

Cannibalism and Sex:  
Shared Standards of Social Disgust

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## Abstract

In 4 studies conducted to explore the evolution of the cannibalism taboo, participants were asked to judge which targets would be more disgusting to cannibalize. Results support a *disease avoidance hypothesis*, suggesting that the cannibalism taboo evolved because eating members of one's own species provides a greater risk of disease, and an *inclusive fitness hypothesis*, suggesting that people avoided cannibalism because it presented a risk of killing genetic relatives – although none of the evidence is conclusive. Two further studies confirmed an observation that the most disgusting targets to eat were those most disgusting for sexual intimacy (correlations greater than .90). This suggests that a general mechanism may be involved in the cannibalism and sexual taboos. We speculate that this mechanism may have evolved for one purpose, but been subsequently adopted for the other purpose (i.e., exaptation). These findings have implications for the study of the evolution of taboos, for the psychology of disgust, and for the nature of evolved psychological mechanisms. It is suggested that these findings question some assumptions of the dominant approach to evolutionary psychology (*cognitive adaptationism* or *narrow evolutionary psychology*).

## Cannibalism and Sex:

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Hannibal Lecter. The Donner Party. Jeffrey Dahmer... Whether real or fictional, cannibals hold a fascination for humans, despite the strong taboo against cannibalistic behavior. The research reported in the current paper began as an investigation into the evolution of this taboo. We sought to adopt the most common logic of evolutionary psychology (i.e., *narrow evolutionary psychology* or *cognitive adaptationism*; see below) to explore why humans would have evolved such a strong disgust at the notion of eating members of our own species. Our results led to a clue as to why we are, at the same time, so fascinated with this behavior.

### Cannibalism in Non-Human Animals.

It seems intuitively plausible that cannibalism can provide evolutionary benefits for all animals. Same-species consumption can provide valuable nutritional resources; at the same time, a cannibal eliminates a potential competitor for resources within their niche (Fox, 1975; Pfennig, 1997).

In fact, there have been reports of cannibalism among as many as 1300 animal species (Polis, 1981), including 75 species of mammals (Polis, Myers, & Hess, 1984). The examples of cannibalism come from a taxonomically broad distribution of species, including protozoa, mollusks, insects, and primates (Fox, 1975; Polis, 1981; the volume by Elgar and Crespi, 1992a collects a series of reviews on cannibalism across a variety of taxa). On the other hand, cannibalism is rare in most species. This suggests that some evolutionary disadvantage also exists, which likely led to selection against cannibalism.

### Cannibalism Among Humans

There are many reported cases of cannibalism among humans (see Askenasy, 1994; Petrinovich, 2000; Sanday, 1986). Most of the non-disputed cases of cannibalism involve survival cannibalism – cannibalism practiced under conditions of extreme hunger. The most famous cases in modern memory seem to be the members of the Donner Party, who were trapped in the mountains of the Sierra Nevada in California in 1846 (cf., Hardesty, 1997; Johnson, 1996), and the case of the Uruguayan soccer team that was stranded after a plane crash in the Andes mountains – a case captured in the popular book (and later movie) Alive (Read, 1974; see also Lopez, 1973).

On the other hand, the evidence of cannibalism as a regular cultural practice has been questioned (e.g., Arens, 1979; Salmon, 1995); nevertheless, it does seem to have occurred throughout time and around the world. Numerous archeological (e.g., Degusta, 1999; Turner & Turner, 1999; White, 1992) and ethnographic (e.g., Conklin, 2001; Poole, 1983; Whitehead, 2000) studies present evidence of human cannibalism. Sanday (1986) found enough information to determine whether or not cannibalism existed in 109 societies ranging from Babylonia (circa 1750 B.C.E.) to societies as recently as the 1960s. Cannibalism appeared to have been practiced in 37 (33.9%) of these societies.

Cannibalism practiced as a regular cultural practice can be classified into at least three categories (Salmon, 1995): medicinal cannibalism, where the consumption of human flesh is viewed as a way to cure or ward off disease; mortuary cannibalism, which involves the consumption of humans as part of the funerary ritual after their death; and sacrificial cannibalism, consumption for the appeasement of the gods or for revenge against one's enemies.

Some have also suggested that cannibalism may have evolved in some cultures to fulfill nutritional needs – gustatory cannibalism. While it is possible that the symbolic meanings of cannibalism are psychological/cultural mechanisms that motivate members of cultures to eat additional proteins, two points should be noted: (1) it is extremely rare for individuals or cultures to include human flesh as a regular, ordinary part of the diet, outside of the symbolic or ritual context, and (2) the ritual practice of cannibalism does not seem to covary with the availability of other protein sources (Conklin, 2001; Sanday, 1986; although, see Dornstreich & Morren, 1974)<sup>1</sup>.

Survival cannibalism seems to be a natural outcome of ever-expanding boundaries of acceptable food as hunger intensifies (Petrinovich, 2000). The fact that people in life threatening situations will expand their *zone of edibility* to include cannibalism does not threaten the notion that cannibalism is a human taboo. From an evolutionary perspective, the survival motive should be stronger than any other (except, perhaps, the motive to reproduce). Such a motive might be expected to over-power the cannibalism taboo under the circumstances when survival cannibalism has occurred. Nevertheless, the fact that cannibalism is the very last strategy that people turn to for food – despite the fact that the consumption of human flesh would arguably provide greater nutritional benefit than many food sources adopted earlier – supports our contention that cannibalism is a powerful taboo.

The incorporation of cannibalism into the cultural rituals of a society does raise questions about the taboo nature of cannibalism. If cannibalism is a universally human taboo, it would seem surprising to find societies where the eating of human flesh was a regular cultural practice.

There is, however, evidence that even in cultures where cannibalism is socially sanctioned in some circumstances, it is unpleasant and perhaps even avoided. For example, Barth (1975, cited by Whitehead, 2000, p. 82) reports that children of the Baktaman society of Papua New Guinea “often to their surprise and disappointment vomit when they first try eating it [human flesh], and even some of the greatest warriors among the Baktaman admit somewhat shamefacedly that they are still unable to eat it, or more non-committally, do not like it.” Similarly, Poole (1983), who witnessed some examples of mortuary cannibalism among the Biman-Kuskusmin (also of New Guinea), writes that “many Bimin-Kuskusmin men and women whom I interviewed and who admitted to socially proper cannibalistic practices acknowledged considerable ambivalence, horror, and disgust at their own acts. Many persons noted that they had been unable to engage in the act, had not completed it, had vomited or even fainted, or had hidden the prescribed morsel and lied about consuming it” (p. 9n). Likewise, Conklin (2001), who lived among the Wari’ of Brazil in a time after they had ceased practicing (mortuary) cannibalism, writes that her older informants reported that “eating the dead was quite unpleasant” (p. 94).

These accounts suggest that where cannibalism has developed as a cultural practice, the cultural norms are enforcing a behavior which is counter to the preferences or natural tendencies of the members of the culture. This is consistent with our assumption that the disgust we feel regarding cannibalism is a manifestation of an evolved taboo. Any full account of the evolution of this taboo will eventually have to confront the question of how these cultural systems developed in interaction with other evolved tendencies. However, such a model goes far beyond the scope of the present paper.

Disgust and the Cannibalism Taboo.

Our review of the literature on cannibalism suggests that cannibalism has and does occur among humans and other species. Moreover, there appear to be at least some evolutionary benefits that could be gained from the practice. Nevertheless, the behavior is rare in all species.

The taboo among humans seems to be enforced by an emotional mechanism which makes the concept of eating human flesh disgusting or unpleasant. Rozin, Haidt, and their colleagues have designated the emotion originating in the actual or imagined oral incorporation of a contaminated object *core disgust* (see Rozin, Haidt, & McCauley, 2000 for a recent review). They point out that the physiological and expressive components of disgust all revolve around actions related to expelling the contaminant (e.g., nausea, facial gape) or avoiding ingestion in the first place (e.g., wrinkling of the nose).

Disgust seems to relatively quickly become generalized from the oral/food domain into areas apparently far removed from the mouth. Rozin et al. (2000; Haidt et al., 1997) suggest that disgust evolves further, into a reaction to anything which reminds humans of our animal nature, and therefore reminds us of our eventual death (elicited by reminders of the functions we share with non-human animals such as eating, excretion, and sex; see also Goldenberg et al., 1999, 2001). Disgust further generalizes to interpersonal disgust (elicited by contact with undesirable others) and to moral disgust (elicited by violation of normative codes of behavior).

The act of cannibalism has the potential to span all four of these disgust domains: It involves the consumption of an unpleasant food substance, it involves behavior

associated with death, it involves contact with other people (potentially undesirable others – although see Conklin, 2001), and it frequently involves violation of moral restrictions.<sup>2</sup> An exploration, therefore, of the nature of the disgust elicited by the idea of cannibalism seems to provide an opportunity to study a uniquely complex disgust elicitor.

Evolutionary Psychology Approach to the Cannibalism Taboo.

We sought to apply ideas from evolutionary psychology to understand the origins and nature of the cannibalism taboo. Although a wide range of epistemological and methodological tools can be used to study the evolution of mental and behavioral phenomena in both humans and non-human animals (see Caporael, 2001; Heyes & Huber, 2000; Holcomb, 2001; Scher & Rauscher, 2003a for descriptions and collections of various approaches) the term “evolutionary psychology” generally refers specifically to the program of research described and defended by scholars such as Buss (1995; 1999), Dennett (1995), Ketelaar (2003; Ketelaar & Ellis, 2000), Pinker (1997), Symons (1979), and Tooby and Cosmides (1992; Cosmides & Tooby, 1997). This program of research uses hypotheses about the possible historical forces that may have led to the evolution of certain cognitive mechanisms to generate predictions about current psychological functioning. Rauscher & Scher (2003; see also Wilson, 2003) have called this approach “narrow evolutionary psychology,” a term meant to be evaluatively neutral, referring to the fact that this approach to evolutionary psychology takes a narrower range of assumptions than the broader construal of evolutionary psychology allows. Because these assumptions largely involve the combining of assumptions from the cognitive revolution in psychology and from the adaptationist perspective in evolutionary biology

(cf., Scher & Rauscher, 2003b), this approach can also be called “cognitive adaptationism” (Scher, 2001).

We adopted this approach to our study of cannibalism. We assumed that our participants would all find cannibalism disgusting. We then generated a series of hypotheses about the selective environment that may have brought about this taboo. Each hypothesis suggested a set of specific predictions about differences in the level of taboo or level of disgust that different cannibalistic victims would produce. We set out to test those predictions. Our initial findings, however, led us to expand our focus to sexual behavior as well.

It is important to point out a major limitation of cognitive adaptationism, because it is a source of confusion among many readers of the evolutionary psychology literature. Most of the time, a confirmatory result in cognitive adaptationism does not provide any information whatsoever as to the presence or absence of specific genetic causes of the mechanism under study. Cognitive adaptationist methods provide support for a hypothesis that the demonstrated mechanism was *selected for*. However, both genetic material and cultural material are in some sense ‘heritable,’ and both can contain variability. Therefore, both have the potential to be the objects of selection. Unless a cognitive adaptationist hypothesis is specifically chosen to differentiate selection of genes from selection of cultural/environmental material, then we cannot make any determination of a genetic cause for a behavior based on cognitive adaptationist methods (beyond the general sense in which all behavior is both genetically and culturally determined). For further discussion of this point, see Scher (1999)

General Methodology.

We tested four distinct hypotheses for the origins of the cannibalism taboo. These four hypotheses, and the predictions associated with them, are summarized in Table 1, and will be discussed further below. We tested these predictions by asking people to compare different cannibalism victims, and identify who it would be most disgusting to eat. In each of the six studies to be described, we generated six (Study One) or eight (Studies Two through Six) targets with a factorial design. Participants were then asked to make all possible pairwise comparisons among the different targets. Disgust scores for each target were generated by counting the number of times that target was chosen as the most disgusting to eat.

### Study One

#### Disease and Predation Avoidance Hypotheses

##### Predation Avoidance Hypothesis.

Our first study was designed to test two hypothesized evolutionary paths to the cannibalism taboo. The first hypothesis was proposed by Dawkins (1989 [1976]), among others (e.g., Holmes, 1977; Jackson, 1979; Polis, 1981). Cannibalism is infrequent, Dawkins suggested, because attempts to kill and consume a member of one's own species present a greater risk to an organism than attacking members of species that are smaller, weaker, slower, or have less effective protective mechanisms.

We made two predictions based on this hypothesis. Firstly, people should find it most disgusting to cannibalize those they have to hunt to eat. Individuals who died from other causes (e.g., illness; accident) die without intervention from a potential cannibal, and therefore do not pose a risk. Secondly, since juveniles present less of a threat than adults, people should find it more disgusting to eat an adult than to eat a child. This is

consistent with the fact that most cases of cannibalism in nonhuman species involve adults eating juveniles (Elgar & Crespi, 1992b; Polis, 1981).

Disease Avoidance Hypothesis.

The second hypothesis tested in Study 1 was a disease avoidance hypothesis. In general, disease transmission seems to be primarily a product of contact with other animals, and as a result, core disgust reactions are primarily related to contact with animals and animal products (Rozin & Fallon, 1980). Moreover, disease avoidance processes seem to play an important part in a number of human psychological processes, including prejudice (Schaller & Park, in press).

Pathogens that have evolved to attack a specific host would be more dangerous to others of the same species, who share most of the physical/genetic makeup of the original host (Freedland, 1983). The consumption of conspecifics should therefore present an especially high risk of disease transmission. This leads to the hypothesis that cannibalism may have been selected against because people were more likely to get sick from eating members of their own species than from eating members of other species.

Support for this hypothesis comes from evidence that bovine spongiform encephalopathy (BSE), otherwise known as Mad Cow Disease, was spread among cattle in Britain because cattle were fed the ground remains of conspecifics who had already died from BSE (see Lindenbaum, 2001). The related disease Kuru most likely spread among the Fore of New Guinea as a result of cannibalism<sup>3</sup> (Mathews, Glasse, & Lindenbaum, 1968; cf., Lindenbaum 1979, 2001; Nelson, 1996. Klitzman, 1998 and Rhodes, 1997 present informal, popular accounts of BSE, Kuru and other prion diseases).

Pfennig, Ho, & Hoffman (1998) provide experimental evidence that cannibalism creates a greater risk of disease in salamanders than does consumption of other, related species.

Based on the disease hypothesis, we predicted that people would find it more disgusting to eat those who died from an illness (especially, a virus) than those who died by other means (e.g., hunted to be eaten; accident). Study One tested this prediction as well as the predictions of the predation avoidance hypothesis.

### Method.

Participants. Thirty-nine females and 22 males participated as part of a research participation requirement for an Introductory Psychology class. All but two of the participants were between the ages of 18 and 24. One participant was 42 and one was 62. The median age was 19. Almost 82% of the participants indicated that they were Caucasian. There were 6 African-Americans, 2 Asian-Americans, 1 Hispanic, and 1 Native-American.

Stimuli. The experiment was self-contained in a questionnaire packet that was distributed to participants. After providing demographic information, participants read: “Cultures around the world consume a variety of unique foods. Many people eat foods that are similar to that of U.S. citizens, but there are many dietary trends that we would think are bizarre and unusual. The most extreme example of this is cannibalism. Eating of human flesh and internal organs, though rare, is known to occur.”

Participants were then told that they would be presented with pairs of people, and they were asked to try and imagine someone eating one of the people. They were presented with 30 pairs of targets and were asked to circle which person in each pair it would disgust them more to eat.

Targets. The 30 choices represented two replications of all possible pairwise comparisons among 6 targets. Within each pair, the order of targets was determined randomly. The order of the pairs was also randomly determined. The 6 targets represented the cells of a 2 (Age: Adult vs Child) X 3 (Cause of Death: Accident/Hunted/Disease) repeated measures ANOVA. The actual six targets are given in Table 2.

### Results.

General Plan of Analysis. The number of times that a particular target was chosen as the more disgusting of a pair represented the disgust score for each target. Because each target appeared 10 times (2 times with each of the 5 other targets), the disgust score ranged from 0 to 10.

Generating these disgust scores allowed us to calculate within-participant analyses of variance, with Age and Cause of Death as independent variables. Because all participants made a total of 30 choices, however, the sum of each participant's disgust scores across the 6 targets had to add up to 30. Therefore, there was no variability in the average disgust score (across all targets). As a result, it was impossible to include between-participant variables (i.e., Participant Gender) in the ANOVA including all the targets.

To test for gender effects, therefore, we conducted separate t-tests on the disgust scores for each of the targets. We then conducted separate 2 X 3 repeated measures ANOVAs for males and females.

Gender Effects. There were no significant gender differences for any of the targets. The largest observed t-value was for the adult who was hunted to be eaten ( $t_{(59)} = -1.44$ ,  $p = .15$ ).

Target Effects. Differences in the disgust level for the different targets were examined by conducting within-participant ANOVAs separately for male and female participants. Only the two main effects (Age; Cause of Death) were significant. The Age effect (for Females:  $F_{(1,38)} = 115.63$ ,  $p < .0001$ ; for Males:  $F_{(1,21)} = 35.97$ ,  $p < .0001$ ) reflected the fact that Ps judged it more disgusting to eat a child ( $M_{\text{females}} = 6.44$ ,  $s = .84$ ;  $M_{\text{males}} = 6.27$ ,  $s = .99$ ) than to eat an adult ( $M_{\text{females}} = 3.55$ ,  $s = .84$ ;  $M_{\text{males}} = 3.73$ ,  $s = .99$ ). The Cause of Death effect (for Females:  $F_{(2,76)} = 10.15$ ,  $p < .0001$ ; for Males:  $F_{(2,42)} = 8.69$ ,  $p < .001$ ) was driven by the fact that Ps found it less disgusting to eat someone who was hunted to be eaten ( $M_{\text{females}} = 5.43$ ,  $s = 2.86$ ;  $M_{\text{males}} = 4.64$ ,  $s = 2.80$ ) than someone who died from a virus ( $M_{\text{females}} = 6.24$ ,  $s = 2.46$ ;  $M_{\text{males}} = 7.00$ ,  $s = 1.95$ ); it was less disgusting still to eat someone who died by accidentally drowning ( $M_{\text{females}} = 3.32$ ,  $s = 1.82$ ;  $M_{\text{males}} = 3.36$ ,  $s = 2.37$ ).

However, the comparison between targets who were hunted to be eaten and those who died by drowning was not significant for female participants. On the other hand, the comparison between those who drowned and those who were hunted to be eaten was not significant for the male participants. Thus, although there is some support for the disease hypothesis, it is somewhat inconclusive.

The greater disgust for eating someone who was hunted to be eaten compared to someone who died accidentally (at least for females) supports the predation avoidance hypothesis. However, the other finding of Study One – that it was more disgusting to eat

a child than to eat an adult – was precisely the opposite of what we predicted based on the predation hypothesis, raising questions about whether risks from preying on members of one's own species contributed to the evolution of the cannibalism taboo in humans.

## Study Two

### Mate Pool Reduction

In Studies Two and Three, we tested the hypothesis that cannibalism was selected against because of a risk of eating people who were potential mates (Fox, 1975; Paine, 1965). If this hypothesis is true, people should be most disgusted by imagining eating someone who would be a desirable mate. Specifically, we reasoned that people would be most disgusted by eating members of the opposite sex,<sup>4</sup> especially if the target is physically attractive. This may be especially true for male participants, because males indicate that physical attractiveness is more important to them in mate selection (e.g., Buss, 1989). Females, on the other hand, seem to value status more in a mate (e.g., Buss, 1989); therefore, they should find it more disgusting to eat a high status male than to eat a low status male.

We also predicted that people would be more disgusted eating an opposite sex target if that target was hunted to be eaten, compared to if that target had died accidentally. Individuals who die accidentally are removed from the mate pool in any event. It is only when someone is deliberately killed to be eaten that they represent an additional reduction in potential mates.

### Method.

The method for Study Two was identical to that for Study One, with the following exceptions. In Study Two, the targets were generated from a 2 (Cause of Death:

Accident vs. Hunted) X 2 (Attractiveness: Handsome/Beautiful vs. Unattractive) X 2 (Gender: Man vs. Woman) ANOVA design. There were, therefore, 8 targets (Table 2). As in Study One, participants made all possible pairwise comparisons of these 8 targets. Only one replication of the comparisons was included in this study. Therefore participants made 28 comparisons (i.e., each of the targets compared once with each of the 7 other targets).

The participants were 36 females and 21 males from the introductory psychology research participant pool. Fifty of the participants indicated they were Caucasian. Five reported their race as African-American, and 2 as Hispanic. Participants ranged in age from 18 to 23, with a median age of 19.

### Results.

As with Study One, we calculated disgust scores based on how many times a particular target was chosen as the most disgusting of a pair. In this study, those scores could range from 0 to 7. We also conducted t-tests, with gender as the independent variable, to determine if any of the targets were seen as more disgusting by one gender than the other. None of these t-tests was significant.

Repeated measures analyses of variance (2X2X2) were conducted separately by gender (see above). There was a significant main effect for target attractiveness (for Female Participants:  $F_{(1, 35)} = 8.58, p < .01$ ; for Male Participants:  $F_{(1, 20)} = 12.31, p < .01$ ). Participants found it more disgusting to imagine eating the unattractive target ( $M_{\text{females}} = 3.92, s = .87$ ;  $M_{\text{males}} = 3.98, s = .62$ ) than to eat the attractive target ( $M_{\text{females}} = 2.78, s = .86$ ;  $M_{\text{males}} = 3.05, s = .96$ ).

There was also an ‘interaction’ between Participant Gender and Target Sex.

Females found it more disgusting to eat a female target ( $M = 4.17$ ,  $s = .79$ ) than to eat a male target ( $M = 3.23$ ,  $s = .62$ ;  $F_{(1,35)} = 6.76$ ,  $p < .05$ ); this effect was not significant for males ( $F_{(1,20)} = .004$ ). No other effects were significant.

### Discussion.

The results of Study Two do not support the Mate Pool hypothesis. In fact, the effects that are significant are in the direction opposite of that derived from this hypothesis.

Females found it less disgusting to eat an opposite sex target (i.e., a potential mate). Both males and females found it less disgusting to eat a physically attractive target than to eat an unattractive target.

### Study Three

Study Three provides an additional test of the Mate Pool hypothesis. Specifically, we tested our predictions regarding target status in this study.

### Method.

The methods of Study Three were identical to those of Study Two, except that instead of manipulating physical attractiveness, we manipulated whether the target was described as a chief or a slave (see Table 2).

The participants were 39 females and 19 males. They ranged in age from 18 to 23, with a median age of 19. Fifty of the participants reported their race as Caucasian, 5 as African-American, and 2 as Hispanic. One participant did not report race.

### Results.

Three of the t-tests comparing male and female participants’ disgust scores for each target were significant. Males were more disgusted than females with the idea of eating a

male chief who accidentally drowned ( $M_{\text{females}} = 2.18, s=2.12; M_{\text{males}} = 3.58, s = 2.43; t_{(56)} = -2.24, p < .05$ ). (Males were also more disgusted with the idea of eating a male chief who was hunted to be eaten, but this comparison did not reach conventional levels of statistical significance;  $M_{\text{females}} = 3.26, s = 2.02; M_{\text{males}} = 4.05, s = 1.43; t_{(56)} = -1.54, p < .13$ ). Females were more disgusted with the idea of eating a female chief who was hunted to be eaten ( $M_{\text{females}} = 4.51, s = 2.22; M_{\text{males}} = 2.95, s = 2.59; t_{(56)} = 2.38, p < .05$ ) and by eating a female slave who was hunted ( $M_{\text{females}} = 4.87, s = 1.99; M_{\text{males}} = 3.68, s = 2.19; t_{(56)} = 2.07, p < .05$ ).

The analyses of variances (conducted separately by gender, as in Studies 1 and 2) indicated that for females the variables in this study had an effect on disgust scores, but the variables had little effect for male participants. None of the effects were significant for male participants. For female participants, however, there were main effects for target gender ( $F_{(1,38)} = 19.35, p < .001$ ) and cause of death ( $F_{(1,38)} = 4.23, p = .05$ ). There were also interactions between target gender and cause of death ( $F_{(1,38)} = 4.08, p = .05$ ), between status and cause of death ( $F_{(1,38)} = 6.77, p < .01$ ), and a three-way interaction between target gender, status, and cause of death ( $F_{(1,38)} = 8.75, p < .005$ ).

Figure 1 shows the relevant means. Female participants found it more disgusting to imagine eating a female who was hunted to be eaten than a female who died by accidentally drowning. Females also rated males who were hunted to be eaten as more disgusting to eat; however, for male targets, status also affected disgust scores: male targets who were low in status (slaves) were judged as more disgusting to eat than were male targets high in status (chiefs).

## Discussion

Like Study 2, the significant findings of this study appear to be opposite of predictions from the mate pool hypothesis: Where gender differences existed, it was the same sex targets who were more disgusting. Although as predicted females were more affected than males by the status of opposite sex targets in their level of disgust, this effect, too, was in the direction opposite of predictions: low status male targets – the less desirable mates – were more disgusting to eat.

#### Study Four

##### Inclusive Fitness Hypothesis

Our fourth hypothesis for the evolution of the cannibalism taboo is an inclusive fitness hypothesis. Specifically, we speculated that cannibalism might be rare because eating members of one's own species presents the risk of eating a genetic relative (Fox, 1975). This hypothesis is supported by the fact that many non-human cannibals avoid the consumption of close kin (Pfennig, 1997).

Accounts of human cannibalism also provide examples of the avoidance of genetic kin. Many cases of cannibalism involve *exocannibalism* – the consumption of individuals captured from outside one's own community. This presents little risk of eating one's relatives. However, even in cases of *endocannibalism*, there are examples of kin avoidance. For example, the Wari' of the Amazon practiced mortuary cannibalism. This form of cannibalism was meant to be an expression of compassion for the close relatives who had died. However, the actual consumption of the dead was completed not by the blood relatives of the deceased, but by the affinal relatives (i.e., relatives by marriage; Conklin, 2001).

We therefore predicted that people would find it more disgusting to eat a relative than to eat a friend of the family. This prediction should be especially true for victims who were hunted to be eaten, because those who died by other means (e.g., accidentally) are already dead, and the cannibalism does not add to the decrease in inclusive fitness.

We also predicted that it would be more disgusting to eat a relative who was of reproductive age, compared to an older target who was beyond reproductive potential. The consumption of older targets does not lower inclusive fitness, since their reproductive years are completed.

#### Method.

The method of Study 4 was identical to that of Studies 2 and 3, with the exception of the targets used (Table 2). In Study 4, we manipulated the target Age (14 or 75 years old), the Cause of Death (Hunted to be Eaten or Accidentally Drowned), and the Relationship with the Participant (Aunt/Niece versus Friend of the Family). We used all female targets, since the age at which males can no longer reproduce is less clear than it is for females. We chose the age of 14 because at this age women are just beginning their fertile years; we chose the age of 75 because it represents an age when virtually all women have reached menopause. We thought it would be less believable for participants to think of a 14 year old aunt or a 75 year old niece, so we altered the relationship along with age. However, nieces and aunts have an equal degree of relatedness to an individual (i.e.,  $r = 1/4$ ).

Participants were 33 females and 21 males from the introductory psychology research participation pool. Forty-eight reported their race as Caucasian, 4 as African-

American, and 2 as Hispanic. Ages ranged from 18 to 22, with one exception, reporting an age of 31. The median age was 19.

### Results.

None of the t-tests comparing male and female participant's disgust scores for each target were significant. The one that came the closest to statistical significance was the disgust score for a 14 year old niece who died accidentally ( $t_{(52)} = 1.71, p = .09$ ). Females rated this target as more disgusting ( $M=3.42, s = 1.70$ ) than did males ( $M=2.67, 1.39$ ).

For female participants, only two effects were significant in the 2X2X2 repeated measures ANOVA. There were significant main effects for Relationship ( $F_{(1, 32)} = 54.1, p < .0001$ ) and for Cause of Death ( $F_{(1, 32)} = 11.31, p < .005$ ). Women found it more disgusting to eat a relative ( $M = 4.32, s = .65$ ) than to eat a friend of the family ( $M = 2.67, s = .65$ ). They also found it more disgusting to eat someone who was hunted to be eaten ( $M = 4.30, s = 1.37$ ) than to eat someone who died by accidentally drowning ( $M = 2.70, s = 1.37$ ).

These same two effects were significant for male participants (Relationship:  $F_{(1, 20)} = 20.02, p < .0005$ ; Cause of Death:  $F_{(1, 20)} = 17.23, p < .001$ ). As with females, males found it more disgusting to eat a relative ( $M = 4.09, s = .61$ ) than a friend ( $M=2.90, s = .61$ ), and they found it more disgusting to eat someone who was hunted to be eaten ( $M = 4.46, s = 1.06$ ) than to eat someone who died by accidentally drowning ( $M = 2.53, s = 1.06$ ).

In addition, for male participants there was a significant interaction between Cause of Death and Target Age ( $F_{(1, 20)} = 7.81, p < .05$ ). Males found it more disgusting to eat a 75 year old who drowned ( $M=3.00, s=2.07$ ) than to eat a 14 year old who drowned ( $M =$

2.07,  $s = 1.24$ ). Age did not make a difference in the disgust scores for those targets who were hunted to be eaten ( $M_{75\text{-year old}} = 4.52$ ,  $s = 1.91$ ;  $M_{14\text{-year old}} = 4.40$ ,  $s = 1.12$ ).

### Discussion

The results of Study 4 support the inclusive fitness hypothesis, in that people found it more disgusting to imagine eating relatives than to imagine eating friends of the family. However, two other aspects of our predictions based on the inclusive fitness hypothesis were not supported: the greater disgust in eating relatives was not mediated by the age of the relative, and although participants found it more disgusting to eat those who were hunted to be eaten, there was no interaction between Cause of Death and Relationship.

### Interim Summary and Discussion

The results of the first four studies provide some evidence about the evolution of the cannibalism taboo, although none is unequivocal. We feel that the best supported hypotheses are the disease hypothesis and the inclusive fitness hypothesis.

As summarized just above, the general finding that people find it more disgusting to imagine eating relatives supports the latter hypothesis, but the more subtle predictions from this hypothesis were not supported. It seems possible that a demand characteristics explanation might explain this finding – participants could easily have assumed that we would expect people to find eating a relative more disgusting, and responded in kind to satisfy that prediction. Even if we discount a demand explanation, the finding that people do not like to imagine eating relatives is not particularly surprising. Cognitive-adaptationist research is more powerful if it leads to findings that were not known beforehand (Tooby & Cosmides, 1992); to the extent that the approach ‘predicts’

phenomena that are already well-known, this approach is susceptible to charges that it is only providing post hoc ‘just-so stories’.

Evidence for the disease hypothesis is somewhat stronger. Although participants may have believed that we predicted they would judge it least disgusting to eat someone who died accidentally, there is no reason to assume that participants would have believed that we predicted that eating a person who died from a virus would be more disgusting than eating someone who was hunted to be eaten. In fact, given the moral implications of hunting (i.e., murdering) a victim for food, it seems possible that the demand explanation would make the prediction that targets who were hunted would be judged more disgusting than targets who died from a virus. Thus, although it seems premature to say with confidence that the cannibalism taboo evolved because cannibalism presents a greater risk for disease, this seems to be the most strongly supported hypothesis, especially considering the consistent evidence from research on non-human animals and on prion diseases, as well as long-standing evidence connecting disgust with the avoidance of disease causing agents (cf., Haidt et al., 1997).

#### Cannibalism and Sexual Attraction

Taking the results of Studies One to Four as a whole, a striking and unexpected pattern emerges. Many of the findings seem to point to the fact that our participants found it most disgusting to imagine eating someone whom they would also find most disgusting to have sex with.

People reported being more disgusted with the idea of eating a relative (Study 4), and we would expect, given the incest taboo, that they would also report being more disgusted having sex with a relative. We would also expect people to report being more

disgusted having sex with someone unattractive; in Study 2, our participants reported greater disgust eating someone unattractive.

The effects of target age on disgust also seem to be generally consistent with a prediction that cannibalism preferences and sexual preferences are operating in parallel. Recall that participants found it more disgusting to imagine eating a child than an adult (ages unspecified; Study 1). This is also what we would expect for sexual preferences. On the other hand, our male participants found it less disgusting to eat a 14 year old female than to eat a 75 year old female in Study 4. We would imagine that while our 18 to 22 year old participants would probably find it somewhat disgusting to have sex with either a 14-year old or a 75-year old, they would be more disgusted by sex with a person more than 50 years older than they are, rather than a person 4 to 8 years younger.

The results of our studies also lean toward a finding that it would be more disgusting to eat members of the opposite sex, but the findings are far from consistent. For example, females found it more disgusting to eat females in Study 2, but the gender effect was not significant for males. In Study 3, when there were significant gender differences in the individual disgust scores (t-tests), it was always the case that participants who were the same sex as the target found eating that target as more disgusting than those participants who were the opposite sex. The main effect for victim gender in Study 3 was again only significant for female participants (although the means were in the right direction for males, as well).

Study 3 revealed one other result that is consistent with the notion that sex and cannibalism judgments are made on the basis of the same standards. Studies of gender differences in mate preferences consistently find that females, but not males, use cues to

status in their mate selection (e.g., Buss, 1989). In Study 3, while male participants were not affected by target status, females found low status targets more disgusting to eat – but only when the targets were male.

To confirm our suspicions about the connection between standards of sexual disgust and cannibalism-related disgust, we conducted two studies. These studies used the same general methodology as the previous four studies; however we also manipulated (as a between-participants variable) whether participants were judging the disgust involved in cannibalizing the targets or were judging the disgust involved in sexual intimacy with the target (specifically, French kissing them).

#### Study Five

##### Method.

Participants were 36 females and 35 males who participated as a requirement for their Introductory Psychology class. Participants ranged in age from 18 to 23, with one exception, who was 29 years old. The median age was 18. Sixty-eight of the participants reported their race as Caucasian, and 1 each reported African-American, Asian, and Native American.

As with the previous studies, participants made all possible pairwise comparisons among 8 targets. The targets (Table 2) were formed from a 2 (Sex) X 2 (Attractiveness: Handsome/Beautiful X Unattractive) X 2 (Relationship: Uncle/Aunt X Friend) factorial design.

All of the participants were told that “Cultures around the world practice a wide variety of unique traditions. These traditions can vary from something that seems trivial to us, to other practices that we may find very disturbing.” Half the participants then read

“Cannibalism is the practice of eating another human’s flesh and internal organs, cooked or raw. The practice of cannibalism takes place in many cultures around the world. However, cultures are different in regards to who is O.K. to cannibalize, and who is not O.K. to cannibalize.” They were then asked to rate which member of each of the following pairs they would find it most disgusting to cannibalize.<sup>5</sup>

The other half of the participants read that “French kissing is the practice of kissing while placing the tongue of one person in to the mouth of the other, and vice versa. The practice of French kissing takes place in many cultures around the world. However, cultures are different in regards to who is O.K. to French kiss, and who is not O.K. to French kiss.” They were asked to rate who it would be most disgusting to French kiss.

### Results.

As with Studies 1 to 4, the methodology of this study made it impossible to include the between-participant and within-participant variables in the same analysis. Therefore, we followed the same strategy as previously, conducting between-participant analyses on each of the disgust scores separately, and then conducting the within-participant analyses separately for each level of the between-participant variables.

In this study, there were two between-participant variables (Participant Gender and Behavior Judged). Therefore, we conducted 2 (Male/Female) X 2 (Cannibalize/Kiss) analyses of variance on each of the separate disgust scores. The Behavior main effect was significant for judgments of Handsome Uncles, Handsome Friends, and Unattractive Uncles. The Gender effect was significant for all eight targets (Table 3). Male participants always found male targets more disgusting to kiss or cannibalize than did the

female participants. Females always found female targets more disgusting to cannibalize or kiss (see Figure 2).

Both of these effects, however, were further complicated by significant interactions on all of these ANOVAs (Table 3). Post hoc tests (Tukey's HSD) revealed that this effect was predominantly driven by male participants judging how disgusting it would be to kiss the targets. These participants were particularly likely to choose male targets as being more disgusting to kiss, and were particularly unlikely to pick female targets as disgusting to kiss. The one exception to this pattern is in judgments of the Handsome Male Friend. For those judgments, it is the female participants judging how disgusting it would be to kiss the target whose ratings stand out (Figure 2). This target was *never* chosen as the more disgusting of a pair to kiss.

The results of within-participant ANOVA's, conducted separately for each behavior/participant-gender combination, generally conformed to our predictions (see Table 4). Participants were more disgusted kissing or cannibalizing a same sex target and a relative (although these effects were not statistically significant for male participants rating the disgust of cannibalism). Participants were also more disgusted kissing or cannibalizing an unattractive target (although this effect was not statistically significant for female participants rating the disgust of cannibalism).

Two interactions reached conventional levels of statistical significance (Table 4). Means for these interactions are reported in Table 5. Female participants who judged the disgust level of French kissing the targets were particularly disgusted by the idea of kissing a Female relative, and particularly low in disgust at the idea of kissing a Male friend; this was reflected in a significant Target Sex X Relationship interaction for these

participants. A significant Attractiveness X Relationship interaction for Male participants judging the disgust of kissing a target reflects the fact that males were more disgusted kissing an unattractive relative, and less disgusted kissing an attractive friend, than either an unattractive friend or an attractive relative.

#### Do People Use the Same Criteria to Judge Sexual Disgust and Cannibalistic Disgust?

Although it is, of course, interesting to further explore what factors seem to make revolutionary (or, French kissing) someone more disgusting, our main concern in the present study is to see if the targets that people find most disgusting to eat are also the targets that people find the most disgusting to cannibalize. The pattern of mean disgust scores across the different behaviors appears to be quite similar (Figure 2). This similarity can be quantified by a correlation between the mean ratings of disgust at cannibalizing a target and disgust at French kissing the same target. We calculated such a correlation with the 16 mean cannibalism ratings (8 targets for Male and Female participants) and the 16 mean French kissing ratings. The correlation was  $r = .90$ .

#### Study Six

The results of Study 5 support our observation that the targets found disgusting to cannibalize are the same targets it was disgusting to be sexually intimate with. Study 6 was conducted to further test this idea with a different set of targets.

#### Method.

Forty-two female and 37 male students in Introductory Psychology participated as part of a research requirement for their course. The participants ranged in age from 18 to 22, with a median age of 18. Seventy-three participants reported their race as Caucasian, 4 as African-American, and 2 as Hispanic.

The methods of this study were identical to the methods for Study 5, except for the targets used. In the current study, the targets were created from the manipulation of Age (14 Year Old vs. 75 Year Old), Status (Chief vs. Slave) and Cause of Death (Disease vs. Accident). In the condition where participants judged how disgusting it would be to French kiss the targets, targets were said to be “dying from” either a disease or as the result of an accident, rather than as having died from that cause (see Table 2 for the specific targets).

### Results.

Mean disgust scores for all the targets are depicted in Figure 3. The 2X2 (Participant Gender X Behavior Judged) ANOVAs on individual disgust scores yielded significant Behavior effects for all the targets except for the 75-year old slave who died/was dying as a result of a disease, and the 75-year old chief who died/was dying as a result of an accident (although this latter effect was marginally significant; see Table 6 for complete ANOVA results). For the other targets, participants rating the disgust level of cannibalizing someone rated the 14-year old targets as more disgusting than did the participants who were rating the disgust level of French kissing someone. The reverse was true for ratings of old targets: participants who rated the disgust level of cannibalizing someone rated the 75-year old targets as less disgusting than did the participants who rated the disgust level of French kissing the targets. Only one other effect reached conventional levels of statistical significance. There was a 2-way interaction for ratings of the 75-year old chief who died/was dying as the result of a disease: Females rating the disgust level for cannibalism found this target less disgusting than females rating French kissing, and less disgusting than both groups of males.

In the within-participant ANOVAs, all three main effects – for Target Age, Status, and Cause of Death – were significant for both behaviors and both genders (Table 7). Participants found it more disgusting to kiss/cannibalize a 75 year old than a 14 year old, to kiss/cannibalize a slave than a chief, and to kiss/cannibalize someone who died/was dying from a disease than someone who died as the result of an accident.

Once again, our primary concern is the relationship between the most disgusting targets to cannibalize and the most disgusting targets to French kiss. The correlation between the 16 mean disgust scores (8 targets for males and for females) for the two behaviors was  $r = .92$ , confirming the close relationship between the standards used to judge disgust of sexual intimacy and disgust of cannibalism.

### Discussion

We began this paper by observing that people seem fascinated with cannibalism. We believe that this fascination goes beyond a simple interest in the exotic, the unusual, or the bizarre. The discovery of an apparent connection between cannibalism and sex suggests possible reasons for this fascination. It can also contribute to our understanding of the evolutionary history of the cannibalism taboo (and of sexual taboos). Finally, the connection raises questions about some of the assumptions of the cognitive adaptationist approach to evolutionary psychology.

#### The Evolutionary History of Cannibalism.

We believe that the most strongly supported hypothesis regarding the cannibalism taboo is the disease hypothesis. Our participants were consistently more disgusted with the idea of eating someone who died as the result of a disease than they were with the idea of eating people who died for other reasons. Experimental evidence in salamanders

(Pfennig, Ho & Hoffman, 1998), evidence about the spread of BSE in cattle (cf., Lindenbaum, 2001; Prusiner, 1995), and of Kuru in humans (cf., Lindenbaum, 1979, 2001), lend further support to this hypothesis.

There may also have been a role for kin-based selection (our inclusive fitness hypothesis) in the evolution of the cannibalism taboo. Our data support the notion that people are more disgusted with the idea of cannibalizing relatives than non-relatives. Pfennig (1997) shows that many cannibalistic species have mechanisms that keep them from cannibalizing close genetic relatives.

Other aspects of our predictions based on the inclusive fitness hypothesis, though, were not supported. Of course, it could be that our derivation of the predictions is wrong, and that kin selection is an important part of the evolutionary history of the cannibalism taboo. However, the rejection of relatives as cannibalism victims may stem from the connection with sexual taboos, rather than from an inherent aspect of the cannibalism taboo.

Cannibalism, Sex, and Exaptation. Our finding that people use the same standards to judge targets as potential cannibalism victims and as potential sexual partners provides additional information to help elaborate the evolutionary history of the cannibalism taboo. The connection is likely best explained by positing some form of exaptation (sometimes also called “preadaptation”) in the evolution of these taboos. “Exaptation” refers to “features that now enhance fitness, but were not built by natural selection for their current role” (Gould and Vrba, 1982, p. 4; for a discussion of the importance of the exaptation concept for evolutionary psychology see Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998; Gould, 1991). The resemblance between the standards used

in evaluating the disgust level of different targets for sex and cannibalism suggests that aspects of one mechanism (either the sex or cannibalism rejection mechanism) was borrowed from the other mechanism for a new purpose.

Of course, further work is needed to verify this history. One open question is the order of the evolution of these mechanisms. That is, there is nothing in our data that informs us whether the cannibalism mechanism was likely exapted from the sexual rejection mechanism, or vice versa.

At first glance, it seems more likely that the standards for choosing appropriate and desirable sexual partners (and, therefore, for rejecting inappropriate or less desirable partners) developed first. The importance accorded mate choice in the evolutionary process would suggest that it would be damning to the evolutionary survival of an organism's line if that line did not evolve successful mate choice standards. An organism which exapted standards specialized for some other behavior to that important process would seem condemned to an adaptive dead-end.

On the other hand, the fact that the emotion involved in both of these processes is disgust points in the opposite direction. As Darwin (1872/1965) pointed out, disgust is evoked by "something revolting, *primarily in relation to the sense of taste* [emphasis added], as actually perceived or vividly imagined" (p. 253). Definitions of disgust proposed in the past 130 years always identify ingestion or the mouth as the most central or 'core' component of disgust (see Rozin, Haidt, & McCauley, 2000 for a review).

The association of disgust with food consumption suggests that the cannibalism mechanism evolved first, and was later exapted by the sexual rejection mechanism. "Core disgust may have been preadapted as a rejection system, easily harnessed to other

kinds of rejection. This harnessing, or accretion of new functions may have happened either in biological evolution or in cultural evolution” (p. 124, Rozin, McCauley, & Imada, 1997). The evolutionary history of these social rejection mechanisms clearly needs further study.

#### Future Research

Further research is also needed to more exactly determine the emotional mechanism associated with taboos. The role of disgust was merely an assumption, and it should be more directly verified. Furthermore, the disgust associated with cannibalism and the disgust associated with inappropriate sexual contact may be two separate emotion. This, too, needs to be examined in future research.

It is also important to examine the connection between sex and cannibalism with methods other than the one we used in the current research. Like a variety of other research within evolutionary psychology (e.g., Burnstein, Crandall, & Kitayama, 1994; Buss, 1989) we relied on self-reported assessments of how people would feel and act in hypothetical situations. We could not very well ask people to engage in actual cannibalistic behavior! However, it would be desirable to systematically examine historical, archeological, and ethnographic accounts of cannibalism to see if the patterns observed conform to patterns of sexual behavior. For example, research using methods designed to examine ‘implicit’ attitudes might be adaptable to examine the connection between sex and cannibalism.

Further examining the parameters of the sex-cannibalism connection is also crucial. Conclusions about the evolution and nature of cannibalism and sexual disgust will be quite different depending on whether the standards used to determine the most disgusting

targets are common to all or many forms of social contact, or whether they appear to be limited to sex and cannibalism. In particular, the two behaviors used in the current research (cannibalism and French kissing) both involve the mouth. It will be interesting to see whether non-oral behaviors (both sexual and non-sexual) will result in the same pattern of interpersonal disgust.

#### Domain-specificity.

The current findings raise empirical questions about a central assumption of cognitive adaptationism. Cognitive adaptationists assume that the human mind is made up of a “an intricate network of functionally dedicated computers, each activated by different classes of content or problem” (Tooby & Cosmides, 1992, p. 94). These *domain-specific* dedicated computers or modules contain their own dedicated rules of operation and content-specific information.

Beyond this general agreement on the modularity of the mind, however, cognitive adaptationists have done little to explicate the nature of modules (Kenrick, Sadalla, & Keefe, 1998; see also Bechtel, 2003; Murphy, 2003) or to provide guidance as to what makes up specific content or problems to which a domain-specific module should be dedicated (Sterelny & Griffiths, 1999; Stotz & Griffiths, 2003).

The concept of a domain is usually simply described with examples. Cosmides and Tooby (1997, Principle 4, para. 4) for example, justify domain-specificity with the following: “To solve the adaptive problem of finding the right mate, our choices must be guided by *qualitatively different standards* than when choosing the right food” (emphasis in the original). As our data demonstrate, however, the connection between food choice and mate choice may not be as obvious as this example seems to imply: Our participants

appear to be using *qualitatively equivalent standards* in at least one aspect of choosing (or, rather, rejecting) mates and food. At a minimum, our findings suggest that a more complete understanding of the nature of domain-specific modules must be developed.

The lack of specificity about the meaning of domain-specificity, however, makes it difficult to clearly decide if our findings are truly evidence of a domain-general mechanism. It may be that the domain of relevance to our findings is the insertion of things in the mouth (e.g., cannibalism and French kissing; see above). Another way to conceptualize our findings may be as part of a disease avoidance module. However, if we allow for such a module, and also accept earlier evidence for modules such as those for mate selection and food choice, then the modules appear not to be as isolated as generally asserted by cognitive adaptationists. What seems obvious is that further conceptual and empirical work is needed to clarify these concepts.

### Conclusion

The current research offers some insight into the evolution of the cannibalism taboo, although many questions remain to be answered. If the connection between sex and cannibalism is confirmed, this could explain our fascination with this behavior. The rejection of inappropriate food and inappropriate sexual partners are ancient needs, and it should not surprise us that the connection has been previously noted, especially by someone as insightful as the father of modern philosophy, Immanuel Kant:

An enjoyment of this sort involves at once the thought of her as merely consumable (*res fungibilis*) and that in fact is what the reciprocal use of each other's sexual organs by two people provides. One or the other parties may be destroyed (consumed) through infection, exhaustion, or impregnation (a

delivery can be fatal), and so the appetite of a cannibal differs only insignificantly from that of a sexual libertine. (Kant, 1797/1999, Ak. 12:182 [p. 521]).

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Table 1. Four Hypotheses for the Evolution of the Cannibalism Taboo

**The Predation Avoidance Hypothesis :** Killing humans was more dangerous than killing other animals.

PREDICTIONS:

- Adults are more dangerous than children, so it will be more disgusting to eat an adult than to eat a child.
- It will be more disgusting to eat someone who was hunted to be eaten than it will be to eat someone who died accidentally or who died from a virus.

**The Disease Avoidance Hypothesis:** We are more likely to get a disease from eating humans than from eating other animals, because humans will have diseases that are specialized for humans.

PREDICTION:

- It will be more disgusting to eat someone who died from a virus than to eat someone who died accidentally or someone who was hunted to be eaten.

**The Mate Pool Hypothesis:** Practicing cannibalism presents a risk of eating potential mates, thereby reducing the mate pool.

PREDICTIONS:

- It will be more disgusting to eat a member of the opposite sex.
- For members of the opposite sex, it will be more disgusting to eat someone who is good-looking (especially for males) and more disgusting to eat someone high in status (especially for females).
- For members of the opposite sex, it will be more disgusting to eat someone who was hunted to be eaten, than someone who died accidentally.
- For members of the same sex, there will be no systematic differences in level of disgust.

**The Inclusive Fitness Hypothesis:** Practicing Cannibalism Risks the Lives of Relatives, who Share our Genetic Material.

PREDICTIONS:

- It will be more disgusting to eat a relative than to eat a friend of the family, especially if they are hunted to be eaten.
- Because older people are beyond reproductive age, it will be less disgusting to eat an older relative than to eat a younger relative, especially if they are hunted to be eaten.

Table 2. Targets Judged in All Studies

Study One

A Child Who Was Hunted to be Eaten

A Child Who Died as the Result of a Virus

A Child Who Died by Accidentally Drowning In a River

An Adult Who Was Hunted to be Eaten

An Adult Who Died as the Result of a Virus

An Adult Who Died by Accidentally Drowning In a River

Study Two

An Unattractive Man Who Was Hunted to be Eaten

An Unattractive Man Who Died by Accidentally Drowning in a River

A Handsome Man Who Was Hunted to be Eaten

A Handsome Man Who Died by Accidentally Drowning in a River

An Unattractive Woman Who Was Hunted to be Eaten

An Unattractive Woman Who Died by Accidentally Drowning in a River

A Beautiful Woman Who Was Hunted to be Eaten

A Beautiful Woman Who Died by Accidentally Drowning in a River

Study Three

A Male Slave Who Was Hunted to be Eaten

A Male Slave Who Died by Accidentally Drowning in a River

A Male Chief Who Was Hunted to be Eaten

A Male Chief Who Died by Accidentally Drowning in a River

A Female Slave Who Was Hunted to be Eaten

A Female Slave Who Died by Accidentally Drowning in a River

A Female Chief Who Was Hunted to be Eaten

A Female Chief Who Died by Accidentally Drowning in a River

Study Four

A 75 Year Old Aunt Who Was Hunted to be Eaten

A 75 Year Old Aunt Who Died by Accidentally Drowning in a River

A 14 Year Old Niece Who Was Hunted to be Eaten

A 14 Year Old Niece Who Died by Accidentally Drowning in a River

A 75 Year Old Friend of the Family Who Was Hunted to be Eaten

A 75 Year Old Friend of the Family Who Died by Accidentally Drowning in a River

A 14 Year Old Friend of the Family Who Was Hunted to be Eaten

A 14 Year Old Friend of the Family Who Died by Accidentally Drowning in a River

Study Five

A Handsome Uncle

An Unattractive Uncle

A Beautiful Aunt

An Unattractive Aunt

A Handsome Male Friend

An Unattractive Male Friend

A Beautiful Female Friend

An Unattractive Female Friend

Study Six

A 14-Year Old Chief Who Died (Is Dying) As a Result of an Accident

A 14-Year Old Chief Who Died (Is Dying) As a Result of a Disease

A 14-Year Old Slave Who Died (Is Dying) As a Result of an Accident

A 14-Year Old Slave Who Died (Is Dying) As a Result of a Disease

A 75-Year Old Chief Who Died (Is Dying) As a Result of an Accident

A 75-Year Old Chief Who Died (Is Dying) As a Result of a Disease

A 75-Year Old Slave Who Died (Is Dying) As a Result of an Accident

A 75-Year Old Slave Who Died (Is Dying) As a Result of a Disease

Table 3. 2 X 2 (Gender X Behavior: Cannibalize/Kiss) ANOVA Results, Separately for Each Target. (Study 5)

|               |            | Targets    |            |              |              |            |            |              |              |
|---------------|------------|------------|------------|--------------|--------------|------------|------------|--------------|--------------|
|               |            | Male       | Male       | Male         | Male         | Female     | Female     | Female       | Female       |
|               |            | Handsome   | Handsome   | Unattractive | Unattractive | Beautiful  | Beautiful  | Unattractive | Unattractive |
|               |            | Relative   | Friend     | Relative     | Friend       | Relative   | Friend     | Relative     | Friend       |
| <u>Effect</u> | $F_{1,67}$ | $F_{1,67}$ | $F_{1,67}$ | $F_{1,67}$   | $F_{1,67}$   | $F_{1,67}$ | $F_{1,67}$ | $F_{1,67}$   | $F_{1,67}$   |
| G             | 24.83***   | 78.22***   | 12.10***   | 53.63***     | 92.85***     | 15.62***   | 88.65***   | 22.71***     |              |
| B             | 5.07*      | 3.91*      | 10.06**    | 0.38         | 0.03         | 6.74**     | 1.00       | 3.97*        |              |
| G X B         | 9.04**     | 12.45***   | 7.24**     | 16.55***     | 12.34***     | 9.48**     | 26.09***   | 9.27**       |              |

\*-  $p = .05$ ; \*\* -  $p = .01$ ; \*\*\* -  $p < .001$

NOTE: G = Gender; B = Behavior;

Table 4. 2 X 2 X 2 (Sex X Appearance X Relationship) Within-Participant ANOVAs – Separately for Each Behavior/Participant-Gender Combination. Study 5.

|                  | Female Participants | Female Participants    | Male Participants   | Male Participants      |
|------------------|---------------------|------------------------|---------------------|------------------------|
|                  | Judging Cannibalism | Judging French Kissing | Judging Cannibalism | Judging French Kissing |
| <u>Effect</u>    | F <sub>1,16</sub>   | F <sub>1,18</sub>      | F <sub>1,16</sub>   | F <sub>1,17</sub>      |
| Sex (S)          | 11.05**             | 160.79***              | 1.32                | 1209.35***             |
| Looks (L)        | 1.63                | 68.20***               | 1.90                | 126.58***              |
| Relationship (R) | 17.49**             | 193.77***              | 3.79‡               | 257.12***              |
| S X L            | .11                 | 2.94‡                  | 2.70                | 0                      |
| S X R            | .13                 | 4.45*                  | .12                 | 1.0                    |
| L X R            | .24                 | .14                    | 1.09                | 4.86*                  |
| S X L X R        | 1.91                | .79                    | 0                   | 1.00                   |

‡ -  $p = .10$ ; \* -  $p = .05$ ; \*\* -  $p = .01$ ; \*\*\* -  $p < .001$

Table 5. Two Significant Interactions. Study 5.

## (a) Female Participants Judging French Kissing

|         | Friends of the Family | Relatives |
|---------|-----------------------|-----------|
| Male    | 0.55                  | 3.79      |
| Targets | (0.23)                | (0.87)    |
| Female  | 3.39                  | 6.26      |
| Targets | (0.98)                | (0.35)    |

## (b) Male Participants Judging French Kissing

|           | Handsome/Beautiful | Unattractive |
|-----------|--------------------|--------------|
| Friends   | 1.92               | 3.25         |
| of the    | (0.39)             | (0.39)       |
| Family    |                    |              |
| Relatives | 3.85               | 4.79         |
|           | (0.33)             | (0.27)       |

Table 6. 2 X 2 (Gender X Behavior: Cannibalize/Kiss) ANOVA Results, Separately for Each Target. (Study 6)

|               |            | Targets     |             |             |             |             |             |             |             |
|---------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|               |            | 14-Year Old | 14-Year Old | 14-Year Old | 14-Year Old | 75-Year Old | 75-Year Old | 75-Year Old | 75-Year Old |
|               |            | Chief who   | Chief who   | Slave who   | Slave who   | Chief who   | Chief who   | Chief who   | Chief who   |
|               |            | Died by     | Died from a |
|               |            | Accident    | Disease     | Accident    | Disease     | Accident    | Disease     | Accident    | Disease     |
| <u>Effect</u> | $F_{1,75}$ | $F_{1,75}$  | $F_{1,75}$  | $F_{1,75}$  | $F_{1,75}$  | $F_{1,75}$  | $F_{1,75}$  | $F_{1,75}$  | $F_{1,75}$  |
| G             | .15        | .16         | 4.68*       | .05         | .75         | 3.86*       | 1.02        | .10         |             |
| B             | 6.07**     | 4.76*       | 2.94‡       | 6.38**      | 12.98***    | 3.07‡       | 5.86*       | .33         |             |
| G X B         | 2.88‡      | 2.54        | 2.83‡       | .53         | 0.00        | 5.03*       | 1.00        | .33         |             |

‡ -  $p = .10$ ; \* -  $p = .05$ ; \*\* -  $p = .01$ ; \*\*\* -  $p < .001$

NOTE: G = Gender; B = Behavior;

Table 7. 2 X 2 X 2 (Age X Status X Cause of Death) Within-Participant ANOVAs – Separately for Each Behavior/Participant-Gender Combination. Study 6.

|                    | Female Participants | Female Participants    | Male Participants   | Male Participants      |
|--------------------|---------------------|------------------------|---------------------|------------------------|
|                    | Judging Cannibalism | Judging French Kissing | Judging Cannibalism | Judging French Kissing |
| <u>Effect</u>      | F <sub>1,20</sub>   | F <sub>1,20</sub>      | F <sub>1,17</sub>   | F <sub>1,18</sub>      |
| Age (A)            | 4.53*               | 96.09***               | 10.72**             | 67.67***               |
| Status (S)         | 43.69***            | 9.82**                 | 4.67*               | 8.06*                  |
| Cause of Death (C) | 50.57***            | 152.94***              | 930.41***           | 102.62***              |
| A X S              | 6.25*               | .25                    | .11                 | .17                    |
| A X C              | 1.79                | 4.08‡                  | .19                 | .09                    |
| S X C              | 1.13                | 1.09                   | .49                 | .92                    |
| A X S X C          | .39                 | .52                    | 1.66                | 1.31                   |

‡ -  $p = .10$ ; \* -  $p = .05$ ; \*\* -  $p = .01$ ; \*\*\* -  $p < .001$

Figure 1. Disgust Scores for Female Participants (Study 3)

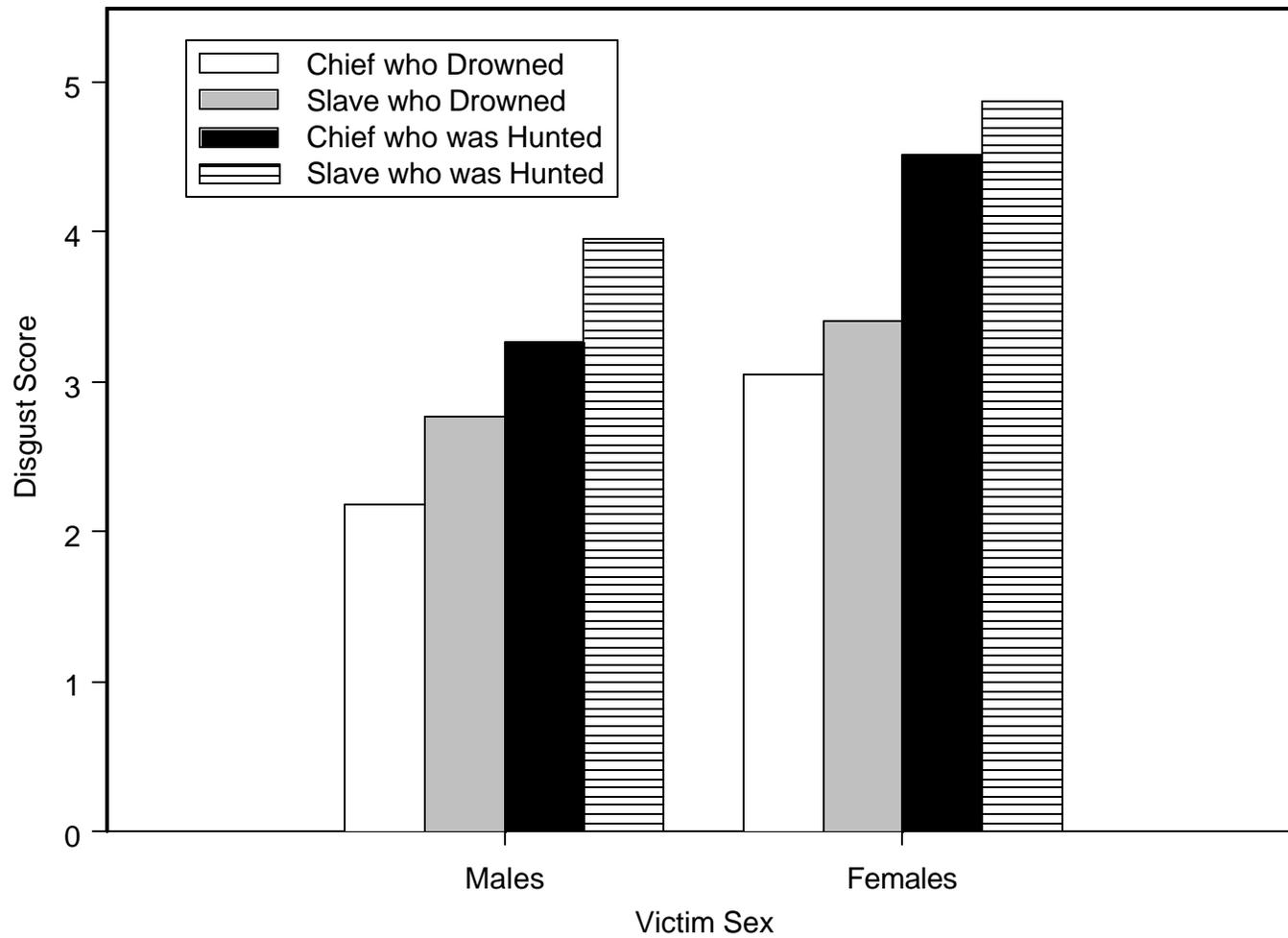


Figure 2. Disgust Scores for Judgments of Cannibalism and French Kissing (Study 5)

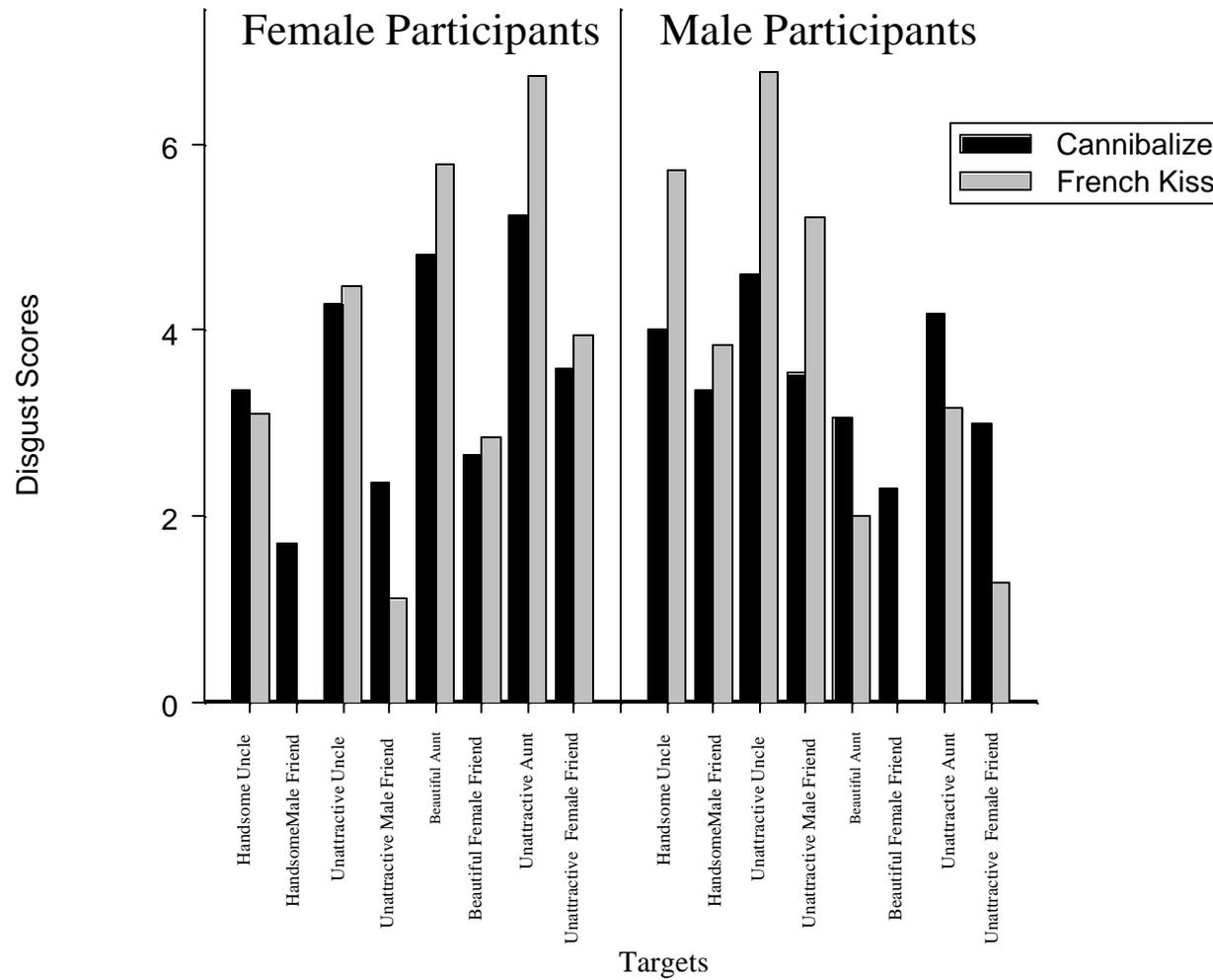
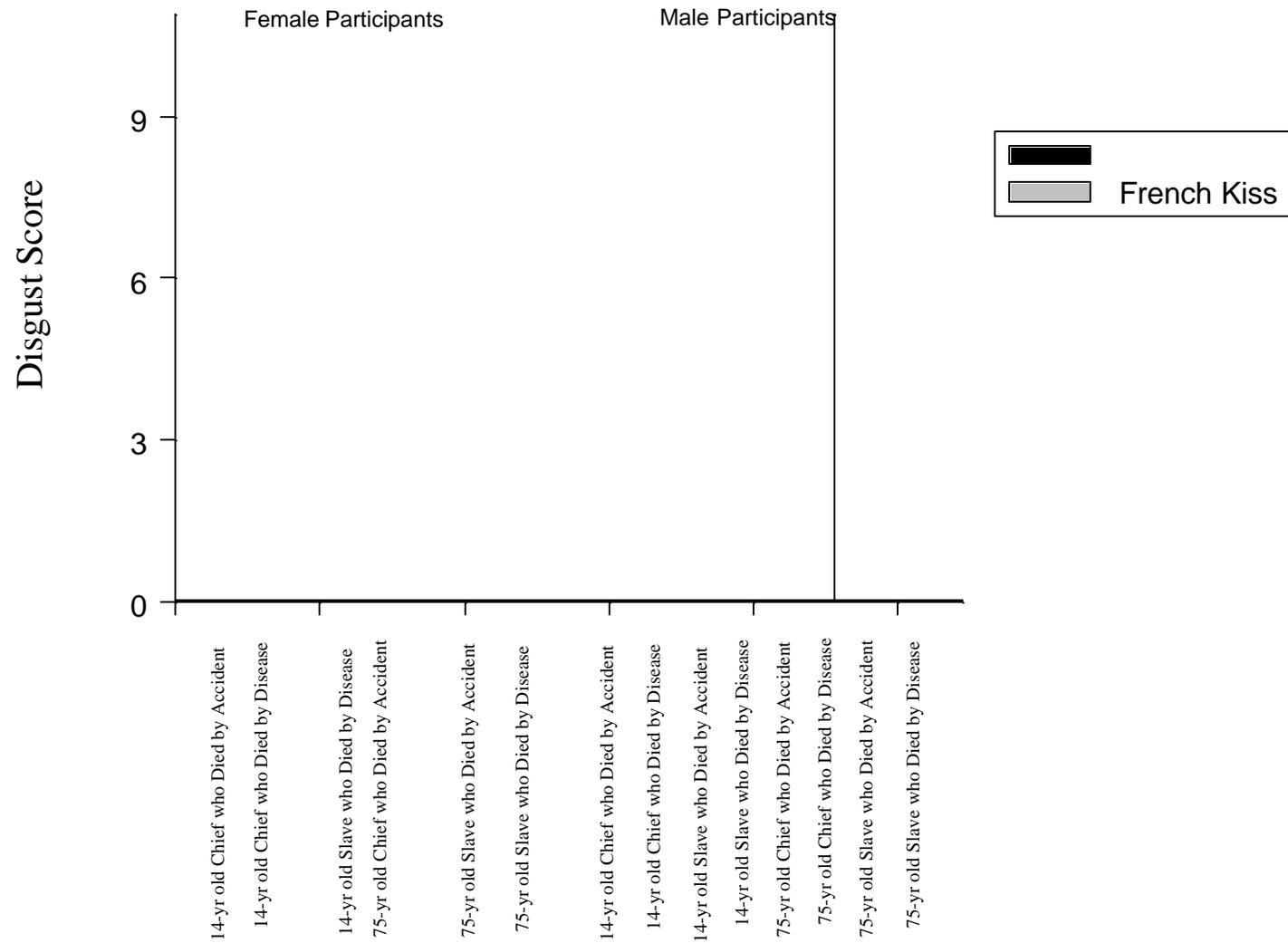


Figure 3. Disgust Scores for Judgments of Cannibalism and French Kissing (Study 6)



## Footnotes

<sup>1</sup> Although cannibalism as a result of some form of mental disorder (e.g., Jeffrey Dahmer) may be related to the issues discussed in the current paper, it is sufficiently different that we will not mention it further.

<sup>2</sup> Ironically, many foods gain their disgust-generating potential not from a natural process, but from their incorporation into a system of moral food taboos (cf., Whitehead, 2000).

<sup>3</sup> Although some have claimed that the disease came not from the consumption of infected victims, but from contact while preparing the corpses (Goodfield, 1997).

<sup>4</sup> Although we did not ask Ps their sexual orientation, previous research with this population suggests that all or almost all participants would have indicated that they were heterosexual. Over 300 students in this population have been asked questions about their sexual orientation, and none have ever indicated anything other than heterosexual. While there is likely some error in this measurement, we can feel confident that the vast majority of participants are heterosexual.

<sup>5</sup> We used the word “cannibalize” rather than “eat” in studies Five and Six, to avoid any possible sexual connotations of the word “eat”.