The Use of Non-Verbal Repair Strategies By Children With Autism

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Deb Keen

University of Queensland

Address correspondence to Dr Deb Keen, School of Education, University of

Queensland, Brisbane QLD 4072 Australia. deb.keen@uq.edu.au

Abstract

This study examined possible links between the occurrence of prosodic changes to vocalizations and gestures and the use of problem behaviors by children with autism when attempting to repair communication breakdowns. The repair strategies of six children with autism aged 2 – 5 years and with fewer than 10 words or signs were analyzed. Mother-child dyads were videotaped at home interacting in naturally occurring contexts. Videotapes were analyzed and coded for communication breakdowns and repair attempts made by the child. Repairs were further analyzed according to the type of repair strategy used, changes in prosidy, and whether the repair mode involved problematic or non-problematic behavior. Results indicated that in most situations, this group of children attempted to repair breakdowns in communication that occurred while interacting with their mothers. Most used both non-problematic and problematic behaviors and were less likely to use augmentations as a repair strategy than repetitions and substitutions. Some repetitions and some augmentations involved the use of gestures or vocalizations with increased emphasis or prosidy. Possible links between repair strategies involving increased prosidy and the use of problem behaviors are discussed together with the implications and significance of these finding in relation to early intervention for children with significant communication impairments.

As children move through the prelinguistic period of development, there are often times

when their attempts to express their needs and wants are overlooked or misunderstood by

a communication partner (Yoder, Warren, Kim, & Gazdag, 1994). This may occur

because at this stage of development, the child is reliant on non-verbal behaviors such as

gestures and vocalizations that may be ambiguous or difficult to interpret (Houghton,

Bronicki, & Guess, 1987). As communicative competence increases, children are able to

use more intentional and symbolic forms of communication that are easier to understand

and interpret, thereby decreasing, although not eliminating, the occurrence of

communication breakdowns (Wetherby, Reichle, & Pierce, 1998).

When communicative attempts are overlooked or misinterpreted, typically developing

children often try to repair the communication breakdown by repeating or modifying their

initial signal (Golinkoff, 1986). The ability to repair appears to rely on the acquisition of

(1) intentionality or goal directedness, (2) the ability to recognize that a breakdown has

occurred and to understand the needs of the communication partner, and (3) effective

verbal and/or non-verbal communicative means or forms (Alexander, Wetherby, &

Prizant, 1997). For typically developing children, this occurs around 12 months of age,

when gestures, vocalizations or a combination of the two are used to repeat, augment, or

substitute for an initial signal that has failed.

As a result of communication and social impairments, children with autism are more

likely to experience communication breakdowns than their typically developing peers

(Keen, 2003). There are several factors that may contribute to the breakdown of

communicative exchanges for children with autism. First, children with autism experience joint attention deficits involving the coordination of attention between the child, another person, and an object or event (Sigman & Kasari, 1995). These behaviors help to involve a communication partner in an exchange and focus his/her attention on the object or activity that is of interest to the child. Ambiguity of meaning or a failure to attend to the child's signal may result when a child is unable to direct a caregiver's attention toward a desired object through the use of eye gaze, gesture, vocalization or a combination of these forms.

Second, with up to 50% of children with autism failing to develop functional language, on-going reliance on prelinguistic forms of communication is more common for this group of children (Wetherby & Prizant, 1992). These forms generally lack the sophistication of more symbolic modes of communication, increasing the risk that the child's message will be misinterpreted (Butterfield, 1991). Children with autism are also more likely to use unconventional forms of non-verbal communication not seen in their typically developing peers. For example, informal gestures, aggression, self-injury, and the direct manipulation of an adult's hand are behaviors that this group of children may use to communicate (Carr & Kemp, 1989; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997). Once again, breakdowns are more likely when these forms are used, particularly when they are used with an unfamiliar communication partner.

The research on the use of repair strategies for children with autism is surprisingly scant given the increased risk of communicative breakdowns. A study of repair strategies

undertaken by Alexander et al. (1997) included six children with pervasive

developmental disorders (PDD). These children were found to use gestures to repair and

while they used a range of repair strategies, they tended to modify rather than repeat the

initial communication signal. When examining the gestural forms used by this group of

children, Alexander and her colleagues found that the children sometimes used gestures

and vocalizations that were more exaggerated and emphatic than the original signal.

Some changes in emphasis were also evident with a group of children who were hearing

impaired (HI) although there were differences between these groups. Changes in vocal

prosidy occurred in 25% of the repairs of children with PDD but did not occur at all for

the HI group. The use of more emphatic gestures, or 'gestural prosidy', occurred with

both groups. The researchers noted that prosodic changes appeared to be associated with

negative emotion for the children with PDD.

This raises the question of whether some problem behaviors observed in children with

PDD may actually be associated with repair attempts involving prosodic changes to

vocalizations or gestures. For example, a failed vocalization used to request a toy could

become a yell or scream, while a tap to request help that goes unnoticed could become a

hit. With problem behavior occurring more frequently in children with autism (Dunlap,

Robbins, & Darrow, 1994), increasing our understanding of possible pathways whereby

children develop more disruptive behaviors to communicate is critical. The aim of this

study was to examine possible links between the occurrence of prosodic changes and the

use of problem behaviors by children with autism and less than 10 words when

attempting to repair communication breakdowns.

Method

<u>Participants</u>

Six mother-child dyads participated in the study. Children were aged between 3 and 5 years and had received a diagnosis of autism from a paediatrician. Descriptive data for the children are presented in Table 1.

Insert Table 1 about here

All the children were at the prelinguistic or early one word stage of language development as measured by the Communication and Symbolic Behavior Scales (CSBS) (Wetherby & Prizant, 1993) and showed significant delays in development, with a percentile rank of 0.1 on the Scales of Independent Behavior – Revised (SIB-R) (Bruininks, Woodcock, Weatherman, & Hill, 1984). The SIB-R was also used to measure levels of problem behavior and all participants, with the exception of YR, had behaviors that were rated at least moderately serious on the general maladaptive index.

<u>Procedure</u>

Communication and Symbolic Behavior Scales (CSBS)

The CSBS is a norm-referenced standardized instrument used to assess children whose functional communication abilities range from prelinguistic to early stages of language acquisition. The Communication Temptations and Sharing Books items from the CSBS were used to assess spoken and signed language. Communication Temptations involved presenting the child with eight structured situations designed to facilitate communicative responses, e.g., putting desired objects out of reach to encourage the child to ask for help. Sharing Books involved the examiner encouraging communication from the child as they

explored two to three picture books together. The number of words and signs used during these interactions were recorded.

Scales of Independent Behavior – Revised, Early Development Form (SIB-R)

The SIB-R was used to assess adaptive functioning and the informant for this was the child's parent. The Early Development Form consists of 40 items covering motor skills, personal living, community living, social interaction and communication. Each item describes a developmental task and the informant evaluates how well their child is able to complete that task on a four-point scale. The assessment yields a standard score, with a mean of 100 and standard deviation of 15, and a corresponding percentile rank.

Scales of Independent Behavior – Revised, Problem Behavior Scale

The Problem Behavior Scale was used to assess the frequency and severity of problem behavior by interviewing the child's parent. The Scale assesses eight problem areas that are arranged into three indexes, the Internalized, Asocial and Externalized Index. There is also a General Maladaptive Index that is an aggregate measure of problem behavior. The Maladaptive Index scores have a mean of 0 and a Standard Deviation of 10.

Observations

Naturalistic observations were conducted in the child's home. Videotaping was conducted by psychology graduate students who had knowledge of children with autism and were trained in the videotaping procedures. Mothers were asked to select normal home-based activities where they would be interacting with their child and asked to go about those activities as usual during the videotaping. Activities chosen usually involved indoor and outdoor play and snack or meal times. Interactions between each mother-child dyad were videotaped on three occasions for 20 to 30 minutes, providing a total of 60 to

90 minutes of tape per dyad. On reviewing the tapes, there were often periods of time where no interaction occurred or where the quality of the tape did not permit accurate coding to take place (e.g., the child was off camera). The total time coded for each child ranged from 12 to 27 minutes with a mean of 18 minutes.

Coding

Videotapes were analyzed and interactions between dyads were coded for communication breakdowns, type of repair used by the child, prosidy changes (gestural or vocal), and child's use of problematic behavior. A team of raters were trained to undertake the coding. Training took approximately 6 hours and involved familiarization with the coding definitions and process using footage of children similar to but not participating in the study.   Any disagreements in coding during the training period were discussed and training continued until 80% reliability among the raters was achieved.

Insert Table 2 and Figure 1 about here

Coding definitions are presented in Table 2 and the process used to determine an interaction cycle between the child and mother is displayed in Figure 1. The definitions and interaction cycle were derived from those used by Golinkoff (1986) with typically developing early communicators. An interaction commenced with the mother or child initiating. If the mother initiated the cycle, the child's first response would be coded as an initial communicative attempt. Using the behaviors listed in Table 3, the child's initial attempts to communicate were coded as problematic or non-problematic. If the mother comprehended the child's meaning and responded to the child's initial attempt, the cycle ended with success. If, however, the mother failed to respond or comprehend, the cycle may have ended in a missed attempt or the child could have attempted a repair. Any

repairs were coded as repetitions (with or without increased prosidy), augmentations (with or without increased prosidy), or substitutions. Coders were also instructed to circle any repairs produced by the child that used a mode of behavior considered problematic according to the list presented in Table 3.

Insert Table 3 about here

According to the interaction cycle, a repair may have ended in a successful interaction (including compromise), further negotiation (and additional repair attempts), or failure, where further attempts to negotiate were abandoned. One interaction cycle could therefore have more than one repair and each of these was coded using the definitions contained in Table 2.

Inter-rater Reliability

Inter-rater reliability was conducted on at least 33% of the coded tapes for each child. Raters were selected from those trained in the procedure as previously described and coded the tapes independently of the primary rater. An agreement was counted when the two raters recorded the same code at the same point in time on the tape. Percentage agreement was calculated using the formula: Agreements/(Agreements + Disagreements) x 100%. Reliability ranged from 72% to 100% with a mean of 82%.

Results

The number of initial attempts to communicate and the frequency of communication breakdowns are presented in Table 4. Participants in this study attempted to repair breakdowns in communication with greater frequency than reported in previous research (Brady, McLean, McLean, & Johnston, 1995). The percentage of communication

breakdowns that were repaired ranged from 71% to 100% with a mean of 85%. There

was some variability in the number of communication breakdowns encountered by each

of the participants and the number of repairs attempted following these breakdowns. The

number of breakdowns ranged from 5 to 27, with a mean of 13.3 while the number of

repairs used ranged from 5 to 24 with a mean of 11.5.

Insert Table 4 about here

Overall 26 (43%) initial attempts to communicate for children in this study involved

behavior that was categorized as problematic. In contrast to most of the participants, RO

used more problematic behavior (8) than non-problematic behavior (1) to initiate

communication. For one other child, RE, problematic initial attempts (3) exceed non-

problematic ones (2) and the remaining children had a greater number of non-problematic

initial attempts, or did not use any problematic forms to initiate.

Table 5 provides data on the number of each repair type used by participants, including

those that involved increased prosidy and problem behavior. Five of the six children used

repetitions and substitutions more commonly than augmentations although for the sixth

child, RO, augmentations were used more frequently than the other two repair strategies.

The percentage of repairs that involved increased prosidy was calculated using the

formula: (repetitions with increased prosidy + augmentations with increased prosidy)/

(repetitions + augmentations + substitutions) x 100. Four of the participants used

increased prosidy and 8.28% of all the repairs used by the participants involved increased

prosidy. The percentage of repetitions and augmentations with increased prosidy that

were problematic was 66% and the percentage of problematic repairs that involved

increased prosidy was 25%. These results indicate that while around 8% of repairs involved increased prosidy, 66% of these repairs involved the use of a problematic behavior. Furthermore, if the child used problem behaviour to repair, 25% of those repairs were repetitions with increased prosidy.

Insert Table 5 about here

Discussion

Five of the children with autism aged 2 to 5 years old and with fewer than 10 words or signs that participated in this study attempted to communicate with their mothers using both problematic and non-problematic modes. They attempted to repair breakdowns in communication with their mothers using repetitions, augmentations and substitutions. Four of these children showed increased gestural or vocal prosidy when repairing and some of these repairs were also found to involve problematic behavior. While the small number of participants and low frequency of communicative behaviors observed between mother-child dyads warrant cautious interpretation of these findings, a number of important observations can be made.

First, the participants in this study appeared to experience frequent breakdowns in communication with their mothers (ranging from 5 to 27) that they often tried to repair using a variety of strategies. The ability of children with autism and limited language to use substitutions and augmentations is interesting, as these strategies have been considered to be indicative of more advanced communicative competence than the strategy of repetition (Alexander et al., 1997). The capacity of the participants in this study to use at least two, if not all three, strategies to repair could be used to build

communicative competence. That is, it may be useful to profile a child's repair strategies and use this information to strengthen and extend their ability to respond effectively to communication breakdowns when they arise (Keen, 2003). Family-centred support may also be helpful to address the high rates of communication breakdowns that occurred between some children and their mothers (EY, YS, and RO). While the children attempted to repair many of these breakdowns, a higher success rate with their initial attempts may reduce the frequency of problem behavior, which was quite high for YS and RO. By sensitizing communication partners such as the child's mother to the child's initial, non-problematic attempts to communicate, and then responding to these, the demand on the child to repair breakdowns could be reduced (Goldbart, 1994).

Second, although these children were quite young, the occurrence of problem behaviors was already evident in some of the children's attempts to communicate and to repair communication breakdowns. Only one of the children (SN) did not use problematic forms when initiating or repairing. For EY, the occurrence of problem behavior was low, with only one problematic repair. The other children used between 5 and 18 problematic initiations and repairs during the observation period. There tended to be more problem repairs than problem initiations. It has been well established that the rates of problem behavior are often higher for children with autism and related disorders than their typically developing peers (Dunlap et al., 1994). These behaviors can emerge from a young age and without intervention, may persist and increase in severity, highlighting the importance of early identification and intervention (Einfeld & Tonge, 1996). The categorization of problem behavior according to whether it is associated with an initial

attempt to communicate or an attempt to repair a communication breakdown may prove

useful to future early intervention efforts. For example, focusing intervention on the

development of repair strategies may be an effective behavioral intervention for a child

who frequently uses problematic forms to repair breakdowns. Development of repair

strategies may also help to decrease frustration for the child that may also lead to an

escalation of problematic behavior.

Third, some repairs used by children in this study involved the use of problematic forms

that were repetitions of previous signals with increased prosidy. One of the children in

this study, for example, vocalized and tapped her mother with an open hand to request a

toy and when this was ignored, the child then vocalized more loudly and hit her mother.

The vocalization and hitting actions were clearly repetitions of the initial vocalization and

tap but with greater force. The hitting action was certainly problematic. The mother

responded by giving the child the toy that was being requested. Over time, behaviors such

as these that are more likely to be noticed and subsequently reinforced could become part

of the child's communicative repertoire (Drasgow & Halle, 1995). Early intervention that

encourages initial, non-problematic communicative attempts and develops competence in

the use of repair strategies in response to communicative breakdowns may not only

improve communication skills but also prevent the establishment of some problematic

behavior in children with autism.

Further research is needed to replicate and extend this research to a larger number of

children. The use of naturalistic observation techniques in this study was important to

help develop an understanding of mother-child interaction patterns. The lack of structure, however, resulted in a small number of interactions and communication breakdowns for analysis with some children. Combining naturalistic and structured observations that create communication breakdowns between the child and a communication partner may help to address this issue.

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Table 1

Description of Participants

Child	DOB	Age (Years:Months)	Gender	Language Stage	SIB-R Early Development	SIB-R Behavior
EY	8/10/98	4:1	Male	Prelinguistic (0 words, 1 sign)	Standard Score: 19 Percentile Rank: 0.1	IMI: marginally serious AMI: serious EMI: marginally serious GMI: serious
YS	26/9/99	3:2	Male	Prelinguistic (0 words or signs)	Standard Score: 18 Percentile Rank: 0.1	IMI: marginally serious AMI: marginally serious EMI: very serious GMI: serious
RE	15/10/99	3:2	Female	Prelinguistic (0 words or signs)	Standard Score: 12 Percentile Rank: 0.1	IMI: very serious AMI: marginally serious EMI: marginally serious GMI: moderately serious

IMI - Internalized Maladaptive Index

AMI - Asocial Maladaptive Index

EMI - Externalized Maladaptive Behavior Index

GMI - General Maladaptive Index

Table 1 (continued)

Description of Participants

Child	DOB	Age (Years:Months)	Gender	Language Stage	SIB-R EDF	SIB-R PBS
SN	19/10/99	3:1	Male	Early One-word (1 word, 1 sign)	Standard Score: 41 Percentile Rank: 0.1	IMI: marginally serious AMI: moderately serious EMI: normal GMI: marginally serious
YR	20/06/99	3:5	Male	Prelinguistic (0 words or signs)	Standard Score: 3 Percentile Rank: 0.1	IMI: moderately serious AMI: marginally serious EMI: normal GMI: normal
RO	20/10/99	3:2	Male	Prelinguistic (1 word, 0 signs)	Standard Score: 53 Percentile Rank: 0.1	IMI: moderately serious AMI: serious EMI: marginally serious GMI: moderately serious

IMI - Internalized Maladaptive Index

AMI - Asocial Maladaptive Index

EMI - Externalized Maladaptive Behavior Index

GMI - General Maladaptive Index

Table 2

Coding Definitions (adapted from Golinkoff, 1986)

Name	Code	Definition
Child Initial Communicative Attempt – Non-problematic	CINP	Behaviors directed toward the caregiver by the child to start an interaction (e.g. pointing, vocalizing, reaching, looking at caregiver/object, leaning towards an object, words or word approximations, giving/offering/showing an object).
Child initial Communicative Attempt – Problematic	CIP	Problem behaviors directed toward the caregiver to start an interaction (e.g., those listed in Table 3).
Caregiver Initial Signals	CIS	Behaviors directed toward the child by the caregiver to start an interaction (e.g. gesture, verbalization, give/offer/show object, question).
Communication Failure	CF	Caregiver does not comprehend the intent behind the child's communicative attempt demonstrated by the caregiver's reaction (e.g. caregiver makes an utterance with interrogative intonation or an explicit statement that they don't know what the child meant) and/or the child's reaction (e.g. child does not accept the caregiver's interpretation and/or repairs their initial communicative attempt). Caregiver purposely causes a communication failure by feigning lack of understanding to encourage communication from the child.
Repair with repetition	Rr	Child repeats all or part of the preceding communicative attempt following a communication failure.
Repair with augmentation	Ra	Child augments their preceding communicative attempt by adding one or more non-verbal or vocal behaviors following a communication failure.
Repair with substitution	Rs	Child replaces the preceding communicative attempt with a completely new behavior following a communication failure.
Repair with increased prosidy	Rr(p)	As per Rr with increased emphasis/prosidy.
	Ra(p)	As per Ra with all or part of the preceding communicative attempt repeated with increased emphasis/prosidy.
No Response	NR	Child abandons their communication goal following a communication failure (e.g. child gives up or ignores the caregiver's communication signals).
Success/Compromise	SC	Caregiver comprehends the child's communicative attempt following a communication failure (e.g. caregiver carries out the child's apparent goal). Caregiver comprehends the child's communicative attempt following a communication failure but won't satisfy it at that time. Caregiver correctly guesses at the child's communication goal (e.g. child accepts the caregiver's interpretation retracting their signal or resuming a prior activity).
Unsuccessful	U	Caregiver or child refuses to continue to negotiate (e.g. child or caregiver walks away and do not return to the interaction).
Immediate Success/Compromise	IS	Caregiver comprehends the child's initial communicative attempt (e.g. child accepts the caregiver's interpretation retracting their signal or resuming a prior activity). Caregiver comprehends the child's initial communicative attempt but won't satisfy it at that time.
Missed Attempt	MA	Child abandons their communication goal due to the caregiver missing or failing to acknowledge the child's communicative attempt.

Table 3

Behaviors Coded as Problematic

Hurtful to others

Hitting others with hands
Hitting others with objects
Scratching others
Pulling others hair
Pinching others
Biting others
Verbal aggression
Meanness/cruelty

Hurtful to self

Hitting head with hand/body part
Hitting body with hand/body part
Hitting body with against objects
Hitting head with/against objects
Biting self
Self-scratching
Self-pinching
Eating inedible objects
Stuffing fingers in body openings
Excessive drinking
Pulling own hair
Teeth grinding
Self induced vomiting

Property Destruction

Hitting object against object s so damage may occur
Picking/pulling at objects so damage may occur
Throwing items so damage may occur

Disruptive

Whingeing
Crying
Yelling
Screaming
Temper tantrums
Spitting
Inappropriate touching of self or others
Stripping
Smearing faeces

Table 4

*Number of Initial Attempts, Breakdowns and Repairs for Each Participant*

Child	Initial attempts (non-problematic)	Initial attempts (problematic)	Communication breakdowns encountered	Number of repairs used	Communication breakdowns repaired (%)
EY	10	0	18	14	78
YS	10	1	27	24	93
RE	2	3	5	5	100
SN	5	0	7	5	71
YR	2	1	7	6	71
RO	1	8	16	15	94
Total	30	13	13.3	11.5	84.5

Table 5

Number of Each Repair Type and Repairs Involving Problem Behaviors

Child	Repetitions	Augmentations	Substitutions	Repetitions and augmentations with prosidy	Problem repairs with prosidy	All problem repairs
EY	5	2	7	1	0	1
YS	14	4	6	7	5	12
RE	1	2	2	0	0	5
SN	1	0	4	0	0	0
YR	2	1	3	1	1	4
RO	3	8	4	3	2	10
Total	26	17	26	12	8	32

Figure 1: Coding Interaction Cycle (Keen & Farrant, 2003)
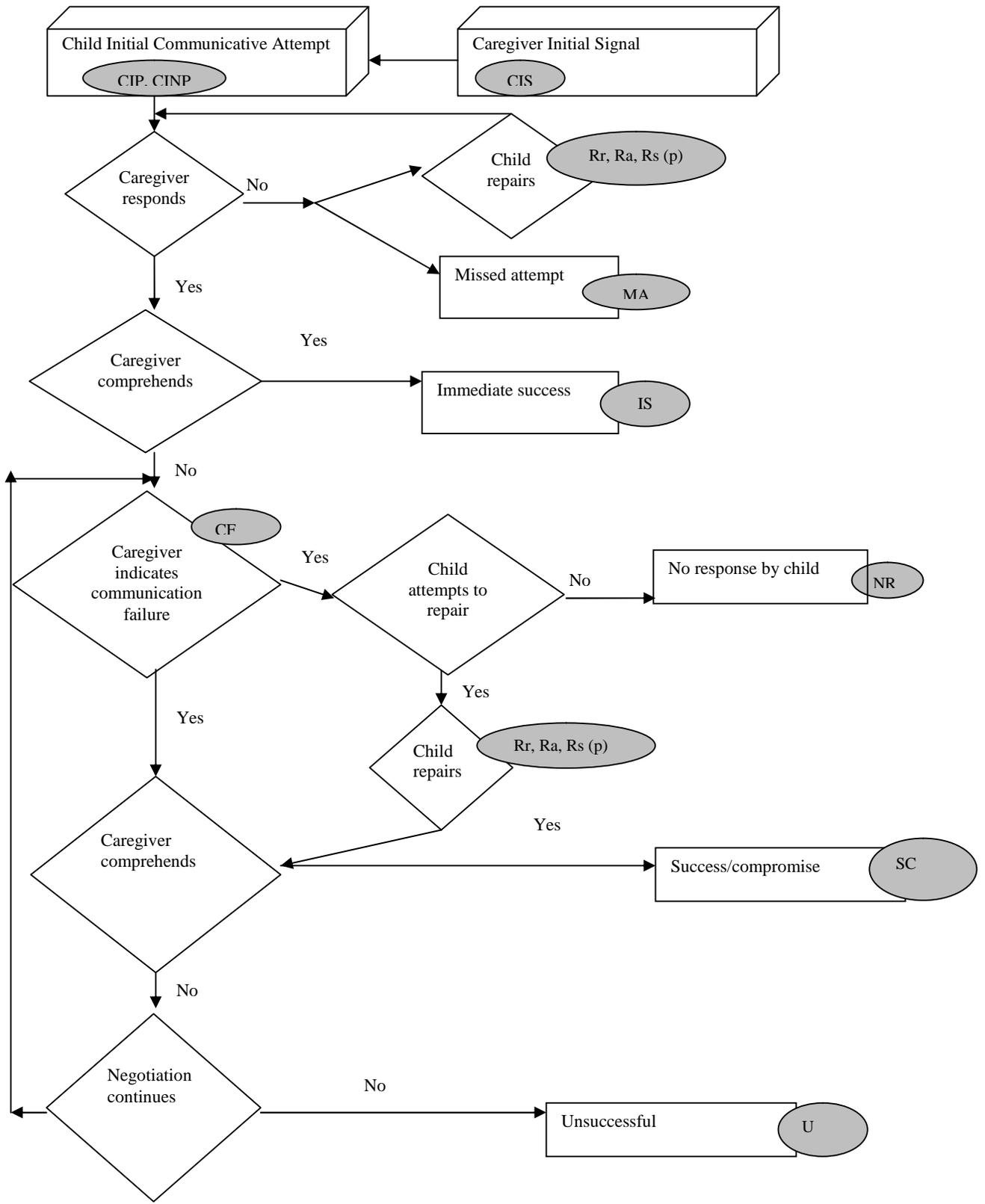
Note: [ ] = Terminates an interaction cycle   ⬭ = Codes