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Mand Compliance as a Contingency Controlling Problem Behavior: A Systematic Review

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Abstract

Bowman et al. (1997) described a dynamic contingency in which severe problem behavior was evoked by adult noncompliance with a variety of child mands, which occurred at high rates, and was reinforced by adult compliance with subsequent mands. They discovered this phenomenon with 2 children for whom standard functional analyses were inconclusive. In recent years, similar contingencies have been shown to influence problem behavior, but the manner in which they have been arranged and described has varied across studies. The purpose of this literature review is to (a) describe contingencies involving mand compliance and the circumstances under which they have been evaluated, (b) summarize procedural variations in analysis and treatment, and (c) discuss what is known and yet to be discovered about the contingency as it relates to problem behavior. Future research focused on improving technology for analyzing and treating problem behavior suspected to be sensitive to mand compliance is discussed.

Keywords: functional analysis, mand compliance, mands, problem behavior

Mand Compliance as a Contingency Controlling Problem Behavior: A Systematic Review

Bowman et al. (1997) demonstrated control over problem behavior by a unique contingency in which problem behavior was evoked by adult noncompliance with a child's requests and reinforced by subsequent acquiescence by adults. Problem behavior was hypothesized to be maintained by compliance with mands. The description of this contingency was predicated on Skinner's (1957) classification of *mands* (e.g., requests) as verbal operants under the control of particular establishing operations (EOs), the topographies of which specified their reinforcers. Bowman et al. (1997), as well as Fisher (2001) and Owen et al. (2020), have suggested that the contingency involves a precurrent relation between problem behavior and mands in that the emission of problem behavior increases the effectiveness of a subsequent mand at producing reinforcement. Said another way, individuals with behavior sensitive to this contingency exhibit problem behavior because mands are more likely to be reinforced in its presence than its absence.

This contingency was described by Bowman et al. (1997) as distinct from commonly evaluated contingencies (e.g., attention, tangibles; see Iwata et al., 1982/1994 for the original description of a functional analysis that assesses multiple commonly suspected contingencies of problem behavior) because (a) children specified their reinforcers with vocal-verbal requests, which appeared to be influenced by momentary EOs, and (b) traditional tests for attention and tangibles sampled controlling variables too narrowly. This was corroborated empirically, as the problem behavior of the two children who participated in Bowman et al. was not influenced by common contingencies, but was sensitive to contingent mand compliance.[1]

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[1] Subsequent replications of Bowman et al. (1997) have labeled this language-based contingency in different ways across studies (i.e., mand compliance, adult compliance with mands, request compliance, compliance with requests, social control, adult-directed play, and escape to child-directed activity). For clarity, we will hereafter refer to the contingency as *mand compliance*.

Figure 1 depicts the contingency arrangement that was manipulated across test (contingency present) and control (contingency absent) conditions in the functional analyses in Bowman et al. (1997). In test, after a 2-min period wherein adults complied with all child requests, the programmed EO involved the adult actively engaging in activity incompatible with that which the child specified, thereby not complying with earlier requests. Requests made by the child during the EO period were ignored, but any problem behavior resulted in the immediate resumption of the child-specified activity as well as reinforcement of subsequent requests for a 30-s interval. Rates of problem behavior in the test condition were compared to rates in the control condition, in which all child requests were reinforced throughout, and this analysis was differentiated for both children who participated in the study. Furthermore, when children were taught a replacement functional communication response that produced a period of mand compliance while problem behavior was placed on extinction, interventions eliminated problem behavior.

Since Bowman et al. (1997), and especially in recent years, several authors have replicated the analysis and treatment and extended their outcomes (Betz et al., 2013; Eluri et al., 2016; Fisher et al., 2004; Greer et al., 2016; Hagopian et al., 2005; Kurtz et al., 2015; O'Connor et al., 2003; Owen et al., 2020; Roscoe et al., 2015; Schmidt et al., 2017; Torres-Viso et al., 2018). The abovementioned replications of Bowman et al. assessed the mand compliance contingency in isolation, usually following inconclusive standard functional analysis results (e.g., Iwata et al., 1982/1994). In addition, a growing number of researchers have included the contingency in initial, interview-informed synthesized contingency analyses (IISCAs; Hanley et al., 2014) when caregivers reported its possible relevance to severe problem behavior via open-ended interviews (Ghaemmaghami et al., 2016; Ghaemmaghami et al., 2018; Hanley et al., 2014;

Jessel et al., 2016; Jessel, Hanley et al., 2019; Jessel et al., 2018; Jessel, Metras et al., 2019; Rose

& Beaulieu, 2019; Slaton et al., 2017; Warner et al., 2020).

It was suggested by Fisher (2001) that mand compliance may be a more prevalent

controlling contingency for problem behavior than its representation in the literature would

suggest. Fisher's commentary was prescient, as the number of analyses of problem behavior

evaluating mand compliance has increased in recent years. However, the quantitative and

qualitative features of the mand compliance contingency have not yet been summarized in the

literature. Therefore, the purpose of this literature review is to: (a) describe the extent to which

mand compliance has been reported to influence problem behavior; (b) summarize the

procedural variations of analyses that tested for mand compliance and treatments designed to

address it; (c) compare and contrast the distinct features of the mand compliance contingency to

other contingencies that have been evaluated in the functional analysis literature; and (d) discuss

opportunities for future research.

Methods

The literature search was in adherence with guidelines described in the Preferred

Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Liberati et

al., 2009). Figure 2 is a flow chart depicting this process. Our search was limited to empirical

studies with human participants, published through January 2020, in English, peer-reviewed

journals in which a functional analysis of problem behavior was conducted. Specifically, we

searched for functional analyses testing mand compliance by combining the search term *problem*

behavior with *mand compliance* and *request compliance.* We also conducted a Google Scholar

search for all articles that cited Bowman et al. (1997) as well as those that may have included

mand compliance in evaluations of synthesized contingencies influencing problem behavior

(e.g., Hanley et al., 2014). The titles and abstracts of all articles returned by these searches were screened to confirm whether they met the abovementioned inclusion criteria, and those that met criteria were screened in greater detail to verify that a contingency emulating that described in Bowman et al. was reported. We excluded applications that did not explicitly describe that the participant specified reinforcers in some way during the reinforcement interval (e.g., *access to preferred conversation* does not specify whether the preferred topic was predetermined or requested by the child during the analysis; see Karen's analysis in Santiago et al., 2016, for an example).

We coded the following variables using information from the Methods and Results section of each article: publication year; number and proportion of participants for whom a mand compliance test was conducted; participant characteristics (i.e., age, diagnosis, language ability); session duration; the type of assessment(s) that informed the mand compliance analysis; whether or not mand compliance was analyzed in isolation or as part of a synthesized contingency; whether or not mand compliance was evaluated in an initial or follow-up analysis; whether or not the mand compliance analysis condition was differentiated relative to the control condition; whether or not mand compliance was tacted as a variable controlling problem behavior; whether or not treatment was conducted to address the mand-compliance function of problem behavior; the type of alternative behavior that was differentially reinforced in treatment; whether or not reinforcement was thinned during treatment; the procedure implemented for reinforcement thinning (if applicable); and whether or not the treatment was efficacious. Evaluation of the extent to which the analysis was differentiated and whether or not the treatment was efficacious was conducted via visual inspection of graphs when possible, and by inspecting tables indicating behavioral function or depicting behavioral outcome data when graphs were not included.

Interobserver agreement was obtained for the coding of all the above-mentioned variables by having a second person independently score 23% of articles. Agreement was recorded if both observers coded an identical response for a given variable within an article whereas disagreement was recorded if observer scores were disparate. Interobserver agreement was calculated by dividing the total number of agreements by the sum of agreements and disagreements and multiplying the quotient by 100. Agreement across all variables was 100%.

Results and Discussion

Summary of Mand Compliance Evaluations

Our search yielded 22 articles that reported a functional analysis of problem behavior in which mand compliance was tested for at least one participant (see Figure 2). Figure 3 depicts the cumulative number of publications and the analyses therein that evaluated mand compliance since Bowman et al. (1997). Seventy-three percent of studies included in this review were published since 2015 and the number of distinct analyses testing mand compliance increased sharply following 2015, suggesting that tests for sensitivity of problem behavior to mand compliance are increasing in count and are perhaps being reported in more studies with large participant pools.[2]

Table 1 provides a summary of assessment information across all reviewed studies. A total of 65 analyses across 64 participants evaluated mand compliance. Thirty-three applications across 33 participants tested mand compliance in isolation (n = 12 studies). Twenty-eight of these isolated tests of mand compliance were conducted following additional assessments that were conducted when a standard functional analysis yielded inconclusive results. The other five

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[2] Greer et al. (2016), Kurtz et al. (2015), and Warner et al. (2020) each reported data on at least one already published analysis of mand compliance; these duplications were omitted from calculation. Owen et al. (2020) reported on multiple individuals who participated in other studies; however, the analyses of mand compliance included in Owen et al. represented otherwise unpublished data.

isolated tests of mand compliance were included along with other conditions in the participant's

initial analysis, usually because it was suggested by a pre-analysis assessment (see Table 1 for a

list of the types of assessments that informed mand compliance analyses. *Note:* The manner in

which Stephen's analysis was informed in Hagopian et al. [2005] was unspecified). Twenty-eight

of the 33 isolated variable analyses of mand compliance were differentiated, indicating control

over problem behavior by the mand compliance contingency. In three of the five analyses in

which problem behavior did not show sensitivity to mand compliance, other variables were

identified within the same analysis (attention for Katy in Fisher et al., 2004; attention for Stephen

in Hagopian et al., 2005; escape from difficult demands for Bill in Roscoe et al., 2015). Two

more analyses were undifferentiated with respect to mand compliance and terminated without the

observation of problem behavior in any condition (Participant 12 in Owen et al., 2020; Dave in

Roscoe et al., 2015). The other 32 of 65 applications across 31 participants tested mand

compliance as part of a synthesized contingency in an IISCA (n = 10 studies, denoted with an

asterisk in Tables 1 and 2), all of which were (a) informed by an open-ended caregiver interview,

and (b) differentiated. In total, there are currently 60 published, differentiated analyses

implicating the influence of mand compliance on problem behavior.

Given the variable rate of publication across years, and that many of the early analyses of

mand compliance occurred only once a standard analysis yielded inconclusive results,

conclusions regarding the prevalence of the contingency's effect on problem behavior are

premature. The current review constitutes a systematic summary and synthesis of the published

literature pertaining to mand compliance; however, the majority of included studies did not

provide details regarding the broader population of individuals from which participants were

selected, thus limiting discussion of the generality or prevalence of this phenomenon (Hagopian,

2020). In addition, the probability that a child referred for the assessment and treatment of severe

problem behavior will engage in behavior sensitive to mand compliance is difficult to glean from

the extant literature because, in many cases, the contingency was only tested once common

reinforcers were ruled out in standard functional analyses. Said another way, when a standard

functional analysis detects a functional relation, it is unlikely to be followed by further analysis

(cf. Owen et al., 2020), but this does not mean that untested contingencies such as mand

compliance are not functionally relevant to an individual's problem behavior. All analyses that

tested mand compliance following an undifferentiated standard analysis were informed by either

(a) caregiver report (e.g., Bowman et al., 1997), (b) descriptive assessment (e.g., Roscoe et al.,

2015), (c) informal observation of behavior before, during, or after the initial functional analysis

(e.g., Betz et al., 2013), or (d) some combination of these assessment tactics (see Table 1). With

the exception of Stephen's analysis in Hagopian et al. (2005), all analyses that included mand

compliance in the participant's initial functional analysis (e.g., in an IISCA) were informed by

indirect and descriptive assessment methods as well. Therefore, the collective results (confirmed

in 60 out of 65 analyses) suggest that an analysis testing mand compliance is likely to produce

differentiated results if the contingency is nominated via indirect or descriptive assessments.

A summary of the information gleaned from indirect and descriptive assessments that led

researchers to analyze mand compliance may be of some utility to those tasked with assessing

and treating problem behavior. Across all reviewed studies, researchers reported similar

caregiver reports and observations that can be characterized in the following manner:

Participants emitted frequent requests for items (e.g., a computer), activities (e.g., playing a

board game), social interactions (e.g., conversing about dinosaurs), environmental arrangements

(e.g., having papers and crayons organized a certain way), and for adults to behave in particular

ways (e.g., imitating a cartoon character's voice and dialogue; see Bowman et al. [1997],

Schmidt et al. [2017], and Warner et al. [2020] for detailed examples of participant requests).

Some participants reportedly recruited only a particular type of reinforcer (e.g., the participant in

Torres-Viso et al. [2018] only requested environmental rearrangement); however, it was more

often reported that the reinforcers requested were heterogeneous, idiosyncratic, and complex

(e.g., Daryl in Schmidt et al. [2017] requested that adults talk like animals while engaging in

conversations with inanimate objects, as well as play board games following special rules that

always allowed Daryl to win). Problem behavior was likely to occur when any one of those

requests was ignored or denied, and was likely to persist and even escalate until the adult granted

requests. Therefore, it was consistently reported that the problem behavior appeared to serve

multiple functions in that similar forms of problem behavior often produced a variety of

reinforcers (i.e., those that were being requested prior to problem behavior). Based on these

descriptions, future researchers and practitioners should consider screening for the possible

relevance of mand compliance to problem behavior via indirect or descriptive assessments prior

to conducting functional analyses.

Participant Characteristics

Participants whose problem behavior was demonstrated to be sensitive to mand

compliance were 59 children and adolescents (age range, 2 - 16 years) with a diversity of

diagnostic profiles, a majority of whom (68%) were diagnosed at minimum with autism

spectrum disorder. Figure 4 depicts the range in language ability across the 59 participants.

Using participant description sections, we attempted to categorize each child's language ability

in accordance with the four-point scale originally reported in Jessel et al. (2016; we note

unspecified if the participant description was insufficient to categorize). Although the modal

language ability was at the level of fluent speech, there were many children with limited verbal repertoires, including four children who emitted no vocal-verbal behavior. For example, Daniel's mand compliance analysis in Roscoe et al. (2015) tested whether or not compliance with requests to engage with particular activities in particular locations influenced problem behavior. Daniel was characterized as non-vocal and communicated by pointing to pictures or in the direction of preferred locations. Therefore, in Daniel's analysis, the therapist allowed Daniel to walk toward and engage with activities to which he pointed during reinforcement periods and ignored pointing during EO periods. Amy's analysis in Torres-Viso et al. (2018) tested whether adult compliance with mands for rearrangement of items in her environment influenced problem behavior. Amy's mands for rearrangement were characterized as vague and unintelligible, and often took the form of gestures and loud vocalizations (Torres-Viso et al., 2018). Despite imprecise communication, the therapists in Roscoe et al. and Torres-Viso et al. controlled problem behavior by responding differentially to the gestures of their participants.

Bowman et al. (1997) noted that, "the [mand compliance] analysis may be most appropriate for verbal children who appear to make unreasonable demands on their parents and who display destructive behavior primarily when their parents do not comply with the child's mands" (p. 263). The range in language ability of the children included in this review suggests that the effect of mand compliance on problem behavior may have generality beyond children with strong language skills; however, further replication and clarification is needed on how to assess mand compliance with individuals who lack a precise mand repertoire. For example, although Roscoe et al. (2015) and Torres-Viso et al. (2018) described controlling problem behavior by responding differentially to pointing and vague gestures, they did not describe the process by which analysts learned to provide the seemingly correct reinforcers. This process may

have involved additional assessments or observations, which could be investigated in more detail

in future research.

Procedural Details

Functional Analysis

Among the analyses that attempted to replicate Bowman et al. (1997), there were

procedural variations in how EOs and reinforcement periods were programmed in the test

condition. Figure 5 is a diagram depicting these variations. It is important to note that, despite the

somewhat transient nature of the EOs that appeared to evoke unique mands among the

participants in the studies under review, environments were arranged so that EOs could be

explicitly programmed in all analyses. Test conditions involved the imposition of EOs and were

always preceded with a reinforcement interval, one in which all mands were reinforced. EOs,

which were sometimes signaled by the adult, were programmed in three different ways: the adult

either (a) actively engaged in an incompatible activity by doing something the child did not

specify (e.g., modifying the environment arranged in a particular way by the child; Torres-Viso

et al., 2018), (b) directed the child to engage in an activity incompatible with that which they

were specifying at the moment (e.g., Eluri et al., 2016), or (c) actively engaged in an

incompatible activity while simultaneously directing the child to do so as well (e.g., Ben's

analysis in Kurtz et al., 2015). When problem behavior occurred, all analyses involved a

contingent period of time (20 s to 60 s) during which the adult reverted to engagement in the

child-specified activity and compliance with any additional requests; however, some analyses

included additional procedures, such as having the adult (a) reinstate the environment to the

arrangement previously specified by the child, or (b) reinforce the request that preceded the

occurrence of problem behavior. Table 2 details the specific procedures implemented in each study.

Despite various procedures being used to analyze problem behavior sensitive to mand compliance, each type of variation depicted in Figure 5 was successful in achieving differentiated analyses across studies (i.e., the five mand compliance analyses that were undifferentiated were procedurally identical to other applications that did produce differentiation; see Table 2). Relative advantages of these contingency permutations are therefore unknown.

In many of the studies investigating mand compliance, reinforcement intervals were described as involving adult compliance with any *reasonable* mands, suggesting that the participants may have occasionally emitted *unreasonable* mands. Hanley et al. (2014) described unreasonable mands as,

> those that were impossible to grant at the time (e.g., asking to go to a movie theater, asking to buy a new toy) or that created a nuisance for others if granted (e.g., providing access to the laptop and projector in a classroom occupied by a graduate seminar). (p. 21)
> Bowman et al. (1997) clarified that,
> if the child's mand was impossible or unsafe to complete (e.g., kick the window), the [therapist] would let the child know that he or she would try to honor the mand but would alter the request to make it possible to complete. (p. 255)

The emission of unreasonable mands during reinforcement periods (e.g., the control condition) in analyses of mand compliance poses interpretive problems because these mands cannot be immediately reinforced and their denial may evoke problem behavior, which may thus obscure analysis outcomes. Given that many individuals with problem behavior sensitive to mand compliance are characterized by their engagement in high rates of mands, both reasonable

and unreasonable, researchers should further investigate and describe strategies for addressing

unreasonable mands during analyses. For example, making sure the analysis is populated with

multiple activities that generate reasonable mands may help minimize the occurrence of

unreasonable mands if they are common; this could be empirically evaluated through systematic

addition of activities in the analysis context.

Inevitable Synthesis

An inspection of the various procedures implemented in the analysis of mand compliance

revealed that the contingency synthesizes positive and negative reinforcement in two general

ways.

In one manner, the child can mand for the production and termination of stimuli during

periods of reinforcement. Bowman et al. (1997; p. 256) illustrated this by highlighting examples

of one child's requests for the adult to laugh and clap on command (positive reinforcers) or to be

left alone (negative reinforcer). The authors also highlighted examples of that child's requests for

events that were inextricably synthesized, such as asking for the adult to switch seats, which

necessarily involves terminating one stimulus (i.e., sitting in one seat) and producing another

(i.e., moving to the other seat).

In another manner, because adults typically imposed the EO by engaging in activity

incompatible with child mands (see Figure 5 for different ways this was achieved), problem

behavior produced both the termination of the incompatible activity as well as the resumption of

the child-specified activity. In some cases, these procedural details obscure the distinction

between tests of mand compliance conducted in isolation and tests that include mand compliance

in a synthesized contingency. There were three studies in which the mand compliance analysis

was described as an isolated variable test, but wherein the analysts additionally, explicitly

programmed an incompatible demand upon EO imposition that was removed contingent on problem behavior (Eluri et al., 2016; Kurtz et al., 2015; Roscoe et al., 2015; see Table 2). For example, Ben's analysis in Kurtz et al. (2015) consisted of an EO that involved both the deviation from the activity Ben specified as well as instruction to engage in adult-specified activity. Problem behavior resulted in the removal of the instruction as well as "30 s of playing his way" (p. 154). Procedures for Ben's analysis read similarly to procedures for Dale's synthesized contingency analysis in Hanley et al. (2014), termed *escape to tangibles, attention, and mand compliance*, wherein the EO involved interrupting Dale's ongoing activity with instruction to complete homework, and problem behavior resulted in resumed access to the activity Dale originally initiated, as well as compliance with any subsequent requests. In both cases, problem behavior resulted in the termination of an adult-directed activity and a period of mand compliance during child-directed activities. As the above examples highlight, tests for mand compliance may subsume other reinforcers because any analysis of mand compliance inherently may and likely does involve the recruitment and consumption of the generic reinforcers of escape, attention, and tangibles. Bowman et al. (1997) provided some evidence of this by describing examples of mands emitted by the child that specified that the adult (a) must play a board game with the child (i.e., mands for tangibles plus attention during reinforcement) or (b) must leave the child alone while they play with a preferred item (mands for tangibles plus escape during reinforcement). A more accurate description of the reinforcers manded for and consumed by participants in future research will allow for a better understanding of the reinforcement contingencies synthesized in mand compliance analyses.

Function-Based Treatment

Forty-two of the 59 children whose problem behavior showed sensitivity to mand compliance in their analysis experienced function-based treatments developed from the understanding that contingent mand compliance was a reinforcer. Table 3 summarizes information for the treatments that were reported across 16 of the 22 reviewed studies. All treatments involved some form of differential reinforcement of alternative behavior. In most cases, an omnibus request was taught that produced a brief period of child-directed activity, and problem behavior was placed on extinction. In some cases, cooperation with certain adult directives was required to produce reinforcement. Some treatments were elaborated with a punishment contingency arranged for problem behavior (e.g., a facial screen contingent on problem behavior for Ben in Kurtz et al., 2015). Some thinned reinforcement using either a multiple schedule (e.g., Greer et al., 2016), a chained schedule (e.g., Owen et al., 2020), or contingency-based delay and denial tolerance training (e.g., Hanley et al., 2014). Eluri et al. (2016) combined some of these strategies in their initial treatment package, using a discriminative stimulus (i.e., a red card) to signal a period of nonreinforcement for mands and a token system with a response cost to chain responses indicative of cooperation with adult instruction during that period. Cooperation with 15 cumulative instructions (each instance of problem behavior resulted in the removal of an earned token) resulted in the removal of the red card and reinforcement for all mands for the remainder of the session. O'Connor et al. (2003) evaluated a levels system, wherein a chained schedule was programmed during a "level 3" condition (i.e., a condition in which reinforcement of all mands was programmed during a component of a compound schedule), but any problem behavior resulted in a timeout from the opportunity to have mands reinforced (i.e., a "level drop") and a requirement that a period of time elapse without problem behavior in order for the chained schedule to resume. All treatments

reported in the literature were successful in reducing levels of problem behavior and strengthening alternative behavior and were proven efficacious through various single-subject experimental designs (e.g., contingency reversal, multiple-baseline across responses).

Further investigation is needed to understand the conditions under which supplementary procedures such as punishment are necessary, and because 100% of treatments reported in the literature ultimately resulted in at least 80% reductions in problem behavior, it is also unknown which treatment variations yield relative advantage. It is clear that, unlike the many reinforcement-based approaches used in treating other social functions such as access to attention or tangibles (e.g., differential reinforcement of other behavior, noncontingent reinforcement), problem behavior sensitive to mand compliance was virtually always treated with functional communication training in the studies under review. It appears that success may be predicated on teaching an alternative response to problem behavior that yields a period during which mands are reinforced, and reinforcement schedules can be thinned with a variety of procedures once problem behavior is replaced with alternative behavior.

Limitations of the Literature

Although assessments and treatments of problem behavior sensitive to mand compliance have been successful in most published applications, there are shortcomings in our understanding of the contingency based on the extant literature that could be clarified through future research.

Chief among the limits of our understanding is the lack of data describing the frequency and topography of mands, adult compliance with those mands, and participant engagement in the activities and interactions specified by the mands in the functional analyses. Although procedures in the mand compliance analysis typically are characterized by the adult *not complying with any* mands during EO periods, and *complying with all* mands during

reinforcement periods, and although the analyses are designed such that multiple reinforcers could potentially be delivered within a single reinforcement interval, data on the occurrence and type of mands/requests has yet to be reported in any study on mand compliance. Across all studies included in this review, the only data reported from the functional analyses are average rates of problem behavior across test and control conditions. As such, it is unknown (a) if any mands were emitted in these analyses, and (b) whether or not those mands, if emitted, were complied with during the reinforcement period or denied during the EO. Therefore, the purported relation between problem behavior and increased mand compliance is not readily apparent from visual analysis of the data in this literature. In the absence of within-session data on manding and adult compliance with mands across stimulus conditions, we do not know if the contingency is static or dynamic in nature, despite repeated characterizations of the latter (Bowman et al., 1997; Fisher, 2001; Schmidt et al., 2017; Slaton & Hanley, 2018; Torres-Viso et al., 2018). In other words, based on the existing data on problem behavior sensitivity to mand compliance, observed problem behavior could have been equally likely to have been controlled by the mere denial of access to a single item as it could have been to the differential likelihood of compliance with multiple mands for unique reinforcers.

Capturing the nature and type of events and interactions that give rise to problem behavior sensitive to mand compliance has potentially important implications for our understanding of the contingency as well as for treatment development. Consider a few examples of the different types of interactions possible in mand compliance analyses based on existing descriptions of procedures.

One example involves a dynamic social interaction that would suggest that problem behavior is functionally related to mand compliance. A child hypothetically engages in multiple

mands for various reinforcers, at a high rate, and does not exhibit problem behavior during any period in which mands are reinforced. The child might mand for (a) an iPad, (b) someone to help unlock the iPad, (c) help typing in a particular title of a video, (d) an adult to repeat the lyrics from a particular song, (e) an adult to sit and watch the video with them, (f) the adult to rewind the video, (g) two people to act out the scene occurring in the video (h) two people to harmonize the lyrics from a particular music video, (i) the adult to retrieve a prop that would make their imitation more realistic, (j) to be left alone while watching the music video, or (k) any combination of the above. Problem behavior occurs only when someone deviates from or does not comply with that which the child specifies, and problem behavior is reinforced by the contingent increase in likelihood of mand compliance. This depiction may be comparable to the behavior patterns commonly described when researchers include the qualitatively rich caregiver reports that inform mand compliance analyses.

In another example, consider a somewhat static social interaction that would still suggest that problem behavior is functionally related to mand compliance. A child hypothetically emits a mand for a single reinforcer, such as an iPad, and consumes it for the duration of the reinforcement interval without any additional manding. When the adult terminates time with the iPad (i.e., deviates from child-specified activity), problem behavior occurs after a mand for the iPad is ignored, resulting in subsequent and contingent mand compliance. In this case, the child is still engaging in problem behavior only when a mand is denied during the EO, but they are not emitting mands during the reinforcement interval because the reinforcer they recruited is available.

In a final example, consider a limited social interaction that would not suggest that problem behavior is functionally related to mand compliance but would instead indicate control

over problem behavior by a static reinforcer. A child hypothetically emits a mand for a single reinforcer (e.g., the iPad) at the start of the session and consumes it for the duration of the session without any additional manding. When the adult deviates from the activity specified by the child (i.e., when they terminate access to the iPad), problem behavior occurs in the absence of manding, and is reinforced with the resumption of the child-specified activity.

The latter two depictions are not consistent with what is commonly described in caregiver reports for individuals with behavior sensitive to mand compliance, but may be equally likely behavior patterns in mand compliance analyses. Across all three hypothetical scenarios, the reinforcement interval is programmed such that a variety of mands could be reinforced if emitted, and the EO interval is programmed such that mands would not be reinforced if emitted, but the important point is that given the existing depiction of functional analysis data, we do not know whether the interactions between participants and analysts therein were dynamic or static.

In order to better understand the mand compliance contingency, researchers should consider measuring and reporting variables such as child mands and adult compliance or noncompliance with each mand, in addition to problem behavior, within and across reinforcement and EO periods. Additional measures depicting the specific types of reinforcers recruited, provided, and consumed could further illustrate the dynamics of the contingency.

In addition to measuring the rate of mands and the proportion of mands reinforced across EO and reinforcement periods, researchers should include descriptive information, within each session, about which mands are emitted when. Specific data regarding the forms of the emitted verbal responses could help convey if a participant's mands specify a single reinforcer (e.g., iPad only), a single category of reinforcers (e.g., tangibles only), or a variety of reinforcers (e.g., tangibles, attention, social avoidance, rearrangement of the environment, unique interactions

during cooperative play), which would help distinguish mand compliance from generic

reinforcement contingencies. Although examples of the types of mands emitted have been

presented in table format in previous studies (e.g., Bowman et al., 1997), more accurate

information regarding when each type of mand is emitted may be of further utility in the analysis

of problem behavior. If multiple types of mands are emitted during EO periods when mands are

not reinforced, but denial of certain mands is more likely to evoke problem behavior, identifying

the more evocative denial events may reveal putative EOs that could help design an optimally

motivating set of conditions in which to treat problem behavior. For example, studies could be

designed to perform finer-grained analyses to determine whether extinction of a mand for a

particular item may be more or less evocative than extinction for a mand for a particular type of

interaction.

In addition to reporting whether or not adults *provide* requested reinforcers during the

reinforcement interval, researchers should include data on the degree to which participants

consume said reinforcers. If a participant requests to play a game with an analyst, do they engage

with the adult while playing, or do they prefer simply to play independently with the adult

present? The former suggests a dynamic interaction that would be difficult to capture outside of a

mand compliance analysis, whereas the latter suggests a more static test for a tangible reinforcer.

Moreover, measures of the participant's consumption of the reinforcers specified by the mands

could help reveal whether or not the mands are indeed evoked by prevailing establishing

operations (i.e., whether or not the verbal responses are indeed *mands*; Skinner, 1957).

General Discussion

Mand compliance has been demonstrated to influence problem behavior in 60 published,

differentiated functional analyses across 59 participants. Although knowledge of its prevalence

as a controlling variable for problem behavior is currently unknown, the dramatic uptick in

recently published evaluations of mand compliance (see Figure 3), coupled with the clear and

consistent caregiver reports and observations that informed mand compliance analyses across

diverse participant profiles, suggest that researchers and practitioners may benefit from screening

for mand compliance via indirect or descriptive assessment methods. Treatments developed from

analyses showing that problem behavior was sensitive to mand compliance in isolation or as part

of a synthesized reinforcement contingency have been shown to reduce problem behavior. These

treatments always included differential reinforcement procedures, which almost always involved

the strengthening of an alternative communicative response. Various procedures have been

successfully employed to extend the treatment beyond continuous reinforcement of the

alternative communication response.

One broad area for future research is a focus on improving the breadth and precision of

the measurement systems with which mand compliance is analyzed and treated and the

procedures for expanding its applicability. Refining procedures related to the reinforcement of

nondescript communicative responses (i.e., application with non-vocal participants), the

emission of unreasonable mands, and the process by which interventions are made more

implementable under relevant conditions are important next steps. The other broad area of future

research involves taking a closer look at the events taking place during analyses of mand

compliance; namely, the nature of mands emitted, the scope of reinforcement provided and

consumed, and the interplay between mands, adult responses to mands, and problem behavior.

The mand compliance contingency is typically described as a dynamic series of events

and social interactions surrounding child mands (Bowman et al., 1997; Fisher, 2001; Schmidt et

al., 2017). In the literature, it has been distinguished from traditional tests for commonly

evaluated reinforcers like adult attention or access to tangibles in its ability to capture fluctuating

EOs for potentially idiosyncratic reinforcers. Despite some procedural similarity, it is also

distinguished from other idiosyncratic contingencies, such as termination of activity interruptions

(Adelinis & Hagopian, 1999; Falcomata et el., 2012; Hagopian et al., 2007) and access to

ritualistic behavior (Hausman et al., 2009; Rispoli et al., 2014) primarily because the controlling

variables for problem behavior appear to be the increased reinforcement for subsequent mands in

addition to the resumption of a child-specified activity.

Various behavior patterns could be inferred from the published analyses of mand

compliance, however, suggesting that it is also possible that the contingency is more similar to

others than typically described. For example, interactions between client and adult when the

mand compliance contingency is programmed may appear similar to an *access to preferred*

conversation condition (e.g., Roscoe et al., 2010) in that the child may only mand for a preferred

conversation topic when the adult deviates from that topic, or an *access to ritualistic behavior*

condition (e.g., Hausman et al., 2009) if problem behavior is only evoked when the adult restricts

access to the opportunity to engage in ritualistic behavior. As another example, the contingency

may appear similar to a traditional test of *access to tangibles* if problem behavior is evoked

solely by the deviation from the child-specified activity, which could involve engagement with a

single tangible reinforcer. In fact, certain descriptions in the literature of traditional tests for

access to tangibles are described in a manner consistent with procedures for testing mand

compliance. Robertson et al. (2013), for example, described a tangible condition with a

programmed EO in which "…toys were restricted by the parent [and] the parent then ignored all

child requests for toys" (p. 1073). Problem behavior resulted in the provision of multiple toys,

suggesting that the child could direct the manner of play with toys during reinforcement.

Research examining within-session data patterns of analyses of mand compliance may help illustrate the nature of the contingency with greater clarity, which could assist practitioners who may be struggling to identify or analyze the contingencies controlling their clients' problem behavior. It may also be beneficial in revealing the mechanisms responsible for how such a potentially dynamic contingency develops in young children. The mand compliance contingency is unique in part because problem behavior is seemingly evoked across a variety of EO conditions, but also because mands seemingly persist, to some degree, under those conditions. A closer analysis may help reveal the intermittency with which certain mands are reinforced, and the contexts in which nonreinforcement yields problem behavior. For example, problem behavior may be (a) induced emotional responding resulting from extinction of particular mands (Goh & Iwata, 1994), (b) evoked by the presentation of salient stimuli signaling nonreinforcement (e.g., "No"), or both. Problem behavior may be reinforced by (a) resumption of a previously specified activity, (b) compliance with subsequent mands, or both. More intimate analyses may allow for control of these various factors, elucidating the putative variables controlling problem behavior in the mand compliance contingency. Finally, this area of future research would be complemented by descriptive research examining the development of problem behavior sensitive to mand compliance in natural environments (Baer, 1973).

The concept of mand compliance as a controlling variable for problem behavior is powerful in that it allows for dynamic, flexible analyses and treatments of problem behavior related to nuanced social interactions involving multiple reinforcers. The abovementioned similarities between mand compliance analyses and other commonly evaluated or idiosyncratic contingencies suggests that mand compliance could be either less or more prevalent than its representation in the literature would indicate. It may be the case that researchers evaluating

mand compliance observed behavior patterns that were not indicative of a functional relation between problem behavior and an increased probability of reinforcement for subsequent mands. It may otherwise be the case that other functional analyses, not described as evaluations of mand compliance, observed behavior patterns indicative of a functional relation between problem behavior and increased reinforcement for subsequent mands. In order to further distinguish *mand compliance* as a contingency controlling problem behavior, a more intimate analysis of the relation between mands, adult responses to mands, and problem behavior is needed.

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Figure 1

An Illustration of the Contingency Arrangement Described in Bowman et al. (1997)

Establishing
operation

| Adult stops complying with earlier request by actively engaging in incompatible activity |

Request → Ignored

Problem behavior

Reinforcement

| Adult resumes child-specified activity and reinforces all requests for 30 s |

Figure 2

PRISMA Flowchart

Identification	Literature search: PsycINFO (n = 25)
	  Problem behavior + Mand compliance (6)
	  Problem behavior + Request compliance (19)
	  Limits: Peer reviewed, human population,
	English language only
		Other sources (n = 146)
		  Cited Bowman et al. (122)
		  Articles evaluating synthesized
		  contingencies of problem behavior (24)
		Limits: Same as in literature search.

Combined search results after duplicates removed:
n = 138

Screening

Results screened by title and abstract

Excluded (n = 83)
  Review, discussion, or book chapter (51)
  Not an FA of problem behavior (28)
  Not behavior-analytic content (4)

Included based on title and abstract:
n = 55

Eligibility

Full text screened for eligibility

Excluded (n = 33)
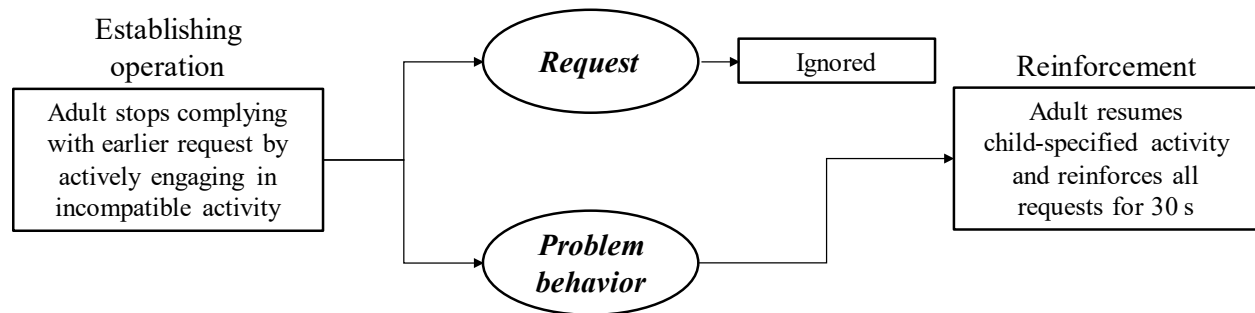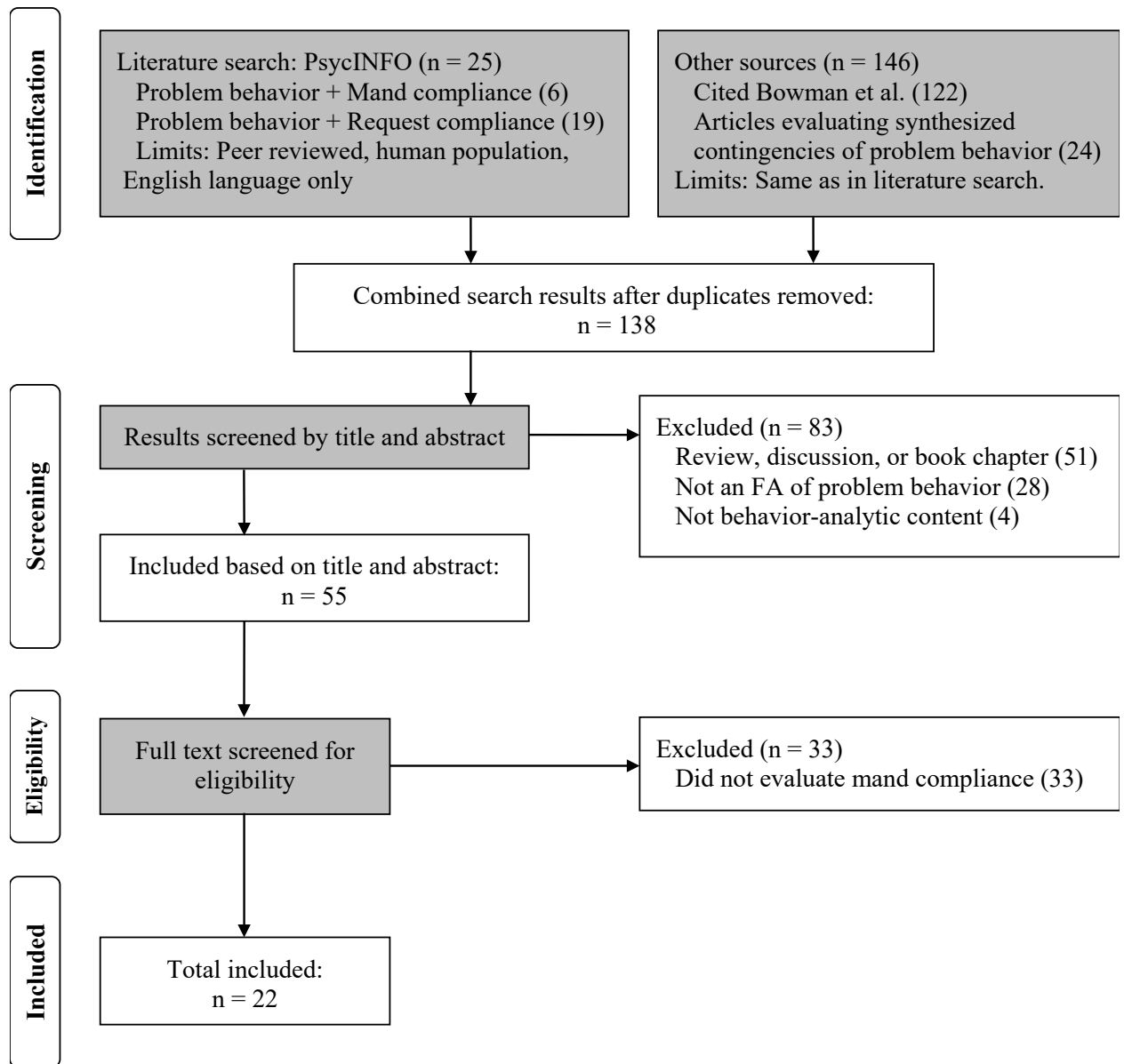 Did not evaluate mand compliance (33)

Included

Total included:
n = 22

Figure 3

Cumulative Publications and Independent Analyses Evaluating Mand Compliance from 1997 to

2020

Figure 4

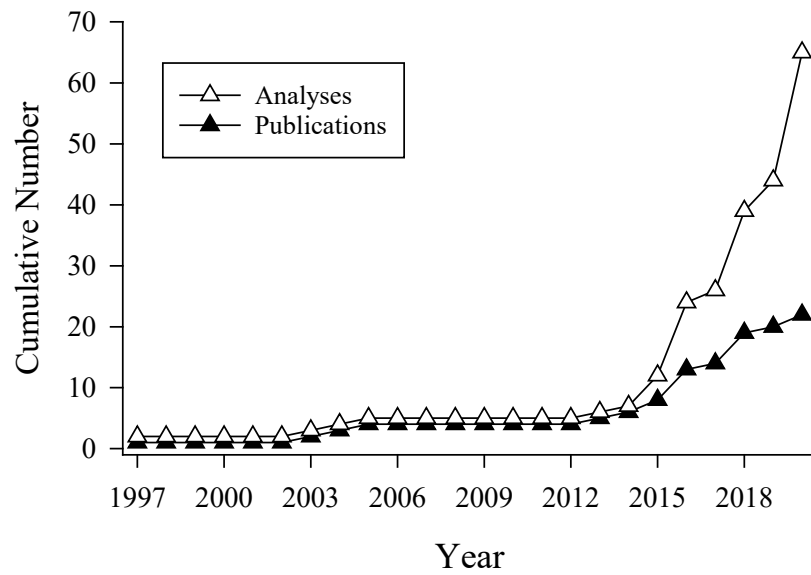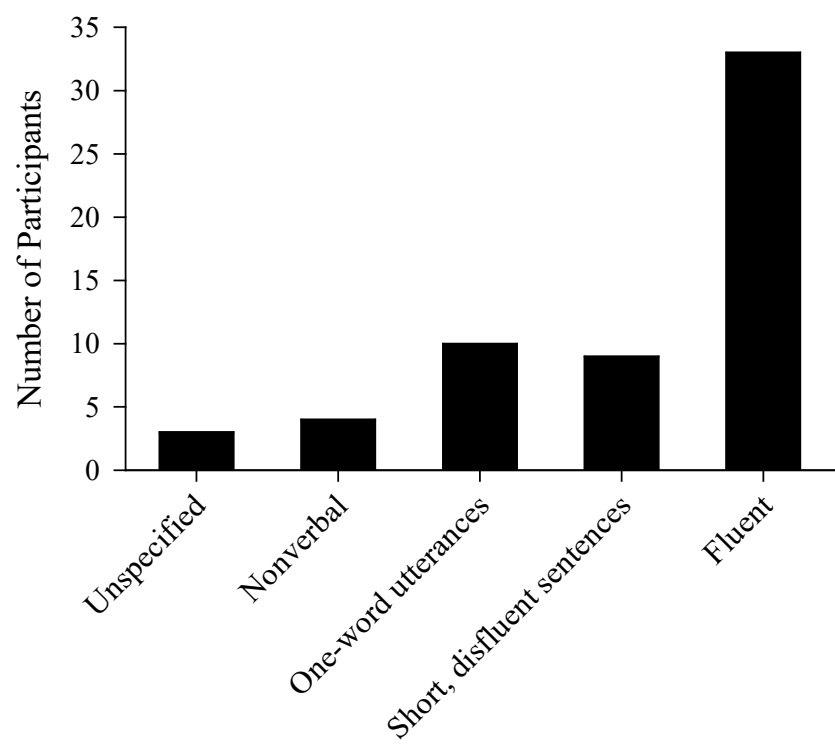*The Range and Distribution of Language Abilities across Participants*

Figure 5

An Illustration of the Various Procedural Arrangements in Test Conditions of Mand Compliance Analyses
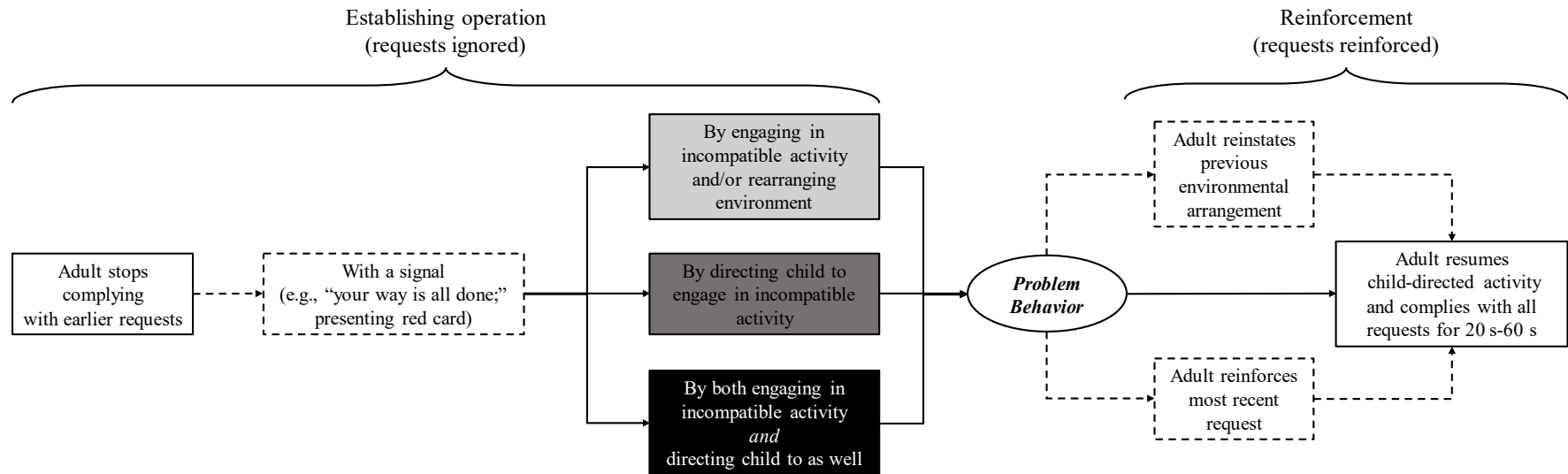
Table 1

Assessment Information

Study	Number of MC analyses	*Initial* or *follow-up* analysis	Assessments informing MC analysis	Analysis design	Session duration (min)	Analysis Differentiated? (Yes/No)
Bowman (1997)	2	Follow up	Caregiver report; ABC data	Multielement	10	Yes
O'Connor (2003)	1	Follow up	Caregiver report; ABC data	Multielement	10	Yes
Fisher (2004)	1	Initial	Caregiver report; Informal observation	Pairwise	20	No
Hagopian (2005)	1	Initial	Unspecified	Multielement	10	No
Betz (2013)	1	Follow up	Informal observation	Multielement	5	Yes
Hanley (2014)*	1	Initial	Open-ended interview; Direct observation	Multielement	5	Yes
Kurtz (2015)	1	Initial	Open-ended interview; Direct observation	Multielement	10	Yes
Roscoe (2015)	4	Follow up	Open- and Closed-ended survey; ABC data	Multielement	10	Yes ($n = 2$) No ($n = 2$)
Eluri (2016)	1	Follow up	Caregiver report; informal observation	Multielement	10	Yes
Ghaemmaghami (2016)*	3	Initial	Open-ended interview	Multielement	5	Yes
Greer (2016)	2	Initial	Indirect assessments	Unspecified	5-10	Yes
Jessel (2016)*	4	Initial	Open-ended interview	Multielement	3-5	Yes

Schmidt (2017)	2	Follow up	Open-ended interview; Direct observation	Reversal; Pairwise	10	Yes
Slaton (2017)*	2	Initial	Open-ended interview	Multielement	5	Yes
Ghaemmaghami (2018)*	4	Initial	Open-ended interview	Multielement	3-5	Yes
Jessel (2018)*	6	Initial	Open-ended interview	Multielement	3-10	Yes
Rose (2018)*	1	Initial	Open-ended interview; Direct observation	Multielement	5	Yes
Torres-Viso (2018)	1	Follow up	Informal observation	Multielement	5	Yes
Jessel, Hanley (2019)*	1	Initial	Open-ended interview	Multielement	5	Yes
Jessel, Metras (2019)*	5	Initial	Open-ended interview	Multielement	3-10	Yes
Owen (2020)	16	Follow up	Caregiver report; ABC data	Multielement; Reversal	5-10	Yes ($n = 15$) No ($n = 1$)
Warner (2020)*	5	Initial	Open-ended interview	Multielement	5	Yes

Note. Studies in which a synthesized contingency analysis was conducted are denoted with an asterisk (*). MC stands for mand compliance.

Table 2

Summary of Procedural Details in Functional Analyses of Mand Compliance

Study	Programmed Establishing Operation				Programmed Reinforcement contingent on problem behavior		
	Adult stops complying with earlier requests	With a signal	Adult engages in incompatible activity/rearranges environment	Adult directs child to engage in incompatible activity	Adult resumes child-directed activity and complies with all requests for 20 s – 60 s	Adult reinstates previous environmental arrangement	Adult reinforces most recent request
Bowman (1997)	✓		✓		✓		
O'Connor (2003)	✓	✓	✓		✓		
Fisher (2004)	✓	✓	✓		✓		
Hagopian (2005)	✓		✓		✓		
Betz (2013)	✓		✓		✓		
Hanley (2014)*	✓		✓	✓	✓	✓	✓
Kurtz (2015)	✓	✓	✓	✓	✓		
Roscoe (2015)	✓	✓		✓	✓		
Eluri (2016)	✓	✓		✓	✓		
Ghaemmaghami (2016)*	✓	✓	✓	✓	✓	✓	
Greer (2016)	✓		✓		✓		✓

Jessel (2016)*	✓		✓	✓	✓		
Schmidt (2017)	✓		✓		✓		
Slaton (2017)*	✓		✓	✓	✓	✓	
Ghaemmaghami (2018)*	✓		✓	✓	✓		
Jessel (2018)*	✓		✓	✓	✓		
Rose (2018)*	✓	✓	✓		✓		✓
Torres-Viso (2018)	✓		✓		✓	✓	
Jessel, Hanley (2019)*	✓		✓	✓	✓		
Jessel, Metras (2019)*	✓		✓	✓	✓		
Owen (2020)	✓	✓	✓		✓		✓
Warner (2020)*	✓		✓	✓	✓		

Note. Studies in which a synthesized contingency analysis was conducted are denoted with an asterisk (*).

Table 3

Summary of Treatment Information

Study	Number of MC treatments	Alternative response	Schedule thinning	How was schedule thinned?	Terminal EO requirement	Supplemental procedures
Bowman (1997)	2	"Please play my way"; "Please play by my rules"	No	--	FR1	Response cost (Jerry only)
O'Connor (2003)	1	Cooperation with academic tasks	Yes	Chained schedule	FR8	Levels program: Time-out from reinforcement
Betz (2013)	1	"My way, please?"	Yes	Mixed and Multiple schedule	FT60 s	None
Hanley (2014)	1	"Excuse me, May I have my way, please?"	Yes	Contingency-based delay and denial tolerance training	67% of session of adult-directed activity	No extinction for problem behavior
Kurtz (2015)	1	"My way"	Yes	Unspecified	Unspecified	Facial screen
Eluri (2016)	1	Cooperation with incompatible activities	No	--	FR15	Response cost
Ghaemmaghami (2016)	3	"I want [item] please"; "Excuse me, May I have my way, please?"	Yes	Time-based and contingency-based delay and denial tolerance training	256 s-600 s of adult-directed activity	None
Greer (2016)	2	Card touch; card exchange; vocal request	Yes	Multiple schedule	FT240 s	None

Schmidt (2017)	2	Tolerating adult-directed play; Compliance (Larry only)	Yes	Multiple and Chained schedule	FT180 s / FR2 (Larry only)	DRO for preferred snack or item (Larry)
Slaton (2017)	1	"My way please"	No	--	FR1	None
Ghaemmaghami (2018)	4	"Excuse me, may I have my way, please?"	No	--	FR1	None
Jessel (2018)	6	"Excuse me, may I have my way, please?"; "My toys, please"; Card touch	Yes	Time-based and contingency-based delay and denial tolerance training	Varied across participants	None
Rose (2018)	1	"Excuse me, may I have the [item/activity] please?"	Yes	Contingency-based delay and denial tolerance training	360 s of adult-directed activity	None
Torres-Viso (2018)	1	"move [item] please"	Yes	Multiple schedule	FT900 s	Momentary DRO during EO component
Jessel, Hanley (2019)	1	"Excuse me, may I have my way, please?"	Yes	Contingency-based delay and denial tolerance training	VR13	None
Owen (2020)	14	Card touch; card exchange; vocal request	Yes	Multiple and Chained schedule	Varied across participants	Time out ($n = 3$); NCR ($n = 1$)

Note. MC stands for mand compliance. EO stands for establishing operation. FR stands for fixed ratio. FT stands for fixed time. VR stands for variable ratio. DRO stands for differential reinforcement of other behavior.