

# 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), and used this account as a springboard for suggestions for future research. Unfortunately, their core assertions are at odds with the published scientific record. This raises questions about the reliability of their recommendations. This reply 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. The credibility of Barnes-Holmes & Harte’s (2022) suggestions regarding the future of the IRAP is undermined by their inaccurate account of its past. However, their analogy with Frankenstein’s monster still holds, albeit under an alternative and correct reading of Shelly’s novel as a cautionary tale about scientific recklessness.

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 this has influenced the behavior of other scientists. For example, other researchers are likely to use a task as an implicit measure if we repeatedly assert that it is one. 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 into IRAP research are to be successful we must build them on an accurate account of the work to date. Indeed, the

credibility of any recommendations for the future of the task should be informed by the accuracy of the account of its past.

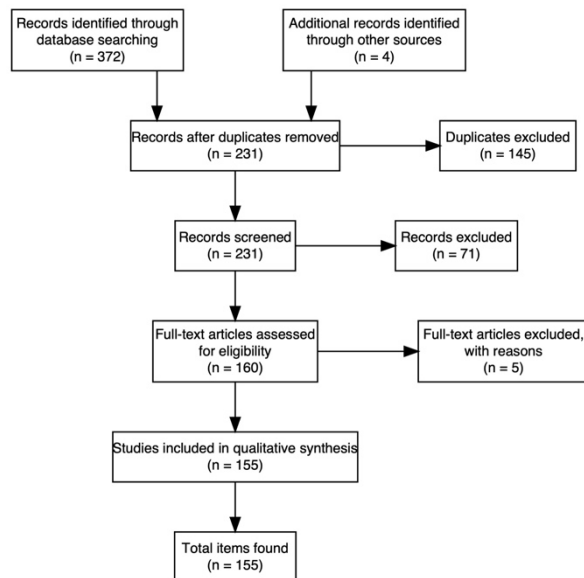
## **Systematic review of published IRAP research**

Barnes-Holmes & Harte’s (2022) claims were therefore testing using a systematic review of the published IRAP literature (2006 to 2022, in English, listed in the Web of Science or psycINFO databases). Full details of the systematic review, including Boolean search strings, all materials necessary to reproduce, reuse, or update the review, all data, and R code to reproduce the analyses are available in the supplementary materials ([osf.io/3bp84](https://osf.io/3bp84)). A PRISMA flow chart detailing all exclusions can be found in Figure 1 (Moher et al., 2009). 155 articles and book chapters that used the IRAP were found.

## **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. To demonstrate this, I provide quotes from the first ten published IRAP articles and book chapters of which Barnes-Holmes was a co-author.

**Figure 1.** PRISMA flow chart for systematic review



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” (p. 611).

Barnes-Holmes continued to refer to the IRAP as an implicit measure for over a decade. In order to not labor the point, I provide quotes from one publication co-authored by Barnes-Holmes per year: “it would also seem prudent to attempt to develop additional methodologies that aim to provide relatively direct measures of implicit cognition. The IRAP may be one such method” (Barnes-Holmes et al., 2010, p. 45); “The Implicit Relational Assessment Procedure (IRAP) is an implicit measure” (Campbell et al., 2011, p. 378); “A broad implicit measure of depressive emotional reactions was created by mapping the content of the depression scale from the Depression Anxiety and Stress Scale (DASS) on to the Implicit Relational Assessment Procedure (IRAP)” (Hussey & Barnes-Holmes, 2012, p. 573); “the Implicit Relational Assessment Procedure (IRAP), which was designed to measure the professional’s implicit attitudes to this particular disability” (Kelly & Barnes-Holmes, 2013, p. 5); “implicit measures such as the Implicit Relational Assessment Procedure ... may provide novel perspectives into disorders such as OCD” (Nicholson et al., 2014, p. 32); “the IRAP is uniquely equipped to measure implicit cognition” (Vahey et al., 2015, p. 60); “we hypothesized that the self-focused measure of implicit evaluations of death (i.e., personal IRAP) would be a superior predictor of group membership than the measure of abstract implicit evaluations of death (i.e., abstract IRAP)” (Hussey et al., 2016, p. 3); “The implicit measures used (IAT and IRAP) are computer-based tests that assess reaction time biases” (Stewart et al., 2017, p. 64).

Barnes-Holmes’ last reference to the IRAP as an implicit measure (i.e., Perez et al., 2019) seems to have been just before the publication of two independent meta-analyses of the IRAP’s psychometric properties (Greenwald & Lai, 2020; Hussey & Drake, 2020). These reviews both concluded that the IRAP demonstrates poor reliability (Cronbach’s  $\alpha = .51$  to  $.56$ ). As such, its psychometric properties make it a poor implicit measure relative to others (see Greenwald & Lai, 2020).

Note that this question of whether the IRAP was claimed to be an implicit measure is agnostic to whether it also has real or potential utility within behavior-analytic research (e.g., as a measure of natural verbal relations). Barnes-Holmes has explicitly stated his position 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 demonstrates otherwise.

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

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

**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 by others, perhaps in ways not intended by its creator. Putting aside the question of how it was used (i.e., given that the previous section shows that it was consistently described as an implicit measure), this claim can be easily tested by examining the authorship of IRAP publications. 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.

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. To understand repeat users of the task, I extracted all researchers with at least five publications using the IRAP. Twenty such researchers were found (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 Dermot Barnes-Holmes himself, fifteen were his current and former students, and one was one of his former student’s students. Only three individuals (15%) who have

frequently published IRAP studies did not come from Barnes-Holmes’s academic lineage. 71% of all IRAP publications 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 reduces the credibility of Barnes-Holmes & Harte’s (2022) claim that the task’s creator lost control of the IRAP and 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 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 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 lose control of the creature: he abandons and betrays it. The creature goes on to cause carnage, but the ultimate cause of this damage is Frankenstein's failure to stay true to his prior words or take responsibility for his influence over his creation.

### Conclusion

Contrary to what Barnes-Holmes & Harte (2022) claimed, a systematic review of the published IRAP literature showed that, from its inception, Barnes-Holmes stated that the IRAP was created and used as an implicit measure. Barnes-Holmes never 'lost control' of the task but rather has continued to be the primary author of IRAP publications. Barnes-Holmes has therefore played a central role in the verbal community that establishes and maintains the labelling and use of the IRAP as an implicit measure. Revisionism or obfuscation of the IRAP's history and evolution only serves to mislead readers and further confuse the task's purpose and potential utility. Unfortunately, the credibility of Barnes-Holmes & Harte's (2022) vision for the future of the IRAP is undermined by their mischaracterization of its past.

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### Statements and Declarations

#### Conflict of Interest

The author declares that he has no relevant financial or non-financial interests to disclose.

#### Funding

This research was supported by the META-REP Priority Program of the German Research Foundation (#464488178).

#### Availability of data, code and materials

All data, code and materials are available at [osf.io/3bp84](https://osf.io/3bp84).

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