



## Original Article

## Physical attractiveness and cooperation in a prisoner's dilemma game

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## ABSTRACT

The modulating role of age on the relationship between physical attractiveness and cooperativeness in a prisoner's dilemma game (PDG) was investigated. Previous studies have shown that physical attractiveness is negatively related to cooperative choices among young men but not young women. Following the argument that the negative relationship between physical attractiveness and cooperation is a product of short-term mating strategies among attractive men, we predicted that this relationship is unique to young men and absent among women and older men. We tested this hypothesis with 175 participants (aged 22–69 years). The results showed that physical attractiveness was negatively related to cooperative behavior among young men but not among women or older men. We further observed that the negative relationship between physical attractiveness and cooperation among young men was particularly strong when attractiveness was judged by women.

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Physical attractiveness, particularly facial attractiveness, invites favorable responses from other individuals. People tend to perceive that physically attractive individuals possess desirable personal traits, such as intelligence and benevolence. This perception is referred to as the “what is beautiful is good” stereotype, which is an example of the more general halo effect studied in social psychology (Dion et al., 1972). This stereotype has considerable effects on daily life. Hamermesh and Biddle (1994) observed that individuals who were rated “above average” in physical attractiveness earned higher incomes than less attractive individuals. This “beauty premium” is caused by employers' beliefs that good-looking employees perform better than their less attractive counterparts (Mobius & Rosenblat, 2006). Mobius and Rosenblat (2006) observed that employers wrongly expect attractive individuals to perform better and pay them more than less attractive individuals, even when productivity is obviously unrelated to attractiveness. Similarly, individuals judge more attractive women as having desirable traits, such as conscientiousness, compared with their less attractive counterparts (Segal-Caspi et al., 2012). Economic game experiments also indicate that attractive individuals are treated favorably. Participants in a prisoner's dilemma game (PDG) tend to cooperate with participants they find attractive (Mulford et al., 1998). In a public goods game, participants cooperated more with attractive than less attractive partners and expected that attractive partners would be cooperative. Consequently, attractive partners earned more than less attractive partners (Andreoni & Petrie, 2008). Additionally, attractive participants in a trust game were expected to be trustworthy and were therefore trusted by their partners (Wilson & Eckel, 2006). These results consistently indicate that (1) people believe

that physically attractive individuals possess desirable traits and (2) attractive individuals are treated more favorably than unattractive individuals (for a meta-analysis, see Langlois et al., 2000).

Is this belief true? Empirical studies of women have revealed that attractiveness does not correlate with desirable inner traits (Segal-Caspi et al., 2012). For men, one laboratory experiment showed that attractiveness functions in the opposite direction than implied by the “what is beautiful is good” stereotype: more physically attractive men were less likely to cooperate during prisoner's dilemma or similar economic games (Takahashi et al., 2006). Zaatari and Trivers (2007) observed a similar pattern in an ultimatum game. The authors observed that the generosity of an offer from male proposers in an ultimatum game was positively correlated with fluctuations in asymmetry (FA; the deviation from bilateral symmetry in the body). Because FA is negatively related to facial attractiveness (Gangestad et al., 1994), this result suggests that the responders' physical attractiveness elicited generous offers from the matched proposer.

### 1. Physical attractiveness and cooperation

Why is physical attractiveness unrelated or negatively related to the behavioral cooperativeness exhibited in the aforementioned experiments? Fitness-related evolutionary theories explain these results from the logic of mate selection (Takahashi et al., 2006; Waynforth, 2002) or phenotypic quality (Zaatari & Trivers, 2007).

Takahashi et al. (2006) assume that physical attractiveness is an indicator of the good genetic quality of others (cf. Gangestad et al., 1994). Building on this assumption, the authors argue that attractive men would be more likely to pursue short-term mating strategies, whereas less attractive men (who would be less successful in short-

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term mating efforts) would be more likely to pursue an alternative, long-term mating strategy. Physical attractiveness, which is an indicator of good genes, is a high-value asset for short-term mating. Physically attractive men who are desired by women because of their good genes can translate their attractiveness into reproductive success in short-term mating. However, less attractive men who are less successful with such a strategy will turn to an alternative strategy to secure reproductive success in long-term mating efforts. These men must attract long-term mates by accumulating resources that make them desirable long-term mates instead of physical attractiveness. Buss and Schmitt (1993) argued that women who adopt long-term mating strategies seek men who have the ability to invest resources in her and her children on a long-term basis. These women value a partner's economic and social resources (e.g., a good financial prospect). Therefore, cooperation with other members of the community helps men acquire such resources. For example, food sharing is prevalent in hunter-gatherer societies and is critical for survival (Kaplan & Hill, 1985), and sharing is typically conditional on the receiver's willingness to give (Gurven, 2006). The long-term mating strategy adopted by less physically attractive men thus encourages them to cooperate with other individuals to acquire valuable resources to make them desirable long-term mates. The logic that connects physical attractiveness and short- versus long-term mating strategies applies less to women, for whom the advantage of utilizing the short-term strategy is not prominent. A possible advantage of physical attractiveness for women in short-term mating may be in their success at attracting men with good genes, but this potential advantage presumes that men are selective when obtaining short-term mates. However, men who seek short-term mates are generally not selective (Trivers, 1972). Women assume the long-term strategy because they cannot utilize their attractiveness in reproductive success that derives from the quality and not quantity of offspring. Thus, no relationship is predicted between women's physical attractiveness and a long- versus short-term mating strategy, which includes cooperativeness as a component of the long-term strategy.

Zaatari and Trivers (2007) presented an argument similar to ours with some differences emphasized. The authors assumed that symmetrical individuals have a wide range of high quality phenotypes (e.g., resistance to parasites, strength, and mental acuity). Accordingly, more symmetrical and thus more physically attractive and fit men would be less likely to make generous offers in an economic game because their superior phenotypic qualities allow them to gain access to resources by force and without cooperation (e.g., via physical aggression). Waynforth (2002) also proposed a similar argument to ours: asymmetrical men (whose facial attractiveness is low) use mating tactics called "nice guy tactics"—the tactics to display a willingness to help women's reproductive efforts. However, "nice guy tactics" differ from the general cooperative strategy we proposed above as a means to acquire resources. "Nice guy tactics" are directly tied to men's behavior toward women, whereas the general cooperative strategy is a more general means to acquire resources. Although Waynforth could not provide evidence from his questionnaire study to support the presence of a positive relationship between FA and "nice guy tactics," his data did not test the relationship between FA and the general cooperation strategy that extends outside men's relationships with women.

We propose that the cooperativeness strategy, as a means to accumulate resources that may be used to attract women for long-term mating, is a general strategy and not necessarily a means to signal men's willingness to help women in their reproductive efforts. In this respect, our argument is different from the ideas that regard cooperative behavior as a mating signal (Farrelly et al., 2007; Hardy & Van Vugt, 2006; Iredale et al., 2008; Roberts, 1998; Zahavi, 1975). Evolutionary theories, such as the costly signaling theory (Zahavi, 1975) and competitive altruism (Roberts, 1998), predict that individuals will "show off" their willingness to cooperate with potential mates. This feature of our argument, that general cooperativeness is an indirect

mating strategy to attract women via resource accumulation, requires a study design in which cooperativeness is measured as a general disposition rather than as a signal to particular partners. This study design, which was adapted in the current study, will effectively eliminate the alternative interpretation that regards cooperativeness as a signaling strategy. Specifically, we used participants' choices in an anonymously played one-shot PDG presented to the participants in an exchange format (e.g., Kiyonari et al., 2000; Yamagishi et al., 2007; see the Method section for details) to measure the level of the participants' general cooperative tendencies.

Despite some differences in the specifics of the mating strategies utilized by more and less attractive men, these evolutionary accounts lead to the identical prediction: more attractive men, particularly young men at the height of their mate choice activities, are less likely to cooperate than their less attractive counterparts are. Previous studies (Takahashi et al., 2006; Zaatari & Trivers, 2007) supported one-half of this prediction—physical attractiveness was negatively related to cooperative tendencies for men but not women. However, the authors' results did not completely address the aforementioned hypothesis between physical attractiveness and cooperation because the negative relationship between the two concepts has only been studied among young men and women. The goal of the present study was to provide full support for the predicted relationship between attractiveness and cooperation. Specifically, we examined whether there was a negative attractiveness–cooperation relationship only for young men and not older men or women regardless of age. Mate selection theory suggests that reproductive competition is more intense among human males than females. Furthermore, male–male competition is considered most intense within age groups in which mating activities are at their peak, as indicated by higher homicide rates among young men than other age–sex groups (Hiraiwa-Hasegawa, 2005; Wilson & Daly, 1985). Furthermore, a preliminary questionnaire study shows the negative correlation between age and short-term mating preference among males, but not females (male:  $r = -.18$ ,  $p < .01$ ,  $n = 233$ ; female:  $r = -.10$ , *n.s.*,  $n = 240$ ). Older males tend to pursue short-term mating opportunity less than younger males (Shinada et al., 2014). The negative link between age and short-term mating orientation among males suggests that mating activity is more intense among young males than older men or women regardless of age.

## 2. Methods

### 2.1. Procedure

#### 2.1.1. Participants

A total of 206 men and women from Sapporo, Japan, 22–69 years old as of February 2009, participated in the study. One hundred and one participants played a one-shot PDG in February and March 2009. The remaining 105 participants played the identical PDG in February 2011. Of the 206 participants who played the PDG, 183 participated in a photography session in October and November 2011. Before playing the PDG, the participants answered a series of questions, including questions about demographic variables such as age, sex, and wealth. The participants' written consent was obtained before their photograph was obtained for research purposes. The participants were asked to remove any adornments (e.g., glasses or accessories) and pose with a neutral expression. Seven participants refused to have their photograph taken or failed to remove their eyeglasses and were excluded from further analyses. We also eliminated one participant's picture because of his inability to understand the PDG payoff structure. Thus, facial photographs of 87 men (age:  $M = 45.36$ ,  $SD = 12.96$ ) and 88 women (age:  $M = 45.97$ ,  $SD = 12.45$ ) were subjected to attractiveness judgments. Each photograph was cropped above the upper forehead and below the chin and edited to form a square. Using the above-described procedures, we obtained facial

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