



Is Evolutionary Psychology a Scientific Revolution? A Bibliometric Analysis

Andrea Zagaria¹

Received: 2 February 2024 / Revised: 21 February 2024 / Accepted: 23 February 2024 /
Published online: 16 March 2024
© The Author(s) 2024

Abstract

Objective The emergence and growth of Evolutionary Psychology (EP) in the behavioral sciences has been characterized as a “scientific revolution” (e.g. Buss, 2020). According to Kuhn’s framework, a scientific revolution in a discipline is marked by the emergence of a new, dominant school of thought, which eclipses all the other theories. The aim of this study was to assess quantitatively if EP may be regarded as a “scientific revolution” *sensu* Kuhn.

Method I performed a bibliometric analysis of the prevalence of EP (broadly defined) in Psychology, and contrasted it with the prevalence of the socio-cultural approach, known as the Standard Social Science Model (SSSM) (Tooby & Cosmides, 1992).

Results My analysis reveals that the SSSM enjoys significantly greater prominence than EP and is growing at a swifter pace. My analysis also suggests that a “cultural evolutionary” approach, which integrates evolutionary and cross-cultural perspectives, is still underdeveloped.

Conclusions Despite being sympathetic to the claim that EP can potentially lead to a paradigm shift in the behavioral sciences, I argue that a prudent approach may involve recognizing the current state of affairs, envisioning realistic change, and building a more conceptually and methodologically heterogeneous research community in EP.

Keywords Evolutionary psychology · Scientific revolution · Paradigm · Kuhn · Standard social science model · Metascience

In a recent thought-provoking paper, David Buss claimed that evolutionary theory is the sole viable metatheory in Psychology and that the emergence of Evolutionary

✉ Andrea Zagaria
andrea.zagaria@unitn.it

¹ Department of Psychology and Cognitive Science, University of Trento, Corso Bettini,
31 – 38068 Rovereto, TN, Italy

Psychology (EP) has brought about a paradigm shift in the behavioral sciences (Buss, 2020). The potential for evolution to provide a metatheory for psychological science has been recognized by many scholars for several decades already, albeit from different perspectives (e.g., Badcock, 2012; Bjorklund, 2018; Buss, 1995; Caporael, 2001; Cosmides et al., 1992; Dunbar & Barrett, 2007; Duntley & Buss, 2008; Ketelaar & Ellis, 2000; Ploeger et al., 2008; Tooby & Cosmides, 1992; Zagaria et al., 2020). Buss (2020), however, seems to go one step further, and claims that this potential has already been realized, and that the revolution in Psychology caused by EP has already occurred.

Although Buss (2020) did not explicitly mention Thomas Kuhn's *Structure of Scientific Revolution* (Kuhn, 1962/1996) in his paper, he appeared to use Kuhn's lexicon and theory of paradigm shifts in the history of science (see below). He also claimed that "Evolutionary psychology truly is a *scientific revolution* providing a fundamental *paradigm shift*" (Buss, 2020, p. 316, my emphasis) and that EP is "a new *paradigm* that fundamentally alters how scientists view their subject matter" (Buss, 2020, p. 216, my emphasis). He eventually paralleled the advent of EP with Copernicus' heliocentric theory.

In this article, I do not intend to challenge the validity of Buss's claim concerning the revolutionary potential of EP, which is shared by many other evolutionary scholars. Rather, I aim to assess whether the 'scientific revolution' announced by Buss has already happened, or is happening as we speak, in accordance to the dynamics and the steps predicted by Kuhn's theory of paradigm shifts in science. To this end, I have investigated the current status of EP within Psychology, to assess whether research conducted within this approach is growing faster, and possibly also at the expense of, research conducted within the rival approach of the Standard Social Sciences Model (SSSM).

Note that, throughout this paper, I use the label 'Evolutionary Psychology' in the broadest possible sense (e.g. Zagaria et al., 2020), to include all the evolutionary behavioral sciences (i.e., evolutionary psychology, human behavioral ecology, dual-inheritance theory) which, despite claims to the contrary (e.g. Buller, 2007), have been empirically demonstrated to be conceptually homogeneous (Machery & Cohen, 2012). What brings together all these different conceptual and methodological approaches is the premise that mind and behavior are significantly shaped by evolutionary processes, i.e., the notion that in order to understand human behavior properly, we cannot ignore evolution. This premise, instead, is not shared by the SSSM (Tooby & Cosmides, 1992). Along with the evolutionary behavioral sciences I also take into consideration other parallel disciplines which are likely to be "evolutionary-informed" such as behavioral genetics, ethology, or animal cognition. A similar inclusiveness is also granted to the sub-disciplines of the SSSM (see [Method](#) section).

Kuhn's Theory of Paradigm Shifts in Science

Kuhn's *Structure of Scientific Revolutions* (1962/1996) is a landmark text in the history and philosophy of science. Even though it has received extensive criticism, and other theories about scientific progress are available (e.g., Lakatos, 1978), the

Kuhnian perspective remains popular among academics (Bird, 2002; Driver-Linn, 2003).

According to Kuhn, scientific progress occurs through five/six stages. The first stage is the *pre-paradigmatic* one, in which different “competing schools and sub-schools” (Kuhn, 1962/1996, p.12) disagree over fundamentals—although they all base their research on the scientific method. Kuhn mentions *physical optics* before Newton as an example of a pre-paradigmatic science. Epicurean, Aristotelian, and Platonic theories were all about light, but had different ontological premises (i.e., different assumptions about what light is); as such, they were incompatible and in competition with one another (Kuhn, 1962/1996).

The second stage is that of the “scientific revolution”, in which a new school (e.g., the one that began with Newton’s *Optics*) takes over the other ones, typically because it is the one with the best *explanatory power* over some phenomena that could not be accounted for by the other schools. The emerging paradigm may encounter some initial resistance, for scientific, sociological, or psychological reasons, but eventually prevails and becomes the dominant one.

The third stage is that of “normal science”. The dominant paradigm, now fully accepted, becomes the “normal” lens through which scientists do their research (which Kuhn labeled a “puzzle-solving” activity). Kuhn (1962/1996) pointed to some signs that indicate that a scientific revolution has occurred and led to the establishment of a new paradigm. First, the now-accepted theories are exposed in the introductory textbooks of a discipline and are the principal means through which a young researcher is educated in the practice of science. Second, scholars no longer need to justify their choices, in terms of the theories and methodology, because these fundamentals are taken for granted. Third, scholars who do not accept the dominant paradigm are marginalized by the scientific community.

Normal science continues in its ‘puzzle-solving’ activities up to the point when the growing accumulation of *anomalies* (facts that cannot be explained through the paradigm’s usual ontology and methodology) leads science to enter a stage of *crisis* (fourth stage). If a new paradigm emerges that has more explanatory power than the previous one, then a new scientific revolution occurs (fifth stage), followed again by a new “normal science” (sixth stage). Phases 4–5–6 can potentially re-occur in an endless cycle, even though, according to Kuhn, seismic paradigm shifts are very rare and occur over a relatively long period of time.

Does EP Represent a Scientific Revolution?

Buss seems to view the history of Psychology through a Kuhnian perspective, seeing behaviorism as the first modern paradigm, superseded later by cognitivism, and this eventually being replaced by EP (Buss, 2020, p. 317, 318). However, this linear characterization of the history of Psychology is at odds with an impressive number of claims regarding the disunification and fragmentation of the field, which have been around since the inception of Psychology, and that justify the categorization of modern Psychology as a *pre-paradigmatic* discipline (e.g., Cronbach, 1957, Heidbreder, 1933; Henriques, 2011; James, 1894; Kuhn, 1962/1996; Miller, 1985,

Koch, 1993; Toomela, 2020; Vygotsky, 1927/2004; Zagaria et al., 2020). These claims have been shown to be empirically founded (Friman et al., 1993; Kiselica & Ruscio, 2014; Robins et al., 1999, Spear, 2007; Tracy et al., 2004; Zagaria & Lombardi, 2024).

If Buss's interpretation of the history of Psychology were correct and the scientific revolution associated with EP had already occurred (as he seems to imply), we should find ourselves currently in a period of "normal science". Such period of EP as a normal science should be revealed by the indices suggested by Kuhn. Evidence for this, however, is lacking. First, although evolutionary principles are increasingly inserted in introductory Psychology textbooks, they are often significantly misrepresented (approximately 70% of the time as of 2004; Cornwell et al., 2005), which is not exactly a good sign of the reception of EP within Psychology. Also, the evolutionary approach is often presented in behavioral science university courses as little more than a curiosity and therefore is far from being the customary introduction to the practice of Psychology (Tooby, 2020).

Second, in scientific articles written by evolutionary psychologists, one often still finds a long introduction in which authors expose the basic tenets of evolutionary theory and justify their methodology before getting to the actual gist of their contribution (for recent examples, see: Del Giudice, 2018; Lukaszewski, 2021; Lukaszewski et al., 2020; Simpson & Belsky, 2016). This suggests that in subdisciplines such as personality, cognitive, social or developmental psychology, the majority of psychologists are still not familiar, and possibly also not comfortable, with the evolutionary approach.

Aside from these signs, a major marker of the occurrence of a scientific revolution should be the rising influence of a school of thought. The school of thought should become dominant (a full-fledged paradigm) and the scientists who are not aligned with it should become marginalized in the scientific community. Even outside of the Kuhnian perspective, one of the most effective ways to evaluate the success of a particular theory or approach in science is to compare its performance with that of a competitor.

In the case of Evolutionary Psychology, the most direct alternative in terms of providing a competing perspective on the same psychological and behavioral phenomena is the Standard Social Science Model (Tooby & Cosmides, 1992).

EP vs the Standard Social Science Model

The SSSM was aptly characterized by Tooby and Cosmides (1992) as an approach that gives the primacy of explanatory power to culture/social dynamics/learned behaviors over innate predispositions/instincts/biological motivations. The premises of the SSSM were articulated by scholars such as Emile Durkheim and more recently by Clifford Geertz. According to the SSSM, nature is:

"merely the indeterminate material that the social factor molds and transforms. [This] contribution consists exclusively in very general attitudes, in vague and consequently plastic predispositions which, by themselves, if other agents did

not intervene, could not take on the definite and complex forms which characterize social phenomena" (Durkheim, 1895/1962, p. 106, as cited by Tooby & Cosmides, 1992, p.7)

In sum, per the SSSM, the influence of evolution is very limited, and consequently almost negligible (Pinker, 2002).

The SSSM originated in the early decades of the twentieth century (in part as a reaction to Social Darwinism, eugenics, and research that emphasized the deterministic influence of biology in race and gender differences; Degler, 1991) and gained popularity in the social and behavioral sciences in the second half of the twentieth century (Degler, 1991), while Evolutionary Psychology emerged in the decade of the 1990s (Buss, 2020). From a cursory analysis of current trends in the behavioral sciences, one could gather that the SSSM is still very popular, even among more biology-oriented psychologists such as neuroscientists, who lean toward a domain-general/blank-state vision of the human mind (Tooby, 2020). Similarly, Del Giudice has recently labeled feminist theories as “dominant” in the current debates about sex and gender (Del Giudice, 2021). Finally, an analysis of “hot topics” in Psychology sees cultural psychology as dramatically rising in the last years, but no reference to EP, strictly speaking, can be found (Bittermann & Fischer, 2018)¹. Such analyses, however, cannot settle the issue of whether a scientific revolution associated with EP has recently occurred or is currently occurring. In the rest of this article, I address this issue with a quantitative approach. Specifically, in line with a growing body of work investigating the relative prominence of different subdisciplines in Psychology (Friman et al., 1993; Robins et al., 1999; Singer, 2022; Spear, 2007; Tracy et al., 2004; Webster, 2007; Zagaria & Lombardi, 2024), I used bibliometric tools to assess the prominence of EP and SSSM, respectively.

Method

The assumption behind bibliometric analyses is that a sub-discipline or a particular research approach is more prominent within psychological studies if it is mentioned more frequently in the literature. A subdiscipline can be operationalized in different ways: selecting influential journals that represent it (e.g., *Cognitive Psychology* for the cognitive approach; e.g. Friman et al., 1993), or selecting some search keywords representing it (for instance, “cognit*” for cognitivism²; e.g. Robins et al., 1999). Then, counts of a subdiscipline being mentioned can be obtained from PsycInfo through different sources—e.g. “flagships” journals (e.g. Tracy et al., 2004), convenience journals (e.g. Webster, 2007), dissertations (e.g. Tracy et al., 2004), all indexed peer-reviewed journals (e.g. Spear, 2007), and other (see Zagaria & Lombardi, 2024). A quantitative assessment of the prominence of a subdiscipline is

¹ Scrutinizing the Electronic Supplementary Material 2 of the paper, I did find a topic that could be related to evolutionary psychology (topic 430); however, no info is given about its trend (increasing, stable or decreasing); for sure it is not increasing as much as the topic of cultural psychology.

² With the use of the wildcard *, PsycINFO will automatically search terms that start with this stem, such as psychoanalysis, psychoanalytic, etc.

obtained by calculating the ratio of papers labeled as "subdiscipline-laden" divided by the total number of papers published in the same source. For instance, if journal X published 200 papers in 1983 and there were 50 EP publications among them, that would mean that 25% of journal X's total output in 1983 that year was evolutionary.

Eventually, the relative frequencies are then registered and plotted over time. Usually, the interpretation of the graphs is qualitative, but regression analyses of the significance of the intercept and the slopes within journals/across journals over time can be performed as well (e.g. Webster, 2007).

I conducted a bibliometric analysis of the relative prominence of EP and SSSM in Psychology using the analytical techniques previously used in similar studies of Psychology subdisciplines. The specific method implemented in this analysis is inspired by Zagaria and Lombardi (2024), who elaborated a rigorous and systematic protocol to address the limitations of previous studies. First, *a*) specific words were selected by consulting the APA Thesaurus to identify optimal "descriptor terms" for both EP and the SSSM. Then, *b*) the keywords were inputted in specific "field codes" for the actual research, and eventually *c*) the percentage of subdiscipline-laden contributions was plotted over time.

Regarding the first step *a*, the APA Thesaurus is the official lexicon adopted by the American Psychological Association, and it controls for redundancy and specificity (i.e. some specific variants of words are univocally decided to match a specific concept—for instance, *work-related injuries* is the official name that designs "work-related injuries", "workplace injuries", "occupational injuries" and "occupational-related injuries"). The APA Thesaurus has been proven to be a valid source in scientometric studies (Bittermann & Fischer, 2018).

In the first step, the following terms from the APA Thesaurus were considered:

- Evolutionary Psychology
- Sociocultural Factors³

Each word was examined along with all its "related terms" and "narrower terms." Additionally, the "related terms" and "narrower terms" of the initial "narrower terms" and "related terms" were considered. The collected terms can be found in Appendix A, available at this link: [Appendix A (https://osf.io/3jpvu/?view_only=9f9be7a1555b43e9a497f38c73c345b1)].

Among the wide variety of names, the 20 terms that best matched EP and the SSSM were:

- for EP: animal behavior* OR animal behaviour*, animal cognition*, animal communication*, behavioral genetic* OR behavioural genetic*, breeding, darwinis*, etholog*, evolut*, heritability, human behavioral ecology OR human behavioural ecology, interspecies, instinct*, life history, mating OR mate OR

³ "Cultural Psychology" would have been a better choice; however, it is not present at the time speaking in the APA Thesaurus. Cross-Cultural psychology, on the other hand would not have been a good operationalizations of the SSSM, as cross-cultural investigations are one of the main means of EP.

- mates, natural selection, phylogen*, population genetics, sexual selection, sociobiolog*, species
- for SSSM: acculturation, critical race theory, cultur*, feminis*, gender identit*, gender role*, intersectionality, majority group*, microaggression*, minority group*, patriarch*, racis*, sex role*, sexis*, social capital, social categoriz*, social discriminat*, social identit*, sociocultural, transcultural psychiatry

Note that the same term has been expanded through the use of wildcard “*” and different orthographies have been specified when necessary (as is the case for “behavior” or “behaviour”). Also, when the wild card was not an appropriate solution (e.g. mat* for “mating”, “mate”, “mates” would have returned also “maths”, “mathematical”, etc.), the single orthographies are specified. Note also that “human behavioral ecology”, “sexual selection”, and “life history” were forcedly included in the EP words even though they are not included in the APA Thesaurus because of their importance in the evolutionary behavioral sciences.

Control has been exerted to account for the emerging “cultural evolutionary” research approach, which represents the intersection of both genetic/evolutionary and environmentalist assumptions (e.g., Weingart et al., 1997; Zagaria, 2021). To achieve this, a search has been conducted in which all the terms of EP and SSSM were combined (EP-keywords AND SSSM keywords). This helped in identifying papers that belong to the intersection of the EP and SSSM paradigm. Subtracting this intersection between the two paradigms from the normal search, “purer” indices of “only EP” vs “only SSSM” contributions were also obtained.

The “unqualified search” method—i.e. typing the keyword into the search bar without further qualifications—was not used; for the limitations of this approach, see Zagaria & Lombardi (2024). Instead, a focus on the specific field codes was favored. “Field codes” are specific parts of a document. For instance, AB stands for abstract, TI for the paper’s title, and KW for keywords selected by the authors. PsycInfo has also “special” field codes, such as subject keywords officially chosen by the APA Thesaurus (DE) (see Burman, 2018) and Medical Subject Headings (MESH) used by PubMed as its controlled vocabulary. For the current study, the following field codes were selected: Abstract [AB], Keywords/Key Concepts/Identifiers [KW], Title [TI], Subjects/Subject Headings/Index Terms [DE], and Medical Subject Headings [MA].⁴ See Appendix B for the specific syntaxes https://osf.io/3jpvu/?view_only=9f9be7a1555b43e9a497f38c73c345b1). This new method was chosen because it is more reliable and can be easily replicated in comparison to the unqualified search.

In order to control for the “noise” that using such a wide array of keywords could have introduced (e.g. an abstract mentioning racism would have qualified as SSSM, an abstract mentioning the “evolution” of a given practice would have been labeled

⁴ I conducted the analysis using the Ebsco platform. It should be noted that the acronym for the field code may vary slightly across different platforms. However, these field codes should remain consistent across platforms (APA, n.d.b). Please also note that when searching by field code, the “apply equivalent subject” option in Ebsco advanced search is automatically deactivated. This option usually matches unspecified terms to their official counterparts in the APA Thesaurus.

as EP), a more specific search using a restricted set of keywords⁵ investigated only the field code [DE] (Subjects).⁶ The “Subject” field code is the most reliable in PsycInfo (Burman, 2018). Also in this search, the intersection of EP and SSSM contributions has been investigated (see Appendix B).

As for the sources investigated, all peer-reviewed journals in PsycInfo were chosen, similar to what Spear (2007) and Zagaria and Lombardi (2024) did. The aim was to track the trends in the entire field of Psychology, so focusing on specific sources (e.g. highly influential journals, Ph.D. dissertations) would have been misleading. The time period investigated was 1950–2022. The citations were computed four years per decade (i.e. 1950, 1952, 1955, 1958; 1960, 1962, 1965, 1968, etc.), up to 2022. The lower bound (1950) is in line with past research (Friman et al., 1993; Tracy et al., 2004) and it roughly delimits post-World War II trends, which are the focus of interest.

As the sample coincides with the population of interest, a qualitative interpretation of the graphs seems to be the elective choice. However, statistical tests have been used when a qualitative analysis did not suggest clear results (e.g. not understanding clearly if a growth trend is statistically significantly different from zero or not).

Results

The results have been plotted in Figs. 1, 2, 3,4. Detailed data can be consulted in Appendix C (https://osf.io/3jpvu/?view_only=9f9be7a1555b43e9a497f38c73c345b1).

An eye-ball investigation of trends of evolutionary contributions in all selected PsycInfo field codes (Fig. 1, green line) reveals a scattered but stable growth, fluctuating around 3% from 1950 to 1990, and then growing and reaching 4% in 2005, a quote that remains approximately constant until 2020. Past studies have indeed shown a statistically significant increase in evolutionary-laden contributions (as operationalized in “evolut*” unqualified search in PsycInfo) in a convenience sample of neuroscientific journals (Webster, 2007). On the other hand, the increase in SSSM (red line) is much more dramatic, going from roughly 5% in the period 1950–1968 and then increasing to about 11% in 2005, and then stabilizing at about 10%.

The intersection between EP and SSSM approaches (a sort of “cultural evolutionary” approach, blue line) fluctuates around 0, which dubious increase through an eye-ball interpretation. An OLS regression with years as the

⁵ Specifically, behavioral human ecology, life history, and sexual selection were removed from the EP set, as they are not part of the APA thesaurus. Social identity, transcultural psychiatry, and social categorization were removed too from the SSSM set, in order to maintain a balance of terms between the two approaches.

⁶ The search on PsycInfo through EBSCO presents a minor issue with the DE code. This issue caused searches within the DE field code to also include MESH terms (MA field code) (Zagaria & Lombardi, 2024; APA personal communication, November 2022). Since MESH terms are also controlled for lexicon, this should have no substantial consequences on the search.

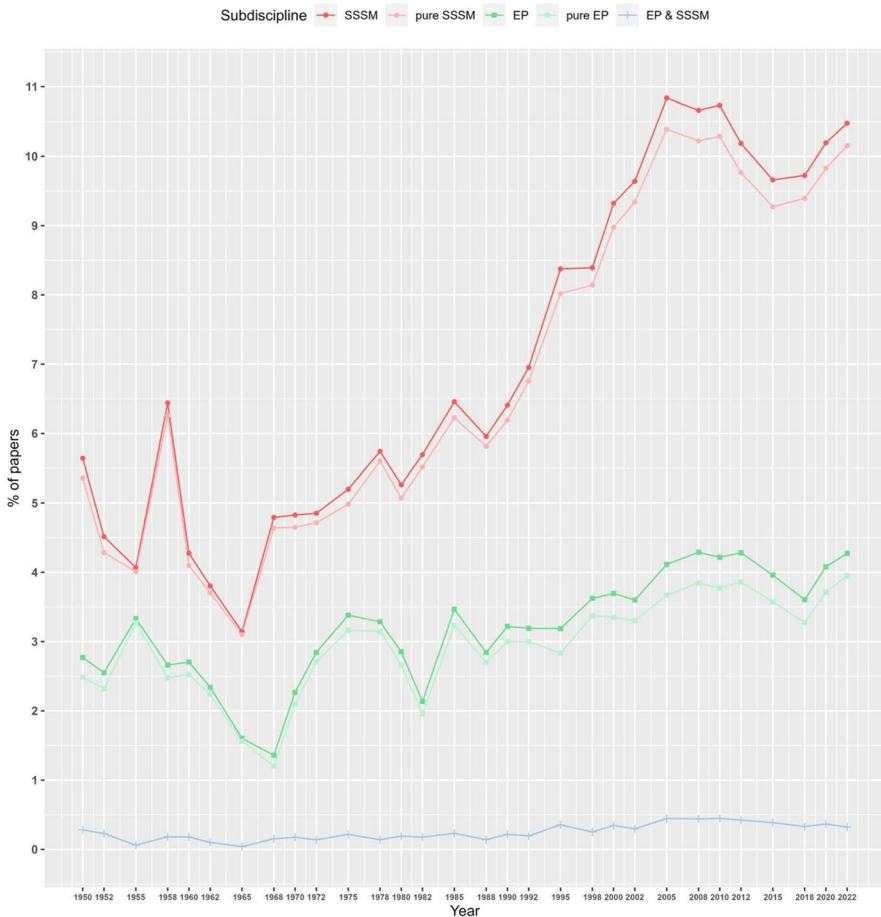


Fig. 1 Evolutionary psychology and the standard social science model in mainstream psychology

independent variable and logit-transformed percentage as the outcome variable (Warton & Hui, 2011)⁷ was run in order to see if the increase was statistically significant. Only linear trends were considered because investigating polynomial trends would have introduced an unnecessary degree of complication in the interpretation of the results. Moreover, the qualitative investigation of the graphs did not support nonlinear trends as regards EP and SSSM in this figure.

The model was significant ($R^2=0.48$, $F(1,28)=26.38$, $p.<0.01$); both intercept and slope were significant ($p.<0.01$). After back transforming the slope through exponentiation, the interpretation was that as a unit increase of a year, there was a

⁷ As some of percentage were 0%, I elaborated the logit function using proportions obtained by adding 1 to the raw number of papers divided by the total number of paper, in order to have proportions that were not exactly 0 and using the minimum proportion useful at stake (Warton & Hui, 2011).

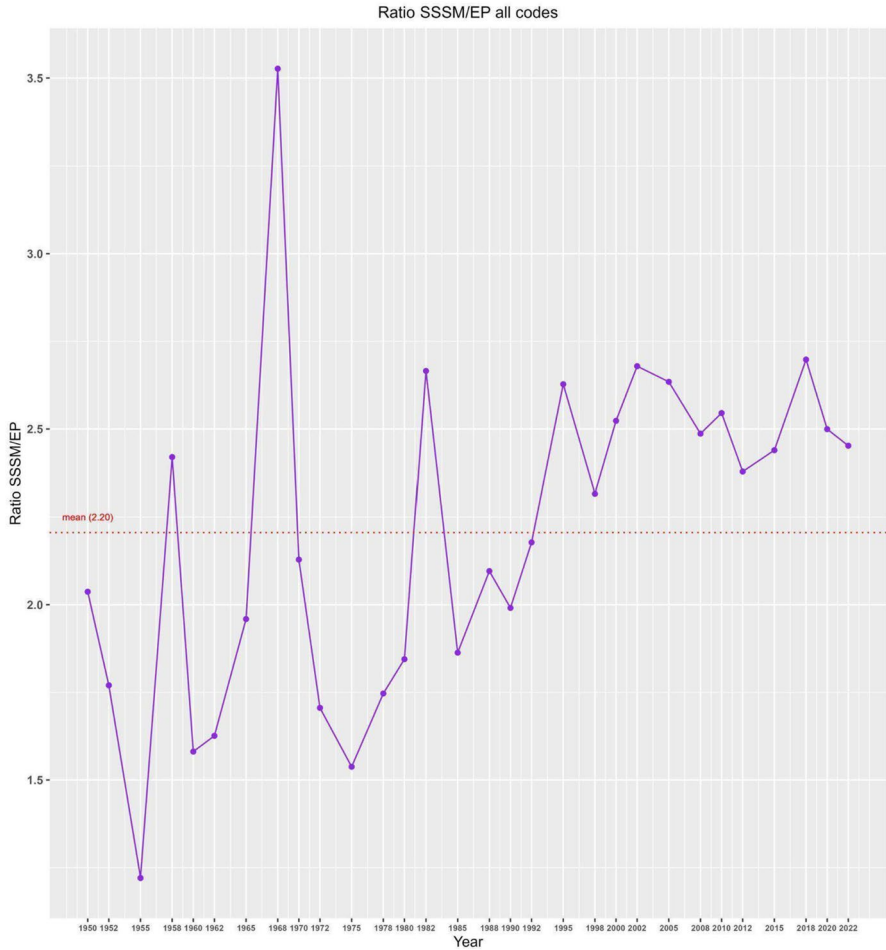


Fig. 2 Ratio between SSSM and EP papers PsychInfo—all field codes

0.01% in the percentage of publications, which means that each year EP & SSSM significantly increased by 0.01%.

As regards the gap between the two approaches, Fig. 2 offers a detailed comparison (ratio between SSSM and EP papers in all PsychInfo field codes). The “peak” in 1968 is likely due to the high number of culturally relevant keywords introduced in that year (see Table 1), but if that is left behind as an “artifact” a more stable and linear growth can be appreciated. Overall, we can see that SSSM contributions are on average more than two times EP contributions (*mean 2.20*) and that the hiatus also steadily increases as the years go on, reaching about 2.5 times nowadays.

In Fig. 3, which is specifically dedicated to PsychInfo Subjects field code (DE), we can see that EP (green line) evolved disorderly from 0% in 1950 to 0.5% in 2015 (with a downward fluctuation from 1975 to 1980, and then an upward

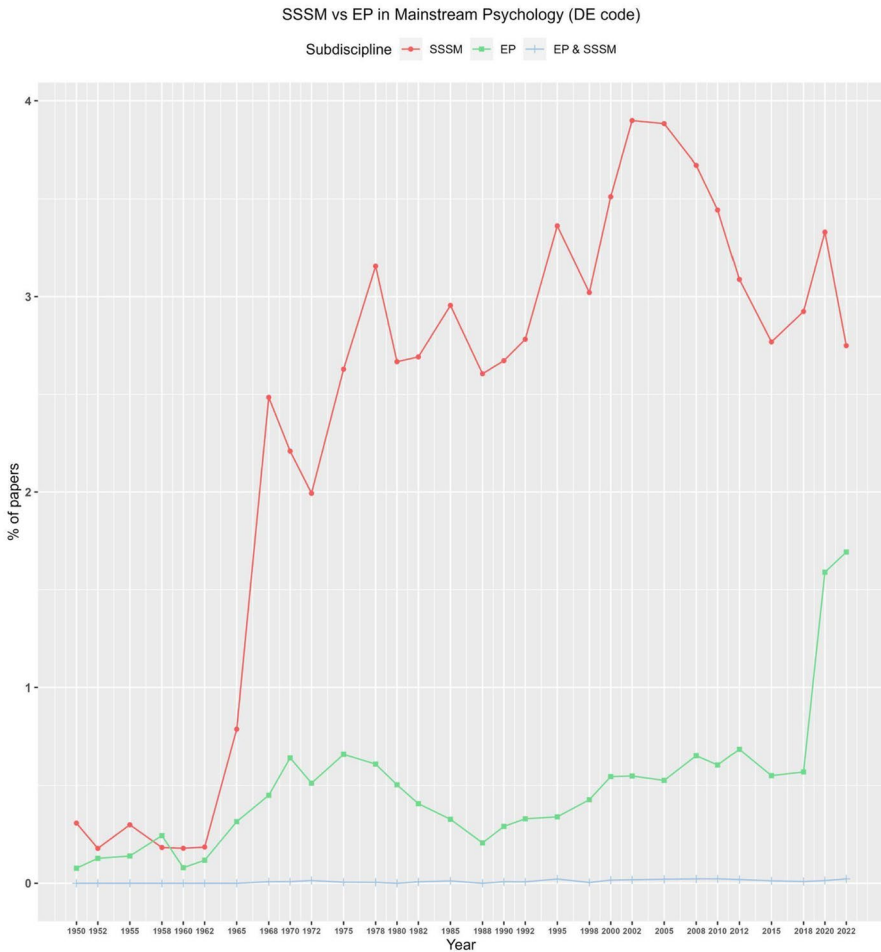


Fig. 3 Evolutionary psychology and the Standard Social Science Model in PsycInfo—De Code

fluctuation again). EP seems to be dramatically increasing from 2018 onward and in 2020/2022 peaked at 1/1.5%. The recent introduction of many APA Thesaurus keywords cannot explain this tendency. The only “recent” EP keywords introduced in the APA Thesaurus have been “animal cognition” [2008], evolutionary psychology [2003], and “heritability” [2005]. All the other keywords have been introduced before (Table 1). Also, many SSSM-related keywords have been introduced even more lately (e.g. “microaggression” in 2015, see Table 1).

SSSM grew dramatically from 1960 to 1970 (going from 0.3% in 1950 to about 3% in the mid of the 70s; ten times its original value). It continued growing, but not as exponentially later, peaking at about 4% in the early 2000s and then stabilizing at about 3% in recent years. The dramatic growth in the late sixties and seventies can arguably be attributed to the introduction of many important APA

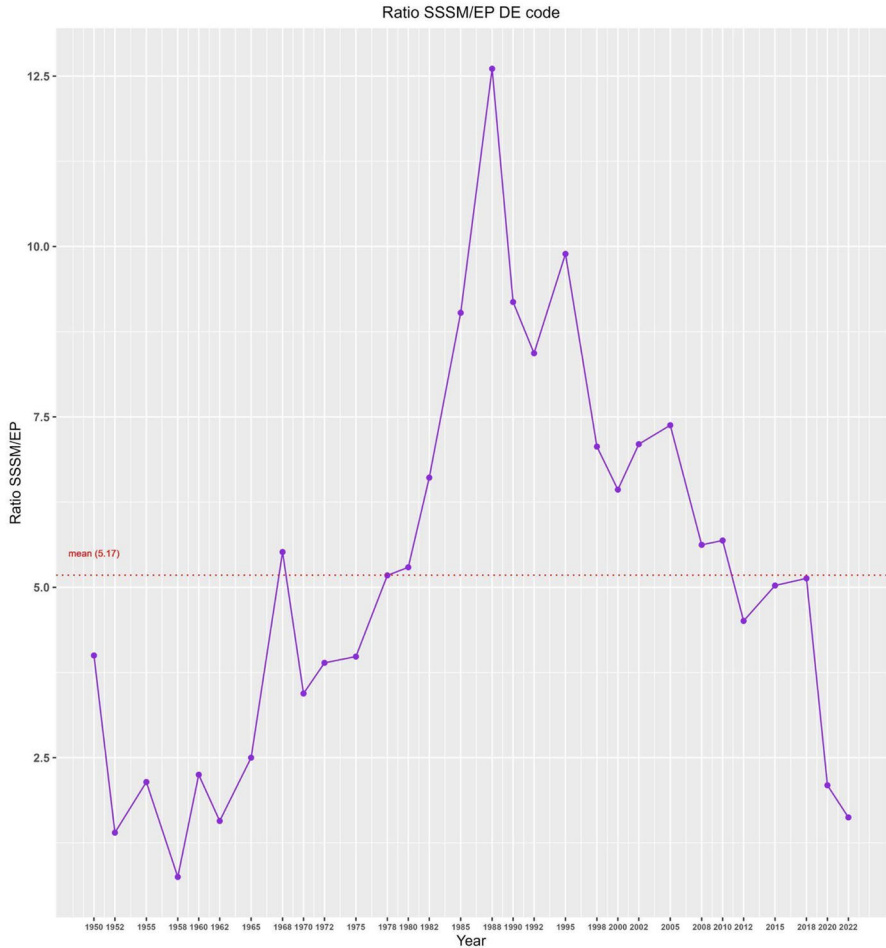


Fig. 4 Evolutionary psychology and the Standard Social Science Model in PsycInfo De Code

thesaurus terms (i.e. “culture”, “racism”, “patriarchy”, etc.) in this period (see Table 1).

In Fig. 3, EP & SSSM (cultural-evolutionary contributions, blue line) always fluctuated negligibly around 0. An OLS linear regression run with the same transformation as the previous one (years as the independent variable and logit-transformed percentage as the outcome variable) led to a non-significant model ($R^2 = 0.01$, $F(1,28) = 0.307$, $p = 0.58$), so the cultural-evolutionary research program is almost absent in the DE code.

The nonimportance of this cross-fertilization has been so marked to the degree the transparent lines (“pure EP” and “pure SSSM”) had to be removed because they were substantially overlapping with the ticker ones obscuring a clear visualization of the data.

Table 1 Year of introduction in the APA Thesaurus of SSSM and EP-related terms

SSSM terms	Year of Introduction	EP terms	Year of Introduction
<i>Acculturation</i>	2003	<i>Animal Behavior</i>	1973
<i>Critical race theory</i>	2022	<i>Animal Breeding</i>	1973
<i>Culture (Anthropological)</i>	1967	<i>Animal Cognition</i>	2008
<i>Feminism</i>	1978	<i>Animal Communication</i>	1967
<i>Gender Identity</i>	1985	<i>Animal Ethology</i>	1967
<i>Gender roles</i>	1997	<i>Animal Mating Behavior</i>	1967
<i>Intersectionality</i>	2021	<i>Behavioral Genetics</i>	1994
<i>Majority Groups</i>	2012	<i>Darwinism</i>	1973
<i>Microaggression</i>	2015	<i>Theory of Evolution</i>	1967
<i>Minority Groups</i>	1967	<i>Heritability</i>	2005
<i>Patriarchy</i>	1973	<i>Human Behavioral Ecology</i>	//
<i>Racism</i>	1973	<i>Interspecies Interaction</i>	1991
<i>Sex Roles</i>	1967	<i>Instinctive Behavior</i>	1982
<i>Sexism</i>	1988	<i>Life History</i>	//
<i>Social Capital</i>	2004	<i>Natural Selection</i>	1997
<i>Social Categorization</i>	2020	<i>Phylogenesis</i>	1973
<i>Social Discrimination</i>	1982	<i>Population Genetics</i>	1973
<i>Social Identity</i>	1988	<i>Sexual selection</i>	//
<i>Sociocultural Factors</i>	1967	<i>Sociobiology</i>	1982
<i>Transcultural psychiatry</i>	1973	<i>Species Recognition</i>	1985

I only noted the main terms, but my search could also have detected related terms in the APA thesaurus. For instance, the search “feminis*” match for the APA thesaurus lexicon Feminism (year of introduction: 1978), Feminist Psychology (2007), and Feminist Therapy (1994). In other cases, the term was wider than the original terms (e.g., “breeding” instead of “Animal Breeding”). Also notice that as anticipated Human Behavioral Ecology, Life History, and Sexual Selection are not included in the APA Thesaurus

As regards the gap between the two approaches in the Subjects code, the hiatus is even more considerable (Fig. 4) than the previous one (Fig. 2). The two trends were as important until 1962, but after that date and before 2020 the gap appeared to be significant, SSSM being 5.17 times greater than EP on average, with a peak of 12.5 in 1988.

Discussion

Many evolutionary psychologists would agree that, conceptually, the evolutionary framework could or does represent a scientific revolution in psychology (Buss, 2020; Tooby & Cosmides, 1992). My analysis, however, suggests that such revolution has not yet occurred in the scientific community. In particular, the paradigm that is in most direct competition with EP, the SSSM, is still dominant in the field

and has become more so in recent years. In the decades covered by my bibliometric analysis, there is no single period in which EP contributions have been more prominent than SSSM contributions (if we exclude 1958 in the only-subject graph; Fig. 3). The strength of SSSM may be comparable to that of other perspectives such as neuroscience or cognitivism (Zagaria & Lombardi, 2024)⁸ whereas EP is weaker and more marginal.

Not only is SSSM more prominent than EP but it is also growing at a swifter pace, as we can see from Figs. 2 and 4. In mainstream Psychology (Fig. 2), the hiatus is greater in more recent (from 1990 on) than in previous years. Kuhn's theory posits that a shift involves the abrupt rise in prominence of a given paradigm; if anything, my analysis suggests that SSSM fits more this trend than EP.

Another result of my analysis is that cultural-evolutionary informed work (EP & SSSM together) seems relatively minor and does not account for a large fraction of either EP or the SSSM-laden work. Therefore, there seems to be little effort in bridging or integrating the two approaches. In Fig. 1 the blue line (EP & SSSM) is not indicative of a substantive research program. The EP & SSSM trend of Fig. 1 does reveal a statistically significant growth but not a marked one (0.01% increase each year). In Fig. 3, the "pure" lines are even less significant, to the degree that they had to be removed to ease the visualization of the data, and the EP & SSSM intersection does not reveal a statistically significant growth. This finding is in line other results showing the insularity of different psychological research programs (Kiselica & Ruscio, 2014; Zagaria & Lombardi, 2024).

As regards the shape of the distributions, the trends overall support a standard "linear" interpretation, with some exceptions. EP in DE code after 2015 hinted at an exponential growth and SSSM in DE code hinted at a tendency that could be investigated through piecewise regression. Also, the "triangular shape" of the ratio between SSSM and EP in the DE code (Fig. 4) is puzzling. However, this might be linked to the specificity of the "Subjects" field code. "Mainstream" Psychology (all the field codes selected, Figs. 1 and 2) is certainly a more robust and reliable source for investigating general trends.

Limitations

The keyword-based search approach used in my analysis comes with certain limitations. This method carries implicit assumptions, such as considering the presence or absence of specific keywords as indicative of a paper being theoretically-laden (EP

⁸ To verify this assertion, control for the syntaxes implemented should be exerted. In Zagaria & Lombardi (2024) work, each paradigm had only 10 descriptors, in contrast to the 20 descriptors used here. Also, its overlapping with the other other dominant paradigms (neuroscience and cognitivism) should be controlled; in other words, SSSM should exhibit a sufficient autonomy (e.g. 60% of non overlapping contributions) with neuroscience or cognitivism. A future study might shed light on this.

vs SSSM), which may lead to false positives or false negatives. Additionally, there is also the potential for the selected field codes to be either overly inclusive or excessively exclusive. Nonetheless, I believe that overall the chosen keywords and field codes were logically justified and reasonable.

There is a slight difference between my analysis and similar work by Zagaria & Lombardi (2024). In their study, the authors chose to conduct a frequency analysis of all candidate keywords with the seed term (for instance, examining how "schema" is associated with "cognit*" over the entire period covered by PsycINFO for peer-reviewed journals) to identify the most indicative search keywords for a research program (i.e. which words are most indicative of "cognitivism", for example: "schema", "human information storage", "mental model*", etc.). However, such an analysis was initially deemed to be not feasible in this context because the term "culture" (and to a lesser extent, "evolution") is not as representative as the original study's seed term. For instance, cross-cultural analyses are a crucial aspect of evolutionary psychology. In this context, a qualitative choice of the search keywords was preferred.

The Subjects-Only search (DE code) is also confounded by a spurious variable: the terms have been included in the APA Thesaurus and in [DE] as a consequence at different timing (e.g., "Theory of evolution" was included in 1967; as well as the term "Culture (Anthropological)"; even though "Natural selection" was included in 1997 and "microaggression" in 2015, see Table 1). However, the inclusion itself is informative of the wider acceptance in the psychological lexicon over time, so was deemed to be informative itself and not a confounding factor.

It is worth mentioning that some scholars (e.g. Rose & Rose, 2010) have argued that the SSSM is a straw man and cannot be directly compared and contrasted with psychology subdisciplines such as EP. However, the SSSM umbrella, while not constituting a single monolithic school or a clearly defined research program, appears to effectively encapsulate a set of assumptions prevalent in the social sciences. Although these assumptions are rarely articulated, they seem to be embraced by many researchers. These may include: *a*) moral skepticism concerning the concept of "human nature" and a significant disregard for phylogenetic forces in shaping human behavior, *b*) recognition of human agency, which not only emphasizes subjectivity but also positions humans as ethical actors and not only scientific objects, and *c*) acknowledgment of the crucial role of environmental context in shaping human actions. For instance, the Yokohama Manifesto (Valsiner et al., 2016) seems to endorse all three of these principles. However, similar arguments could be made for neurofeminist approaches (e.g., Schmitz & Höppner, 2014), among others.

In the academic community, the dichotomy between "constructivist" and "evolutionary" explanations seems indeed to be present—as shown, for instance, by the recent gender differences conference held in Santa Fe (Santa Fe Boys Educational Foundation, 2023). The "SSSM vs EP" characterization, therefore, might be a valid heuristic overall.

Conclusions

The high prominence and popularity of a particular paradigm within a field of study do not necessarily equate with its theoretical and empirical soundness; the same applies to paradigms with lower prominence and popularity. As I believe that the evolutionary approach is overall conceptually and empirically sound, the question of why it has not yet reached the popularity it deserves warrants investigation. Many possible factors contributing to the current state of affairs (e.g. political or methodological concerns, ideological biases, and in-group vs out-group dynamics in academia) have already been explored to the degree that there is a full-fledged micro line of research within EP that explores resistance to EP by other psychologists (see Buss & von Hippel, 2018; Jonason & Schmitt, 2016).

An additional factor that has been discussed only tangentially (e.g. Buss & von Hippel, 2018) is the very nature of human reasoning, which seemed to have evolved to persuade others, rather than to seek an “objective” truth (Henriques, 2011; Mercier & Sperber, 2017). Since we seem to be biologically hardwired to conflate the descriptive “is” with the moral “ought”, evolutionary explanations are often viewed through the lens of the naturalistic fallacy (‘what is natural is good’) and rejected on ideological grounds. As Buss and von Hippel (2018) ironically noted, our evolved psychology could indeed explain why we do not are prone to study our evolved psychology.

As a way forward, I suggest that EP scholars should not *exclusively* challenge and debunk culturalist assertions when they are not supported by the data or ideologically laden. The critical attitude, though necessary, should be accompanied by a tolerant and collaborative disposition. I believe that engaging in *the practice of interdisciplinary research* and building bridges with scholars working from a different scientific background may be a promising way to change the current state of affairs and enhance the prominence of EP in the scientific community. For example, EP should try to find possible areas of contact and cross-fertilization with personality psychology and clinical psychology/psychotherapy. To some extent, successful cross-fertilization between personality psychology and EP (e.g. Lukaszewski, 2021; Lukaszewski et al., 2020), as well as between clinical psychology/psychotherapy and EP (e.g. Gilbert et al., 2014; Liotti et al., 2017), has already occurred. However, I believe there is significant room for further growth. By building new bridges and strengthening existing ones, EP might gain further acceptance and popularity among behavioral scientists. It may also be enriched by other research approaches and perspectives.

Acknowledgements Thanks to Willem Frankenhuis for reading and providing comments on a previous version of the manuscript.

Author Contributions Conceptualization, data curation, formal analysis, investigation, methodology, software: Andrea Zagaria ideated the study, crafted the syntaxis used in PsycInfo, collected and analyzed the data, and produced the graphs.

Funding Open access funding provided by Università degli Studi di Trento within the CRUI-CARE Agreement. No financial support has been received from any agency.

Data Availability Data can be publicly accessed on the Open Science Framework (https://osf.io/3jpvu/?view_only=9f9be7a1555b43e9a497f38c73c345b1).

Declarations

Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Software Andrea Zagaria ideated the study, crafted the syntaxis used in PsycInfo, collected and analyzed the data, and produced the graphs.

Project Administration, Resources, Validation Not applicable.

Writing, Original Draft The original draft was written by Andrea Zagaria.

Writing, Review and Editing Andrea Zagaria produced the final draft.

Competing Interests The authors declare no competing interests.

Ethics Approval This article does not contain any studies with human participants or animals performed by any of the authors.

Consent for Publication All the authors mentioned in the manuscript have agreed for authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Badcock, P. B. (2012). Evolutionary systems theory: A unifying meta-theory of psychological science. *Review of General Psychology, 16*(1), 10–23.
- Bird, A. (2002). Kuhn's wrong turning. *Studies in History and Philosophy of Science, 33*, 443–463.
- Bittermann, A., & Fischer, A. (2018). How to identify hot topics in psychology using topic modeling. *Zeitschrift Für Psychologie, 226*, 3–13.
- Bjorklund, D. F. (2018). A metatheory for cognitive development (or “Piaget is dead” revisited). *Child Development, 89*, 2288–2302.
- Buller, J. D. (2007). Varieties of evolutionary psychology. In M. Ruse & D. L. Hull (Eds.), *The Cambridge companion to the philosophy of biology* (pp. 255–274). Cambridge University Press.
- Burman, J. T. (2018). Through the looking-glass: PsycINFO as an historical archive of trends in psychology. *History of Psychology, 21*(4), 302–333. <https://doi.org/10.1037/hop0000082>
- Buss, D. M. (1995). Evolutionary psychology: A new paradigm for psychological science. *Psychological Inquiry, 6*(1), 1–30.
- Buss, D. M. (2020). Evolutionary psychology is a scientific revolution. *Evolutionary Behavioral Sciences, 14*(4), 316–323. <https://doi.org/10.1037/ebs0000210>
- Buss, D. M., & Von Hippel, W. (2018). Psychological barriers to evolutionary psychology: Ideological bias and coalitional adaptations. *Archives of Scientific Psychology, 6*(1), 148–158. <https://doi.org/10.1037/arc0000049>

- Caporael, L. R. (2001). Evolutionary psychology: Toward a unifying theory and a hybrid science. *Annual Review of Psychology*, *52*(1), 607–628.
- Cornwell, R. E., Palmer, C., Guinther, P. M., & Davis, H. P. (2005). Introductory psychology texts as a view of sociobiology/evolutionary psychology's role in psychology. *Evolutionary Psychology*, *3*(1). <https://doi.org/10.1177/147470490500300124>
- Cosmides, L., Tooby, J., & Barkow, J. (1992). Evolutionary psychology and conceptual integration. In J. Barkow, L. Cosmides, & J. Tooby (Eds.), *The Adapted Mind: Evolutionary psychology and the generation of culture* (pp. 3–15). Oxford University Press.
- Cronbach, L. J. (1957). The two disciplines of scientific psychology. *American Psychologist*, *12*, 671–684. <https://doi.org/10.1037/h0043943>
- Degler, C. N. (1991). *In search of human nature: The decline and revival of Darwinism in American social thought*. Oxford University Press.
- Del Giudice, M. (2018). *Evolutionary psychopathology: A unified approach*. Oxford University Press.
- Del Giudice, M. (2021). Ideological bias in the psychology of sex and gender. In C. L. Frisby, W. T. O'Donohue, R. E. Redding, & S. O. Lilienfeld (Eds.), *Political bias in psychology: Nature, scope, and solutions* (pp. 743–778). Springer.
- Driver-Linn, E. (2003). Where is psychology going? Structural fault lines revealed by psychologists' use of Kuhn. *American Psychologist*, *58*(4), 269–278.
- Dunbar, R. I. M., & Barrett, L. (2007). Evolutionary psychology in the round. In R. I. M. Dunbar & L. Barrett (Eds.), *Oxford handbook of evolutionary psychology* (pp. 3–9). Oxford University Press.
- Duntley, J. D., & Buss, D. M. (2008). Evolutionary psychology is a metatheory for psychology. *Psychological Inquiry*, *19*(1), 30–34.
- Friman, P. C., Allen, K. D., Kerwin, M. L., & Larzelere, R. (1993). Changes in modern psychology: A citation analysis of the Kuhnian displacement thesis. *American Psychologist*, *48*(6), 658–664. <https://doi.org/10.1037/0003-066X.48.6.658>
- Gilbert, P., & Bailey, K. G. (Eds.). (2014). *Genes on the couch: Explorations in evolutionary psychotherapy*. Routledge.
- Heidbreder, E. (1933). *Seven psychologies*. Century/Random House UK.
- Henriques, G. (2011). *A new unified theory of psychology*. Springer.
- James, W. (1894). Epilogue. *Psychology, briefer course* (Vol. 14, pp. 395–401). Harvard University Press.
- Jonason, P. K., & Schmitt, D. P. (2016). Quantifying common criticisms of evolutionary psychology. *Evolutionary Psychological Science*, *2*, 177–188. <https://doi.org/10.1007/s40806-016-0050-z>
- Ketelaar, T., & Ellis, B. J. (2000). Are evolutionary explanations unfalsifiable? Evolutionary psychology and the Lakatosian philosophy of science. *Psychological Inquiry*, *11*, 1–21.
- Kiselica, A. M., & Ruscio, J. (2014). Scientific communication in clinical psychology: Examining patterns of citations and references. *Clinical Psychology & Psychotherapy*, *21*(1), 13–20. <https://doi.org/10.1002/cpp.1815>
- Koch, S. (1993). Psychology" or the "psychological studies. *American Psychologist*, *48*, 902–904. <https://doi.org/10.1037/0003-066X.48.8.902>
- Kuhn, T. S. (1996). *The Structure of Scientific Revolutions*. The University of Chicago Press. Original work published in 1962.
- Lakatos, I. (1978). In Worrall, J., & Currie, G., (Eds) *The methodology of scientific research programmes: Philosophical papers*. Cambridge University Press.
- Liotti, G., Fassone, G., & Monticelli, F. (2017). *L'evoluzione delle emozioni e dei sistemi motivazionali*. Raffaello Cortina.
- Lukaszewski, A. W. (2021). Evolutionary perspectives on the mechanistic underpinnings of personality. In J. F. Rauthmann (Ed.), *The handbook of personality dynamics and processes* (pp. 523–550). Academic Press.
- Lukaszewski, A. W., Lewis, D. M., Durkee, P. K., Sell, A. N., Sznycer, D., & Buss, D. M. (2020). An adaptationist framework for personality science. *European Journal of Personality*, *34*(6), 1151–1174.
- Machery, E., & Cohen, K. (2012). An evidence-based study of the evolutionary behavioral sciences. *The British Journal for the Philosophy of Science*, *63*, 177–226.
- Mercier, H., & Sperber, D. (2017). *The enigma of reason*. Harvard University Press.
- Miller, G. A. (1985). The constitutive problem of psychology. In S. Koch & D. E. Leary (Eds.), *A century of psychology as science* (pp. 40–59). American Psychological Association. <https://doi.org/10.1037/10117-021>

- Pinker, S. (2002). *The blank slate: The modern denial of human nature*. Penguin.
- Ploeger, A., Van Der Maas, H. J. L., & Raijmakers, M. E. J. (2008). Is evolutionary psychology a metatheory for psychology? A discussion of four major issues in psychology from an evolutionary developmental perspective. *Psychological Inquiry*, *19*, 1–18.
- Robins, R. W., Gosling, S. D., & Craik, K. H. (1999). An empirical analysis of trends in psychology. *American Psychologist*, *54*(2), 117–128. <https://doi.org/10.1037/0003-066X.54.2.117>
- Rose, H., & Rose, S. (2010). *Alas poor Darwin: Arguments against evolutionary psychology*. Random House.
- Santa Fe Boys Educational Foundation. (2023, Sept 30 - Oct 1). *Sex/gender differences. The Big Conversation*. A conversation among international experts on the origins, mechanisms, and meaning of sex/gender differences. <https://santafeboys.org/why-the-big-conversation/>
- Schmitz, S., & Höppner, G. (2014). Neurofeminism and feminist neurosciences: A critical review of contemporary brain research. *Frontiers in Human Neuroscience*, *8*, 546. <https://doi.org/10.3389/fnhum.2014.00546>
- Simpson, J. A., & Belsky, J. (2016). Attachment theory within a modern evolutionary framework. In J. Cassidy & P. R. Shaver (Eds.), *The handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 131–157). Guilford Press.
- Singer, S. (2022). Development of three psychology sub-disciplines over the past 30 years: A citation analysis. *Review of General Psychology*, *27*, 164–176. <https://doi.org/10.1177/10892680221133785>
- Spear, J. H. (2007). Prominent schools or other active specialties? A fresh look at some trends in psychology. *Review of General Psychology*, *11*(4), 363–380. <https://doi.org/10.1037/1089-2680.11.4.363>
- Tooby, J. (2020). Evolutionary psychology as the crystalizing core of a unified modern social science. *Evolutionary Behavioral Sciences*, *14*(4), 390–403.
- Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19–136). Oxford University Press.
- Toomela, A. (2020). Psychology today: Still in denial, still outdated. *Integrative Psychological and Behavioral Science*, *54*(3), 563–571. <https://doi.org/10.1007/s12124-020-09534-3>
- Tracy, J. L., Robins, R. W., & Gosling, S. D. (2004). Tracking trends in psychological science. In T. C. Dalton & R. B. Evans (Eds.), *The life cycle of psychological ideas* (pp. 105–130). Springer.
- Valsiner, J., Marsico, G., Chaudhary, N., Sato, T., & Dazzani, V. (2016). *Psychology as the science of human being: The Yokohama Manifesto*. Springer.
- Vygotsky, L. S. (2004). The historical meaning of the crisis in psychology: A methodological investigation. In Rieber, R. W., & Robinson, D. K., (Eds.), *The Essential Vygotsky* (pp. 227–357). Kluwer Academic/Plenum. (Original work published 1926–27).
- Warton, D. I., & Hui, F. K. (2011). The arcsine is asinine: The analysis of proportions in ecology. *Ecology*, *92*(1), 3–10.
- Webster, G. D. (2007). Evolutionary theory in cognitive neuroscience: A 20-year quantitative review of publication trends. *Evolutionary Psychology*, *5*(3). <https://doi.org/10.1177/1474704907005003>
- Weingart, P., Mitchell, S. D., Richerson, P. J., & Maasen, S. (Eds.). (1997). *Human by nature: Between biology and the social sciences*. Lawrence Erlbaum.
- Zagaría, A. (2021). What do we talk about when we talk about culture? There is a missing link between the natural and the social sciences. *Integrative Psychological and Behavioral Science*, *55*(4), 850–857.
- Zagaría, A., Ando', A., & Zennaro, A. (2020). Psychology: A giant with feet of clay. *Integrative Psychological and Behavioral Science*, *54*, 521–562.
- Zagaría, A., Ando', A., & Zennaro, A. (2021). Toward a cultural evolutionary psychology: why the evolutionary approach does not imply reductionism or determinism. *Integrative Psychological and Behavioral Science*, *55*(2), 225–249.
- Zagaría, A., & Lombardi, L. (2024). A new perspective on trends in Psychology. *New Ideas in Psychology* (in press).