Reply to Barnes-Holmes & Harte (2022)

“The IRAP as a Measure of Implicit Cognition:

A Case of Frankenstein’s Monster”

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Barnes-Holmes & Harte (2022) recently provided an account of the history of the development and use of the Implicit Relational Assessment Procedure (IRAP) in order to make suggestions for its future development and use. Unfortunately, their core assertions are at odds with the published scientific record. This commentary uses a systematic review of the published IRAP literature to show that, contrary to Barnes-Holmes & Harte’s (2022) account, (1) Barnes-Holmes repeatedly and explicitly stated that the IRAP is an implicit measure, and (2) Barnes-Holmes did not ‘lose control’ of the task. Rather, he and his research group have produced the majority of all IRAP publications. However, Barnes-Holmes & Harte’s (2022) analogy with Frankenstein’s monster may still hold under a correct reading of Shelly’s novel as a cautionary tale about recklessness in science.

Barnes-Holmes & Harte (2022) recently provided their historical account of the development and use of the Implicit Relational Assessment Procedure (IRAP). Unfortunately, their core assertions are at odds with the published scientific record. As scientists generally, we should be concerned with verifiable facts and avoid revisionism. As behaviorists specifically, we should take responsibility for how we have arranged the environment and how it has influenced the behavior of other scientists. This commentary therefore details and corrects the two key inconsistencies between the account provided by Barnes-Holmes & Harte (2022) and the actual contents of Barnes-Holmes’ published work on the IRAP. Specifically, they argued that (1) “the IRAP did not start out as a measure of implicit cognition” (pp. 5-6) and (2) “the creator of the IRAP seemingly lost control of his creation as the procedure became almost exclusively employed as a measure of implicit cognition” (p. 2). These points are both key to Barnes-Holmes & Harte’s (2022) account and demonstrably not the case. These corrections are not merely pedantic: Barnes-Holmes & Harte (2022) provided a roadmap for future research based on their view of the past nearly two decades of IRAP research. If future investments in to IRAP research are to be successful we must build them on an accurate account of the work to date.

# Barnes-Holmes consistently stated that the IRAP was created as an implicit measure

Claim 1: “the IRAP did not start out as a measure of implicit cognition” (Barnes-Holmes & Harte, 2022, pp. 5-6). On the contrary, the early IRAP literature is very explicit that it was created and used as one. In order to demonstrate this, I provide quotes from the first ten published IRAP articles and book chapters, all of which Barnes-Holmes was a co-author of. These articles were taken from a recent and publicly available systematic review that lists all published IRAP studies from 2006 to 2022 (Hussey, 2022), which I will return to later. In many cases, statements that the IRAP was employed as an implicit measure are present not only in the text but also the title of the article, including the first and most cited paper.

The first IRAP publication, Barnes-Holmes et al. (2006), was subtitled “Developing the Implicit Relational Assessment Procedure (IRAP) as a direct measure of implicit beliefs” and stated that “the current results do suggest, if only tentatively, that the IRAP provides a measure of implicit beliefs” (p. 173). McKenna et al. (2007) stated “another procedure for assessing implicit cognitions has been proposed, the Implicit Relational Assessment Procedure” (p. 254) and “the current findings provide some support for the IRAP as an implicit measure” (p. 267). Cullen & Barnes-Holmes (2008) stated “it is prudent to develop additional methodologies that aim to provide relatively direct measures of implicit cognition. One such methodology has recently been offered: the Implicit Relational Assessment Procedure” (p. 35). Barnes-Holmes et al. (2008) stated “the IRAP meets the second two criteria for an implicit measure” (p. 512). Chan et al. (2009) referred to the IRAP as an implicit measure in their title and stated “The current article reports the findings from two preliminary experiments investigating … the Implicit Relational Association Procedure (IRAP) as measures of implicit attitudes in the domain of work and leisure … The results support the use of the IRAP as a measure of implicit attitudes” (p. 317). Dawson et al. (2009) also referred to the IRAP as an implicit measure in their title and stated “The aim of the present study was to determine if the IRAP would be more effective at revealing sexual offenders’ implicit beliefs about children than an explicit (questionnaire-based) methodology” (p. 63). Vahey et al. (2009) stated the IRAP was “used with all participants to measure implicit self-esteem” (p. 374). Barnes-Holmes et al. (2009) stated that their “findings support the IRAP as a potentially useful measure of implicit attitudes.” (p. 389). Power et al. (2009) referred to the IRAP as an implicit measure in their title and that the IRAP “was designed to examine implicit beliefs or attitudes” (p. 621). Cullen et al. (2009) stated “at the very least, therefore, the current findings indicate that the IRAP could provide a possibly useful alternative to the IAT when a fine-grained analysis of implicit cognition is required” (p. 611).

Barnes-Holmes continued to refer to the IRAP as an implicit measure until at least 2019 (e.g., Perez et al., 2019). This happened to coincide with the publication of two independently conducted meta-analyses of the IRAP’s psychometric properties that both concluded that the IRAP demonstrates poor reliability, and that its psychometric properties therefore make it a poor measure of individual differences even relative to other implicit measures (Cronbach’s α = .51 to .56: Greenwald & Lai, 2020; Hussey & Drake, 2020).

Note that this point whether the IRAP was claimed to be an implicit measure is agnostic to whether it also has utility within behavior-analytic research (e.g., as a measure of natural verbal relations). Barnes-Holmes has explicitly stated elsewhere that functional-analytic explanations and cognitive representational explanations of behavioral phenomena are separate levels of analysis that do not interact or preclude one another (Barnes-Holmes & Hussey, 2016). As such, the question of whether the IRAP is an implicit measure or a measure of natural verbal relations is not an ‘either/or’ question. Barnes-Holmes & Harte’s (2022) claim was that the IRAP did not start out as an implicit measure. The published scientific record clearly demonstrates otherwise.

# Barnes-Holmes cannot have lost control of his creation because he produced most of the literature

Claim 2: “the creator of the IRAP seemingly lost control of his creation as the procedure became almost exclusively employed as a measure of implicit cognition” (Barnes-Holmes & Harte, 2022, p. 2). The implication here is that researchers other than Barnes-Holmes used the task extensively and perhaps in ways not intended by its creator. Putting aside the question of how it was used (i.e., given that it was consistently described as an implicit measure it was reasonable to use it as one), this claim can be easily tested by examining who has used the IRAP. If Barnes-Holmes & Harte’s (2022) claim that Barnes-Holmes ‘lost control’ of the task is valid, then the task would have to have seen extensive use by others. To examine this, I made use of a publicly available systematic review of the IRAP literature.

This systematic review was conducted for other purposes that are currently in-progress (i.e., to review the designs, sample sizes, and statistical power in the published IRAP literature). The complete list of IRAP articles and book chapters produced by the review was reused to examine authorship in the IRAP literature (i.e., I make use of this systematic review for its complete list of IRAP publications, not to qualitatively or quantitively analyze the contents of those publications). Full details of the systematic review, including all materials necessary to reproduce, reuse, or update the systematic review are available (Hussey, 2022). The review followed PRISMA guidelines (Moher et al., 2009) and found 155 articles and book chapters published between 2006 and 2022 that employed the IRAP. The authorship list was then analyzed in R (see supplementary materials for reproducible code and data: [osf.io/3bp84](https://osf.io/3bp84/)). These publications included 289 individual authors. The median number of publications per author was 1, with low variation (Median Absolute Deviation = 0). This demonstrates that the modal researcher who uses the IRAP uses it just once. In order to understand repeat users of the task, I extracted all researchers with at least 5 publications using the IRAP. This included 20 researchers (see Table 1). Results demonstrated that Dermot Barnes-Holmes was a co-author of 48% of all IRAP publications between 2006 and 2022. Of these twenty frequent users of the IRAP, one was Barnes-Holmes, 15 were his current and former students, and 1 was one of his former student’s students. Only 3 individuals (15%) who have frequently published IRAP studies did not come from Barnes-Holmes’s academic lineage. When considering all IRAP publications, 71% included Barnes-Holmes, one of his students, or one of his students’ students as a co-author.

Collectively, this analysis of the authorship patterns in the IRAP literature reduce the credibility of Barnes-Holmes & Harte’s (2022) claim that the task’s creator lost control of the IRAP, or the implication that it was authors other than Barnes-Holmes that used the IRAP as an implicit measure.

# The analogy with Frankenstein

Barnes-Holmes & Harte’s (2022) analogy between the IRAP and Frankenstein’s monster is instructive and worth of exploring. They stated that “In Mary Shelley’s classic novel, Frankenstein (1818), we are presented with the case of a doctor who creates a living monster by successfully piecing together and reanimating body parts from different people. However, not long after the monster has been brought to life he becomes Dr. Frankenstein’s nemesis and eventually leads to their joint demise. … However, as was the case with Dr. Frankenstein’s monster, the creator of the IRAP seemingly lost control of his creation as the procedure became almost exclusively employed as a measure of implicit cognition. … we hope that this story will not end in the same way that Shelley’s did. Rather we hope that

**Table 1.** Authors who have five or more IRAP publications and their association with Barnes-Holmes.

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| --- | --- | --- | --- | --- |
| Author | Number of IRAP authorships | Proportion of all publications | Student of DBH | Student of DBH’s student |
| Dermot Barnes-Holmes | 75 | 48% | - | - |
| Yvonne Barnes-Holmes | 34 | 22% | Yes | Yes |
| Ciara McEnteggart | 21 | 14% | Yes | Yes |
| Ian Stewart | 17 | 11% | Yes | Yes |
| Carol Murphy | 15 | 10% | Yes | Yes |
| Michelle Kelly | 10 | 6% | Yes | Yes |
| Diana Bast | 9 | 6% | Yes | Yes |
| Colin Harte | 9 | 6% | Yes | Yes |
| Ian Hussey | 9 | 6% | Yes | Yes |
| Julio de Rose | 7 | 4% | No | No |
| Sean Hughes | 7 | 4% | Yes | Yes |
| Louise McHugh | 7 | 4% | Yes | Yes |
| Renato Bortoloti | 6 | 4% | No | No |
| João Henrique de Almeida | 6 | 4% | Yes | Yes |
| Chad E. Drake | 6 | 4% | No | No |
| Deirdre Kavanagh | 6 | 4% | Yes | Yes |
| Emma Nicholson | 6 | 4% | Yes | Yes |
| Lynn Farrell | 5 | 3% | No | Yes |
| Martin Finn | 5 | 3% | Yes | Yes |
| Aileen Leech | 5 | 3% | Yes | Yes |

the IRAP, unlike Frankenstein’s monster, will be tamed and refined into a better understood, more precise, functional-analytic tool” (pp. 1-2). This rendition of the novel’s plot and themes is a common and ironic misunderstanding: Shelly’s Frankenstein is a story about the follies of scientific ambition that is blind to responsibility. Through his labors, Victor Frankenstein creates new life. But he does not merely lose control of the creature, he abandons and betrays it. The creature goes on to cause chaos, but the ultimate cause of this damage is Frankenstein’s failures to stay true to his prior words or take responsibility for his influence.

# Author note

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