldwide. The test assesses cognitive, language and motor development in children aged between 1– and 42 months confidently with high internal consistency and test-retest reliability.[12] There are no Turkish norms for the Bayley-III so we used original norms for the scoring as in general.

Language development was evaluated with the Pre-school Language Scale 5 (PLS-5). PLS-5 is a language test which is widely used in children aged between 0- and 7 years 11 months to assess receptive and/or expressive language skills. It was adapted for Turkish children by Sahlı and Belgin and found to be a valid and reliable language test in our cultural context.[13]

The questionnaire for the sociodemographic data was prepared by the study team. Socio-economic status (SES) was determined using the Hollingshead Redlich Scale which was based on the profession and training of both parents.[17]

All tests were conducted by an experienced and certificated developmental pediatrician and a child development specialist in the study team.

Data analysis

Numerical variables were evaluated for normality and parametric tests were used for data with normal distributions whereas non-parametric tests were used otherwise. Concurrent validity of the Maternal Responsiveness Global Rating Scale was analyzed with the Spearman rho correlation coefficient using the responsiveness sub-domain of the Piccolo. Known group validity was analyzed using the cut-off point of the responsiveness sub-domain of the Piccolo and the groups were categorized as responsive (group without risk) and non-responsive (group with risk). The distributions of Maternal Responsiveness Global Rating Scale were compared by Mann Whitney U test in each group. Receiver operating characteristics (ROC) analyses were used to determine the diagnostic accuracy of the Maternal Responsiveness Global Rating Scale. The area under the ROC curve (AUC) was calculated as a measure to assess the accuracy of the Maternal Responsiveness Global Rating Scale. Intra-class Correlation Coefficient (ICC) and Weighted Kappa were used for the reliability analyses. The Intra-class Correlation Coefficient (ICC) was calculated to determine both the intra and inter-rater reliability. For test-retest comparison and inter-rater reliability, we used the weighted Kappa coefficient. The power analysis of the study was made with NCSS 2007 in PASS programme. P value <0.05 was defined as the limit of significance. All statistical analyses were performed using IBM SPSS Statistics 23.0 software.

Results

Twenty-seven children with language delay and mother-child interactions were included in the study. However two records were excluded from the study. In one of them the parent playing with the child was the father and, in the other the quality of the video was too low to rate. One video from each participant was collected.

Finally, twenty-five mother-child dyads were analyzed. The mean ages of patients were 31 ± 6.6 months with a range of 12-41 months and, 64% of them were male (n = 16). The mean maternal age was 30.3 ± 4.3, and the mean age of the fathers was 34.5 ± 5.3. Mothers were mostly educated ≤ 8 years (84%) and housewives (88%). The number of children in the household was usually 2 (56%) and they were mostly the second child (60%) in the family. Most of the participants were term (mean 38.4 ± 1,95 weeks) and normal birth weight (mean 3377 ± 627 gr). Our median rating of maternal responsiveness was 2 (range 1-4). Detailed sociodemographic data of participants, child language outcomes and maternal responsiveness ratings are shown in Table II.

Reliability Analyses

The intraclass correlation coefficient (ICC) and Weighted Kappa were used for the reliability analyses. ICC for intra-rater reliability were 0.912 and 0.827 (p < 0.001) of Rater-1 and Rater-2 for Time-1(T1) and Time-2(T2), respectively. ICC for inter-rater reliability were 0.897 and 0.762 (p <0.001) of Rater-1 and Rater-2 for T1 and T2, respectively. Weighted Kappa was also used for the reliability. The values of kappa for intra-rater reliability were 0.8196 and 0.6753 (p <0.001) of Rater-1 and Rater-2 for T1 and T2 showing 93.3% and 88% compliance, respectively. The values of Kappa for inter-rater reliability were 0.7222 and 0.6324 (p <0.001) of Rater-1 and Rater-2 for T1 and T2, respectively. The reliability analyses are shown in Table III.

Validity Analyses

Concurrent validity of the Maternal Responsiveness Global Rating Scale was analyzed with the Spearman rho correlation coefficient using the responsiveness sub-domain of the Piccolo. For Rater 1 and Rater 2, r= 0.887 and r= 0.816, respectively with a significance of p <0.001.

Known group validity was analyzed using the cut-off point of the responsiveness sub-domain

Table II. Characteristics of the participants, child language outcomes and maternal responsiveness ratings.

Variables	Total sample (N=25)
Children	
Mean Age (month ± SD)	31 ± 6.6
Male % (n)	64 (16)
Term born % (n)	92(23)
Number of children at home (median)(range)	2(1-4)
Number of the child (to be the second child) % (n)	60 (15)
PLS5 standard scores of children (mean ± SD)	
Expressive	74.3 ± 3.4
Receptive	92.1 ± 7.4
Total	84 ± 8.9
Mothers	
Maternal age (mean ± SD)	30.3 ± 4.3
Maternal education(≤8 years) % (n)	84 (21)
Maternal employment(housewife) % (n)	88 (22)
Married % (n)	100 (25)
SES*(range:2-4) % (n)	
Class 2	36 (9)
Class 3	48 (12)
Class 4	16 (4)
Maternal Responsiveness Global Rating(median)(range)	2(1-4)
% (n)	
1= very low	40(10)
2= low	28(7)
3=moderate	24(6)
4=high	8(2)
5=very high	0(0)

PLS5: Preschool Language Score_5, SES: Socioeconomic status SD: standard deviation *: Hollingshead Redlich Scale provides categorical results according to the profession and training of both parents and lower levels of the classes demonstrate higher SES.

Table III. The reliability analyses of the Maternal Responsiveness Global Rating Scale.

	ICC	WKappa
intra-rater reliability*		
Rater 1	0.912	0.8196
Time 1-Time 2		
Rater 2		
Time 1-Time 2	0.827	0.6753
inter-rater reliability*		
Time 1		
Rater1 –Rater 2	0.897	0.7222
Time 2		
Rater1 –Rater 2	0.762	0.6324

ICC= Intraclass Correlation Coefficient and WKappa= Weighted Kappa
*: $p < 0.001$ for all reliability analyses.

of the Piccolo and the groups were categorized as responsive (group without risk) and non-responsive (group with risk). The distribution of the results of the Maternal Responsiveness Global Rating Scale was analyzed with the Mann Whitney U test in each group. Maternal Responsiveness Global Rating scores of Rater-1 and Rater-2 were compared with the groups of the PİCCOLO which were categorized as group with risk and group without risk and found to be p <0.001 for both raters (Table IV).

Receiver Operating Characteristics (ROC) analyses were also used to observe the performance of the scale for classification. Area under the curve (AUC) can take values between 0.5- 1.0. As the value is closer to 1.0, the classification performance of the test increases. The closer the curve to the left upper corner, the better the test.[18] Area under the curve for Rater 1 and Rater 2 were 0.961 and 0.951, respectively (Fig. 1). The standard error for Rater-1 and Rater-2 were 0.033 and 0.039, respectively and p <0.001 for both of them.

There was no association between the sociodemographic characteristics and maternal responsiveness in the correlation analysis. Additionally the power analyses of the scale were implemented via the performance of classification of the scale and found to be 100% power.

Discussion

The results of this study demonstrate that the Turkish translation of the Maternal Responsiveness Global Rating Scale shows strong evidence of adequate reliability and validity and is a feasible tool to measure responsiveness in routine child health care
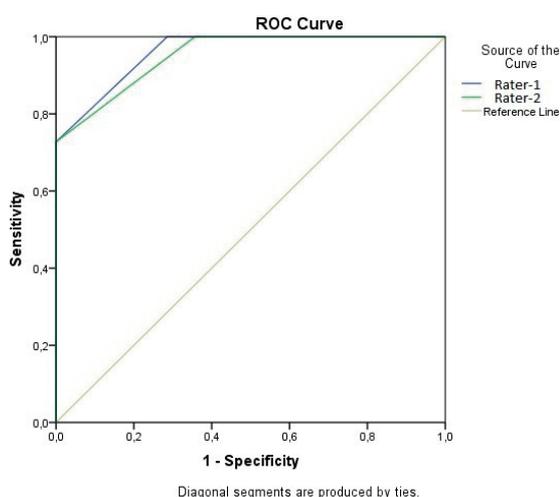

Fig. 1. Receiver Operating Characteristics (ROC) Curve of Maternal Responsiveness Global Ratings of Rater-1(R1) and Rater-2(R2). The area under the curve (AUC) for both raters are close to 1.0 and the curves are close to the left upper corner; R1_AUC:0.961, R2_AUC: 0.951.

practice for children with language delay in Turkey.

The contribution of maternal behaviors to early language development and the predictive potential of the scale have been previously shown at the population level by Levickis et al.[2] and Hudson et al.[3] With the adaptation of this scale to Turkish we hope to open the way to use it in studies with new hypotheses and facilitate any research in this area. It is important as this method does not require any transcription or coding software, unlike detailed coding methods, and therefore reduces both cost and time and is of a user-friendly nature for health professionals since only brief training is necessary. Furthermore as the free-plays were videotaped in a home environment, the settings are thought to be more representative of the natural parent-child dyad rather than laboratory

Table IV. Known group validity analyses of the Maternal Responsiveness Global Rating Scale.

Maternal Responsiveness Global Rating scores	Group with risk n=14	Group without risk n=11	p
Rater1(median)(range)	1(1-1)	3(2-4)	0.000
Rater2(median)(range)	1(1-2)	3(3-4)	0.000

The groups were identified with risk and without risk according to the cut -off point of the Piccolo and, Maternal Responsiveness Global Rating scores were analyzed by the Mann-Whitney U test.

or clinic-based observations.[3,14,19] The technical difference in our study which includes playing with their own toys (sets of farm and nurturing toys) and recording by themselves may provide a closer approach to the natural environment for such interactions. Besides, enabling its' use by many professionals should be considered in low and middle- income countries where technical difficulties have been present.

In the population-based study with slow-to-talk toddlers the average rating of maternal responsiveness has been found to be 3.3 ± 0.9 and one-fifth of mothers have been rated 'low' or 'very low' on the global scale.[3] In our study we found that 68% of mothers were rated 'low' or 'very low' and the median rating of maternal responsiveness was 2 (range 1-4). Our average rating of maternal responsiveness was lower and the number of mothers with high responsiveness was less than in the original study. Additionally, our children's mean expressive language scores were lower than those of the original study (74.3 ± 3.4 compared to 90.5 ± 12.1). Uncontrolled variables such as socio-economic level between two study samples could be the reason for these differences. Another possible explanation of this finding is that, as has been noticed in the study, low maternal responsiveness is associated with lower language scores.[3] This result also contributes to existing literature by providing evidence regarding the importance of maternal responsive behaviors for early language development. Several descriptive studies have described the causal influence of parental responsiveness on child development. Children whose parents display a high level of responsiveness have been reported to have better communication, cognitive and socio-emotional functioning.[20-23] Therefore interventions including responsive behavior teaching strategies have been recommended to encourage parents to promote dimensions of engagement. It has been asserted that these behaviors maintain the processes of developmental learning that depends on the increasing frequency of using such behaviors.[24] Furthermore, in our study, the use of a video-

recording procedure in their own environment at home and without an observer may have reflected more natural behavior of the participants. There are some methodological issues relating to direct observation of parent-child interaction in literature.[19] The type of task imposed by the observer, directing the parent and child to play rather than observing spontaneous interaction and the location of the observations such as in a clinic or laboratory rather than at home have been technical concerns discussed in observational studies. Although it has been suggested that the presence of an observer does not disturb the nature of interactions, a review of a number of studies in this area has reported that interactions in structured or artificial settings are not necessarily representative of those normally taking place at home.[19]

To the best of our knowledge this is the first time that low maternal responsive ratings have been demonstrated in children with language delay in Turkey. As the early identification and intervention of language delay are crucial, evaluating maternal responsiveness is noteworthy to enable the support of both parents and children during the critical developmental stages.

The small sample of the study was the main limitation. Cultural differences should be considered in this context. Our patients were not willing to record their natural home environment. One of the videos was excluded from the study because the person who was playing with the child was the father despite the precise instructions. However, the power analysis of the study has demonstrated that the sample was large enough to enable the adaptation of the scale with this video recording procedure.

We have investigated the reliability and validity of the Maternal Responsibility Global Rating Scale and indicated good reliability and validity of the scale in Turkey. This inexpensive, easy-to-use and reliable tool may be recommended in order to identify which slow-to-talk toddlers and their mothers need early intervention and

may be used by community-based practitioners and researchers in Turkey to support language development during the early intervention stages.

Acknowledgement

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