Adaptations of the Interview-Informed Synthesized Contingency Analysis

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In 2014, Hanley et al. introduced a functional analysis (FA) format designed to quickly assess problem behavior under ecologically relevant conditions. The interview-informed synthesized contingency analysis (IISCA) begins with an open-ended interview to identify potential contingencies maintaining each participant's problem behavior. Those unique contingencies are then subsequently evaluated across matched test and control conditions. In the original study, analyses for each participant were differentiated, and those results informed interventions in which participants learned to communicate, tolerate delays and denials to reinforcement, and cooperate with instructions in place of problem behavior.

In the 7 years since Hanley et al.'s (2014) publication, empirical support for the IISCA's generality has grown. A recent review by Coffey et al. (2020) found that 95% of IISCA replications published between 2014 and 2018 obtained differentiated analyses in approximately 25 min. These results were achieved despite variations in participant demographics, problem behavior topographies, settings, and cultures. However, the generality of a FA does not guarantee its utility. Instead, the utility of any FA depends on the ease with which it can be implemented across ecologically relevant settings and the extent to which it informs effective interventions. Any FA format is unlikely to find purchase if it cannot inform effective treatment under a variety of circumstances.

To that end, researchers have begun to evaluate procedural modifications to the IISCA to better meet clinicians' needs. Several of these modifications have resulted in novel FA formats. However, there are no reviews summarizing these advancements. Therefore, the purpose of this brief review is to describe the characteristic procedures of three novel IISCA formats and to offer suggestions for further research. All articles identified through cross-reference searches were included if they (a) contained the first published example of a new IISCA format or (b) extended the literature surrounding one of the novel IISCA formats below.

Latency-Based IISCA Format

Following an IISCA, functional relations are typically identified by evaluating whether response rates are differentiated across test and

control conditions. Higher response rates in the test condition indicate the presence of a functional relation, whereas similar response rates across conditions indicate an absence of control. However, obtaining response rates requires repeated exposure to evocative conditions, which may be a safety concern when problem behavior is severe (e.g., eye gouging). In addition, certain problem behavior topographies are not easily recorded as response rates without rearranging the experimental setting or transitioning participants between experimental contexts (e.g., elopement). To circumvent these challenges, latency measures may be used in place of rate measures (e.g., Thomason-Sassi et al., 2011). Differentiation in latency-based FAs is achieved when response latencies are consistently shorter in the test condition than the control condition. Thus, latency measures may reduce risk because a single instance of problem behavior per test session is sufficient to evaluate whether a functional relation is present.

As a rate-based FA, the IISCA is also subject to the methodological concerns described above. Therefore, Jessel, Ingvarsson, et al. (2018) implemented a latency-based IISCA to assess the elopement of two boys with autism in an outpatient clinic. One participant, for example, was reported to run away from his parents in crowded areas to play with water (e.g., fountains, strangers' cups). Therefore, researchers designed an analysis in which access to water stations was contingent on elopement. Test sessions were terminated after a single instance of elopement, which immediately initiated the next session. Session duration ranged from 30 s (i.e., reinforcement interval duration) to 3 min (i.e., elopement never occurred), and differentiation was achieved after observing only three instances of elopement for both participants.

The latency-based IISCA has since been replicated with additional participants exhibiting elopement (e.g., Boyle et al., 2020), but extensions of this format to other dangerous problem behavior topographies are limited to one participant in Lambert et al. (2017), who engaged in severe aggression and self-injury. However, this participant did not emit problem behavior during the analysis and treatment data were not included in the publication, so little can be said about the efficacy of the latency-based IISCA for populations with other forms of severe problem behavior.

Validating the outcomes of latency-based IISCA applications remains an area for future research. As fewer instances of problem behavior are necessary to achieve differentiation, future researchers could also investigate the extent to which latency measures promote safety. Reporting social validity measures or quantifiable characteristics of injury (e.g., contusions) could help to evaluate client safety.

Trial-Based IISCA Format

When problem behavior is assessed in analogue settings, there is a risk that treatments designed under those conditions will not produce desired outcomes in ecologically relevant contexts. Furthermore, the experimentally precise conditions characteristic of FAs may not be representative of everyday environmental conditions. A trial-based approach might improve the ecological validity of FAs because each trial begins when an establishing operation (EO) for a putative reinforcer occurs in the future treatment context.

Curtis et al. (2020) assessed the problem behavior of three children with autism in a university-based clinic in the first published study combining trial-based measures with the IISCA. The authors hypothesized that using trial-based measures during an IISCA would allow teachers to assess relevant EOs in a classroom while avoiding the shortcomings of analogue, session-based procedures. Caregiver-informed synthesized contingencies were evaluated in twenty 4-min trials with each child.

Trials were divided into 2-min test and control segments. Test segments began once a control segment was terminated. Control segments were terminated when 2 min elapsed or an instance of problem behavior occurred. Problem behavior was measured as a binary occurrence, and percentage of occurrence was then compared across test and control segments. The trial-based IISCA resulted in differentiated analyses for all three participants in an average of 74 min, with approximately 21 instances of problem behavior per participant.

Though the results from this study are promising, the currently accepted procedures call for at least 20 trials per participant. To improve the practicality of this assessment, researchers could evaluate procedural variations of the trial-based IISCA that allow ongoing visual analysis. Doing so would permit teachers to review FA outcomes on a trial-by-trial basis and discontinue the analysis once differentiation is apparent.

Single-Session IISCA Format

Clinicians have often reported time shortages as a barrier to conducting FAs, leading to a reliance on indirect assessments. Because clinicians with large caseloads may have limited time for additional assessments following client intake, further improvements to the efficiency of the IISCA may increase the use of empirical methods to identify contingencies influencing problem behavior.

Reducing the number of IISCA sessions is one strategy for improving efficiency (e.g., Strand & Eldevik, 2018). However, reducing the number of sessions may also limit demonstrations of control. Instead, clinicians might test a hypothesized contingency by collecting within-session measures that evaluate whether problem behavior is influenced by the systematic removal and presentation of reinforcers. If response rates are elevated in the presence of the EO and reduced in the presence of reinforcement, control has been demonstrated. Narrowing the window of observation shifts the evidence of control from aggregate rates across sessions to second-to-second response analyses. Such within-session analyses of problem behavior are termed single-session IISCAs (Jessel et al., 2016).

The single-session IISCA was originally evaluated with three preschool children referred to an outpatient clinic for the treatment of severe problem behavior (Jessel, Hanley, et al., 2018). Following interviews with parents and brief observations in the clinic, individualized contingencies were analyzed in single, 5-min sessions. The single-session IISCAs were identical to a 5-min test session of a full IISCA in that 30-s access to synthesized reinforcers was contingent on any problem behavior topography. Once the 30-s reinforcement interval elapsed, an EO was presented. Researchers then calculated rates of problem behavior during reinforcement and EO intervals. Analyses were differentiated for all participants; problem behavior rates were elevated predominantly when an EO was presented, and were reduced when reinforcers were present. Reanalyses of single-session IISCA data showed similar levels of differentiation when session duration was reduced from 5 to 3 min (Jessel et al., 2020). However, the strongest control over problem behavior was most likely to occur during 10-min analyses.

Despite the single-session IISCA's brevity, technological and time requirements necessary to conduct post-hoc, within-session analyses may be impractical in many settings. In addition, achieving differentiated outcomes in such a brief amount of time requires salient and relevant evocative events. Future researchers may want to investigate procedures that facilitate the identification of relevant variables, such as: (a) caregiver reports of severity, (b) level of ecological relevance, and (c) saliency of the EO. Due to the brevity of the assessment period, future researchers could also evaluate

the single-session IISCA as a tool for clinicians to quickly verify hypothesized contingencies while problem behavior occurs in real time. This research could be especially relevant for those individuals whose preferences and interests fluctuate throughout the day.

Further Research Considerations

Although the latency-based and single-session IISCAs have been replicated across participants and settings, Curtis et al. (2020) represents the only published application of the trial-based IISCA to date. In order to facilitate the adaptation of the above IISCA formats to a variety of clinical settings, it will be necessary to continue research on their clinical validity. Another important step in continuing this line of research is to investigate the generality of these analysis formats, particularly under conditions where each IISCA format may prove uniquely useful. For instance, researchers might replicate the latency-based IISCA in residential settings with adult participants because this analysis format may provide additional safety precautions for participants whose problem behavior may otherwise be too dangerous to manage. Likewise, because the only published example of the trial-based IISCA took place in a clinic, researchers might implement this analysis across a variety of classroom settings. When replicating the single-session IISCA, future researchers could consider introducing smartphone applications that graph data in real time so that post-hoc analyses are unnecessary.

Performance-Based IISCA

Another avenue of future research could be to evaluate whether additional procedural modifications would further increase the acceptability and accessibility of the IISCA. One way this might be studied is to add three novel elements to the single-session IISCA to create a new analysis format. First, time requirements could be removed from reinforcement intervals, allowing access to reinforcement for an indefinite period following instances of problem behavior. This modification essentially creates one reinforcement interval punctuated by EO presentations, and will likely make the analysis longer than 5 min. However, it also decreases exposure to the EO, which may increase safety. Safety may be further increased by progressing EOs only when problem behavior is absent from reinforcement intervals. Second, problem behavior could be recorded as count instead of rate. There are no great technological requirements for counting problem behavior. Thus, count measures may be more accessible in clinical settings where resources are scarce. De-aggregating data also permits analysts to terminate an IISCA based on moment-to-moment responding (e.g., if problem behavior persists during reinforcement). If FA termination can be influenced by moment-to-moment measures of behavior, it follows that participant performance may also be used to determine whether control is established over problem behavior (e.g., when five consecutive instances of problem behavior occur exclusively during EO presentations). Third, individualized indices of happiness and relaxation (e.g., positive affect) or item engagement could be measured. These measures could provide evidence that reinforcement contingencies assessed during the FA will sustain skills (e.g., leisure activities) during subsequent function-based treatments, or provide indirect evidence of assent.

The combination of these three novel procedural modifications defines what can be tentatively termed the *performance-based IISCA* (Hanley, 2020). This IISCA format might increase participant safety and provide clinicians with some evidence about existing skill repertoires without sacrificing functional control over behavior. However, further empirical investigation is necessary to assess the efficacy of the performance-based IISCA format.

The IISCA formats described in this article were developed to address practical concerns

such as safety, efficiency, and ecological relevance. Additional research on procedural modifications to the IISCA may produce experimental FAs that are well suited to a greater variety of settings and are more acceptable to clinicians and stakeholders.

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