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THROUGH THE LOOKING-GLASS: PsycINFO as an Historical Archive of Trends in Psychology

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Those interested in tracking trends in the history of psychology cannot simply trust the numbers produced by inputting terms into search engines like PsycINFO and then constraining by date. This essay is therefore a critical engagement with that longstanding interest to show what it is possible to do, over what period, and why. It concludes that certain projects simply cannot be undertaken without further investment by the American Psychological Association. This is because forgotten changes in the assumptions informing the database make its index terms untrustworthy for use in trend-tracking before 1967. But they can indeed be used, with care, to track more recent trends. The result is then a Distant Reading of psychology, with Digital History presented as enabling a kind of Science Studies that psychologists will find appealing. The present state of the discipline can thus be caricatured as *the contemporary scientific study of depressed rats and the drugs used to treat them* (as well as of human brains, mice, and myriad other topics). To extend the investigation back further in time, however, the 1967 boundary is also investigated. The author then delves more deeply into the prehistory of the database's creation, and shows in a précis of a further project that the origins of PsycINFO can be traced to interests related to American national security during the Cold War. In short: PsycINFO cannot be treated as a simple bibliographic description of the discipline. It is embedded in its history, and reflects it.

Keywords: historical trend analysis, PsycINFO, controlled vocabulary, digital historiography, Cold War social science

“You may look in front of you, and on both sides, if you like,” said the Sheep, “but you can’t look all round you. . . .”

—Lewis Carroll, *Through the Looking-Glass*

It is not widely known today that bibliometrics—the subfield of scientometrics dedicated to the analysis of scholarly output—owes its origins to a psychologist. Indeed, none other than James McKeen Cattell (1860–1944) is credited with pioneering the systematic scientific study of intellectual productivity: his multivolume biographical series, *American Men of Science*, presented a natural history of the species of intellect driving American scientific advancement (Godin, 2006). This was

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I thank the members of the PsyBorgs Lab at York University in Canada, led by Christopher Green and Mike Pettit, as well as the members of the Theory and History of Psychology Department at the University of Groningen in the Netherlands. Both groups read early drafts, and listened to me explain my goals. I am especially grateful to Douwe Draaisma and Maarten Derksen for encouraging me to develop the more-critical angle that defined the final version. And to Linda Beebe and Gary VandenBos, both now retired from the American Psychological Association: this wouldn’t have been possible without your support. Thank you for everything.

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an extension of the same eugenic interests that had inspired intelligence testing, via the earlier efforts of Francis Galton (1822–1911), with its associated focus on the disproportionate impact of “great men” (Godin, 2007).

Psychologists have preserved their leadership in the psychometric aspect of this project. Over time, however, the original endeavor’s constituent parts became disconnected. Dissociated, even (Godin, 2009). Psychologists then lost their connection to an increasingly important and influential area of study: the assessment and analysis of innovative output, impact, and productivity (Godin, 2012). Now, as a result, the original bibliometric methods are often applied uncritically (see Green & Martin, 2017; Hegarty & Walton, 2012; Pettit, 2016). The result has been the emergence of something we might call a “trust in numbers” problem (following Porter, 1995).¹ And this has very serious consequences: the different sides in any historical argument can appeal to different apparently-objective methods to provide “different facts” (Watrin & Darwich, 2012, p. 269).

My goal here is to take on this problem directly. I therefore interrogate one of the most popular contemporary bibliographic systems behind the numbers that psychologists trust: the American Psychological Association’s (APA’s) PsycINFO search engine.² My intent is to show when and how it is possible to use that system to make trustworthy and meaningful inferences about our science’s changing character.³

Ideally, of course, it should be possible to use these methods to derive an empirical answer to psychology’s foundational and perennial question: “What is psychology?” (see, e.g., Bode, 1922; Bushnan, 1859; Canguilhem, 1958/2016; Gibson, 2003; Hebb, 1974; McComas, 1923; Piaget, 1978; Yanchar & Hill, 2003). However, this is not a straightforward thing to do. There are assumptions that need to be accounted-for in order for the numbers describing these different facts to be considered trustworthy, many of which have been forgotten. That then also affords a secondary goal for what follows: I aim to highlight some of what has been lost, so that the original project—a kind of Science Studies informed by psychological insights—can be picked up once again, with new advances made quickly by building on subsequent critiques of the original hagiographic “great man” approach that informed the work by Galton and Cattell (following e.g., Ball, 2012, 2014).

¹ I am indebted to Mike Pettit for making this observation, which emerged during a discussion regarding the manuscript that became his article on big data and historical time (Pettit, 2016).

² For 5 years, between 2007 and 2012, I served on the PsycINFO advisory board (then called the Electronic Resources Advisory Committee). From this vantage, I had the opportunity to get inside the logic of the American Psychological Association’s search service and reflect on the interests that guided its development. This led to considerations not only of how the service could be extended, but also how its past might have reflected similar goals. However, the resulting views are personal opinions and interpretations informed by original research; they are not meant to represent any position of the APA, the committee’s other members, or support staff.

The essay itself is an extended response to John Burnham’s objection to papers presented by the author at APA and Cheiron (Burman & Ball, 2011, 2012). Briefly, his opposition was to the suggestion that digital methods could introduce a kind of “mechanical objectivity” into the identification of potentially fruitful historical projects (following Daston & Galison, 2007). This was intended to be consistent with “sign-posting” as discussed in this journal (especially by Ball, 2012). But the whole digital approach was rejected at that time as historiographically untenable.

The most fraught “mechanical” aspect of the earlier effort has since been published by Green (2017)—unproblematically, and with the author’s blessing—to inform a substantive discussion of the difference between “productivity at the time” and “recognition today” (see also Green & Martin, 2017). Still, the primary contribution of the original conference papers remained undeveloped (cf. Burman, 2012b). The present essay therefore represents a bridge back toward that original intent, with gratitude to Burnham for having indicated the need for a more careful approach and to Green for having cleared the way.

³ I occasionally use “our” to refer equally to psychologists and historians of psychology. This is an accidental consequence of belonging to both groups, by training, and at the same time trying to speak to both as an insider (while also adopting the norms of each). I regret any confusion this may cause. And I am grateful to Jenn Bazar for pointing it out.

The result is not intended to be a “scientizing” of history (pace [Furumoto, 1995](#)). Nor is it intended to rehash those problematic aspects of earlier attempts at quantitative history. Instead, my goal here is critical: to examine whether it is possible to use modern tools to pick up the still-relevant but forgotten aspects of the Victorian project that afforded the basis for psychometrics (and could perhaps do something similar for the study of scientific output).⁴

Of course, even considering such an endeavor raises important issues.⁵ Indeed, it ought to go without saying that psychologists interested in Science Studies must do more than count. Yet so too must we go beyond Cattell’s questions of quantity and quality; production and advancement. We must also think carefully about the underlying assumptions. Most importantly for this project, we must answer a series of questions: How have our objects become countable? (e.g., [Carson, 2007](#); [Fancher, 1985](#); [Gould, 1981/1996](#); [Hegarty, 2013](#); [Igo, 2007](#); [Young, 2014](#)).⁶ And what are the deeper conventions that inform our decisions regarding what ought to count at all? (e.g., [Godin, 2005](#); [Hacking, 1990, 1975/2006](#); [Law, 2004](#); [Porter, 1986, 1995](#); [Slaney, 2017](#)).

Today, this critical approach to the norms informing psychological science is the concern primarily of specialist historians of psychology: metapsychologists whose contribution is not to conduct experiments, but is rather to use evidence to advance understanding (following especially [Danziger, 1990, 1994, 1997, 2013](#)). New discoveries are still made, of course. One such discovery is discussed below. But the goal of such history, generally, is to try to escape the ignorance caused by our own assumptions (e.g., [Burman, 2015](#)). In the process, new perspectives are uncovered that no one had thought to consider (e.g., [Burman, 2016](#)). And sometimes these even inspire public debates regarding important policies of national and international concern (e.g., [Dehue, 2002, 2004](#)). At the same time, however, there are also conflicts to be managed when historians interact with their publics (e.g., [Brush, 1974, 1995](#); [Teo, 2013](#)). I consider some of these next, before delving into the bibliographic problem that psychologists face in undertaking quantitative histories using even our own tools.

Once it’s clear that the interests of psychologists can be addressed in ways that are consistent with the norms of specialist historians of psychology, I turn to the history of PsycINFO itself. Because this is the source of the trends to which bibliometric methods are applied to track changes over time, I dig into the assumptions that guided the gathering of that data. The subsequent investigation provides the core of the article, and takes the form of several validity studies. Then I engage with a particularly troublesome discovery: that it may not be possible to use PsycINFO to do certain

⁴ By this, however, I do not mean to identify my project with historiometry. That’s because I follow different historiographical norms. This difference is made obvious when comparing historiometric work by [Simonton \(2002, 2005\)](#) with similarly-focused digital histories by [Green \(2017\)](#); see also [Green & Martin, 2017](#)). Although both sought to examine prodigious output, each based their study on different assumptions and then found different things.

⁵ This assumes, of course, that the associated and problematic social norms are left behind. An obvious example of this is that eugenic interests have been largely jettisoned from scientific discourse. Another is that we no longer dismiss the efforts of women. Of course, it’s not necessary to use bibliometric methods to engage with either topic (e.g., [Gould, 1981/1996](#); [Tavris, 1992](#)). But the contributions of women to science can indeed be made easier to see—or perhaps harder to ignore—by the use of such methods (see, e.g., [Green et al., 2015a](#), pp. 22–23). My concern here, however, is even broader than that. I am trying to identify and limit the circumstances under which it could be possible to omit influences at the source (see also [Burman, in press](#)). Without doing so, silenced subjects could become even more difficult to recognize, because they would have been ignored as a result of the use of such apparently objective methods. This then also represents a new concern for historiography: the rise of the digital as a tool for objectivity, the inappropriate and unthinking application of which is ultimately what I think Burnham was objecting to (see [Gitelman, 2013](#); also [Novick, 1988](#)).

⁶ An e-mail to the listserv of the graduate program in the History and Theory of Psychology Program at York University demonstrated that there is a truly vast amount of literature related to this issue. I am grateful to Ian Davidson, Mike Pettit, Alex Rutherford, and Thomas Teo for their detailed replies and recommendations.

kinds of quantitative history without a great deal of additional preparatory spade-work, some of which may not itself be possible without large investments from the APA (as database owner). This in turn leads to a still-further investigation: pursuing an until now-invisible but also more traditional quantitative-inspired history that must be undertaken as a consequence of the validity studies. Because the resulting discovery is substantial, it is presented here only in the form of an historical précis (which raises a series of new questions). Together, the three histories—of PsycINFO as a data source, of the contents of PsycINFO, and of an issue arising from adopting a critical attitude in approaching those contents as data—illustrate my view of the contributions that such digital methods can make to Science Studies (see also [Burman, in press](#); [Burman, Green, & Shanker, 2015](#); [Green, Feinerer, & Burman, 2013, 2014, 2015a, 2015b](#)).

History and Psychology

In history, there is no quantitative indicator that “enough” evidence has been examined to test an historical hypothesis. The tendency is therefore to try to collect *everything*, even if the results aren’t strictly speaking “relevant” to the interest that launched the project. The historian’s goal is then to explain how the resulting collection makes sense internally, according to its own logic, or externally by reference to the context from which it originated; to show how things that might not be reasonable today *could have been, then*, according to the standards of that time. In short, the goal is not to *judge*; the goal is to *understand*.⁷

This is a challenge for the quantitative analysis of historical trends: historical data have typically been treated by psychologists who are interested in trend-tracking as if they were equivalent to psychological data. In other words, an historical claim is tested by collecting “enough” of “the right” data, such that the required result is demonstrated. This can then become rhetorically useful as an existence-proof (see, e.g., [Watrin & Darwich, 2012](#), p. 269). But historians work differently.

For historians, quantitative claims can only rarely be examined at all. Such data are usually too disembodied, too acontextual, and too distant from their sources. Concerns then arise because the main consequence of the resulting omissions, in history, is *misunderstanding*. Indeed, focusing on one finding too narrowly can skew the resulting insights (e.g., [Martens, 2000](#); responding to one of the sources used for rhetorical purposes by [Watrin & Darwich, 2012](#)). Yet this skewing of historical perception—or, perhaps

⁷ The most powerful illustration of this that I know was provided by Robert Darnton (2009), in his essay on “the great cat massacre of Rue Saint-Séverin”. What’s difficult about this piece, however, is not counting the number of cats that were killed. Or the number of workers involved in killing them. (Or identifying the means they used.) Rather, the difficulty is in figuring out how to see the situation from the workers’ perspective; to understand their delight, and good humor, at perpetrating the killings; to get *inside* their joke. As he explained in the book’s conclusion, “To get the joke in the case of something as unfunny as a ritual slaughter of cats is a first step toward ‘getting’ the culture” (p. 262). The new preface to the revised edition of the book then expands on this in a useful way that goes beyond the brief discussion in the original’s conclusion:

To study a cultural episode like the massacre of cats is similar to going to a play: you read the actions of the actors in order to understand what they are expressing. You don’t reach a conclusion comparable to the bottom line of a bank account or the verdict of a judge, because interpretive history is necessarily open-ended. . . . But open-endedness does not mean that anything goes or that an interpretation cannot be wrong. (p. xvii)

This is then a big part of the difference between psychology and history: in history, there aren’t numbers to be compared. And yet there are still interpretations. Indeed, Darnton struggled with a problem that psychologists will recognize; what he called “the problem of proof and the problem of representativeness” (p. 261). This two-headed hydra is what I attempt to engage here, albeit without cutting off either head.

better, “epistemological blindness” (Toomela, 2013, pp. 1119–1120)—is also what the new quantitative historians of psychology aim to address: *to see all ‘round us*, as the logician Dodgson put it (whom I have quoted in the epigraph with attribution to his better-known penname).⁸ To this, though, I would add . . . *but without looking in such a way that would introduce a new source of bias*.

This is, admittedly, a shift for historians. Rather than “close reading,” the move is toward “distant reading” (following Moretti, 2013). But the result then intends to accommodate the standpoint of the psychologist, and the associated interest in trend-tracking, while supporting the historian’s interest in completeness and perspective. And although the result is rarely complete—in the sense that a quantitative approach to history often only articulates questions that must be pursued by more traditional investigative means—it is at least consistent with “sign-posting” (discussed in this journal by Ball, 2012). This is because the results point the way to new research questions that might not otherwise have been thinkable (discussed in this journal by Green, 2016).

That said, however, such studies do still often suffer from a deep methodological problem: blindly counting the occurrence of strings of characters that can be matched by computer algorithms, rather than assessing their meanings and the contexts in which those meanings have derived their descriptive and explanatory power (discussed in this journal by Pettit, 2016). A powerful warning on this theme, by Josh Sternfeld (2011) of the Division of Preservation and Access at the U.S. National Endowment for the Humanities, is so apt as to be worth quoting at length:

A database of “retrievable fragments” invites users to generate associations previously unconsidered, but, at the same time, it can establish the dangerous precedent of generating erroneous narrative constructions. A search query can lead to the false expectation that all hits within the query possess an inherent link to one another. Users may be tempted to construct false relationships among disparate pieces of information, swayed by the notion that they share some commonality under the umbrella of a search term. (p. 557)

In other words, attempting to use databases to track trends can be dangerously misleading. My project thus aims to address this concern; to serve an historical interest of psychologists while also protecting the historiographical concerns of specialist historians of psychology. I have therefore leveraged a tool that has already been used for this purpose, but also narrow in on the period for which it is valid to use it in that way. We can then begin to investigate the questions arising, with one such investigation included here as a demonstration of the utility of the approach.

In short, I aim to treat the APA’s repository of bibliographic information (PsycINFO) as an historian’s archive. Yet to understand the role it has played, and thereby identify any associated influences on reported content, we must first understand how that archive was constructed; how psychology came to describe itself in ways that could be quantified, or rather how the dominant governing body came to represent its subjects in such a way as to allow them to be counted—*disciplined* (following Foucault, 1977, 2004/2007). Only then we can begin to dig, validly, into the data.

About the Data: Reflecting on Our Looking-Glass

The origin of bibliographic data in American psychology can be found in the history of the discipline’s finding aids, of which the present PsycINFO database is just the latest

⁸ The homage to Unger (1983) in my choice of title was unintentional, initially, but—in retrospect—it is appropriate. I am grateful that Laura Ball noted the similarities between our two essays. And I decided to retain the title in the hopes that the apparent appropriation might spark a small controversy that would lead ultimately to a deeper consideration of the fundamental issues discussed in both articles: “our models of reality influence our research in terms of question selection, causal factors hypothesized, and interpretation of data” (p. 9). Of course, our two articles also both intend the reference to be to Lewis Carroll.

incarnation. Perhaps surprisingly, these go back almost to the founding of the APA in 1892. (For the association's early history, see [Cattell, 1917](#); [Fernberger, 1932, 1943](#); [Pickren & Rutherford, 2017](#); [Sokal, 1992, 1994](#); also [Pate, 2000](#)).

The first official bibliography of American psychological literature was announced in 1894 by founding members, and soon-to-be APA presidents, James McKeen Cattell and James Mark Baldwin ([Benjamin & VandenBos, 2006](#), p. 941). The resulting yearbook—*The Psychological Index* ([Warren & Farrand, 1895](#))—subdivided the discipline according to eight major subject headings:

- I. General
- II. Genetic, Comparative, and Individual Psychology
- III. Anatomy and Physiology of the Nervous System
- IV. Sensation
- V. Consciousness, Attention and Intellection
- VI. Feeling
- VII. Movement and Volition
- VIII. Abnormal

The editors argued that these headings more accurately described the territory mapped by the literature published in *The Psychological Review*, and thus were to be preferred over the categories provided by the—to them—anachronistic Dewey Decimal system (see, e.g., Warren qtd. in [Soudek, 1983](#), p. 186). As a result, however, these headings also represent the first major discipline-spanning institutionalization of an explicit system of “meta-data” in psychology for use by psychologists: a descriptive layer that sits atop the published literature, while remaining separate from it.

After the creation of this metalayer, authors were expected to continue in the usual way to write about their narrow and focused topics, while their editors—or, rather, the APA as institutional organizer (and then later directly as publisher; see [VandenBos, 1992](#), pp. 351–357)—began attaching to articles a changing set of descriptive terms as a way of grouping them. Yet these categories were not themselves determined computationally (see [Green et al., 2013, 2014, 2015a, 2015b](#)). Nor were the terms defined intended to provide a complete description of psychological phenomena: Psychology's vocabulary was initially much more informal than it is today, and the contemporary meanings developed over time (see especially [Danziger, 1997](#); also [Benjafield, 2012, 2013, 2014](#); [Green, 1996](#); [Morawski & St. Martin, 2011](#); [Winston, 2004](#)).

Baldwin's (1901, 1902, 1905) three-volume, four-codex *Dictionary of Philosophy and Psychology* introduced some standardization into the discipline's language. This lexicon was then inherited by each subsequent generation of psychologists, as its definitions of the discipline's technical terminology came to be reflected as norms in *The Psychological Index* and the later *Psychological Abstracts* (introduced in 1927; see [Benjamin & VandenBos, 2006](#)). The reorganization of the association after World War II then produced a new structure for the discipline, when the divisions were introduced along different organizational lines ([Benjamin, 1997](#); [Dewsbury, 1996–2000](#)).⁹

⁹ The modern structure of the discipline can be seen more easily there than in the original subject headings: during its postwar reorganization, the APA refocused on issues of interest primarily—by total number of votes—to clinical (1,951), personnel (1,733), child (1,619), abnormal (1,480), consulting (1,412), educational (1,312), measurement (1,111), and social (1,047) psychologists (see [Table 1](#) in [Benjamin, 1997](#), p. 730).

The modern system of controlled vocabulary, used today, only began to be introduced in the late 1960s. Then, during another moment of disciplinary self-reflection (see Cautin, 2009a, 2009b), it was formalized through the publication of the first edition of the *Thesaurus of Psychological Index Terms* was published under the general editorship of Robert G. Kinkade. This reduced Baldwin's attempt at a "complete" lexicon to just a few thousand general terms (Benjamin & VandenBos, 2006, p. 950). And it is that reduction that provides the key advance upon which we will build in what follows: fuzzy matching of the precise technical vocabulary used by psychologists to broader disciplinary concepts with meanings specified by the governing association (see also Burman et al., 2015).

This reduction is consistent with the APA's other activities as an institutional bastion against information overload: a source of impositions on publishing, but with a view to simplifying scientific communication (see especially Benjamin & VandenBos, 2006; Sigal & Pettit, 2012). Indeed, the move was presented as a pragmatic solution to an increasingly difficult disciplinary problem: an index of controlled terms has tangible benefits for "search and retrieval" (Kinkade, 1974, p. i). The standardized metalayer was then revised continually, with the present electronic version of the *Thesaurus* emerging as new technologies began pushing finding aids out of codices and into computers (see also Haworth Editorial Submission, 1986; VandenBos, 2017).

PsycINFO itself was announced in December 1975 in an advert published in *Psychological Abstracts* (VandenBos, 1992, p. 362). By 1977, the database could be accessed by terminal through servers run by Dialog and Bibliographic Retrieval Services (VandenBos, 1992, p. 363). A disk-based version then became available in 1986, called PsycLIT, making it possible to search the literature without a server (VandenBos, 1992, p. 364).

Yet this was by no means the system we have today. For example, abstracts were still being entered into the database separately, by hand, at a delay of up to 3 years (Beebe, 2010, p. 3). That only changed, in 1994, with the development of an in-house production system (Benjamin & VandenBos, 2006, p. 952). This new system streamlined the creation and delivery of abstracts by having them be "born digital," and this in turn enabled the millionth record to be released in 1995 (Beebe, 2010, p. 4). A large historical expansion, backfilling the database to cover the period between 1892 through 1967, was then introduced in 1998 (Benjamin & VandenBos, 2006, p. 953). This added another half million records (Beebe, 2010, p. 4).

In 2002, machine-assisted indexing tools—rudimentary AIs—were built to help APA staff implement the *Thesaurus*' controlled vocabulary in a more automated fashion. This sped up indexing time and freed up resources, enabling PsycINFO to pass the 2-million-record mark in 2004 (Beebe, 2010, p. 5). It also enabled the further growth of the index into new areas, and PsycINFO was expanded yet again in 2005 to include material published in books. That in turn resulted in the creation of a new product: PsycBOOKS (finally delivering on the proposal by Bodin, 1963; see also Winerman, 2005). Relevant topical expansions then began to be introduced into the main database. This expanded psychology's information retrieval service to incorporate greater coverage of methods and statistics, the life sciences, sociology, and neuroscience (APA, 2008; Beebe, 2010).

Today, the easiest way to search PsycINFO's 4-million-plus records¹⁰ is simply to type a query into the textbox and explore the results (i.e., to "Google it"). More advanced searchers will use basic Boolean operators (AND, OR, NOT) to focus in on the specific and narrow aspects of the psychological literature that interest them. This is made easier by using the advanced search form, which can construct simple Boolean statements automatically. But the majority of searchers will never do more even than this (Vakkari, Pennanen, & Serola, 2003). Indeed, most queries are comprised of just a few words, often

¹⁰ A current count is provided at <http://www.apa.org/pubs/databases/psycinfo/index.aspx>.

even without using quotation marks to constrain for meaningful “multiword terms” (Yi, Beheshti, Cole, Leide, & Large, 2006).

Yet that’s not quite how I conducted my investigation. The interrogations described here required going a few steps further, using the functions enabled by the APA’s PsycNET interface.¹¹ Indeed, the key advance here is to use the interface to access the discipline’s controlled vocabulary, directly, via the *Thesaurus*-based *index terms* (as they are now called, reflecting their origins).

This is the easiest way to take advantage of the APA’s own view of psychology’s language: every article is described according to a small number of standardized terms—usually around half a dozen, but varying widely—without regard for author quirks and vocabular idiosyncrasies (see, e.g., APA, 2012b). And we want to track the trends in their application.

In other words, the old *Thesaurus* has been integrated into PsycINFO’s search functions. The history of its development has been made invisible to contemporary users. It is now part of the search engine, and is accessible directly through the PsycNET interface (where it is called, simply, “Term Finder”).¹² At the same time, however, the broader Baldwin-style codex-based dictionaries are also being extended and updated to reflect how psychology’s spoken language is evolving (see, e.g., VandenBos, 2006, 2009). The discipline therefore has two lexicological forms: one reflected in use—where the language of psychology is “spoken” in myriad specialist dialects by scientists and practitioners, often referencing meanings tied to exemplary experiments that then themselves are forgotten even as their words continue to be used—and the other reflected in structure, where the ever-expanding and otherwise-disconnected topics of psychology are unified and reflected in finding aids (which in turn define and constrain what it is possible to search-for if you aren’t already hip to the lingo).¹³

Capturing Controlled Vocabulary

Those familiar with the history of linguistics will recognize a parallel in Saussure’s (1916/1983) separation between *langue* (a group’s language) and *parole* (the individual’s speech). Another potentially productive comparison is to the recent linguistic turn in philosophy. Indeed, the historical problem afforded by trend-tracking—especially when using databases like PsycINFO—seems to map onto Rorty’s (1979) differentiation between the “compulsion of language” and the “compulsion of experience” (p. 179). In this case, however, we can then interpret that to mean something like *compelled by the discipline’s past* versus *compelled by contemporary intent*. And thus the hard historiographical problem to be engaged by such projects is made clearer: to properly track trends in the discipline, we need to access the changes in that deeper linguistic structure while controlling for our own unavoidably presentist interests.

¹¹ It is important to make a distinction between “the database” (PsycINFO) and “the interface” (PsycNET). This is because third-party vendors resell the database under their own interface. The resulting differences are often compared so librarians can make informed decisions balancing quality and cost (e.g., West, Powers, & Brundage, 2011). Indeed, these reviews also often discuss some of the challenges that those interested in replicating my findings may encounter. Thus, for example, PsycINFO sometimes reports a different number of results across vendor platforms. This is simply because the databases provided are from slightly different times. Different features may also be implemented in different ways. Yet because PsycINFO is an APA product, and PsycNET is the APA interface, I have chosen to stay “in house.” This enables the approach to take advantage of the database’s native features, without concern that another vendor’s integration of the database with other products might be causing problems for retrieval.

¹² For a simple tutorial on the use of Term Finder, see APA (2012c).

¹³ This is then how psychology is unified: in the institutional structuring and governance of its language, but not in how that language’s meanings are used in psychological speech (see Green, 2015).

We seek the meanings underlying the conduct of psychological science as it existed in the past, not those that serve the rhetorical goals of present-day researchers. And of course this task is complicated in all of the same ways implied by Saussure and Rorty, as well as subsequent commentators, because the desired meanings are only *reflected* in what people actually say. To simplify the practical side of this problem, however, we can differentiate the kinds of methods that can be used for trend-tracking. To be clear, though: although the publishing activities of psychologists are observable as behavior, that's not ultimately the trend that the historian seeks to track. To focus on assessing what's most important, therefore, we treat the observable traces of past behavior as evidence of the underlying interests that they index (discussed in this journal by [Burman, 2012a](#), pp. 86–87, 89–90; implemented as method by [Burman, 2016](#); *in press*).

Method

The usual approach relies on string-matching for language-use, and is exemplified by Google's Ngram project ([Michel et al., 2011](#); [Lin et al., 2012](#)). This is a visualization of the trends that can be plotted from a search of Google's database of books: results are displayed in a graph to show changes in relative frequency over time, and these changes can then be referred-to directly (e.g., [Greenfield, 2013](#); [Oishi, Graham, Kesebir, & Galinha, 2013](#); discussed by [Pettit, 2016](#)). A more complex approach uses full-text to develop "topic models" describing subsets of a collection according to their own logic. This can be done in several ways (e.g., [Flis & van Eck, 2018](#); [Green et al., 2015a, 2015b](#); [Cohen Priva & Austerweil, 2015](#)). But that's not what I've done here either. The topics we want to track have been predefined by the APA in the controlled vocabulary, and mapped onto the full-text to provide higher level synonyms for the different uses that may have themselves changed.

The approach here takes advantage of the existing metadata (as advocated by e.g., [Koplenig, 2017](#)). Indeed, this is what I propose could usefully serve the psychologist's interest in historical trend-tracking: the data come from a controlled source and the method's use requires very little additional historiographical heavy-lifting aside from what will be discussed. Thus, to distinguish what I intend from the various more popular Googley approaches, I will refer to my method as the *controlled vocabulary method* (following [Burman et al., 2015](#)). This then reduces the English language's prolixity to the just over 8,000 terms that are included today in the discipline's official vocabulary (see the discussion in the introductory remarks to [Tuleya, 2007](#)).

A selection of these terms is attached to every indexed article, as metadata, so it's the trends in the application of these terms that the controlled vocabulary method will track. But because PsycINFO was not intended for this use, and because its construction incorporated the effects of implicit influences that could well bias the results—such as the response to the Dewey Decimal System, the postwar reorganization, ongoing power-struggles between science and practice, and so forth—my goal in this first essay is simply to narrow in on how such a project could be pursued. This then sidesteps some of the problems of the present interface,¹⁴ and defers a subset of questions until after a more complete system of interrogation has been made available.¹⁵

¹⁴ A limitation of the PsycNET interface is that it returns only the top 11 terms associated with any one search. I have side-stepped this partially, but a complete solution will only be possible with the creation of a new "digital humanities" research interface.

¹⁵ The PsycINFO Data Solutions service is intended to serve this need, but still seems poorly resourced. One of our hopes, with this special section, is to show not only *how* high-quality research is possible but also *that* it is possible to do it. The existence-proof can then justify further investments by APA, as demand for a new research tool grows. (Each can feed the other.)

Questions of Assessment

My goal is to enable psychologists to use PsycINFO to track trends in such a way that historians will not object to the results, and thereby provide access to a powerful set of tools for reflecting on psychology as a whole. To pursue this goal, we must therefore first begin by assessing the quality and trustworthiness of the archival collection to be examined: *What exists today that can be used? And for what ends?*

Such questions are, from the historian's perspective, issues of completeness. From the psychologist's perspective, that can in turn be expressed in terms of the exclusion of data. Indeed, the disclosure of such decisions has become a disciplinary norm; advanced as part of the "journal article reporting standards" (APA Publications & Communications Board Working Group on Journal Article Reporting Standards, 2008). So that is how we will approach them.

The issue of whether and how to exclude data is a reflection of our desire to take advantage of the discipline's controlled vocabulary as a way to validly assess its changing trends without at the same time falling prey to the "different facts" objection. From this perspective, the decision to exclude is first a function of coverage: *Is the new method able to capture the discipline, and describe it simply?* (This ensures that concerns regarding selection bias are addressed: "face validity.") It is also, second, a function of the "ecological validity" of the new method: *Does such an approach return what we expect, when we know what to expect?* Third, we must assess the method's "concurrent validity" against the presently accepted search-driven keywords-based method. (This then also ensures that we are able to use what's already known as a kind of calibration of the method itself.) And, fourth, the controlled vocabulary must stay "controlled" in application: *Are the resulting trends reasonably smooth, from year to year, or—if not—are abrupt and unexpected anomalous changes explainable by making reference to a trusted source?* (This ensures that the method achieves what it is intended to achieve, in describing the discipline's actual trends: "content validity.") I then used the resulting assessments to delve deeper, in additional studies that will be reported separately. (Specific details regarding identified trends are shared only to whet readers' appetites for those more in-depth studies, not as ends in themselves).

Setting up the Search

Starting from the PsycNET interface landing page (<http://psycnet.apa.org>), I first selected the PsycINFO database. Then, using the *Advanced Search* tab, I constrained the search to focus solely on journal articles. This was done by adding a "document type" under "Only Show Content Where. . ." (in the blue horizontal bar; see Figure 1). The result is that everything *not* indexed as a "journal article" was ignored. In addition, because PsycINFO includes a large number of non-English texts, I also added a language constraint.¹⁶ This was done by "searching for" in the Language field and entering "English." Aside from these constraints, however, I purposefully chose not to search for a particular keyword: in this approach, we are not matching strings. Indeed, ideally, we aren't really looking for anything at all.

Our search is of the structure of the discipline, as reflected in the index's coverage of its content. We are not interested in any one *term*, specifically, but want instead to examine the changes in coverage that the *database* captures as a reflection of the primary governing body's view of its discipline. To simplify the process of identifying the terms that are most

¹⁶ Non-English sources are indexed using English index terms, so they need to be excluded to focus solely on the trends in English-language psychology. That said, however, replications with other languages—to describe the trends in different "national psychologies"—could theoretically be performed in the same way. Of course, a separate set of validation studies would first need to be conducted.

The screenshot shows the APA PsycNET search interface. At the top, there are navigation tabs: SEARCH, BROWSE, TERM FINDER, and MY PsycNET. Below these, there are links for 'Select Databases:' with checkboxes for PsycINFO, PsycBOOKS, PsycCRITIQUES, PsycARTICLES, PsycEXTRA, PsycTESTS, and Select ALL. A 'SEARCH' button is visible. The main search area is titled 'LOOK FOR' and includes a text input field with 'english' and a dropdown menu for 'In: Language'. Below this is an 'AND' section with another text input field and a dropdown menu for 'In: Any Field'. There are links for 'Journals Lookup' and 'Authors Lookup'. The 'ONLY SHOW CONTENT WHERE' section has a 'Hide' button and a dropdown menu for 'Document Type' with a list of options: Column/Opinion, Comment/Reply, Dissertation, Editorial, Encyclopedia Entry, Erratum/Correction, and Journal Article. Below this is a 'None selected' dropdown menu and a 'Peer-Reviewed Journals only' checkbox. The 'DATE' section has a 'Hide' button and two radio buttons: 'Published:' and 'Added to PsycNET:'. The 'Published:' section has a dropdown menu for 'All years' to 'present' and a radio button for 'From 1995 to 1999'. The 'Added to PsycNET:' section has a radio button for 'In the last 7 days'. The 'DISPLAY' section has a 'Hide' button and two radio buttons: 'Results per Page:' and 'Sort By:'. The 'Results per Page:' section has radio buttons for 25, 100, and 250. The 'Sort By:' section has radio buttons for Year, Author, Title, and Relevance.

Figure 1. Setting up the search: journal articles only, while also constraining for date and language. See the online article for the color version of this figure.

relevant to assessing long-term trends, I also added “date bins” by entering a date range covering five years.

To construct a dataset of trend candidates, I used a spreadsheet program to record the top “index terms” reported in the left-hand gutter on the results page: the most frequently indexed terms are returned automatically. To get the following bin’s results, I simply clicked “edit search,” incremented the date range, and repeated the process.¹⁷ These steps provided the basis for all of the reported results. I then also filled in the missing data (i.e.,

¹⁷ This was all done completely by hand to avoid conflicts with the user license agreement. However, it could certainly be simplified by following the techniques described by Knox (2013). To replicate our approach exactly: expand and copy the top index terms from PsycNET, “paste special” as unformatted text into Word, find-and-replace to remove the space and left-parenthesis and replace them with a tab-character, then recopy and paste into Excel. Find-and-replace again to remove the right-parenthesis (i.e., replace with nothing). The extra line, from the index-term expansion, will be removed automatically later. Because some index terms include parentheses, it is very important to ensure that the replacements are done properly. Otherwise, the table will include extraneous columns. However, if the procedure is followed correctly, it converts an HTML list into a properly formatted row-and-column Excel table. When iterating across date-bins, move the pasted text into the appropriate column: each date-bin receives its own date-column, with the index terms themselves collected together in the left-most column. Some useful keyboard shortcuts, in the order we used them, after selecting the index terms on the PsycNET results page: *Copy* the index terms ([Ctrl] + c), *Change Programs* from web browser to Word ([Alt] + [Tab]), *Paste Special* ([Ctrl] + [Alt] + v), *Find-and-Replace* ([Ctrl] + h), *Replace-All* ([Alt] + a), *Select-All* ([Ctrl] + a), *Copy* ([Ctrl] + c), *Change Programs* from Word to Excel ([Alt] + [Tab]), *Paste* ([Ctrl] + v), *Select dates* ([Shift] + Click), and *Move dates* (drag-and-drop to new column).

those terms not included among the top index terms) with specific additional manual searches: I constrained for “index term,” and then iterated across dates and terms. (This last step was necessary because there is as yet no digital humanities research interface for PsycINFO akin to Google Ngram.) With a preliminary dataset thus built, I began interrogating it.

Toward Trend-Tracking

Journal coverage in English starts in 1887, in PsycINFO, with the first volume of *The American Journal of Psychology* (see [Green & Feinerer, 2015, 2016](#); [Young & Green, 2013](#)). Beginning our examination there, and running through 5-year catchment bins until 2011, the total number of digital objects indexed as English-language journal articles—at the time of writing¹⁸—was 2,066,616.

This is an impressive collection. However, there are only 603,793 index terms reported by PsycNET to describe it. And this is a potentially serious problem: if contemporary articles receive a half dozen or so terms as descriptors in their metadata, and this is the standard by which trend-tracking would be made possible, then the reported results describe perhaps no more than 5% of the archive. This is equivalent to the Google Ngram dataset, which has surpassed 6% coverage ([Lin et al., 2012](#)). So perhaps such a limited tool could still be useful. But it is problematic given the historian’s interest in completeness. We must therefore examine the reported results carefully: *Should something be excluded? What? (Why?)*

Coverage

If the reported index terms do not adequately describe the contents of the database, then they simply cannot be used to track trends. The first validity study therefore examined *when* the index terms began to behave in the way we see presently, which in turn affords limits for when we can use this method for trend-tracking. To conduct this first study, I divided the number of terms reported by PsycNET by the number of journal articles indexed. These data were collected for each date-bin, and plotted on a graph (see [Figure 2](#)).

Adopting this approach shows a dramatic change in coverage in the 1960s. This is consistent with what we know from the published histories of the database and its predecessors (viz., 1967 being the start of the historical backfill). But a more detailed examination of the changes in annual coverage shows that the demarcation isn’t as clear as a backfill would suggest (see [Figure 3](#)). The question about where to draw the line therefore remains open. The boundary clearly belongs somewhere between 1962 and 1967, and—to a psychologist—this is simply a question of exclusion. To an historian, however, it’s an invitation to investigate. A précis of such an investigation is therefore provided below, in the place that would be “discussion” in a more traditional experimental article.

¹⁸ PsycINFO is itself a living source. It changes. New journals are added occasionally, and backfilled, as various advisory boards redefine the boundaries of the discipline (to include material previously dismissed as e.g., “education, information science, mass communication, cultural anthropology, business management, marketing, ethnic and racial studies, neuroscience, public health, and speech pathology” [[Beebe, 2010, p. 6](#)]). The entire backend is also sometimes “reloaded” (see, e.g., [APA, 2012a](#)). This ensures that the database reflects the discipline as it exists in the moment, both in content and in structure. And this is part of what makes it such a valuable tool for those who use it only to search the literature. But this will also make exact replications of our results increasingly uncertain over the long term. Therefore, readers must treat this analysis as an historical object in itself: an accurate reflection, at one moment, of a source that may itself have changed in the interim.

Figure 2. All look at the entire discipline, as it is reflected in PsycINFO and described by the index terms reported by PsycNET. From this, it seems clear that the “controlled vocabulary” does not become historically useful until the mid-1960s. See the online article for the color version of this figure.

Ecological Validity

Despite the suggestion that material from before the 1960s is unusable, the unexpected “tail” at the very start of the coverage in Figure 2 suggests that an examination of ecological validity ought to begin at the very beginning. Yet, looking specifically at material indexed from the relevant journal, *The American Journal of Psychology*—from the perspective of in-depth computational studies of its first years of operations, 1887–1905 (Green & Feinerer, 2015; Young & Green, 2013)—we see immediately that the early coverage in PsycINFO of APA’s controlled vocabulary is seriously flawed: there are only three index terms returned by PsycNET for the journal during this period, despite there being 320 articles listed. This then provides converging support for the earlier suggestion that the new method cannot be used to describe the early history of the discipline: the tail is an artifact, and that material must be excluded.

Coverage does seem better for journals for which APA holds the full-text. For example: *Psychological Review* published 1,022 articles in English in its first 3 decades, 1894–1923, and 606 index terms are reported by PsycNET to describe them: *consciousness states* (82 articles), *cognitive processes* (77), *perception* (63), *visual perception* (62), *psychology* (59),¹⁹ *memory* (57), *emotions* (49), *judgment* (42), *color* (40), *attention* (38), and *motor processes* (27). These then indeed correspond to several of the categories identified in computational studies of that journal’s substantive full-text (Green et al., 2013, 2014, 2015a, 2015b). So there are some possibilities for early period investigations using these methods. But these cannot be straightforwardly pursued. With such poor coverage, it would have been impossible to draw

¹⁹ Some of the terms applied to these early articles are unhelpfully vague. For example, the frequent application of “psychology” is not a useful marker for a database of psychological literature.

Figure 3. When in the mid-1960s did trend-tracking become possible? See the online article for the color version of this figure.

any firm conclusions without also having had access to the recent studies of the journal's full-text for that same period (which in any case produced more detailed insights).

Furthermore, there are questions that need to be answered regarding the meanings of these contemporary terms as they have been applied to those early articles. The term *cognitive processes*, for example, acquired its present technical meaning in the 1950s and 1960s, and it would be inappropriate to describe earlier studies in ways that equate the two uses (see Green, 1996). In other words, there is a potential “recency bias” to the meanings indexed in PsycINFO by the APA's methods. Earlier uses may well qualify as “false friends” (see Chamizo Domínguez & Nerlich, 2002). This then provides a further reason to suggest that using the database to track historical trends back before the 1960s is—for the most part, and for the moment—inappropriate. But that doesn't speak to the validity of using it afterward.

Concurrent Validity

The question of whether the controlled vocabulary method captures what is accepted to exist is an important one. The similarity to earlier full-text investigations is heartening, but these cannot speak to later material for which full-runs of journal contents are typically not made available for research. And studies of abstracts can take us only so far (pace Flis & van Eck, 2018).

To execute this new check, I performed the same English-only, journals-only search as described above. This time, however, I also added Boolean operators to search for unambiguous character-strings corresponding to highly popular index terms: *rat OR rats* in any field, *mouse OR mice* in any field, and *schizophrenia OR schizophrenic* in any field. This then allowed me to make some comparisons.

All three searches capture all of the relevant index terms, but they also capture every other mention of each string in the database—whether the found-article is actually *about* rats or mice or schizophrenia, or if it just *mentions one of them*. Such searches also capture articles when the characters comprising the terms are *used in an acronym* (e.g., radar

acquisition and tracking system, remote access terminal server, research and technology studies, etc.). And there is no way to distinguish these three kinds of usage with the string-matching method. Thus, a regular Google-style search of PsycINFO must necessarily capture *more* results than a search for an APA-controlled index term. But these need not be *better* results.²⁰ Indeed, as in the case of matched acronyms, *the additional results may be totally irrelevant*.

Thus the key question for us, in presenting the controlled vocabulary method as an improvement over the string-matching method for use in the quantitative analysis of historical *trends*, is whether its results *skew* in any particular direction. A stable and consistent difference in coverage would be acceptable, because it is assumed that the string-matching method will capture a larger number of documents, but an inconsistent difference would not be: inconsistency causes uncontrolled skew when comparing results across time. This is much easier to visualize than it is to explain, however, so these data are illustrated in Figure 4 and Figure 5.

Examining Figure 4, we see that the coverage of the two methods tracks very well. But the delta—the relative space between them—also does seem to change in the 1960s: the distance between the paired-lines gets narrower. (This is most dramatic for *schizophrenia* between 1957–1961 and 1967–1971.) After the 1960s, however, the deltas smooth out in exactly the way one would expect of a valid tracking system. Using index terms captures the same trends as does string-matching, but in a more controlled way.

Figure 5 makes this even clearer. Here, I have divided the string-matching coverage by the controlled vocabulary coverage—the two kinds of trend illustrated in Figure 4—to provide a ratio measure of the skew trend: changing skew (steep slope) suggests that the controlled vocabulary method is invalid for that period, while stable skew (flat slope) suggests validity. Thus, for example, the string-matching method returns 12.2 times more results than the controlled vocabulary method for a search of *schizophrenia OR schizophrenic* in 1947–1951, 9.3 times more results in 1952–1956, 7.5 times in 1957–1961, and so forth. We can therefore conclude that the new method is invalid for those early years, and we must exclude those data in any examination of historical trends. But later, in the 1960s, the new method begins to return the same approximate number of results. And it does so consistently: the slope is relatively flat.

Figure 5 therefore suggests that the index terms data are highly problematic for capturing trends in the early years of the database, but not in later years. Indeed, the result is akin to a geometrical proof of changing correlation over time: the relations stabilize in the 1960s. And this implies that the data may well be usable after that point.

This all suggests that it is valid to track trends in PsycINFO starting at roughly the time of the historical backfill project: around 1967. A further, deeper backfill will therefore be necessary to improve the quality of PsycINFO's older historical metadata.²¹ Otherwise, it will simply not be possible to use the database's controlled vocabulary for quantitative analyses of earlier historical trends. In this more recent period, however, the new controlled vocabulary method tracks very well with the string-matching method for unambiguous keywords (see Figure 5). And the coverage is exceptionally good, as I will show. Because the approach relies on defined terms, and not on matched strings, its

²⁰ Alvin Walker, editor of the five previous editions of the *Thesaurus* and now manager of product development for PsycINFO, put it this way: "The most important part of the controlled vocabulary in the *Thesaurus* is that it does allow you to zero in on specific concepts, without the noise, without the garbage, that you get without using a controlled vocabulary" (quoted in APA, 2012b, p. 1).

²¹ This is not unheard of. Something similar has already been done with author names: between 1967 and 1996, coauthored articles were indexed with "et al." for secondary authors, but a separate backfill project corrected those records (Beebe, 2009, p. 2). This then matters quite a bit to those interested in using the meta-data. Indeed, without this particular backfill, projects requiring access to author names could not have been validly undertaken (see e.g., Green, 2017). It is by analogy to this success that we can therefore reasonably expect similar future investments to make new research projects possible.

Testing the skew of Index Terms vs. String-Matching Rats, mice, and schizophrenia

Figure 4. Index terms track coverage by string-matching coverage, but this started to tighten up even further in the mid-1960s. See the online article for the color version of this figure.

validity for complex concepts will offer a dramatic improvement over uncontrolled methods (in response especially to Friman, Allen, Kerwin, & Larzelere, 2000).

Quantitative Results

With all of these caveats presented, I can now share a summary of my data; the basis for a foundation that seems strong enough to inform a further investigation. The full results for top index terms captured for 1967–2011 are presented in Table 1 (raw counts), with the data filled in for periods when those terms weren't included in the annual "top 10" provided by the PsycNET interface in the left-hand gutter of the results page.

The total number of English-language journal articles examined over this valid period, 1967–2011, is 1,843,360. The extracted terms then describe 914,968 articles (or 49.6% of the total accessible articles and half-again as many as are reported automatically by the interface). This compares very favorably to Google's string-matching Ngram Viewer. Even more impressive is that only 33 terms are needed to achieve this result.

Of course, the top terms often change year-to-year. Only a handful of them are consistently included among the top 5. Yet even these are useful for the window they provide on the discipline. Listed chronologically, these top terms are *rats* (1967–2011 [i.e., all years under consideration]), *age differences* (1972–1996), *human sex differences* (1972–2006), *drug therapy* (1982–2011 [most recent]), and *major depression* (1987–2011 [most recent]).

That contemporary psychology could be summarized, superficially, as *the scientific study of depressed rats and the drugs that treat them* is of course a caricature. But it is one that many will recognize. And it is also clear that this result cannot be understood to mean

Figure 5. Large ratios between keyword and index terms coverage tightened up considerably in the mid-1960s, providing a geometrical proof of correlation. See the online article for the color version of this figure.

that psychology is *only* about such rats. Not only do mice show up in our table too, but it's also clear from more detailed examinations that rats are just the most visible among several model organisms studied by psychological scientists (e.g., Pettit, 2010; Pettit, Serykh, & Green, 2015; Rodkey, 2015).

In addition, we can conclude nothing about *how* the rats themselves were studied from the fact of their having been mentioned, nor do we know what the use of rats in experiments has *implied* at different times—or what *rats* mean, for whom, and when (e.g., Clause, 1993; Logan, 1999, 2001; Pettit, 2012; also Guthrie, 1976; Harris, 1979, 2011). Indeed, the terms themselves are not always consistent in what they capture. Narrower terms have been introduced into the index, at various points, when it was useful to the discipline to make finer distinctions between subject areas. And because superordinate terms did not continue to be included in counts for articles marked with the new narrower terms, this fractionating then “hived off” relevant results. As a result, it is even possible that important trends are hiding in the diversity of certain sub-disciplines’ terms; whole subjects made less visible by the disunity of their vocabulary (cf. O’Donnell, 1979, p. 293 on Terman’s response to Boring’s accounting of the APA membership’s interest in Applied Psychology).

This means that larger trends are impossible to infer *directly* for all but only a handful of index terms with no narrower terms (e.g., *age differences*). Where terms have easily identifiable meaning changes, it is possible to add two terms together to track a larger trend (e.g., following the distinction introduced in 1988 between *depression [emotion]* and *major depression*). But relying on the individual trend-tracker’s interpretation, in

Table 1
The Top Index Terms of English-Language Journal Articles, 1967–2012, Extended out to Show Changes Over Time

Index term (date introduced)	Total indexed									
	1967–1971 (n = 69,462)	1972–1976 (n = 91,281)	1977–1981 (n = 92,350)	1982–1986 (n = 149,581)	1987–1991 (n = 159,669)	1992–1996 (n = 192,273)	1997–2001 (n = 224,255)	2002–2006 (n = 334,012)	2007–2011 (n = 530,477)	
Age differences (1967)	1,619	2,455	3,340	4,342	4,595	5,303	6,268	5,702	6,803	6,803
Brain (1967)	900	240	262	564	742	1,028	1,994	7,178	13,842	13,842
Case report (1967)	1,509	1,964	2,249	3,684	3,361	2,963	926	71	137	137
Cognitive processes (1967)	736	1,576	2,015	1,876	2,608	3,269	5,012	6,768	6,506	6,506
College students (1967)	1,727	3,107	1,859	2,644	2,300	2,721	3,013	4,725	7,976	7,976
Depression (emotion) (1967)	887	1,139	1,778	4,325	906	665	991	1,345	1,248	1,248
Drug therapy (1967)	1,594	2,157	2,531	4,635	6,413	8,379	9,528	14,660	18,582	18,582
Drugs (1967)	2,973	5,018	4,315	589	865	598	974	1,445	2,289	2,289
Elementary school students (1967)	1,157	1,606	1,732	3,107	2,618	2,682	2,226	1,603	1,542	1,542
Human sex differences (1967)	1,554	2,308	3,877	4,957	5,071	6,402	8,552	9,474	11,632	11,632
Learning (1967)	2,647	395	651	651	1,063	1,728	2,916	4,470	7,690	7,690
Literature review (1967)	539	1,289	2,587	4,995	3,199	2,634	1,195	64	131	131
Mental disorders (1967)	1,868	801	1,043	2,003	2,879	4,005	4,581	6,970	8,148	8,148
Models (1967)	912	327	982	2,862	3,270	3,857	6,712	5,602	4,724	4,724
Personality (1967)	1,933	192	192	595	455	707	988	1,479	2,699	2,699
Psychiatric patients (1967)	1,700	2,058	1,999	2,373	2,351	2,397	2,196	1,747	1,560	1,560
Rats (1967)	4,853	6,540	6,265	8,298	8,236	10,816	10,731	12,597	20,881	20,881
Reinforcement (1967)	1,918	724	514	332	328	435	582	770	1,127	1,127
Schizophrenia (1967)	1,523	1,734	2,066	2,919	3,765	5,185	6,255	8,353	10,312	10,312
Social perception (1967)	1,134	1,790	1,494	1,723	1,326	1,181	1,614	1,181	1,147	1,147
Treatment (1967)	2,362	366	900	1,807	2,325	2,120	3,270	4,993	9,602	9,602
Visual perception (1967)	1,733	1,639	1,267	1,182	1,614	1,991	3,059	4,157	4,654	4,654
Cognitive ability (1973)	3	265	387	1,072	2,295	3,148	4,700	6,664	7,507	7,507
Follow-up studies (1973)	8	376	661	1,706	2,808	3,557	972	23	67	67
Health (1973)		216	280	687	1,275	1,697	2,564	7,041	11,106	11,106
Human females (1973)	26	<i>1,312</i>	1,785	3,210	2,434	3,703	5,413	8,442	10,472	10,472
Longitudinal studies (1973)	9	342	565	1,464	2,373	3,923	1,524	155	206	206
Mice (1973)	649	<i>1,318</i>	1,161	1,513	1,652	2,193	2,830	4,785	13,180	13,180
Neurons (1973)	5	304	468	324	529	1,254	1,718	4,500	11,315	11,315
Major depression (1988)	4	<i>109</i>	<i>137</i>	<i>466</i>	<i>5,951</i>	7,484	8,708	12,688	17,367	17,367
Intervention (2003)						<i>41</i>	<i>110</i>	<i>4,253</i>	<i>10,637</i>	<i>10,637</i>
Intellectual development disorder (2012)	2,118	2,055	2,082	3,045	2,650	2,159	<i>1,869</i>	<i>2,154</i>	<i>2,743</i>	<i>2,743</i>

Note. Boldface indicates the top 3. Italics indicate terms that were introduced later and then backfilled.

detecting and correcting these changes, simply pushes back the original problem by one step; the goal of seeing everything, without prejudgment, fails at a remove.

The various and diverse, but also clearly related results all need to be recombined if the trends data are to be useful in the way intended. And there are methods now to do that (Burman et al., 2015). Yet this is a more advanced task, requiring detailed discussion (for which there is no space here). For now, though, we need a baseline. In this sense, the changes in the distribution of these top terms do indeed seem to be suggestive of the discipline’s changing primary concerns. And examining quartiles allows us to see the consistency at the top of that tail. A few words always describe significantly more of the discipline than virtually all the others (see Figure 6).

It is useful to note that these results are consistent with statistical laws that digital humanists are beginning to expect from their data. In this case, our data conform to both Bradford’s law and Zipf’s law. Respectively, these are: a small number of sources account for the majority of relevant works in any particular subject area (Bradford, 1934/1985), and the frequency at which any term appears is inversely proportional to its rank in a frequency table (Zipf, 1935). What this then means, however, is more interesting: we can expect a rapidly diminishing rate of return for adding more index terms to our analyses, and so more precise recombined examinations of top terms are unlikely to change much in the broad patterns represented here. Still, though, this does not imply that there may be an historical equivalent of “statistical power” lurking in these data. My intuition is that this would be a fundamental misunderstanding; a difference in investigative kind between history and psychology. Yet when used to identify opportunities, such insights do certainly produce fascinating investigations (e.g., Benjafield, 2016, 2017).

Quartiles in coverage by the top index terms in Table 1, 1967-2011

Figure 6. A small number of index terms capture a consistent percentage of the discipline. See the online article for the color version of this figure.

In short, the challenge with trend-tracking is not only to see what can be seen as a result of adopting these tools. Rather, the harder and more interesting problem is to figure out what cannot be seen, but which is suggested; “sign-posted” (Ball, 2012). To that end, a series of follow-up articles will examine the recombined results for individual index terms of interest. And these will engage with new questions as they arise. But there’s also another kind of more traditional history that’s made possible by such an investigative approach. That’s what we turn to next.

Précis of a New History

The change in the 1960s, identified in Figure 2 and Figure 3, preceded whatever it was that also led to the historical backfill that worked backward from 1967. I have traced this change to an internal report, from the APA, which concluded that the quality of the index would be substantially improved by increasing the number of terms associated with each article (APA, 1965). At the time, the average article received only 2.5 index terms, which were in turn drawn from a lexicon of only 800 informal, general, and largely uncontrolled subject headings (Haworth Editorial Submission, 1986, p. 25). And this, it was argued, was insufficient.

The change illustrated in Figure 2 and Figure 3 certainly *seems* to be a result of this report. The subsequent changes to the ways in which the APA managed its abstracting and indexing—which include an increase in the number of terms used to describe each article, the move to electronic databases, and the creation of the *Thesaurus*—were also so influential that the report itself has since been described as “an important landmark” (Haworth Editorial Submission, 1986, p. 24). But that report also fits into a context which merits a mention, because the cause of the change could also have been the cause of the report. Note, too, that Figure 3 shows an increase in terms starting in 1963; before the publication of the report, although perhaps not before the ideas it contained began circulating.

Digging deeper, I discovered that the “landmark” report was part of an internal project undertaken by the APA between 1961 and 1972 with funding from the National Science Foundation (NSF; Little, 1974, p. 369). That project then produced a *series* of reports and publications (APA, 1963–1969; Garvey & Compton, 1967; Garvey & Griffith, 1963, 1964, 1965, 1966, 1967, 1971, 1972; Siegmans & Griffith, 1966; also Brožek, 1966; Garvey, Gottfredson, & Simmons, 1984). And *their* impact was quite widespread, so the resulting efforts are certainly not unknown.²² What has been largely overlooked, however, is the extent to which the resulting bibliographic systems were not *merely descriptive* (pace Benjamin & VandenBos, 2006, pp. 949–950).

It is now clear—as we see simply by looking at the PsycINFO database itself, and then investigating the changes indexed there—that interests external to the bibliographic project influenced the descriptions that were reported. We then find evidence suggesting that this was also neither accidental, nor incidental. For example, the APA’s executive officer at the time, Arthur Brayfield, commented that the developments behind these changes were a key part of how the association would manage the discipline’s future. As he put it, “*APA has moved from a reactive posture to an active stance*” (Brayfield, 1968, p. 845; italics in the original). Soon afterward, he also described the program to develop a National Information System for Psychology as “a significant and complex venture in social change” (Brayfield, 1970, p. iv). Indeed, it is now clear that the greater part of the

²² An article that is often included among the founding studies of scientometrics, “Collaboration in an Invisible College” (de Solla Price & Beaver, 1966), actually originated in one of the collections produced by this project. But this is typically presented without the broader context of psychology’s turn toward computerized information systems or the APA’s leadership in undertaking those projects.

resulting efforts—including the associated Experimental Publication System (described by Clark, 1971) and the Journal Supplement Abstract Service (Siegel, 1972; Linder & Siegel, 1976)—can be understood as direct precursors to PsycINFO.

It seems obvious, in retrospect, to seek a connection between these developments and Vannevar Bush's "memex" proposals: the imagined construction of a collective memory machine (Bush, 1945, 1967). That he was also instrumental in setting up the NSF, and making an explicit place within it for the Social Sciences, seems like a promising avenue for further investigation (see, e.g., Alpert, 1955). Yet this connection is speculative; hypothetical. It is only by digging still deeper, in the way typical of historians, that we can place the APA's NSF grants in their proper institutional context.

So far, I have traced these grants to meetings in 1957–1959 at the APA's Board of Scientific Affairs. It was their eventual and collectively authored report—about the need and urgency of developing a new scientific communication system (Board of Scientific Affairs, 1959)—that led Helen Brownson, Director of Scientific Documentation at the NSF's Office of Science Information Service, to approach John G. Darley at APA about developing the system that eventually became PsycINFO.

Darley preceded Brayfield as executive officer. And he reported that it was Brownson's support and encouragement that catalyzed the entire process (see Darley, 1966; also Brayfield, 1970, p. iii).²³ In other words, the NSF approached the APA; not the other way around. This then affords another step back; we can dig still deeper, following the thread out of the history of the APA and over to the history of the NSF.

This produces a surprise. It connects PsycINFO to the broader social and political context of the postwar period. Especially intriguing are the connections between the NSF and the American response to Sputnik in 1957, and in particular the subsequent passing of the National Defense Education Act in 1958 (see, e.g., Urban, 2010). Adding to this Brownson's institutional and personal interests—including her transfer from the NSF to the Central Intelligence Agency in 1966—then seems to locate the emergence of PsycINFO solidly as part of the history of Cold War social science (see therefore Pickren, 2007; Solovey, 2013; Solovey & Cravens, 2012).

This is so significant as to merit its own sustained archive-driven research project. Its continuing relevance is made obvious by its reflection of contemporary concerns regarding the conflicts and interminglings between disciplinary and national interests (see Hoffman et al., 2015, pp. 73–85; thus also Harris, 1997). And yet this is also just one possible discovery among the many that such an investigative approach affords.

Suffice it to say here, therefore, that it's clear that PsycINFO must be understood as more than a simple bibliography and finding aid. One cannot just trust in the numbers it produces in response to a search, and then draw direct inferences about what really happened. Even the least problematic method, using tools designed by the APA to enable fuzzy matching, cannot be used unthinkingly. In short: that fact-finding is a beginning, not an end. The numbers provide sign-posts, not solutions; new questions, not just new answers (Ball, 2012; Burman, in press; Green, 2016; Pettit, 2016).

²³ For biographical details, see especially Jayroe (2012). Note, too, that Brownson is attributed in the *Oxford English Dictionary* with having been first to propose the use of a thesaurus in parsing the meanings of electronic documents (Gilchrist, 2002, p. 8). Given that, it's then interesting to note that one of the proponents of the APA's resulting Experimental Publication System—Robert G. Kinkade (1970a, 1970b)—soon afterward edited the first APA *Thesaurus* (Kinkade, 1974). And this can in turn be understood as a continuation of an earlier ARPA-funded attempt to construct a taxonomy of human performance (Fleishman, Kinkade, & Chambers, 1968). We then also find him, and another later APA-affiliated author, in discussions of an NSF-funded information system for biology (Judd, Fromm, & Kinkade, 1967; Kinkade & Bedarf, 1967; Kinkade, Bedarf, & Van Cott, 1967; Van Cott & Kinkade, 1967). So there does indeed seem to be something larger going on that merits further investigation (see also Kinkade, 1972; Van Cott, 1970). The system that became PsycINFO seems to have been at the centre of a much larger project that has so far eluded proper historical investigation.

Reflection

The consideration of PsycINFO's controlled vocabulary for use in tracking trends suggests that the database itself is not *just* a finding aid, but *also* that it is a kind of governmental system. This then locates this more traditional aspect of our project in a lineage of earlier examinations of how the APA has worked to define itself in that role (e.g., Altmaier, 2003; Bazerman, 1988; Belar & Kaslow, 2003; Wallin, 1960). And that is in turn consistent with the historian's view of archives as sources of information about the past, but also simultaneously sites of disciplinary control (see, e.g., Featherstone, 2006).

From a psychological perspective, we might consider the role of the APA's controlled vocabulary in ways that reflect the Sapir-Whorf hypothesis: what psychological scientists can say about psychology shapes how they can think about psychological science (cf. Madigan, Johnson, & Linton, 1995, 1996). And so the systems governing that language are themselves objects worthy of study: they both reflect and constrain the extant "epistemes," as Foucault (1966/2002) put it. One could also say "discourses" (Foucault, 1972).

That this should be the case is a simple consequence of disciplining psychology's language. The dominant association's way of parsing psychological phenomena, and naming them—one might even say taming them (cf. Hacking, 1990)—informed the categories that in turn informed reinforcing-institutions like curricula and accreditation standards. These then required textbooks that simplified and represented their contents, and higher level books that reflected the same assumptions but then also built on them using the same language. The new generation of psychologists was then socialized to speak that language, and came to treat it as if it were natural. In doing so, of course, they also extended it even as they reinforced it.

This disciplining is itself very significant. Insofar as these technical definitions and discussions affect and influence the public, the disciplining affords new ways for regular people to make sense of their own subjectivities (see Hacking, 1986, 1995, 1998, 2007). From this perspective, the APA's controlled vocabulary also serves as a kind of "technology of power" (see Foucault, 1982). And changes in such things are certainly worth tracking (e.g., Rose, 1990, 1996; also Rose, O'Malley, & Valverde, 2006; Teo, 2017). Yet note, too, that this deeper examination is not really about tracking *trends* in the published contents of journals. These issues are more fundamental: *What was it possible to think? When was it possible to think those thoughts? And what is the impact of thinking them? (What is the worldview, and the self-view, afforded by feeling them? [Burman, 2012a].)*

Such concerns are ultimately about the boundaries of psychological phenomena. They are about the stuff from which psychology has been made, and will continue to be made for as long as there is a discipline governed by these institutions. The language—when controlled in this way—is therefore constitutive, and not just descriptive (Danziger, 1990, 1997; Soudek, 1980, 1983; also Gergen & Gergen, 1984). It echoes the past and constrains the future. It is socially-constructed, but also no less real in its impact.

Conclusion

It's cliché to say, as many do in undertaking such projects, "a picture's worth a thousand words." But we can perhaps now begin to dig into this: not all words are equally apt, nor are they all as vivid in their descriptions of the phenomena that can be observed. The right words might even describe the entire discipline, at least in outline. In the way that I have attempted to proceed here, the result then affords a "distant reading" of psychology as a whole.

This can be illustrated. But it can also be presented as a summary—from the perspective provided by the most recent 5 years in Table 1—to define contemporary psychology as *the*

scientific study of rats, drug therapy, and major depression (as well as of brains, mice, human sex differences, health, neurons, interventions, human females, schizophrenia, and various other topics of lesser relative importance like treatments, mental disorders, cognitive ability. . .). That is of course a different view from what one would expect given how the discipline is described in textbooks (see Flis, 2016; Thomas, 2007). But this is because the approach presented here doesn't just rely on individual insights or perspectives, derived from close-readings of primary and secondary sources; we are instead reflecting on a view of everything, all at once. (Ideally.)

That is the power of distant reading. More powerful still, from the psychologist's perspective, it provides the means to identify and reflect on alternatives to past parsings and inheritances that may no longer suit contemporary needs. The challenge, with those alternatives identified at the horizon, is then to get closer again; to figure out how to track the changes in the deeper concepts represented by these terms, and begin to see the details that fill in the broad trends (cf. Burman et al., 2015; also Boyack, 2017).

We have started moving in that direction. I have shown here what it is not possible to do, and explained why. I have also suggested how further action by the discipline's main governing body, the APA, could extend the identified investigative window backward in time. For example: by reprocessing materials added during the historical backfill in 1967, using contemporary AI-assisted indexing methods, it will become possible to identify and investigate other ruptures in the record. (That this first one pointed to an intertwining between the development of PsycINFO and concerns regarding national security was quite a surprise, and I am excited to investigate the many other surprises that are no doubt waiting for us.) Furthermore, I have also shown that such an intervention would represent a continuation of earlier efforts at disciplinary governance, rather than a separate or new kind of epistemic activism. And of course it would increase the usefulness of the search engine, the licensing of which serves as a major revenue generator for the association (so perhaps we will not have to wait long for these new developments now that a major limitation has been identified).

My intent in this undertaking was always to take advantage of the APA's own goal in developing and refining electronic research databases: to capture *everything* (Walker & Mulholland, 1992, p. 40). The project can therefore be located as a reflection on the Association's "knowledge dissemination program" (see VandenBos, 1992, pp. 357–365; 2017). Indeed, this project amounts—essentially—to an examination of how it could be possible to use what was done for earlier reasons to deliver on contemporary and unrelated interests. Yet proceeding without such a reflection is to risk being blinded by an assumption that is as mistaken as it is widely shared: the erroneous belief that bibliographic data is "raw data" (see Gitelman, 2013). It's clearly not. Unexamined assumptions always need to be investigated before the numbers they produce can be trusted and relied upon.

I also hope to have shown that such approaches to history are question asking, rather than just answer giving. And despite the new method's good tracking of unambiguous keywords, it's important to be clear that no such method will be able to access the discipline's history directly. Thus, for example, although *clinical psychology* is included as a single term in the controlled vocabulary, using only this in a search does not return everything published that is recognizable by experts as belonging to that subdiscipline. Tracking single terms is insufficient. Yet I believe that we now have enough of an understanding to begin to piece together an examination of this kind, and then use it to inform new investigations that themselves provide new and unexpected insights.

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