Evolutionary Psychology and LGBTQ+ Issues: A Qualitative Study of Queer Women's
Perspectives on Research Results

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Abstract

This study examines reactions to a recent evolutionary psychology article that uses self-report data to claim that same-sex attraction in women evolved because men find it a desirable quality in a mate. Our study explores a novel perspective on the article by interviewing 29 women with attraction to women in Halifax, Nova Scotia. Participants read a news article about the original study, then the original article, and were then asked about their thoughts and feelings. Our research questions were as follows: 1) What cognitive and emotional reactions to the article do women with attraction to women experience? 2) Why did this article generate a lot of online criticism, from the perspective of women who are attracted to women? 3) Do papers like this cause women with attraction to women to change their opinions about psychological journals and/or psychological research? Using thematic analysis, we found seven themes: Negative emotion, identity threat, failure to address sociocultural explanations, male/hetero-centric, differences in paradigms, sensationalized news article, and contextualizing. The proliferation of articles like these represents one of many small stressors women attracted to women deal with as a minority population, and this stress can have important implications for health.

Keywords: Qualitative, sexuality, queer, feminism, evolutionary psychology, critique, perceptions of research

Evolutionary Psychology and LGBTQ+ Issues: A Qualitative Study of Queer Women's Perspectives on Research Results

Evolutionary psychology (EP) is a framework used to study a multitude of psychological phenomena. Over the past few decades this emerging area has become more popular in psychology and neuroscience (Lewis, Al-Shawaf, Conroy-Beam, Asao, & Buss, 2017; Webster, 2007a; Webster, 2007b). This rise in popularity has not come without controversy. Jonason and Schmitt (2016) found there is more criticism of EP than either of its parent fields, i.e. general psychology and evolutionary biology. This criticism often comes from feminists (Kelly, 2014), qualitative researchers, and people who are gay or bisexual (Jonason and Schmitt, 2016). Feminist critics assert that evolutionary psychology is the newest tool used to uphold the status quo (Kelly, 2014). Rose and Rose (2010) claim that EP continues a history of biology being used to “justify forms of social domination, from discrimination and exclusion to genocide.” From a scientific standpoint, EP is criticized for producing hypotheses that are not testable or falsifiable, and for ignoring the influences of culture (Confer et al., 2010; Jonason et al., 2016, Parameswaran, 2014). Evolutionary psychologists defend their discipline by asserting that these arguments are based on misunderstandings. Tybur and Miller (2007) “tested the controversy” and found that scholars in EP are actually less conservative than a typical US citizen. EP scholars also argue that the field does take culture and social learning into account, and that both genes and environment are involved in any manifest human behaviour (Confer et al., 2010; Buss & Schmitt, 2011). While some scholars, such as Feminist Evolutionary Psychologists (Sokol-Chang & Fisher, 2013), try to bridge the divide between the two sides, others assert that feminism and EP are and will always be incompatible (Kelly, 2014).

Evolutionary Theories on Same-Sex Attraction in Humans and Animals

EP has investigated many explanations for homosexual attraction and behavior in humans and animals, including adaptive and non-adaptive explanations (Bailey & Zuk, 2009). Some non-adaptive explanations include that homosexuality is caused by an infectious disease (Cochran, Ewald, & Cochran, 2000) or that it happens when members of the opposite sex are scarce (Van Gossum, De Bruyn, & Stoks, 2005). However, most theorists argue that homosexual behavior has adaptive features. Kuhle and Radtke (2013) argued that sexual fluidity in women was beneficial when there was a lack of paternal investment, as it allowed women to form strong bonds with other women who would invest in the child-rearing. This “alloparenting” strategy is also seen in bonobos and several monkey species (Kuhle & Radtke, 2013). Drawing on animal research in various species, Prum (2012) theorized that homosexual behavior in humans evolved through female mate choices that advance female sexual autonomy. Prum (2012) argued that female same-sex behavior protected against sexual coercion by dominant males, and male same-sex behavior was adaptive because it reduced male-male sexual conflict for mates.

Another recent hypothesis is developed through several papers by Menelaos Apostolou (Apostolou, 2007, 2010, 2016b, 2016a; Apostolou, Shialos, Khalil, & Paschali, 2017). At the core of the hypothesis is “weak selection pressures”. According to Apostolou, strong selection pressures minimize alleles that predispose for homosexuality in the population, but pressures on alleles that predispose for slight deviations from heterosexuality are weaker, and this is why there are more “heteroflexible” or bisexual women than women who are exclusively homosexual. Apostolou proposes that, historically, parents chose heterosexual mates for their children and expected them to reproduce (i.e. arranged marriage), and this allowed for alleles predisposing for homosexuality to stay in the population (Apostolou, 2007, 2010).

Apostolou and colleagues (2017) and the Male Choice Hypothesis

“The evolution of female same-sex attraction: The male choice hypothesis” (Apostolou, Shialos, Khalil, & Paschali, 2017) uses a weak selection pressures hypothesis to explain female same-sex attraction. The authors propose that males prefer female partners with same-sex attraction because it reduces the risk of cuckoldry and increases the likelihood of gaining access to their partners’ female sexual partners. Therefore, a male’s fitness is improved by having a female partner with some same-sex attraction. To test this theory, they administered an online survey to 590 heterosexual men and women in Cyprus. When asked what sexual orientation they prefer in a partner, 34% of men said they would prefer an individual who was attracted “predominantly to members of the opposite-sex but occasionally to members of the same-sex.” In contrast, the vast majority (87.6%) of women preferred a completely heterosexual partner. Moreover, 21% of men said they desire their short-term sexual partners to have sexual contact with members of the same sex occasionally (vs. frequently or never). Apostolou et al. (2017) presented these results as evidence for the male choice hypothesis.

The Male Choice Hypothesis Goes Viral: Quantifying Social Media Impact

The Apostolou et al. (2017) article went viral; headlines appeared on news websites and in social media. People voiced anger and even disgust toward the article. To illustrate the ways in which the Apostolou and colleagues (2017) paper became popular, we used the Altmetric database (“Altmetric,” n.d.), which continually tracks the popularity of academic papers on non-academic internet platforms (e.g., News sites, social media). Firstly, we compared the Altmetric scores for evolutionary psychology articles, and specifically Apostolou’s article, to other articles in the database. Figure 1 shows that the Apostolou and colleagues (2017) article is in the 99th

percentile. This is still the case when controlling for age and journal. This shows that Apostolou and colleagues (2017) has received more media attention than approximately 99% of all other scientific articles in the database.

Furthermore, to find out what type of attention this article was getting, we coded the comments on four different news articles about this study. The majority of comments on three news articles were off-topic, followed by negative comments that disagreed with the article (Figure 2). The Daily Mail had more negative comments than off-topic. There were low numbers of positive comments, ranging from 3.4% on RT News to 14% on The Daily Mail article. Thus, it appears that this article attracted negative media attention from readers.

Qualifying Social Media Impact: Observations from news article comments

What is it about this article attracted so much negative attention? Reviewing the comments on the news articles about the study, people disliked the article for a variety of reasons: some seemed to view the findings as pseudoscience; some found it nonsensical to survey men for a research question about same sex attraction in women; some responded with homophobic comments; and more. It is probable that the readers did not have a thorough understanding of the content of the article before commenting- one commenter even admitted to only reading the title. Another cause for outrage may have been the news websites simplifying and sensationalizing the article, with titles such as “Homosexual behaviour in women only developed because of men, controversial new scientific study claims.” Interestingly, a Russian news outlet, RT News, published a story about the article, and the comments were strikingly homophobic. The word clouds for each news outlet can be seen in Figures 3-6; the central word in the RT News word cloud is “God”. Even excluding more subtle microaggressions, the RT

article has dozens of homophobic comments, from homosexuality being a “disease”, even to mentions of genocide.

Did the news coverage of the Apostolou et al. (2017) article make waves that caused indirect harm to the LGBTQ+ community? If LGBTQ+ folks read the title, the article, or the comments, what effect did this have on them? Jonason and Schmitt (2016) found that people who identify as bisexual or homosexual are more likely to strongly criticize evolutionary psychology- is it because of incidents like these? Could it even change LGBTQ+ people’s trust in science in general? The present study set out to answer some of these questions by interviewing women with attraction to women.

Rationale, Goals, and Research Questions

The goal of this study was to investigate what women attracted to women think and feel about the Apostolou et al. (2017) article and the resulting news articles. Asking the stakeholders who were excluded from the original study what they think of this research provides a novel perspective on evolutionary psychology research. It also allows us to evaluate what impact this article may have had on women attracted to women, or on their views of psychology. We used qualitative methods to allow participants to answer freely and in more nuanced ways than a quantitative measure. Moreover, qualitative methods are often used to empower the voices of marginalized populations by preserving individual voices that are lost when using quantitative measures and large samples (Sacks, 2015). Thus, we interviewed women with attraction to women to answer the following questions:

RQ1. What cognitive and emotional reactions to the Apostolou et al. (2017) article do women attracted to women experience?

RQ2: Why did this article generate a lot of online criticism, from the perspective of women who are attracted to women?

RQ3. Do papers like these cause women attracted to women to change their opinions about psychological journals and/or psychological research?

Methods

Participants

Twenty-nine women with same-gender romantic or sexual attraction were recruited through paper fliers and advertisements on websites such as kijiji.ca, SONA (a website designed to allow psychology undergraduate students at Dalhousie University to participate in research projects), and the Queer Exchange group on Facebook. One inclusion criterion was that they must be a woman, including non-binary, transgender, and intersex women. Women were included if they had experienced romantic or sexual attraction to women within the past year. Participants were excluded if they were friends or acquaintances with the researcher conducting the interviews, to prevent a conflict of interest or other ethical concerns. Data collection was stopped when theoretical saturation was reached, that is, when additional interviews ceased to produce novel data (Braun & Clarke, 2006; Maxwell, 2012).

Materials

After signing the consent form, the first questionnaire participants filled out collected general information such as age, sex, ethnicity, relationship details, occupation, education, and annual personal income. The following are other materials that were used.

Gender identity. The Equality and Human Rights Commission Questionnaire on Gender Identity (Equality and Human Rights Commission, 2012) is a 5-item questionnaire that asks

about birth sex, gender identity, gender transitioning, and sexual orientation. It was tested through focus groups and one-to-one interviews and determined to be satisfactory to both transgender and cisgender people (Balarajan, Gray, & Mitchell, 2011).

Sexual orientation. The Sell Assessment of Sexual Orientation (Sell, 1996) was developed to gather information on a participant's sexual orientation, sexual contact, and sexual attraction. This 12-item questionnaire has 6 items on the frequency and intensity of sexual attractions, 4 items on behavior, and 2 items on sexual identity. It possesses good construct validity ($p < .001$; Bankoff, Marks, Swenson, & Pantalone, 2016).

Articles. Participants were provided with a Pink News article (Cherubini, 2017) about the Apostolou et al. (2017) paper, as well as the original paper. The Pink News article gave the participants a quick summary of the Apostolou et al. (2017) paper in case they found the scientific paper difficult to read or understand. Moreover, having participants read this article was more ecologically valid because most laypersons encounter scientific articles via secondary sources such as news outlets, not via primary sources. We chose Pink News because, relative to other news articles we reviewed, it presented a balanced and less sensational view of the Apostolou and colleagues (2017) article, and it described the article's methodology more fully.

Interview questions. The interview questions were created by the authours and were designed to guide participants toward answering our research questions. First, the researcher asked participants whether they had heard about Apostolou and colleagues (2017) before, and asked them to describe their understanding of the article. Then the researcher asked how the article made them feel (RQ1) and whether it changed their trust in the authours, journal, or

psychology in general (RQ3). Then, a question on why the article may have received such a negative reaction from the public, and what recommendations they had for future researchers (RQ2).

Procedure

Participants contacted the researchers by email or over the phone. Fifty participants were screened and placed on a list for contact. In order of screening, participants were contacted to schedule an interview. All interviews were conducted by the first author in a private room. Each participant was given a consent form and the questionnaires to complete, then told by script about the articles they would read. Participants were instructed to read the Pink News article (Cherubini, 2017) first, then the original Apostolou and colleagues (2017) article. While the participant completed the questionnaires and read the papers, the researcher sat across from them working on a laptop and answered any questions the participant had. The researcher did not express any opinions or emotions about the article before or during the interview, and answered any questions objectively. After the participant finished reading, the researcher began the audio recording and verbally made the participant aware of this. The researcher read a script about the upcoming interview process and proceeded to ask the participant a list of questions. After the interview, each participant was given a debriefing form and signed an audio records release form to give their consent for having their data and anonymous quotes used in the study.

Compensation options were as follows: \$25 CAN, \$10 CAN and one bonus point in an eligible Dalhousie University psychology course, or two bonus points.

Data Analysis

All interviews were transcribed according to a standardized protocol. Transcribed interviews were coded by one researcher using thematic analysis, described by Braun and Clarke (2006). Using Microsoft Word, the researcher familiarized themselves with the raw data and assigned each part of it a code. The code was a word or short phrase that summarized the content and meaning of that part of the data. After all of the data was coded, the researcher examined all codes and grouped similar codes together using colour coding in Excel. These groups became themes that were named to summarize the codes within them. Then the themes were compared again to the raw data to ensure the two agree and nothing important is missing from the themes (Braun & Clarke 2006). Another researcher then independently read the interview transcripts and made notes on the main topics that came up in the interviews, and these topics were compared to the final themes.

Reflexivity

All research has bias, but while quantitative researchers try to eliminate and deny bias, qualitative researchers use reflexivity to explore bias (Finlay, 1998). Doing so can make researchers more aware of their personal views and illuminate its influence on the research. For the sake of brevity, a description of each author has been spared for this section. Each author of this paper holds a different epistemological stance, but for the purpose of this paper, the authors took a pragmatist epistemological stance. Pragmatism is a stance that values practicality and both subjective and objective knowledge (Hanson, Creswell, Clark, Petska, & Creswell, 2005). The authors value and respect the scientific method and the pursuit of finding truth, while also believing that science should be used toward the betterment of society. While the

authors began this study with a pre-existing set of informed opinions (i.e., that the Apostolou and colleagues (2017) article is methodologically and logically flawed), they made every effort not to bias participants at any point of the process. As is standard for thematic analysis (Braun & Clarke, 2006), these assumptions were bracketed and set aside during the analysis phase.

Results

Participant Demographics and Questionnaire Results

Of the 29 women interviewed, all were assigned female at birth and all considered themselves women, but two identified with other identities as well (one non-binary; one gender-fluid), and ages ranged from 18-37, with a mean age of 22.83. Most participants were Caucasian ($n=23$), one was Asian, one was East Indian, and four were mixed-race. The majority of the sample had completed some university education (51.7%) at the time of study. In addition, 27.6% had completed a Bachelor's degree, and 10.3% had completed a Master's. The results of the Sell Assessment of Sexual Orientation can be found in Table 1. Most participants identified as bisexual (37.9%) followed by gay/lesbian (24.1%), other (24.1%; write-in responses included "queer" and "pansexual"), and straight (3.4%).

Assessing Prior Exposure to the Article

Participants were asked if they had heard of the Apostolou et al. (2017) study previously. Four (13.8%) saw a headline about the Apostolou article. One said she saw it on Reddit, one saw it on Autostraddle and Twitter, one saw it on Tumblr, and one participant did not say where she saw the headline. Two participants read a news article about Apostolou; one read the Pinknews article, and one read an unspecified news article that was not Pinknews. For the remaining 23 participants, this was their first time hearing about Apostolou and colleagues (2017).

Thematic Analysis Results

We conducted thematic analysis on 646 data items derived from 29 interviews. There were 94 codes that did not fit any themes, so the analysis summarizes the remaining 552 data items. For the sake of brevity, only themes relevant to our research questions are presented below.

RQ1: What cognitive and emotional reactions to the Apostolou and colleagues (2017) article do women attracted to women experience?

Negative emotion theme. This theme encompasses all negative emotions expressed verbally by participants. Twenty of 29 participants expressed negative emotion at some point during the interview. Most of these expressions happened when asked how the article made them feel (Question 4). For example, one participant described annoyance about the article being poorly written and devaluing queer women's experiences:

I just thought it was [...] a poorly written paper. Um, so I found it like just a bit annoying in that sense. [...] I wouldn't say they're making me actually like, angry, but um, I found it a little bit upsetting that this is something that...like, actually got published and people, I'm sure some people do consider to be like a significant study [mhm] and it's kind of devaluing of the experiences of actual queer women, um, especially where they're only really taking in the responses of straight participants. (P10).

Similar to the passage above, many participants endorsed feelings of annoyance, frustration, or general upset.

Identity threat theme. The "Identity Threat" theme includes codes where participants expressed that the article devalues or invalidates women's sexual identities, and that women are

bound to get defensive over this invalidation. For example, when asked how she felt, one participant described feeling “up in arms” due to the researchers diminishing women’s sexualities:

At first, there was definitely a, um, like an instant kind of...like, ugh, of course, you’re gonna try to diminish, you know, a woman’s, sort of, sexuality down to what a man had wanted or, just that kind of like up in arms feeling that you instantly get when that sort of thing is presented to you. (P12).

In the same way that this participant used the word “diminishes”, other participants within this theme used words like “devalues”, “invalidates”, and “takes away”. Others also described defensive responses in themselves or in the LGBTQ+ community. Another participant spoke more in terms of the community at large:

I think that the LGBT community, um, has experienced a lot of [...] negative, um...pressures from outside ser-sources, so I think like, any like, marginalized group of people, the community’s kind of naturally like, um, defensive, just because it’s been so long that like that we’ve had to like prove that we’re valid, and that like, our thoughts and feelings are real, and that we count and we matter. (P15).

This participant explains that the defensiveness of LGBTQ+ people comes from a prolonged fight to be recognized as valid in their identities. This use of “valid” shows similarity with the other participants’ descriptions of the article as invalidating.

RQ2. Why did this article generate a lot of online criticism, from the perspective of women who are attracted to women?

Though participants were broadly very critical of the article and provided a wide variety of criticisms, we attempt here to summarize the most prominent of these to better understand why the Apostolou article was criticized so heavily online.

Failure to address sociocultural explanations theme. The sociocultural factors theme included criticisms of the authors for failing to account for confounding social factors. Such factors included culture, religion, pornography, masculinity, and others. For example, this participant felt that media's sexualization of women and easy access to porn were important factors:

I think there's just like so many other variables. Um, the biggest thing to me is the um, accessibility to, like media. [...] media portrays and like, sexualizes women so much, that it's like already ingrained as, as soon as you're born [...] it's just like, it's all sexualizing women, and there's not much with men. Um, and then also just like the accessibility and like, easy access to porn that anyone can get now [...] I feel like most of the porn sites are, are um, showcasing women on women, and it's always male domination. (P28).

Many participants, however, did not mention specific cultural factors and instead commented that social influences should not be ignored in favor of an evolutionary argument. This is representative of a broad difference in beliefs about causality in the world: Apostolou et al. propose that human sexuality originates through evolutionary mechanisms, whereas participants in our study tended to argue that gender and sexuality is socially constructed. Given

this difference in approach, many participants felt that cross-cultural research would be essential, in order to rule out this alternative explanation.

Male/hetero-centric theme. The male-centric and hetero-centric theme included participants' expressions that the study seemed overly focused on straight men, which to them seemed nonsensical or offensive when discussing female homosexuality. Many participants assumed that the authors intended to generalize their results to all women with same-sex attraction, including lesbians. In this light, many participants disagreed with the authors' portrayal of lesbianism being "for men" or "about men": "logically, when you think of like, how lesbian is defined, like a lesbian isn't going to be a lesbian for men, that's kind of the whole point of being a lesbian: it's not about men (chuckles)" (P18).

Most participants approached the article from a perspective that closely resembles feminist Standpoint Theory (Bowell, 2011). That is, they felt the best way to understand marginalized populations is from the perspective of people with lived experience from that group. For example, participant 03 said "Like it was about, okay so everything is for what the male wants, and like I get that in evolutionary terms but ... I feel like women themselves have a voice there that wasn't heard". Many participants recommended that if future researchers are studying female homosexuality, they should include queer women in their sample or on the research team. "I would definitely say to try to integrate queer people into your research team, first of all, so that maybe someone can check some of the, you know, huge assumptions and biases you might have" (P01).

Differences in paradigms theme. Some participants seemed to have different worldviews than Apostolou et al. Specifically, some participants were coming from critical, transformative, and feminist paradigms (Nelson & Prilleltensky, 2010). This was evidenced by their recommendations for methodology, views on bias, and views that research on a marginalized population should benefit that population.

Some participants felt that quantitative methods were not suitable for the information they were trying to gather. For example:

Quantitative doesn't work [...] for social issues. You can get basic quantitative data, but what really changes people's perspectives and what really brings people together is qualitative, narrative research because you learn about other people, and you learn about their lives and you get a fuller perspective of experience. (P06)

Some participants were more explicit in discussing paradigms in research. For example, this participant named her own paradigm shift and noted that all researchers have preconceived biases:

I started in psych, [...] and now I'm in, like, the social justice critical theories. [...] we come forward with a set of beliefs and values and frameworks that even if we don't acknowledge it, they're already driving the way we study, the way we approach research. And what science tends to do is it assumes a non-bias [...], especially quantitative research where like "oooh, we're taking ourselves out of it, we didn't decide any of this, this is unbiased, this is...objective, this is rational, this is something that we can believe

as truth.” And this is assuming that there is a [*sic*] objective rational truth, which is usually held by the white (chuckles) male perspective. (P06)

This participant also suggests that the idea of objective truth is an assumption that some scientists make, which is a reference to the ontology of positivist and post-positivist paradigms (Guba & Lincoln, 1994). Another participant felt that research should serve the population it studies:

Privileged groups or dominant groups wanna study, like, the lives of the marginalized from their own position of power and their own interest in, like, advancing their own (laughs) like, CV or publication list or whatever [...] I don’t think it’s really serving (chuckles) like, women’s communities, you know it’s not really serving queer women [...] I think research should have that goal, right, like that political goal of like, serving the community in which it’s trying to learn about or explore or represent. (P02)

These ideas are typical within critical transformative paradigms (Nelson & Prilleltensky, 2010), which these participants seemed to endorse. In sum, participants tended to prefer approaches from feminist and critical theory to answer these sorts of problems.

Sensationalized news article theme. Many participants thought that the news article sensationalized the topic and findings relative to the journal article, and that this contributed to the online backlash. For example:

Like, in the news articles like, they kind of, they don’t twist it, but they like, glamourize it I guess and over exaggerate, so, um, I also think it’s like, extremely controversial,

because, I d-, just to say that one thing like, ultimately caused the behaviour of a lot of people is kind of a big conclusion to draw from like, one or two studies. (P25).

In sum, participants believed that sensationalizing coverage of this research in the media was a one contributing factor to why this article generated a great deal of online criticism.

RQ3. Do papers like Apostolou and colleagues (2017) cause women attracted to women to change their opinions about psychological journals and/or psychological research?

Contextualizing theme. In the contextualizing theme, participants expressed negative views of the authours, but were able to use their broader knowledge of science to see this article as an exception to the rule. As a result, their views of psychology were largely unchanged. Firstly, 18 participants expressed distrust or a negative opinion about the authours, and many claimed they would be skeptical of future publications by them:

These specific researchers, I might be pretty skeptical and not too trustworthy going in.

[...] I wouldn't necessarily totally discount them, but I don't, I...don't have the best opinion of them as it stands, um just because I felt that...like the article...even forgetting how I feel personally about the question, like the article itself I didn't find terribly convincing. (P01).

One might expect that this distrust in the authours would extend to the journal that published the paper and even psychology as a discipline. Indeed, some participants criticized the journal for publishing the article. However, others were more understanding of the reasons why the journal would publish the article, even if they disagreed with it.

Participants used cognitive justifications to maintain their original opinion of psychology, whether positive or negative. Some participants were critical of the authors and the journal, but put this study in the context of the larger body of credible research in psychology to maintain their positive opinion of the discipline. However, if participants had a negative opinion of psychology, they saw the article as evidence supporting that opinion:

I think that it is a field that doesn't have as many answers as is generally perceived, um in society. [...] psychological research is often really focused on, a- like, college students because this is where you can get like a super broad base of people who are willing to like, spend an hour for 25 bucks answering questions. [...] This just kind of confirms what I already thought about psychology, which is, uh, a lack of diversity in its participants, which skews data sets. (P13).

Whether the participants' opinions of psychology were positive or negative, they maintained the same views after reading the unsavory article.

Discussion

Our study centers the voices of a marginalized group, women attracted to women, responding to psychological research on issues that pertain to them. This is a novel perspective that can add to the existing debate between feminists and evolutionary psychologists, and it highlights the harm that EP studies can cause to marginalized groups. In addition, our results can provide insight as to why some scholars (Jonason and Schmitt, 2016) have found that gay and bisexual individuals have negative views of evolutionary psychology.

We interviewed 29 women with attraction to women and performed thematic analysis on their qualitative data. Of our seven main themes, most exemplified a negative, angry, and critical reaction to the Apostolou and colleagues (2017) study. This falls in line with responses LGBTQ+ people have to microaggressions, defined as “behaviors and statements, often unconscious or unintentional, that communicate hostile or derogatory messages, particularly to members of targeted social groups” (Nadal, Whitman, Davis, Erazo, & Davidoff, 2016). Nadal et al. (2010) identified one type of microaggression called “exoticization”, defined as “when LGBT persons are dehumanized or treated like objects”. Exoticization is relevant here, as participants reacted negatively to the article’s reduction of women to an object of a man’s desire. In Nadal and colleagues (2011), LGBTQ+ participants described microaggressions they had experienced and how they reacted. Anger was included as an emotional reaction, as well as sadness, and this was coupled with confrontational reactions toward the person who had committed the microaggression. This matches the anger and upset our participants expressed and the criticisms they made toward the authors, who they felt had objectified and devalued their identity.

Microaggressions are a subtle form of discrimination. The minority stress model by Meyer (2013) posits that stigma and discrimination toward minority groups, in this case LGBTQ+ people, creates chronic stress that has important implications for mental and physical health (Frost, 2017; Nadal et al., 2011; Williams & Mann, 2017; Burgess, Lee, Tran & van Ryn, 2007; Kelleher, 2009; Lehavot, & Simoni, 2011). Therefore, when popular scientific articles display subtle homophobia, this can contribute to social and health disparities of LGBTQ+ populations. This study was one step toward holding researchers accountable for the negative

downstream effects of their work. This is not to say that scientists should not explore any avenue of their choosing to come closer to the truth of a matter; rather, the standard of evidence and scientific rigor must be higher when the results have potential implications for minority populations.

Limitations

Our small sample of mostly white educated women in Halifax Nova Scotia is not necessarily generalizable to all LGBTQ+ women. We cannot make inferences about how LGBTQ+ women of other demographic groups would react to articles like these. However, the data we got from this small sample was rich and nuanced in nature. Future research could explore the reactions of less educated people who may not necessarily have the academic knowledge required to make scientific criticisms of an article of this nature.

Conclusion

The authors would like to take this opportunity to endorse some of the recommendations offered by participants: 1) Those who wish to study marginalized populations should include individuals from their target population in their sample and/or their research team, and 2) Those who wish to study topics related to LGBTQ+ issues should educate themselves on issues relevant to the community and consider alternative methodologies, so as not to inadvertently cause harm. As researchers, we offer the following recommendations: 1) Researchers should consider what societal and policy implications their work could have for minority populations and try to reduce harm, and 2) The scientific community and the public should hold scientists to a higher standard of rigor, especially if the research has potential to cause harm.

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Figures

Figure 1. Percentile rankings for the Apostolou and colleagues (2017) article in comparison to all articles within the Altmetric database (Top left), all evolutionary psychology articles in PAID (Top right), all articles within 3 months in age (Bottom left), and evolutionary psychology articles within 3 months of age in PAID (Bottom right). PAID = Personality and Individual Differences.

Figure 2. Percentages of comments on news articles about Apostolou and colleagues (2017) that were coded as positive, off topic, negative, or mixed/no opinion.

Figure 3. Word cloud made from the comment section of the Daily Mail article about Apostolou et al. (2017). Larger words indicate higher frequency of use.

Figure 4. Word cloud made from the comment section of the Independent article about Apostolou et al. (2017). Larger words indicate higher frequency of use.

Figure 5. Word cloud made from the comment section of the PinkNews article about Apostolou et al. (2017). Larger words indicate higher frequency of use.

Appendix: Methods for Altmetric data

Software

Altmetric data was collected using a web browser plugin called Altmetric API. This permission had some restrictions, such as prohibited sharing of raw data. This software can be found at <https://api.altmetric.com>. Data were acquired using the rAltmetric package (Ram, 2014), which makes use of the Altmetric API. Both graphs were created using R software, available at <https://cran.r-project.org/>. R was programmed to collect data from Altmetric, and to create a .csv file (comma delimited format) so that the data was readable to the program.

Data Sharing

Data and R syntax are located on our OSF page (<https://osf.io/xwrcv/>). The Altmetric data are proprietary, and are protected by a Data Sharing Agreement. Any researcher who would like access to these data must sign Altmetric's Data Sharing Agreement, also located on our OSF page. If this agreement is signed and sent to the corresponding author (mackinnon.sean@dal.ca) you can get access to the data. This said, a full list of all the articles and dois used in our sample (minus the Altmetrics) are available on our OSF page in the file "updated.dois.jan11.2018.csv". Data and syntax for the news article comments are open-access (including word documents for all of the comments we coded) on our OSF page, and are freely available for re-use. The raw interview transcripts informing our thematic analysis contain identifiable information. Thus, keeping with recommendations from our REB, these raw data are not open access (however, we provide numerous representative quotes below). Access to these data for secondary analysis would require an ethics application to our Research Ethics Board.

Procedure

Dot plots. Articles on evolutionary psychology were found using the database “psycINFO” and using the following search terms: evolution*, Darwin*, natural selection, intrasexual competition, and sexual selection. The search included only articles published between 2007 and 2017 in the journal *Personality and Individual Differences (PAID)*, and the search was completed on January 11, 2018. Abstracts were scanned, and were rejected if they didn’t include any of the following terms: evolution, evolutionary psychology, evolutionary, evolved, Darwin, natural selection, intrasexual competition, mate choice, sexual selection, or mate preference(s). Four additional articles were found by hand-screening journal issues, so in total 233 evolutionary psychology articles were found. Then their Altmetric data was acquired using the rAltmetric package and compiled into a spreadsheet. Many articles did not have Altmetric data because they had never been mentioned on the web, so only the 166 articles with Altmetric data were included in the graphs. Altmetric compared the statistics from these 166 articles to the statistics of the following: all articles in the altmetric database (with some exceptions¹), all articles published in *PAID*, all articles published within three months of the target article, and all articles published within three months of the target article in *PAID*. Each article has these four comparisons with a calculated percentile score for each (e.g., a percentile

¹Altmetric updates percentile scores of an article only when it is mentioned on the web. This means that each time the score is updated, it is compared to more articles, if more articles have been published and mentioned on the web since the last time it was updated. Therefore, an article that was not recently updated will be compared to fewer articles than one that was recently updated. Similarly, if an article has never been mentioned on the web, it is not included in the database or percentile score. (N. Madjarevic, personal communication, August 7, 2017)

score of 90%, would indicate that that article was cited by Altmetric sources more than 90% of the articles to which it was compared).

Hypothesis tests. We calculated one-sample t-tests comparing to a null hypothesis of 50 for the percentile scores displayed in Figure 1. This provides a hypothesis test to determine whether our selection of evolutionary psychology articles were above average in Altmetric scores relative to other journal articles. The average percentile scores were significantly higher than 50 in all four reference groups: (a) All journals in the Altmetric database ($t(177) = 7.61, p < .001, M = 68.11, SD = 31.74$); (b) all articles in the Altmetric database of a similar age ($t(177) = 8.05, p < .001, M = 68.07, SD = 29.94$); (c) all journals in PAID ($t(177) = 4.38, p < .001, M = 60.29, SD = 31.39$); and (d) all articles in PAID of a similar age ($t(177) = 2.63, p = .01, M = 55.94, SD = 30.20$).

News article comments. Altmetric was used to find news articles on the web about the Apostolou and colleagues (2017) article. All news articles with under 10 comments were excluded, leaving three articles by *RT News* (formerly known as *Russia Today*), *The Independent*, and *The Daily Mail* (Cliff, 2017; RT, 2017; Young, 2017). One commonly shared article by *PinkNews* was found outside of the Altmetric database (Cherubini, 2017). All the comments on each web article were copied and pasted into a word document, and each were assigned an ID number. Each comment was coded as off-topic (i.e., entirely unrelated to the article) (0), a negative comment disagreeing with the study (1), mixed/no opinion, but still talking about the article (2), or a positive comment agreeing with the study (3). In total, 784 comments were rated. The percentage of prevalence of each rating was then calculated and these percentages were imported into R to create graphs using the ggplot2 package. We used the AC1 coefficient for

inter-rater reliability (Gwet, 2002) and found that inter-rater reliability was adequate ($AC1 = 0.763$, $95\% \text{ CI} = 0.728 - 0.798$).

Supplementary Table 1

Descriptive statistics from Sell Assessment of Sexual Orientation

Gender of Other	Question							
During the past year, how many different [men/women] were you sexually attracted to?								
	None	One	Two	3-5	6-10	11-49	50-99	100+
Men	9 (31.0%)	3 (10.3%)	4 (13.8%)	4 (13.8%)	2 (6.9%)	6 (20.7%)	1 (3.4%)	0 (0.0%)
Women	0 (0.0%)	1 (3.4%)	1 (3.4%)	10 (34.5%)	5 (17.2%)	6 (20.7%)	1 (3.4%)	5 (17.2%)
During the past year, on average, how often were you sexually attracted to a [man/woman]?								
	Never	Less than once per month	1-3 times per month	1 time per week	2-3 times per week	4-6 times per week	Daily	
Man	10 (34.5%)	6 (20.7%)	2 (6.9%)	1 (3.4%)	3 (10.3%)	2 (6.9%)	5 (17.2%)	
Woman	0 (0.0%)	1 (3.4%)	3 (10.3%)	3 (10.3%)	8 (27.6%)	3 (10.3%)	11 (37.9%)	
During the past year, the most I was sexually attracted to a [man/woman] was...								
	Not at all	Slightly	Mildly	Moderately	Significantly	Very	Extremely	
Man	7 (24.1%)	4 (13.8%)	4 (13.8%)	2 (6.9%)	3 (10.3%)	3 (10.3%)	6 (20.7%)	
Woman	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.4%)	5 (17.2%)	7 (24.1%)	16 (55.2%)	
During the past year, how many different [men/women] did you have sexual contact with?								
	None	One	Two	3-5	6-10	11-49	50-99	100+
Men	12 (41.4%)	5 (17.2%)	6 (20.7%)	3 (10.3%)	3 (10.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Woman	10 (34.5%)	6 (20.7%)	5 (17.2%)	6 (20.7%)	2 (6.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
During the past year, on average, how often did you have sexual contact with a [woman/man]?								
	Never	Less than once per month	1-3 times per month	1 time per week	2-3 times per week	4-6 times per week	Daily	
Man	12 (41.4%)	9 (31%)	4 (13.8%)	2 (6.9%)	1 (3.4%)	0 (0.0%)	1 (3.4%)	
Woman	10 (34.5%)	4 (13.8%)	5 (17.2%)	2 (6.9%)	3 (10.3%)	4 (13.8%)	1 (3.4%)	