

# To Thine Own Self Be False: Self-Deceptive Enhancement and Sexual Awareness Influences on Mating Success

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Over 25 years ago, evolutionary biologist Robert Trivers proposed in the introduction to Richard Dawkins' *The Selfish Gene* that self-deception might facilitate other-deception in intersexual competition and thereby be an unconscious adaptive mating strategy. Self-deception, or the unconscious deception of self through holding beliefs in the face of strong contrary evidence, may facilitate manipulation of others by concealing cues of cognitive load that generally accompany conscious deception. One prediction of this model is that self-deceptive self-promotion benefits mating success. We tested this hypothesis among 107 heterosexual undergraduates, measuring self-deception using the Self-Deceptive Enhancement scale and two phenotype marker-based measures. Following parental investment theory, we approximated mating success as rate of intercourse partners and partner social status. When controlling for covariates, we found that self-deception predicted intercourse-partner rate and partner status in females only. In males, self-deception did not predict mating success for either variable. These data represent a long-overdue test of Trivers' hypothesis and provide an operational model to be refined for further research.

**Keywords:** self-deception, self-enhancement, positive illusions, self-awareness, mating success

Over 25 years ago, evolutionary biologist Robert Trivers proposed that self-deception, “the acquisition and maintenance of a belief . . .

in the face of strong evidence to the contrary” (Deweese-Boyd, 2012), has been adaptively preserved and even enhanced through mating and agonistic situations (Trivers, 2006/1976). Despite periodic refinement of this model (Trivers, 2000, 2009; Trivers & Newton, 1982; von Hippel & Trivers, 2011), it remains untested. While some scholars have critiqued the concept of self-deception as an untenable contradiction on the basis that it is not possible to simultaneously know and not know something (e.g., Haight, 1980; Paluch, 1967), others indicate self-deception is possible and consistent with a modular theory of mind (Kurzban, 2010). The goal of the present study is take a first step toward developing and testing an empirical model of adaptive mating-relevant self-deception.

Self-deception is of equal interest within the natural and social sciences and humanities (Mele, 1997). It is described using many synonymous and overlapping terms and employed in numerous ways, such as denial (Stefano &

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Fricchione, 1995; von Hippel et al., 2005), positive illusions (Johnson, 2004; Taylor, 1989; Taylor & Armor, 1996), impression management (Paulhus, 1986), overconfidence (Anderson, Ames, & Gosling, 2008; Anderson, Brion, Moore, & Kennedy, 2012), and dissociation (Frost, Arfken, & Brock, 2001; Lynn, 2005). Self-deception is a variety of biased belief, which can be motivated, as with positive or negative misinterpretations, selective focusing/attending or evidence gathering; or unmotivated, as via vivid sensory input, overvaluing information simply because of its availability, confirmation bias, and the human tendency to search for causality (Mele, 1997).

The basis of self-deception is the belief in a conflicting proposition  $c$ , though having been consciously exposed to the reality  $r$ . This is distinguished from simply being wrong or having false intentions about  $c$  yet not exposed to the truth or having true intentions  $r$ . A philosophical dilemma this model poses is how a person could simultaneously hold contradictory beliefs, which is termed the “static” paradox (Mele, 1988, 2001). One solution is that  $c$  is held in the conscious mind while  $r$  is in the unconscious (Trivers, 2000), but critics question, if  $r$  is not known consciously, to what extent is it really “known” (Pinker, 2011)? Another paradox, termed “strategic” or “dynamic,” posits that in some cases the denial of  $r$  in favor of  $c$  is an intentional process and that an advantage is gained by believing  $c$  (Mele, 2001). This is the basis of Trivers’ (2000, 2011) evolutionary model, which posits that motivated self-deception enables the holder of belief  $c$  to portray the self in a more favorable light without exhibiting the “tells” associated with the cognitive load of deception relating to  $r$ . The problem with this is the paradox of maintaining ignorance of  $r$ , especially if belief in  $c$  is motivated and strategic. How can one be strategic in choosing  $c$  without being conscious of  $r$ ? One resolution is recognition of the temporal factor often involved in self-deception. While an individual may have once known  $r$ , in the process of actively promoting  $c$ ,  $r$  is forgotten. Another explanation is that  $r$  and  $c$  are psychologically partitioned from each other, as through dissociation (Lynn, 2005; von Hippel & Trivers, 2011) or brain modularity (Kurzman, 2010). Finally, there is an admitted difficulty in demonstrating that the subject indeed knows  $r$ , especially if the

motivation to hold onto  $c$  is to avoid unpleasant truths about the self (von Hippel & Trivers, 2011).

Despite these philosophical problems, there is evidence that self-deception is real, pervasive, and an adaptive result of the emotional coherence required to satisfy subjective approach or avoidance goals (Sahdra & Thagard, 2003). A telling example that goes beyond courtship but demonstrates the emotional coherence and potential disadvantages of self-deception involves the criminal trial of basketball star Kobe Bryant for date rape (Taslitz, 2005). Police investigators in the case interpreted Bryant’s affected deflection of whether the victim had said “no” as self-deception. They believed Bryant honestly thought the victim had consented but lied about whether she’d said “no” because Bryant felt no one would believe his interpretation of the context, which was that the way she’d said “no” actually conveyed “yes.” The court case, which was dropped by the prosecution, hinged on whether “Bryant *reasonably should have known* that he proceeded against her will” (Taslitz, 2005:383)—that is, if he should be held responsible for his self-deception.

Following Trivers (Trivers, 2000; Trivers & Newton, 1982), we note that there are numerous disadvantages to self-deception that also appear to exert a selective disadvantage at a population level. For instance, maladaptive self-deception can result in social disaster, as in historical cases wherein any number of world powers has waged clearly unwinnable wars. Viewed simply, such maladaptation should be selectively purged unless the advantages of self-deception outweigh the costs. Therefore, because self-deception appears to be a ubiquitous cognitive feature, it is likely beneficial at the unit of selection through behaviors that influence reproductive success (Trivers, 2000, 2006/1976; 2009; 2011). According to this model, self-deception is an aspect of mating intelligence, employed selectively in courtship and coupling situations to maximize reproductive opportunities and fitness (O’Brien, Geher, Gallup, Garcia, & Kaufman, 2010; O’Sullivan, 2008).

Hypothetically, this mating-relevant self-deception should be consistent with the principles of parental investment theory. When one gender invests disproportionately in offspring, as females do in humans, pressure is put on the

other gender to demonstrate quality, either honestly or deceptively (Schmitt, 2010; Trivers, 1985, 2011). This will motivate males to preferentially self-promote qualities that make a positive impression and to hide their negative qualities. Females, therefore, as a counterstrategy, will look for signals of fitness that are hard to fake and thus likely to be honest (e.g., size, symmetry, bright coloration, or complex song; Zahavi & Zahavi, 1997). The counter-counterstrategy of males, therefore, is to be able to project quality without betraying signs of dishonesty, which self-deception theoretically facilitates. However, this model does not represent the dynamic breadth of human courtship. Females also strive to impress males. In fact, sometimes high-quality males are in short supply, forcing females to advertise their own quality (i.e., fertility) to attract a male quickly, thereby creating a paradigm wherein self-deception will also be employed by females (Trivers, 2011).

### Issues With Operationalizing Self-Deception and Mating Success

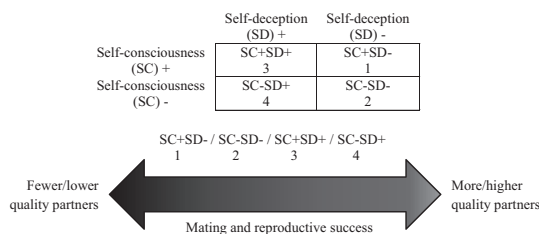
While studies demonstrate that self-deception positively impacts health (Folks, Freeman, Sokol, & Thurstin, 1988; Ford, 2004; Lane, Merikangas, Schwartz, Huang, & Prusoff, 1990; Levine et al., 1987; Roth & Ingram, 1985; Sackeim, 1983; Taylor, 1989; Taylor & Armor, 1996; Taylor & Brown, 1994a; Taylor & Brown, 1994b; Taylor & Gollwitzer, 1995), pain management (Jamner & Schwartz, 1986), athletic abilities (Starek & Keating, 1991), warfare (Johnson, 2004; Wrangham, 1999), and dealing with social exclusion or stereotyping (von Hippel et al., 2005), no studies have yet tested the relationship with mating success. There are several difficulties in approaching this, including how to operationalize both a mating-relevant domain of self-deception and success in mating. Targeting a college student population enabled us to sample a demographic wherein courtship is of primary concern, though actual mating experiences were limited. Several questionnaires exist to target self-deception, the most widely used, reliable, and valid of which is the Self-Deceptive Enhancement scale (Paulhus, 1991). However, we propose that self-deception is not a unitary psychological mechanism but part of distributed networks or,

following Kurzban (2010), modules capable of deafferentation—that is, limiting information flow into them. In other words, networks mediating self-deception with regard to warfare would necessarily be different than those influencing mating behavior and necessitate uniquely relevant measures to assess those domains.

As such, we developed methods to assess mating-relevant self-deception through comparison of self and other ratings of attractiveness, desirability, seductiveness, and handgrip strength. Because we did not use a natural fertility population and could not assess reproductive success directly, we used potential reproductive success as a proxy of mating success by querying number of intercourse partners, age at first consensual intercourse, and status of current partners. These metrics targeted expectations based on parental investment theory, assuming males maximize number of partners and females partner quality. However, we believe intrasexual competition, human pair-bonding, sexuality, contraception use, cultural mores, and individual dispositions regarding male and female sexual behavior are all mitigating factors that should be considered in interpreting results.

Furthermore, the degree to which self-deception is necessary to achieve self-oriented goals depends not just on the extent to which one needs to conceal behavioral cues of deception but the context of the interaction, the moral sense that doing something selfish is wrong, and, as Figure 1 outlines, being self-aware enough to recognize it. The most difficult part of deception is the cognitive load of simultaneously maintaining a falsehood with the appearance of honesty (Trivers, 2009, 2011), a task made less onerous if one has no sense or concern for doing wrong. Consistent with this, a recent study found that moral self-concept is strongly associated with self-deceptive enhancement and to a greater degree among more self-conscious individuals (Lu & Chang, 2011). This suggests that self-deception may be a necessary limiter for self-awareness to be adaptive.

Given these operational issues and concerns, the aim of the present study was to conduct a first test, using a standard college student sample, of the prediction that self-deception positively influences mating success as illustrated in Figure 1. In addition, we considered the mod-



*Figure 1.* A simplified dichotomous model of self-deception ( $\pm$ ) and self-consciousness ( $\pm$ ) posits four possibilities (top) that vary in predicted mating success. The proposed model holds that individuals lower in self-consciousness and higher in self-deception appear at one end of a continuum (right) of mating success, where more (particularly for males) and higher quality (particularly for females) partners likely also lead to greater reproductive success. Individuals higher in self-consciousness and lower in self-deception are at the other end (left) and might exhibit lower reproductive success.

erating influence of self-consciousness with regard to multiple measures of self-deception.

### Method

Data were collected in two phases. Phase 1 involved collecting the primary data to test the study hypothesis. Phase 2 involved ratings of phase 1-participant facial attractiveness to develop the self-deception metrics outlined below. Following the guidelines of Simmons et al. (2011), we report all variables for which data were collected, though not all of these data were included in analyses. Phase 1 data were collected over the course of 2 1/2 semesters, and we collected as many observations as possible during that period. Participants reported their age; gender; relationship status; sexual orientation; education; social status; partner status; parental income; partner-parental income; grade point average (GPA); number of children; age at first intercourse; number of male and female intercourse partners; self-ratings of attractiveness, desirability, seductiveness, mate quality, and handgrip strength; and completed scales to measure self-deceptive enhancement, impression management, self-deceptive denial, sexual awareness, dissociation, and self-consciousness. They were also independently photographed and measured for waist circumference (females), shoulder circumference (males), hip circumference, digit length, and height. Phase 2 participants reported only their age, gender, ethnicity, number of committed relationships, number of intercourse partners, year in college,

and major, in addition to rating photos of all phase 1 participants.

### Participants

Phase 1 data were collected from 121 undergraduates (43% females, mean age  $\pm SD = 19 \pm 1.7$ ) at the University at Albany (SUNY) in exchange for course credit. Ten self-reported as homosexual, bisexual, or preferred not to report sexuality and were excluded, as were 4 participants whose data were incomplete. Data from 107 heterosexual participants were retained for analyses. Fifty-seven percent of the participants were White, 19% Black or African American, and 18% self-reported as "other," which was representative of the University at Albany student population. They were primarily upper-middle status on a 10-rung scale (mean  $\pm SD = 6.6 \pm 1.18$ ), where 10 is highest (Singh-Manoux, Adler, & Marmot, 2003), and above-average students according to grade point averages (GPA) on a 4-point scale (mean  $\pm SD = 3.01 \pm 0.50$ ).

Ratings of phase 1 subject attractiveness using facial photographs were subsequently collected from 64 undergraduates (47% females, mean age  $\pm SD = 20.5 \pm 0.89$ ) at the University of Alabama. Thirty-two were excluded for not completing over 50% of the ratings or self-reporting as homosexual, bisexual, or preferring not to declare sexuality. Thirty-two ratings (63% females) were retained for analyses. These raters were 91% White, 3% Black, and 6% other.

Protocols were approved by University at Albany and University of Alabama Institutional Review Boards.

## Procedures

Analyses in this study utilized questionnaire data to assess self-deception, self-awareness, and mating success. Additional measures of self-deception and controls for attractiveness were determined through comparison of self- and other-ratings of facial attractiveness and self and sample mean comparisons of handgrip strength. Supplementary control data collected via anthropometric means included fluctuating asymmetry derived from digit length.

Phase 1 subjects were recruited from the University at Albany introductory psychology research pool and given course credit in exchange for participation. Upon arrival in the lab, facial photographs and anthropometrics were taken. They were photographed in expressionless poses against a neutral background. This approach was used instead of full body photos or more naturalistic facial expressions because we theorized that subjects vary in the effort they put into their appearances for research studies, and we wanted to “level the playing field” for those subjects who might have put more effort in if they were actually trying to attract mates. Handgrip strength was measured for both hands using a handheld dynamometer (Lafayette Instruments Model 78010), and the greater handgrip strength was used in analyses. Digit measurements were taken by scanning both hands together with palms down and fingers splayed on a 600 dpi flatbed color scanner (Hewlett Packard Scanjet 3200c). Participants were then placed in a private office with a computer to complete online questionnaires. Finally, to preserve anonymity, subject facial attractiveness was rated objectively by heterosexual opposite sex participants recruited online from the University of Alabama. Four sets of questionnaires were constructed to vary the order of phase 1 facial photographs.

## Measures

**Self-deception.** Data included three indicators of self-deception. The Self-Deceptive Enhancement scale (Paulhus, 1991) is a reliable and valid measure of the tendency to unconsciously tailor the self to impress an audience or

avoid social disapproval. It consists of 20 items rated on a 5-point scale (e.g., “My first impressions of people usually turn out to be right”; 1 = *not like me at all*) and was scored using a continuous approach (Stöber, Dette, & Musch, 2002). The Cronbach’s alpha (0.76) indicated acceptable reliability.

We assessed mating-relevant self-deception using the difference between participant self-ratings of sex appeal in terms of attractiveness, desirability, and seductiveness and ratings of facial photographs by similarly aged, opposite sex others. Numerous studies indicate that facial attractiveness is an important indicator of fitness and corresponds to other indicators, such as handgrip strength, body configuration, and 2nd-to-4th digit ratios (Gallup, Frederick, & Pipitone, 2008). Self and other ratings of attractiveness, desirability, and seductiveness were given on a 7-point scale (e.g., “If a stranger saw you but did not meet you, how do you think s/he would rate you in terms of attractiveness?”; 1 = *very unattractive*). Other-ratings for each phase 1 subject were averaged. Other-ratings were subtracted from self-ratings to produce a variable termed “positive illusions.”

The third self-deception indicator was the difference between self-estimations of handgrip strength compared to other similar-aged, same sex students and the mean sex-specific handgrip strength of the sample. We theorized that participants would be less uncomfortable about rating their own handgrip strength than aspects of their sex appeal. A firm handgrip has been associated with extraversion, emotional expressiveness, and openness (Chaplin, Phillips, Brown, Clanton, & Stein, 2000), suggesting inherent potential for response bias. This handgrip strength was then subtracted from the sample average for their respective gender. The difference was categorized on a 7-point scale using *SDs* around means by sex. Participants rated their self-perceived handgrip strength on a 7-point scale (1 = *much weaker than others of the same age and sex*). A variable for “handgrip-strength illusions” was created by subtracting the relative categorization of actual handgrip strength from the subjective rating.

**Self-awareness.** Following Lu and Chang (2011), we predicted that self-awareness moderates self-deception, such that highly self-conscious individuals manifest relatively higher degrees of self-enhancement to achieve self-

serving goals without seeming overtly selfish. We tested the relevance of two self-awareness measures, including a two-factor Self-Consciousness Scale (SCS) and the Sexual Awareness Questionnaire (SAQ). The 17-item version of the SCS is a valid and reliable measure of private self-consciousness, or the tendency to think about those aspects of the self not publicly known or displayed (e.g., “I’m concerned about my style of doing things”; 1 = *least like me*), and public self-consciousness, the tendency to regard how publicly manifest aspects of self may be appraised by others (e.g., “I am always trying to figure myself out”; Fenigstein, Scheier, & Buss, 1975; Scheier & Carver, 1985). The SCS for this sample elicited a Cronbach’s alpha of 0.79, indicating acceptable reliability.

We predicted that mating-relevant self-awareness would be even more salient than the general self-awareness measured by the SCS, so we included the SAQ (Snell, Fisher, & Miller, 1991) to measure sexual consciousness. The SAQ is a valid and reliable 36-item tool designed to measure four factors of sexual consciousness on a 5-point scale—awareness of internal sexual cues or consciousness (e.g., “I am very aware of my sexual feelings”; 1 = *unlike me*), awareness of others’ monitoring of one’s sexuality (e.g., “I wonder whether others think I’m sexy”), sexual assertiveness (e.g., “I’m assertive about the sexual aspects of my life”), and preoccupation with one’s own appeal (e.g., “I know immediately when others consider me sexy”). The SAQ obtained good reliability, with a Cronbach’s alpha of 0.80.

**Mating success.** Mating success can only be approximated, especially in an undergraduate-age sample. Based on the parental investment principles of intersexual competition (Trivers, 1972), the model of success for some males is number of sexual partners. Typically this has been assessed via self-reports of number of different intercourse partners and age at first intercourse. In addition, because courtship behaviors can be more intense at certain phases of the life cycle than others, we calculated an “intercourse-partner rate” by dividing the total number of different intercourse partners by the number of years since first intercourse. By controlling for age in analyses, this rate could give an indication of success in partnering relative to

the amount of time an individual has been sexually active.

For other males, heavy investment in a high-quality partner could be considered successful, similar to females, for whom success was modeled as the acquisition of resources. We therefore measured the quality of a current partner, if they had one. Because undergraduates largely evaluate each other based on potential rather than prematurely evaluate resource accumulation and because status has been found to predict reproductive success (Hopcroft, 2006), we measured “partner status” using the MacArthur Scale of Subjective Social Status (Singh-Manoux et al., 2003), a 10-rung ranking from *least* (1) to *most* (10) money, *worst or no* to *best* job, and *least* to *best* education. In addition, we asked participants to indicate their partner’s parents’ income (1 = 0–\$20k, 2 = \$21–40k, 3 = \$41–60k, 4 = \$61–80k, 5 = \$81–100k, 6 = \$101–150k, 7 = \$151–200k, 8 = \$201k+) and GPA. Fewer data were provided regarding partner-parent income and GPA and were not retained for primary analyses but were used to check for bias in estimating partner status.

**Covariates.** We also collected participant data regarding sex, age, GPA, social status, ethnicity/ancestry, and fluctuating asymmetry as potential covariates. Fluctuating asymmetry is the slight random deviations from bilateral symmetry usually attributable to disruptions in developmental stability. It has been significantly associated with lifetime intercourse partners and age at first intercourse when controlling for sex, age, marital status, body stature, ethnicity, height, and physical attractiveness (Thornhill & Gangestad, 1994). From scanned hand images, finger lengths were calculated from fingertip to basal crease using the Acrobat X Pro Version 10.1.2 (Adobe Systems, Inc., San Jose, CA), and fluctuating asymmetry was calculated using the mean difference of index and ring fingers of the right and left hands with negative values multiplied by  $-1$  to derive absolute deviation from symmetry.

## Statistical Analysis

Analyses were conducted using SPSS 20.0 (IBM Corp., Armonk, NY). We used bivariate correlations and *t* tests to compare female and male statistics and determine possible interactions with self-awareness variables and hierar-

chical regressions to test study hypotheses. Results were considered significant if  $p < .05$ .

## Results

### Sample Demographics and *t*-Tests by Sex

Table 1 outlines sample statistics. As these statistics make clear, the majority of participants harbor positive illusions about their sex appeal relative to independent raters. On the other hand, the mean for handgrip strength is slightly greater than 0, but the majority of participants hold negative illusions about their relative handgrip strength. Because we predicted different mating success variables would be influenced by self-deception for males and females, we used the student's *t* statistic to determine whether any systematic sex differences occurred in the sample. There were significant sex differences in social status (females: mean  $\pm$  *SD* =  $6.3 \pm 1.01$ , males:  $6.8 \pm 1.26$ ;  $t = -2.08$ ,  $p = .04$ ), fluctuating asymmetry (females:  $0.046 \pm 0.0278$ , males:  $0.062 \pm 0.0380$ ;  $t = -2.21$ ,  $p = .03$ ), and positive illusions (females:  $4.6 \pm 2.76$ , males:  $7.5 \pm 3.05$ ;  $t = -4.85$ ,  $p < .001$ ), indicating that males in the sample were slightly higher in status and asymmetry and considerably higher in positive illusions than females.

We also compared male and female self-reports of number of intercourse partners and the status, parental income, and GPA of their partners. If participants self-deceptively enhanced in completing the questionnaires, we

would expect a systematic bias with females enhancing their partner quality and males enhancing their number of intercourse partners. The intercourse partner mean was higher for males ( $7.38 \pm 10.08$ ) than for females ( $5.46 \pm 6.22$ ). Females generally rated their partner's parents' income higher ( $5.1 \pm 1.94$ ) than did males ( $4.81 \pm 2.21$ ), but males generally rated partner status ( $7.23 \pm 1.34$ ) and GPA ( $3.27 \pm 0.37$ ) higher than did females (partner status:  $6.68 \pm 1.29$ ; GPA:  $3.08 \pm 0.57$ ). These values and the lack of statistical significance in any of these differences, as noted above, lead us to conclude that no systematic bias influenced these self-reports.

### Assessing Relationships Between Self-Deception and Self-Awareness

To look for associations among dependent and independent variables and check for collinearity, we conducted bivariate correlations for females and males of age, number of opposite sex intercourse partners, age at first intercourse, intercourse-partner rate, partner status, self-deceptive enhancement, positive illusions, handgrip-strength illusions, self-consciousness, and sexual awareness. As Table 2 illustrates, age was a significant predictor of number of partners in males ( $r = .37$ ,  $n = 63$ ,  $p = .003$ ) but only approached significance for females ( $r = .29$ ,  $n = 44$ ,  $p = .06$ ). Age also positively predicted sexual awareness in males ( $r = .30$ ,  $n = 63$ ,  $p = .02$ ). An association between intercourse-partner rate and sexual awareness

Table 1  
*Sample Descriptives*

	N	<i>M</i>	<i>SD</i>	Minimum	Maximum
Age	107	19.2	1.77	16.00	29.00
GPA	95	3.0	0.50	1.48	4.00
Social status	107	6.6	1.18	3.00	10.00
Fluctuating asymmetry	92	0.1	0.03	0.00	0.23
Intercourse-partner rate	107	2.2	2.36	0.00	15.00
Partner status	44	7.0	1.33	4.00	9.00
Self-deceptive enhancement	107	87.2	13.82	55.00	119.00
Positive illusions	99	6.3	3.26	-0.89	13.70
Handgrip strength illusions	91	0.2	1.13	-4.00	3.00
Self-consciousness (SCS)	107	64.0	12.74	30.00	94.00
Sexual awareness (SAQ)	107	81.6	12.89	47.00	109.00

*Note.* GPA = grade point average; SCS = Self-Consciousness Scale; SAQ = Sexual Awareness Questionnaire.

Table 2

*Bivariate Correlations for Females (Bold) and Males of Mating Success, Self-Deception, Self-Awareness, Attractiveness Variables, and Possible Covariates*

	1	2	3	4	5	6	7	8	9	10
1. Age	—	<b>-0.21</b>	<b>0.29</b>	<b>0.11</b>	<b>0.40</b>	<b>0.03</b>	<b>0.14</b>	<b>-0.08</b>	<b>0.12</b>	<b>-0.05</b>
2. Intercourse-partner rate	0.11	—	<b>0.63**</b>	<b>0.28</b>	<b>-0.03</b>	<b>0.27</b>	<b>-0.08</b>	<b>-0.09</b>	<b>0.22</b>	<b>0.42*</b>
3. Number of partners	0.38**	0.93**	—	<b>-0.02</b>	-0.25	<b>0.04</b>	<b>0.03</b>	<b>0.08</b>	<b>0.19</b>	<b>0.39*</b>
4. Age at first intercourse	0.01	0.08	-0.21	—	-0.05	<b>0.14</b>	<b>-0.40*</b>	<b>-0.11</b>	<b>0.02</b>	<b>-0.06</b>
5. Partner status	-0.14	0.51*	0.40	0.27	—	<b>0.36</b>	<b>0.48</b>	<b>-0.40</b>	<b>0.16</b>	<b>0.18</b>
6. Self-deceptive enhancement	-0.02	0.28	0.28	0.03	0.05	—	<b>0.07</b>	<b>-0.32</b>	<b>-0.15</b>	<b>0.02</b>
7. Positive illusions	-0.08	0.15	0.21	-0.15	-0.06	0.24	—	<b>0.03</b>	<b>0.10</b>	<b>0.33</b>
8. Handgrip-strength illusions	0.04	0.15	0.11	-0.10	-0.45	0.15	-0.01	—	<b>-0.25</b>	<b>0.09</b>
9. Self-consciousness	0.30*	0.10	0.17	-0.15	-0.54*	-0.20	0.12	0.06	—	<b>0.25</b>
10. Sexual awareness	-0.04	0.24	0.35**	-0.15	0.28	0.20	0.19	0.10	0.33*	—

\*  $p < 0.05$ . \*\*  $p < .01$ .

was significant for females ( $r = .37, n = 44, p = .01$ ) and males ( $r = .37, n = 63, p = .003$ ), as was an association between number of partners and sexual awareness (females:  $r = .39, n = 44, p = .01$ ; males:  $r = .48, n = 63, p < .001$ ). An inverse relationship between positive illusions and age at first intercourse was significant for females only ( $r = -0.40, n = 36, p = .02$ ), whereas a positive correlation between self-consciousness and sexual awareness was significant for males only ( $r = .30, n = 63, p = .02$ ). In males, partner status correlated significantly and inversely with handgrip-strength illusions ( $r = -0.48, n = 22, p = .02$ ), and relationships between partner status and intercourse-partner rate ( $r = .40, n = 22, p = .06$ ) and self-consciousness ( $r = -0.41, n = 22, p = .06$ ) approached significance. Because it involves a variable of primary interest, we believe it also worth noting that, in females, an association between partner status and age approached significance ( $r = .40, n = 22, p = .06$ ). In females, an inverse relationship between self-deceptive enhancement and handgrip-strength illusions approached significance ( $r = -0.33, n = 38, p = .05$ ).

These data suggest sexual awareness as assessed by the SAQ is the most salient predictor of number of partners and intercourse-partner rate in males and females. Positive illusions are the only notable influence on age at first intercourse and only in females, such that females with greater positive illusions have sex at an earlier age. The primary factors influencing partner status were age in females and handgrip-strength illusions in males. Self-consciousness

assessed by the SCS was only minimally associated with other factors and therefore not used in regression analyses.

### Linear Regressions on Mating Success

We used hierarchical regression analyses to test for main effects of self-deception and sexual awareness and possible interaction effects. We constructed four regression models to test the influences of independent variables on intercourse-partner rate and partner status parsed by sex. The first block for intercourse-partner rate (Table 3) included the covariates age, ethnicity/ancestry, social status, and fluctuating asymmetry. We controlled for age because of lifecycle factors related to mating behavior, ethnicity/ancestry because of differences between participants and raters, and social status and fluctuating asymmetry because of sample sex differences in these factors.

The second block included the independent variables of interest, including sexual awareness and those representing response biases, which were self-deceptive enhancement, positive illusions, and handgrip-strength illusions. Variables were mean-centered before entering to remove variance. The third blocks contained the interaction terms, entered in separate models to avoid singularity. As depicted in Table 3, interaction terms were calculated using cross-multiplied mean-centered variables to assess the correlation between self-deceptive enhancement and sexual awareness (SDE- $x$ -SA, Step 3a) because of significant main effects and between positive illusions and sexual awareness



**Table 3**  
*Regression Analyses Predicting Intercourse-Partner Rate From Self-Deception, Sexual Awareness, and Interaction Variables*

	Unstandardized coefficients		<i>t</i>	<i>r</i> <sup>2</sup>	<i>F</i>	<i>df</i>	<i>p</i>
	$\beta$	<i>SE</i>					
<b>Females</b>							
Step 1: Covariates				0.22	2.22	4,32	<i>ns</i>
Step 2: Main effects				0.47	3.04	8,28	.01
Sexual awareness	0.07	0.03	2.74				.01
Self-deceptive enhancement	0.05	0.02	2.15				.04
Positive illusions	-0.12	0.13	-0.90				<i>ns</i>
Handgrip-strength illusions	0.07	0.31	0.22				<i>ns</i>
Step 3: Interactions*				(a) 0.47	2.34	9,27	.04
				(b) 0.47	2.61	9,27	.03
SDE-x-SA	0.001	0.002	0.63				<i>ns</i>
PI-x-SA	0.002	0.01	0.14				<i>ns</i>
<b>Males</b>							
Step 1: Covariates				0.05	0.62	4,47	<i>ns</i>
Step 2: Main effects				0.19	1.26	8,43	<i>ns</i>
Sexual awareness	0.07	0.03	2.09				.04
Self-deceptive enhancement	0.03	0.03	1.02				<i>ns</i>
Positive illusions	-0.01	0.14	-0.06				<i>ns</i>
Handgrip-strength illusions	0.34	0.33	1.04				<i>ns</i>
Step 3: Interactions*				(a) 0.20	1.18	9,42	<i>ns</i>
				(b) 0.22	1.29	9,42	<i>ns</i>
SDE-x-SA	0.002	0.003	0.79				<i>ns</i>
PI-x-SA	0.02	0.01	1.20				<i>ns</i>

*Note.* *ns* = not significant; SDE = self-deceptive enhancement; PI = positive illusions; SA = sexual awareness. Models controlled for the following covariates: age, ethnicity/ancestry, social status, and fluctuating asymmetry.

\* Entered separately to avoid singularity.

(PI-x-SA, *Step 3b*) because of bivariate correlation in the combined sample ( $r = .27$ ,  $n = 85$ ,  $p = .01$ ).

Preliminary analyses revealed no violations of normality, linearity, or homoscedasticity. As expected with product terms, interaction variables were collinear with their factors, as indicated by tolerance values below 0.40 (Allison, 1999). We report the unstandardized coefficients, *t* tests, and *p* values, which are unaffected by such multicollinearity (Allison, 1977). As outlined in Table 3, for females the models for the main effects of self-deception and sexual awareness on intercourse-partner rate and the interaction terms were significant, though interaction terms did not explain any more variability than the main effects and thus do not contribute to the third model in any meaningful way. Self-deceptive enhancement and sexual awareness were the only significantly predictive variables. Models for males were not significant, with only sexual awareness significantly explaining any variance.

Regression analysis on partner status was conducted on a subsample of participants who had partners ( $N = 40$ ) using the same variables as with intercourse-partner rate. As outlined in Table 4, for females the models for main effects and interactions were significant, with the interaction model accounting for a negligible 1% more of the variability in partner status. Consistent with our hypothesis, self-deceptive enhancement and positive illusions were also significant and positive predictors, though we consider these results preliminary because of the limited *N* value. For males, neither the models nor any variables were significantly predictive.

## Discussion

We predicted that male self-deception would be most relevant in obtaining unique mating opportunities, whereas female self-deception would most likely be employed to partner with males of equal or higher status. We found that

Table 4  
*Regression Analyses Predicting Partner Status From Self-Deception, Sexual Awareness, and Interaction Variables*

	Unstandardized coefficients		<i>t</i>	<i>r</i> <sup>2</sup>	<i>F</i>	<i>df</i>	<i>p</i>
	$\beta$	<i>SE</i>					
<b>Females</b>							
Step 1: Covariates				0.29	1.32	4,13	<i>ns</i>
Step 2: Main effects				0.82	5.05	8,9	.01
Sexual awareness	-0.03	0.02	-1.63				<i>ns</i>
Self-deceptive enhancement	0.06	0.02	3.70				.01
Positive illusions	0.33	0.10	3.30				.01
Handgrip-strength illusions	-0.39	0.21	-1.85				<i>ns</i>
Step 3: Interactions*				(a) 0.83	4.20	9,8	.03
				(b) 0.84	4.61	9,8	.02
SDE-x-SA	-0.001	0.002	-0.59				<i>ns</i>
PI-x-SA	-0.01	0.01	-1.01				<i>ns</i>
<b>Males</b>							
Step 1: Covariates				0.42	3.02	4,17	<i>ns</i>
Step 2: Main effects				0.61	2.54	8,13	<i>ns</i>
Sexual awareness	0.03	0.03	0.96				<i>ns</i>
Self-deceptive enhancement	0.01	0.02	0.31				<i>ns</i>
Positive illusions	-0.01	0.09	-0.08				<i>ns</i>
Handgrip-strength illusions	-0.56	0.26	-2.16				<i>ns</i>
Step 3: Interactions*				(a) 0.61	2.09	9,12	<i>ns</i>
				(b) 0.61	2.10	9,12	<i>ns</i>
SDE-x-SA	0.0001	0.002	0.07				<i>ns</i>
PI-x-SA	0.002	0.01	0.20				<i>ns</i>

Note. *ns* = not significant. Analyses represent a subsample of participants self-reporting as currently in a relationship (*N* = 40).

\* Entered separately to avoid singularity.

self-deception predicts intercourse-partner rate and partner status in females but not in males. Only sexual awareness with regard to intercourse-partner rate was predictive in males. It seems unlikely that false self-reporting of number of intercourse partners or age at first consensual intercourse could account for this relationship given the low mean intercourse-rate for males and females and our tests for bias among self-report items. Thus, our hypothesis was only partially supported.

While we hypothesized that both sexes would exhibit self-deceptive enhancement and positive illusions for different reasons, this does not appear to be the case. Our a priori predictions were based on error management theory, which suggests that males tend toward a false-positive strategy in overestimating signs of interest from females, while females tend toward a false-negative strategy in evaluating male commitment-sincerity (Haselton & Buss, 2000). Given the basis of error management theory in the

disparities of parental investment (Trivers, 1972), we believed that males self-deceive about their sincerity to commit to a long-term relationship so as to overcome female commitment-skepticism bias and obtain sexual access. Although we did not directly test the domain of sincerity in relationship commitment, it appears that, in males, self-deception is less effective as a mating strategy than straightforward sexual self-awareness. On the other hand, we predicted that females would self-deceive to preferentially couple with higher status males but not with regard to number of intercourse partners, which would increase the chances of unwanted pregnancies. However, both female self-deceptive enhancement and, in part, positive illusions positively correlated with partner status and intercourse partner-rate. Rather than contradict error management theory, we believe these findings can be interpreted as a testable refinement. Female overskepticism of male commitment sincerity has been born out in face-

to-face tests except where female interest in the male is high (Henningsen & Henningsen, 2010). Perhaps this pressure is strong enough to elicit greater demonstrations of sincerity from males rather than more deceptive manipulation, consistent with the handicap principle of costly honest signaling (Zahavi & Zahavi, 1997). Yet, self-deception is likely condition-dependent. When females are interested in a male, they appear to be more susceptible to that male's strategies (Henningsen & Henningsen, 2010), which may explain the positive relationship in females between intercourse-partner rate and self-deceptive enhancement. Conversely, the male overestimation bias of female interest has also been validated, except where males are not interested in females (Henningsen & Henningsen, 2010). This, however, means that males exert little if any pressure on female self-deceptive tendencies and would be relatively uncritical of female confidence or overconfidence.

Archaeological evidence suggests there may be some basis for greater overall self-deception in females with regard to mating success. There are historic and prehistoric examples wherein the sex ratio favored females, disparities attributed to depletion of males through warfare or hunting (Angel, 1971; Meyers, 1983). Given that intersexual competition is frequency-dependent, this would have exerted greater pressure on females and amplified intrasexual competition (Trivers, 2011). Similar scenarios have been noted during times of economic crisis. Termed the "lipstick effect," cosmetic sales for females have been noted to increase, a phenomenon attributed to greater intrasexual competition among females not for limited males but for the limited number of males with resources (Hill, Rodeheffer, Griskevicius, Durante, & White, 2012).

### Limitations and Methodological Constraints

These results are important as a long-overdue empirical test (Dunning, 2011) of a nearly 40-year old model favoring selection of self-deception with regard to mating success (Trivers, 2006/1976). Our findings point the way toward future refinements of this model. Nevertheless, conclusions drawn from these data are tentative because of several limitations, most critical of which is the low variability of sexual

experience in the sample, which can be corrected in future research by drawing from the general population instead of an undergraduate setting. This would also address the limited sample size we were able to obtain for analyses using partner status. Second, while we designed the positive illusions index to target mating behavior, sex appeal would be better assessed through interpersonal interaction, wherein multiple sensory dimensions of manipulation may be employed. Also, self-deception is difficult to operationalize because of its conceptual paradoxes and further complicated by its domain specificity. We attempted to overcome these limitations by using multiple measures that would prime mating-relevant networks but recognize these efforts may not have altogether achieved their ends. In addition, no assessment was made regarding short- and long-term sexual strategies, which clearly differ for both sexes (Buss & Schmitt, 1993) and are possibly more significant in a college-age sample than overall number of intercourse partners and partner potential. Finally, it remains unclear whether our model actually measures self-deception or simply degrees of inaccurate self-assessment (Pinker, 2011), "selective information processing" (Frey & Voland, 2011), or "bullshitting" (Dunning, 2011). Yet the implications for adaptation remain the same, so it is perhaps merely a conceptual problem, requiring examination of mating success with regard to a more basic construct, such as "nonconscious thought" (O'Sullivan, 2008). Future research can benefit, however, not just from our findings but the methodological approaches we have taken. We recommend domain-specific methods to assess mating-relevant self-deception in appropriate contexts. In addition to the methods we have piloted, speed-dating paradigms offer a likely avenue for complementary techniques (Finkel, Eastwick, & Matthews, 2007), such as skin conductance measures of sympathetic nervous system response or the overclaiming technique to capture actual self-deception (Paulhus & Harms, 2004), rather than the mere likelihood that one is self-deceptive.

### Summary

There remains little doubt that self-deception is an effective aspect of the human psyche, but problems relating to defining and empirically

assessing the effects were only partially resolved in our study. However, we demonstrated that self-deception can be operationalized and encourage continued research along these lines. The model we tested illustrates the adaptive importance of self-deceptive mechanisms for females and represents a long-overdue first step in testing the evolved mating-relevant self-deception model originally posed by Trivers. We suggest the influence of intrasexual competition in females may be underappreciated and warrants further attention. These findings complement other evidence that self-deception and positive illusions can benefit well-being (Ford, 2004; Jamner & Schwartz, 1986; E. A. Johnson, Vincent, & Ross, 1997; Lopez & Fuxjager, 2012; Sackeim, 1983; Starek & Keating, 1991; Taylor, 1989). Taken together, these data suggest multiple pathways by which the mechanisms influencing various types of self-deception could have been exapted through evolutionary processes.

## References

- Allison, P. D. (1977). Testing for interaction in multiple regression. *American Journal of Sociology*, 83, 144–153. Retrieved from <http://www.jstor.org/stable/2777767>
- Allison, P. D. (1999). *Multiple regression: A primer*. Thousand Oaks, CA: Pine Forge Press.
- Anderson, C., Ames, D. R., & Gosling, S. D. (2008). Punishing hubris: The perils of overestimating one's status in a group. *Personality and Social Psychology Bulletin*, 34, 90–101. doi:10.1177/0146167207307489
- Anderson, C., Brion, S., Moore, D. A., & Kennedy, J. A. (2012). A status-enhancement account of overconfidence. *Journal of Personality and Social Psychology*, 103, 718–735. doi:10.1037/a0029395
- Angel, J. L. (1971). Early Neolithic skeletons from Catal Hüyük: Demography and pathology. *Anatolian Studies*, 21, 77–98. Retrieved from <http://www.jstor.org/stable/3642632>
- Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, 100, 204–232.
- Chaplin, W. F., Phillips, J. B., Brown, J. D., Clanton, N. R., & Stein, J. L. (2000). Handshaking, gender, personality, and first impressions. *Journal of Personality and Social Psychology*, 79, 110–117.
- Deweese-Boyd, I. (2012). Self-deception. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Spring 2012 edition). Stanford, CA: Metaphysics Research Lab, CSLI, Stanford University. Retrieved from <http://plato.stanford.edu/archives/spr2012/entries/self-deception/>
- Dunning, D. (2011). Get thee to a laboratory. *Behavioral and Brain Sciences*, 34, 18–19.
- Fenigstein, A., Scheier, M. F., & Buss, A. H. (1975). Public and private self-consciousness: Assessment and theory. *Journal of Consulting and Clinical Psychology*, 43, 522–527.
- Finkel, E. J., Eastwick, P. W., & Matthews, J. (2007). Speed-dating as an invaluable tool for studying romantic attraction: A methodological primer. *Personal Relationships*, 14, 149–166. Retrieved from <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1475-6811.2006.00146.x>
- Folks, D. G., Freeman, A. M., Sokol, R. S., & Thurstin, A. H. (1988). Denial: Predictor of outcome following coronary bypass surgery. *International Journal of Psychiatry in Medicine*, 18, 57–66.
- Ford, C. V. (2004). Lying and self-deception in health and disease. In I. Nyklicek, L. Temoshok, & A. Vingerhoets (Eds.), *Emotional expression and health: Advances in theory, assessment and clinical applications* (pp. 11–28). Hove, East Sussex: Routledge.
- Frey, U., & Volland, E. (2011). The evolutionary route to self-deception: Why offensive versus defensive strategy might be a false alternative. *Behavioral and Brain Sciences*, 34, 21–22.
- Frost, C., Arfken, M., & Brock, D. W. (2001). The psychology self-deception as illustrated in literary characters. *Janus Head*, 4. Retrieved from [www.janushead.org/4-2/frost.cfm](http://www.janushead.org/4-2/frost.cfm)
- Gallup, G. G., Jr., Frederick, M. J., & Pipitone, R. N. (2008). Morphology and behavior: Phrenology revisited. *Review of General Psychology*, 12, 297–304. doi:10.1037/1089-2680.12.3.297. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=pdh&AN=gpr-12-3-297&site=ehost-live>
- Haight, R. M. (1980). *A study of self-deception*. Sussex, United Kingdom: Harvester Wheatsheaf.
- Haselton, M. G., & Buss, D. M. (2000). Error management theory: A new perspective on biases in cross-sex mind reading. *Journal of Personality and Social Psychology*, 78, 81–91. doi:10.1037/0022-3514.78.1.81
- Henningsen, D. D., & Henningsen, M. L. M. (2010). Testing error management theory: Exploring the commitment skepticism bias and the sexual over-perception bias. *Human Communication Research*, 36, 618–634. doi:10.1111/j.1468-2958.2010.01391.x
- Hill, S. E., Rodeheffer, C. D., Griskevicius, V., Durante, K., & White, A. E. (2012). Boosting beauty in an economic decline: Mating, spending, and the lipstick effect. *Journal of Personality and Social Psychology*, 103, 275.

- Hopcroft, R. L. (2006). Sex, status, and reproductive success in the contemporary United States. *Evolution and Human Behavior*, 27, 104–120. doi:10.1016/j.evolhumbehav.2005.07.004
- Jamner, L. D., & Schwartz, G. E. (1986). Self-deception predicts self-report and endurance of pain. *Psychosomatic Medicine*, 48, 211–223. Retrieved from <http://www.psychosomaticmedicine.org/cgi/content/abstract/48/3/211>
- Johnson, D. D. P. (2004). *Overconfidence and war: The havoc and glory of positive illusions*. Cambridge, United Kingdom: Harvard University Press.
- Johnson, E. A., Vincent, N., & Ross, L. (1997). Self-deception versus self-esteem in buffering the negative effects of failure. *Journal of Research in Personality*, 31, 385–405.
- Kurzban, R. (2010). *Why everyone (else) is a hypocrite: Evolution and the modular mind*. Princeton, NJ: Princeton University Press.
- Lane, R. D., Merikangas, K. R., Schwartz, G. E., Huang, S. S., & Prusoff, B. A. (1990). Inverse relationship between defensiveness and lifetime prevalence of psychiatric disorder. *American Journal of Psychiatry*, 147, 573–578.
- Levine, J., Warrenburg, S., Kerns, R., Schwartz, G., Delaney, R., Fontana, A., . . . Cascione, R. (1987). The role of denial in recovery from coronary heart disease. *Psychosomatic Medicine*, 49, 109–117. Retrieved from <http://www.psychosomaticmedicine.org/cgi/content/abstract/49/2/109>
- Lopez, J. K., & Fuxjager, M. J. (2012). Self-deception's adaptive value: Effects of positive thinking and the winner effect. *Consciousness and Cognition*, 21, 315–324. doi:10.1016/j.concog.2011.10.008
- Lu, H. J., & Chang, L. (2011). The association between self-deception and moral self-concept as functions of self-consciousness. *Personality and Individual Differences*, 51, 845–849. doi:10.1016/j.paid.2011.07.014
- Lynn, C. D. (2005). Adaptive and maladaptive dissociation: An epidemiological and anthropological comparison and proposition for an expanded dissociation model. *Anthropology of Consciousness*, 16, 16–49. doi:10.1525/ac.2005.16.2.16
- Mele, A. R. (1988). *Irrationality: An essay on akrasia, self-deception, self-control*. New York, NY: Oxford University Press.
- Mele, A. R. (1997). Real self-deception. *Behavioral and Brain Sciences*, 20, 91–102.
- Mele, A. R. (2001). *Self-deception unmasked*. Cambridge, United Kingdom: Cambridge University Press.
- Meyers, C. (1983). Procreation, production, and protection: Male-female balance in early Israel. *Journal of the American Academy of Religion*, 51, 569–593. Retrieved from <http://www.jstor.org/stable/1462582>
- O'Brien, D. T., Geher, G., Gallup, A. C., Garcia, J. R., & Kaufman, S. B. (2010). Self-perceived mating intelligence predicts sexual behavior in college students: Empirical validation of a theoretical construct. *Imagination, Cognition, and Personality*, 29, 341–362.
- O'Sullivan, M. (2008). Deception and self-deception as strategies in short- and long-term mating. In G. Geher, & G. Miller (Eds.), *Mating intelligence: Sex, relationships, and the mind's reproductive system* (pp. 135–157). New York, NY: Erlbaum.
- Paluch, S. (1967). Self-deception. *Inquiry*, 10, 268–278.
- Paulhus, D. L. (1986). Self-deception and impression management in test responses. In A. Angleitner & J. S. Wiggins (Eds.), *Personality assessment via questionnaires: Current issues in theory and measurements* (pp. 143–165). Berlin, Germany: Springer.
- Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver, & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 17–59). San Diego, CA: Academic Press.
- Paulhus, D. L., & Harms, P. D. (2004). Measuring cognitive ability with the overclaiming technique. *Intelligence*, 32, 297–314. doi:10.1016/j.intell.2004.02.001
- Pinker, S. (2011). Representations and decision rules in the theory of self-deception. *Behavioral and Brain Sciences*, 34, 35. doi:10.1017/S0140525X1000261X
- Roth, D. L., & Ingram, R. E. (1985). Factors in the self-deception questionnaire: Associations with depression. *Journal of Personality and Social Psychology*, 48, 243–251.
- Sackeim, H. A. (1983). Self-deception, depression, and self-esteem: The adaptive value of lying to oneself. In J. Masling (Ed.), *Empirical studies of psychoanalytic theory* (pp. 101–157). Hillsdale, NJ: Erlbaum.
- Sahdra, B., & Thagard, P. (2003). Self-deception and emotional coherence. *Mind and Machines*, 13, 213–231. doi:10.1023/A:1022940107699
- Scheier, M. F., & Carver, C. S. (1985). The self-consciousness scale: A revised version for use with general populations. *Journal of Applied Social Psychology*, 15, 687–699. Retrieved from <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1559-1816.1985.tb02268.x>
- Schmitt, D. P. (2010). Human mate choice. In M. P. Muehlenbein (Ed.), *Human evolutionary biology* (pp. 295–308). New York, NY: Cambridge University Press.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in

- data collection and analysis allows presenting anything as significant. *Psychological Science*, 22, 1359–1366. doi:10.1177/0956797611417632
- Singh-Manoux, A., Adler, N. E., & Marmot, M. G. (2003). Subjective social status: Its determinants and its association with measures of ill-health in the Whitehall II study. *Social Science & Medicine*, 56, 1321–1333. Retrieved from <http://www.sciencedirect.com/science/article/B6VBF-45S9BJ2-3/2/2ce9665f3acf831360f82593861c2a21>
- Snell, W. E., Fisher, T. D., & Miller, R. S. (1991). Development of the sexual awareness questionnaire: Components, reliability, and validity. *Sexual Abuse: A Journal of Research and Treatment*, 4, 65–92. doi:10.1007/BF00850140
- Starek, J. E., & Keating, C. F. (1991). Self-deception and its relationship to success in competition. *Basic and Applied Social Psychology*, 12, 145–155. Retrieved from [http://www.leononline.com/doi/abs/10.1207/s15324834basp1202\\_2](http://www.leononline.com/doi/abs/10.1207/s15324834basp1202_2)
- Stefano, G. B., & Fricchione, G. L. (1995). The biology of deception: The evolution of cognitive coping as a denial-like process. *Medical Hypotheses*, 44, 311–314. Retrieved from <http://www.sciencedirect.com/science/article/B6WN2-4CP8052-69/2/daf7d6da8d3002403b4f154a8dbfaa3e>
- Stöber, J., Dette, D. E., & Musch, J. (2002). Comparing continuous and dichotomous scoring of the Balanced Inventory of Desirable Responding. *Journal of Personality Assessment*, 78, 370–389. doi:10.1207/S15327752JPA7802\_10
- Taslitz, A. E. (2005). Willfully blinded: On date rape and self-deception. *Harvard Journal of Law & Gender*, 28, 381.
- Taylor, S. E. (1989). *Positive illusions: Creative self-deception and the healthy mind*. New York, NY: Basic Books.
- Taylor, S. E., & Armor, D. A. (1996). Positive illusions and coping with adversity. *Journal of Personality*, 64, 873–898.
- Taylor, S. E., & Brown, J. D. (1994a). “Illusion” of mental health does not explain positive illusions. *The American Psychologist*, 49, 972–973.
- Taylor, S. E., & Brown, J. D. (1994b). Positive illusions and well-being revisited: Separating fact from fiction. *Psychological Bulletin*, 116, 21–27.
- Taylor, S. E., & Gollwitzer, P. M. (1995). Effects of mindset on positive illusions. *Journal of Personality and Social Psychology*, 69, 213–226.
- Thornhill, R., & Gangestad, S. W. (1994). Human fluctuating asymmetry and sexual behavior. *Psychological Science*, 5, 297–302. doi:10.1111/j.1467-9280.1994.tb00629.x
- Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man, 1871–1971* (pp. 136–179). Chicago, IL: Aldine.
- Trivers, R. L. (1985). *Social evolution*. Menlo Park, CA: Benjamin/Cummings.
- Trivers, R. L. (2000). The elements of a scientific theory of self-deception. *Annals of the New York Academy of Sciences*, 907, 114–131.
- Trivers, R. L. (2006/1976). Foreword. In R. Dawkins (Ed.), *The selfish gene* (pp. xix–xxx). New York, NY: Oxford University Press.
- Trivers, R. L. (2009). Deceit and self-deception. In P. M. Kappeler & J. B. Silk (Eds.), *Mind the gap: Tracing the origins of human universals* (pp. 373–393). New York, NY: Springer. Retrieved from <http://libdata.lib.ua.edu/login?url=http://dx.doi.org/10.1007/978-3-642-02725-3>
- Trivers, R. L. (2011). *The folly of fools: The logic of deceit and self-deception in human life*. New York, NY: Basic Books.
- Trivers, R. L., & Newton, H. P. (1982, November). The crash of flight 90: Doomed by self-deception? *Science Digest*, 66–67, 111.
- von Hippel, W., & Trivers, R. L. (2011). The evolution and psychology of self-deception. *Behavioral and Brain Sciences*, 34, 1–16.
- von Hippel, W., von Hippel, C., Conway, L., Preacher, K. J., Schooler, J. W., & Radvansky, G. A. (2005). Coping with stereotype threat: Denial as an impression management strategy. *Journal of Personality and Social Psychology*, 89, 22–35. doi:10.1037/0022-3514.89.1.22
- Wrangham, R. (1999). Is military incompetence adaptive? *Evolution and Human Behavior*, 20, 3–17. doi:10.1016/S1090-5138(98)00040-3
- Zahavi, A., & Zahavi, A. (1997). *The handicap principle: A missing piece of Darwin's puzzle*. New York, NY: Oxford University Press.

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