

Original Article

Changes in pornography-seeking behaviors following political elections: an examination of the challenge hypothesis

Patrick M. Markey^{a,*}, Charlotte N. Markey^b

^aVillanova University, Villanova, PA 19085, USA

^bRutgers University, Camden, NJ 08102, USA

Initial receipt 7 December 2009; final revision received 22 June 2010

Abstract

The current study examined whether or not individuals who vicariously win a competition seek out pornography relatively more often than individuals who vicariously lose a competition. By examining a portion of Google keyword searches during the 2004, 2006 and 2008 US election cycles, the relative popularity of online pornography keywords searches was computed for each state and the District of Columbia the week before and the week after each election. Consistent with the Challenge Hypothesis, following all three election cycles, individuals located in states voting for the winning political party tended to search for pornography keywords relatively more often than individuals residing in states voting for the losing political party.

© 2010 Elsevier Inc. All rights reserved.

Keywords: Political psychology; Sex; Internet; Challenge Hypothesis

1. Introduction

Social and natural scientists have successfully employed various evolutionarily based hypotheses, historically applied to anatomy and physiology, to predict and understand behavioral adaptations in humans. For example, although the Challenge Hypothesis was originally proposed to account for relations between testosterone and aggression found among birds (Wingfield, Hegner, Dufty & Ball, 1990), it has recently been extended to research on humans. According to the Challenge Hypothesis (Wingfield et al., 1990), testosterone levels in males tend to rise during competition. Specifically, the Challenge Hypothesis suggests that the changes in testosterone which occur in response to challenges help support various reproductive behaviors (e.g., mate guarding, dominance disputes, etc.). Consistent with the Challenge Hypothesis, a recent meta-analysis, examining various types of competitions (e.g., wrestling, basketball, coin toss, etc.), found that individuals who win a competition tend to have greater increases in their testosterone

one than individuals who lose a competition (mean weighted $d=.31$; Archer, 2006).

Interestingly, individuals do not even have to be directly involved in a competition for their testosterone levels to be affected; spectators can experience similar changes in testosterone levels. Past research has found that male fans watching their favorite soccer or basketball teams tend to have higher levels of testosterone if their team wins the competition than if their team loses the competition (Bernhardt, Dabbs, Fielden & Lutter, 1998). More recently, Stanton, Beehner, Saini, Kuhn and LaBar (2009) found that following the 2008 US presidential election men who voted for the winning candidate (Barack Obama) had higher testosterone levels after the election than men who voted for a losing candidate. Due to the link between testosterone and sex-related behaviors [effect sizes range from $d=.17$ to $d=1.07$; see Archer (2006) and van Anders and Watson (2006) for reviews about this link], at least one researcher has speculated that there may be an “Obama baby bump” 9 months after the election (Choi, 2009).

Although an Obama baby bump has yet to be detected, another sexual behavior that might shift following the winning or losing of a competition is the seeking of visual–sexual stimulation (e.g., pornography). Men’s interest in pornography is typically attributed to men’s evolved interest

* Corresponding author. Villanova University, Villanova, PA 19085, USA. Tel.: +1 610 662 9399.

E-mail address: patrick.markey@villanova.edu (P.M. Markey).

in sexual variety and multiple partners. As noted by Symons (1979, p. 171), men tend to fantasize about a place where “sex is sheer lust and physical gratification, devoid of more tender feelings and encumbering relationships, in which women are always aroused, or at least easily arousable, and ultimately are always willing.” As a result of these desires, men often seek out pornography (Buzzell, 2005; Ropelato, 2006), which typically depicts women engaging in casual sex without investment (Malamuth, 1996).

Given the above-discussed links for men between vicariously winning a competition and increases in testosterone (Bernhardt et al., 1998; Stanton et al., 2009), testosterone and sexual behaviors (Archer, 2006; van Anders & Watson, 2006), and the evolved desire for pornography (Malamuth, 1996; Symons, 1979), it seems likely that men who vicariously win a competition will express more interest in sexual behavior and therefore seek out pornography more than men who lose a competition. The current study examines whether or not this predicted pattern of pornography-seeking behaviors will occur in response to political elections (e.g., both presidential and midterm elections). Consistent with the Challenge Hypothesis, it is expected that individuals located in states voting for the winning political party will seek out pornography more often than individuals residing in states voting for the losing political party.

Pornography uses a variety of media, ranging from books, magazines, film and video. However, currently, one of the most prevalent means of distributing pornography is the internet (Ropelato, 2006). By simply typing a few keywords into a search engine (e.g., Google) it is extremely easy to search for pornography on the internet. Every day, up to 25% (68 million) of all internet search engine requests are for pornography with the majority of these requests made by men (Buzzell, 2005; Ropelato, 2006). Although it is not possible to know exactly who is typing a specific keyword into a search engine, Google Trends supplies weekly reports on the volume of queries related to various topics. By analyzing a portion of Google searches, Google Trends computes the relative number of searches done on a given set of keywords. Through recording user’s IP addresses, Google Trends provides a “snapshot” of what is on the public’s mind in a particular area of the United States at different points in time (Google, 2009).

Google Trends has web search information dating back to 2004. More importantly, for the purposes of the current study, Google Trends has data available for the 2004 and 2008 presidential elections and the 2006 midterm election in the United States. Data from these election years will be used to test the prediction that when individuals vicariously win a competition they express more pornography-seeking behaviors than individuals who vicariously lose a competition. Thus, this study will address three predictions. Prediction 1: During the 2004 presidential election (when a Republican candidate won the election), Red states (Republican voting states) will have higher rates of pornography-seeking behaviors the week after the election than Blue states

(Democratic voting states). Prediction 2: During the 2008 presidential election (when a Democratic candidate won the election), Blue states will have higher rates of pornography-seeking behaviors the week after the election than Red states. Prediction 3: During the 2006 midterm election (when Democrats captured the House of Representatives, the Senate and a majority of governorships and state legislatures), states that are traditionally Blue states will have higher rates of pornography-seeking behaviors than swing states (i.e., states which tend to favor both Democratic and Republican candidates), which will have higher rates of pornography-seeking behaviors than Red states.

2. Method

2.1. Participants

Participants in this study were all individuals residing in the United States who entered select pornography keywords into the Google search engine in 2004, 2006 and 2008. Other than the state participants resided in and when they searched for the select pornography keywords, no other demographic information is available. However, past research suggests that visitors to pornography web sites tend to be male (72%) and between the ages of 18 and 45 (Buzzell, 2005; Ropelato, 2006).

2.2. Measurements and procedure

2.2.1. State voting style

For the 2004 and 2008 presidential elections, each state and the District of Columbia’s voting style was determined by the winning political party based on the statewide vote count (Democrat=Blue state; Republican=Red state). In the 2006 midterm election, this methodology could not be used because all voters were not electing a common national candidate. Due to the massive variability between states in what and who they were electing (some areas were electing senators, others governors, still others were electing both or neither) and because the current research was attempting to assess voters’ reaction to a national outcome, it seemed appropriate to assess how states tend to vote at the national level. Therefore, for the 2006 midterm election, state voting style was determined by each state’s tendency to vote either predominantly for the Republican Party, for the Democratic Party or for both parties. States and the District of Columbia were classified into one of these three categories by compiling the mean margin of victory in the 1992, 1996, 2000, 2004 and 2008 presidential election ($\alpha=.97$). States with an average margin of victory of $>5\%$ for the Democratic candidate were classified as Blue states, states with an average margin of victory of $>5\%$ for the Republican candidate were classified as Red states and the remaining states were classified as swing states. Swing states were included in the 2006 analysis because there is some level of uncertainty about how the majority of voters in some states (i.e., swing states; e.g., Colorado, Florida, Ohio, etc.) might

have felt concerning the 2006 outcome, whereas in other states the feelings of the majority of voters are fairly easy to predict (i.e., traditionally Red and Blue states; e.g., Utah, Massachusetts, Wyoming, etc.).

2.2.2. Pornography-seeking behavior

The internet service WordTracker was used to determine which keywords individuals tend to use to search for pornography. Keywords are the words individuals enter into various search engines in order to find something online. For example, a person might type in the word “porn” or “sex” into the Google search engine when attempting to find pornography. By compiling data from millions of searches each week, WordTracker is able to identify the top keywords individuals tend to use to find pornography (WordTracker, 2009). This is done by first providing WordTracker with a seed word relevant to pornography. For the current study the researchers simply used the word “porn.” WordTracker then searched the top 100 websites that rank highest on search engines for the term “porn” and extract additional keywords utilized by these sites. From this analysis, the 10 most frequently occurring, non-domain-specific, pornography keywords (e.g., “xvideos,” “boobs,” “tits,” etc.) were selected for the current study. A complete list of the 10 keywords utilized for the current research is available from the first author.

Google Trends was then utilized to determine the popularity of these pornography keywords. For each state, Google Trends sampled a portion of Google web searches to determine how many searches for the pornography keywords have been conducted in a given week relative to the average number of searches on Google for those keywords over a given year. Although Google Trends does not supply the raw number of searches that occurred, the information they provide allows for the computation of a search volume index (SVI), which provides the percent increase or decrease from the yearly mean for the pornography keywords for a given week (Google, 2009). Because there are fluctuations in the SVI that occur across all the states at different times of the year that are unrelated to elections (e.g., in 2008, January had the lowest SVI for pornography keywords and February had the lowest SVI for pornography keywords in 2004), a relative SVI (RSVI) was computed by centering each state’s weekly SVI across all states (i.e., the mean state RSVI score was 0%; this linear transformation does not alter any of the results yielded from the statistical analyses performed). The interpretation of the RSVI is fairly straightforward. A RSVI score of 0% indicates a state had a SVI for pornography keywords equivalent to the norm on a given week. A RSVI score of 2% indicates that a state had a score 2% higher than the norm on a given week and a RSVI score of –2% indicates a SVI for pornography keywords was 2% lower than the norm on a given week. It is important to note that because the RSVI is a relative score it removes any differences that might

exist between states due to population, internet access or a state’s overall tendency to search for pornography keywords (Google, 2009).

In the current study, RSVI pornography keyword scores were computed for the week before an election and for the week after an election (including the Election Day itself) for each state during the 2004, 2006 and 2008 elections. In addition to supplying information that can be used to compute the RSVI, Google Trends also supplies the relative standard error (RSE) for each observation. RSE provides a means of assessing the reliability, or precision, of a given observation. Observations with large RSEs are considered less reliable than estimates with small RSEs. For 2006 and 2008, all of the state RSEs were fairly low (average RSE <2.5%). However, in 2004, 14 states had fairly high RSEs (>10%; for RSE values >10% Google Trends simply reports “>10%”). These high RSEs likely occurred because the sample sizes Google utilized to compute these values were small as these states tended to have either relatively small populations (e.g., Delaware, Wyoming, etc.) or insufficient internet penetration in 2004 (e.g., Mississippi, New Mexico, etc.). Therefore, states with RSEs of 10% or greater in 2004 were excluded from the 2004 analysis. Of the excluded states, nine (64%) were Red states and five were Blue states in 2004. This percentage of exclusion by voting style is not significantly different than what would be expected by chance [goodness of fit $\chi^2(1)=.43$; $p=.51$], given the number of Red states (61%) in the 2004 election.

3. Results

Two-tailed t tests were computed in order to determine whether or not states that voted for the winning political party during the 2004 and 2008 presidential election had significantly higher RSVIs for pornography keywords than states that voted for the losing political party (see Fig. 1). Consistent with Prediction 1, the week after the 2004 presidential election Red states (i.e., the states that voted for the winner of the election) had marginally higher RSVIs for pornography keywords than Blue states [$t(35)=-1.97$, $p=.056$; $r=-.31$]. Similarly, consistent with Prediction 2, the week after the 2008 presidential election Blue states (i.e., the states that voted for the winner of the election) had significantly higher RSVIs for pornography keywords than Red states [$t(49)=2.11$, $p=.040$; $r=.29$]. To examine Prediction 3, a regression analysis was conducted to examine whether or not traditionally Blue states (coded 2) had higher RSVI scores than swing states (coded 1) which had higher RSVI scores than traditionally Red states (coded 0). Consistent with the third hypothesis, a significant linear trend was found [$t(49)=2.32$, $p=.024$; $r=.31$].

Although the means displayed in Fig. 1 are relative scores controlling for possible mean differences between states, the next analyses further examined whether or not RSVI scores significantly changed after an election. In

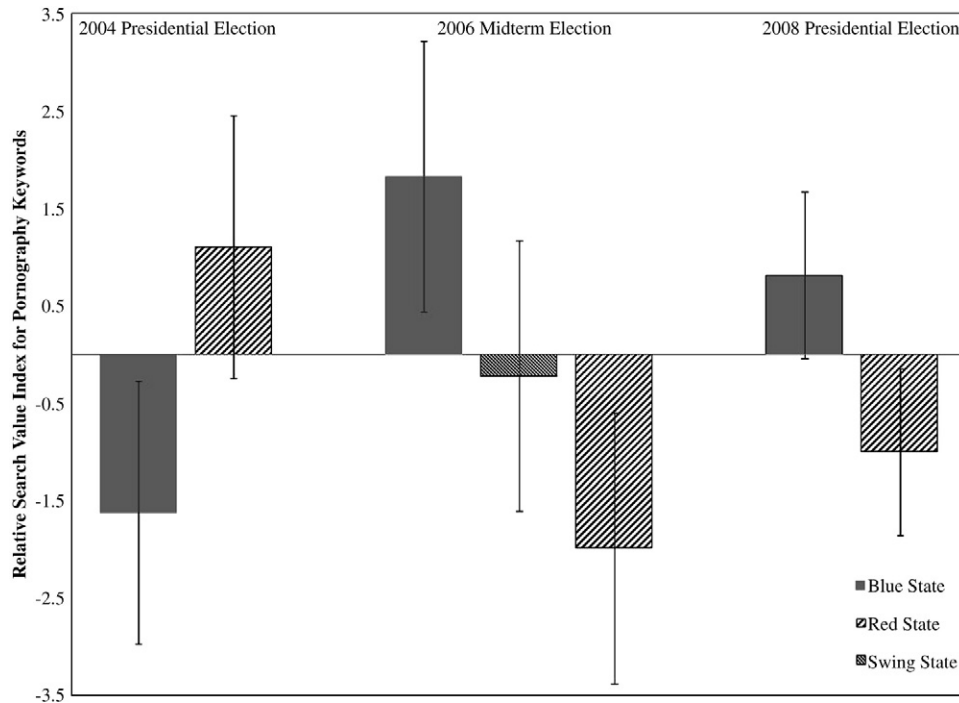


Fig. 1. Pornography-seeking behaviors for Blue, Red and swing states the week after the 2004, 2006 and 2008 elections.

these analyses, changes in RSVIs were assessed by means of a regressed change procedure using multiple regression. For each election year, the RSVI score the week after the election was regressed on the RSVI score the week before the election and on states' voting styles. These analyses simply treat the week before the election RSVI score as a covariate, effectively removing all correlation from the week after the election RSVI score (Cohen, Cohen, West & Aiken, 2003). As expected, RSVI scores the week after an election changed in the predicted direction for the 2004 presidential election [$t(34) = -2.02, p = .050, sr = -.30$], the 2006 midterm elections [$t(48) = 2.34, p = .022; sr = .29$] and the 2008 presidential election [$t(48) = 2.07, p = .044; sr = .28$].

4. Discussion

The current study examined pornography-seeking behaviors following three different US elections. As predicted, for the 2004, 2006 and 2008 elections, individuals located in states that voted for the winning political party tended to have higher rates of pornography-seeking behaviors following the election than did individuals located in states that voted for the losing political party. This finding remained even after controlling for pornography-seeking behaviors the week before the election. These results are consistent with the Challenge Hypothesis (Archer, 2006; Wingfield et al., 1990) and with the link between testosterone and sex-related behaviors

(Archer, 2006; van Anders & Watson, 2006), suggesting that individuals who vicariously won a competition experienced increased levels of testosterone and elevated interest in sexual behavior and therefore sought out pornography more than individuals who vicariously lost a competition.

Of course, there are other possible explanations for these findings that should be considered. It is likely that individuals who voted for the winning candidate tended to be in better moods than individuals who voted for the losing candidate. A person who voted for the winning candidate might have simply been happier and more likely to desire sex than individuals who voted for the losing candidates. In other words, it might have been changes in voters' moods rather than testosterone levels that explain the observed changes in pornography-seeking behaviors. Although such an explanation might seem intuitive, previous research is somewhat mixed as to the relations between mood, interest in pornography, and masturbation (Frohlich & Meston, 2002; Reid, Carpenter & Lloyd, 2009; Reid, Carpenter, Spackman & Willis, 2008; Rinehard & McCabe, 1998). It is hoped that future research might provide a more complete understanding of the mediators that explain why pornography-seeking behaviors tend to change following political elections.

Although the results of the current study support the Challenge Hypothesis, there are several limitations that should be noted. Other than location, Google Trends does not supply user data, such as gender. The Challenge Hypothesis predicts that changes in testosterone are

stronger for men than for women (Archer, 2006; Wingfield et al., 1990); however, it is unknown whether the change in pornography-seeking behaviors found in the current study occurred equally for men and women. Given the frequency that males use the internet to search for pornography (Buzzell, 2005; Ropelato, 2006) and the keywords used in the current study to operationally define pornography searchers (e.g., “boobs,” “tits,” etc.), it seems likely that the observed findings were driven by males. However, it would be informative for future researchers to utilize a different methodology that allows for the assessment of gender in order to examine whether or not the changes observed in the current study are stronger for men than for women.

An additional limitation of the current study is that Google Trends does not provide the raw number of times a term was searched for in a given time period. Such information would be useful in order to better understand exactly how many more pornography searches occurred following a political election. However, given the number of searches for pornography that occur each day using Google, it seems likely that even a tiny change in RSVI could reflect thousands of additional searchers. Therefore, the small percent difference observed in Fig. 1 for each election cycle might actually reflect thousands (even millions) of additional searches beyond what is typical for a given state.

In order to confirm predictions derived from the Challenge Hypothesis, the current study employed a novel methodology — internet search engines. Given the prevalence of internet use, such a methodology allows for a large-scale sampling of various topics that people might be thinking about and interested in examining. Researchers at Google Labs have used this methodology to track interest in H1N1 (i.e., the “swine flu”) keywords in order to predict potential locations where there might be a flu outbreak (Google, 2010). Recent research has even found a link between the keywords “suicide” and “depression” and suicide, suggesting such internet search activity could be used to predict self-injury and death (McCarthy, 2010). In a similar manner, the current study demonstrated how researchers can use this methodology to examine topics of interest to various areas of social science. Future researchers utilizing this method will soon realize that it provides a quick and inexpensive means of examining extremely large samples of data collected since 2004.

References

- Archer, J. (2006). Testosterone and human aggression: an evaluation of the challenge hypothesis. *Neuroscience and Biobehavioral Reviews*, 30, 319–345.
- Bernhardt, P. C., Dabbs, J. M., Fielden, J. A., & Lutter, C. D. (1998). Testosterone changes during vicarious experiences of winning and losing among fans at sporting events. *Physiology and Behavior*, 65, 59–62.
- Buzzell, T. (2005). Demographic characteristics of persons using pornography in three technological contexts. *Sexuality and Culture*, 9, 28–48.
- Choi, C. Q. (2009). Jock the vote: election outcomes affect testosterone levels in men. Retrieved November 6, 2009, from Scientific American website <http://www.scientificamerican.com/article.cfm?id=vote-election-testosterone>.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression: correlational analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum, 2003.
- Frohlich, P., & Meston, C. (2002). Sexual functioning and self-reported depressive symptoms among college women. *Journal of Sex Research*, 39, 321–325.
- Google. (2009). Google Trends. Retrieved November 8, 2009, from <http://www.google.com/intl/en/trends/about.html>.
- Google. (2010). Google Flu Trends. Retrieved April 10, 2010, from <http://www.google.org/flutrends>.
- Malamuth, N. (1996). Sexually explicit media, gender differences and evolutionary theory. *Journal of Communication*, 46, 8–31.
- McCarthy, M. J. (2010). Internet monitoring of suicide risk in the population. *Journal of Affective Disorders*, 3, 277–289.
- Reid, R. C., Carpenter, B. N., & Lloyd, T. Q. (2009). Assessing psychological symptom patterns of patients seeking help for hypersexual behavior. *Sexual and Relationship Therapy*, 24, 47–63.
- Reid, R. C., Carpenter, B. N., Spackman, M., & Willis, D. L. (2008). Alexithymia, emotional instability, and vulnerability to stress proneness in patients seeking help for hypersexual behavior. *Journal of Sex and Marital Therapy*, 34, 133–149.
- Rinehard, N. J., & McCabe, M. P. (1998). An empirical investigation of hypersexuality. *Sexual and Marital Therapy*, 13, 369–384.
- Ropelato, J. (2006). Internet pornography statistics. Retrieved November 6, 2009, from TopTenREVIEWS website: <http://internet-filter-review.toptenreviews.com/internet-pornography-statistics.html>.
- Stanton, S. J., Beehner, J. C., Saini, E. K., Kuhn, C. M., & LaBar, K. S. (2009). Dominance, politics, and physiology: voters' testosterone changes on the night of the 2008 United States presidential election. *PLoS ONE* 4, e7543, doi:10.1371/journal.pone.0007543.
- Symons, D. (1979). *The evolution of human sexuality*. New York: Oxford University Press; 1979.
- van Anders, S. M., & Watson, N. V. (2006). Social neuroendocrinology: effects of social contexts and behaviors on sex steroids in humans. *Human Nature*, 17, 212–237.
- Wingfield, J. C., Hegner, R. E., Duffy, A. M., & Ball, G. F. (1990). The ‘challenge hypothesis’: Theoretical implications for patterns of testosterone secretion, mating systems, and breeding strategies. *American Naturalist*, 136, 829–846.
- WordTracker. (2009). Keyword Research Tools for SEO. Retrieved November 10, 2009 from <http://www.wordtracker.com/>.