

A THEORETICAL PROPOSAL FOR EXAMINING THE INTEGRATION OF COOPERATIVE AND COMPETITIVE MOTHERING BEHAVIOR

Maryanne L. Fisher¹, Becky Burch² Rosemarie I. Sokol-Chang³

¹Department of Psychology, Saint Mary's University, Halifax, NS, Canada

²Human Development, State University of New York, Oswego, NY, USA

³American Psychological Association

mlfisher.99@gmail.com

ABSTRACT

Over the course of evolutionary history, women have faced situations where they presumably have needed to both compete and cooperate with the same group of kin and non-kin individuals for the purposes of advancing reproductive success. Here we focus exclusively on mothers, and explore some of the advantages of cooperating with other mothers (as well as other individuals) versus competing with other mothers (and others). There has been noteworthy attention paid towards cooperative mothering behavior, but competitive mothering behavior has been relatively neglected. Therefore, our goal is to provide a review of the ways in which both types of behavior enhance a mother's reproductive success, and ultimately, show that the most beneficial strategy is integrate both cooperative and competitive behavior.

Keywords: *Cooperation, competition, allomothering, cooperative breeding, indirect aggression.*

INTRODUCTION

Over the course of human evolution, there have been strong selective pressures for women to form close relationships with other women, both kin and non-kin. These relationships serve the adaptive purpose of providing support, shared goods, and childcare assistance. Women occupy multiple roles within groups; among hunter-gatherers, they gather and prepare food, raise offspring, fish and hunt small mammals, construct houses, and prepare equipment for men's hunting parties, among other roles

(see Sokol-Chang, Burch, & Fisher, in press, for review). Women also face unique challenges in bearing children and in child-rearing, and contribute the most in terms of parental investment (Trivers, 1972). Women's maternity certainty means that they are assured that any investment in their children is directly dedicated towards biological kin, whereas men do not have parallel paternity certainty. Men may therefore provide little support, if they are unsure of their biological connection to the child (note, though, that compared to other mammals, human males do generally invest to a high degree, e.g., provisioning; Clutton-Brock, 1991). However, men's investment is usually far less than that of women, and women literally often must live with the consequences of reproduction (Gallup & Suarez, 1983). As a result, women might be left with near total responsibility of caring for children with little contribution from men; thus, there have been evolutionary pressures to the formation of strong bonds between mothers and others, primarily other women, who may provide needed assistance (Hrdy, 2009). This assistance comes in various forms. For example, among hunter-gatherer groups, women share gathered food, provide domestic assistance, and engage in cooperative childcare, which allows mothers to collect resources away from a base camp (see Sokol-Chang, Burch & Fisher, in press, for a review).

At different times in their lives, women both compete and cooperate with the same group of kin and non-kin women, which ultimately serves the evolutionary purpose of enhancing their reproductive success. Here, we focus exclusively on the point in women's lifespan where they become mothers. Over the course of human evolutionary history, the overwhelming majority of women would likely become mothers; as of 2014, even with the advent of contraceptives, only 19% of women in the United States were not mothers (Caumont & Wang, 2014). While there are strong pressures for mothers to cooperate with other mothers (and generally, other women) in the group, there are likewise circumstances where women directly compete with each other to increase the likelihood of their survival and reproductive success (see Stockley & Campbell, 2013). Women may compete for access or retention of mates, often in indirect ways such as through derogation of competitors or self-promotion (Fisher, 2013); we argue that mothers are included in such competitions. Likewise, in addition to competing to retain a mate, mothers may compete for resources that influence their children and themselves (Fisher & Moule, 2013); they presumably compete to gain access to food, clean water, and protection, all of which ultimately influence their own reproductive success and the survival of their children.

While there has been considerable attention towards cooperative mothering, the topic of competitive mothering has been almost entirely neglected. Therefore, our goal is to outline the theoretical framework which enables mothers to be both cooperative and competitive with other mothers, for the purposes of increasing child survival and reproductive success. We thus argue that evolutionary models of mothering must integrate both cooperative and competitive behavior.

MOTHERS AND COOPERATIVE BAHOVIOR

One of the motivations for cooperative behavior among mothers stems from the incredible threat of infant and child mortality on reproductive success. Volk and

Atkinson's (2008) analysis of human groups clearly indicates that once an individual reaches adulthood, mortality rates are relatively low. Moreover, in adulthood, the overwhelming majority of people will find a mate (almost 100% of women and approximately 90% of men in hunter-gatherer societies; Volk & Atkinson, 2008). Therefore, the largest challenge to individual fitness from an evolutionary stance is to raise a child who survives early threats to mortality.

As we review elsewhere (see Sokol-Chang, Burch, & Fisher, in press), raising an infant poses significant costs, due to their high level of dependence and consequently, multiple caregivers ideally provide support during the child's early years. Evidence of shared care stems from studies on infant holding; Hewlett (1989; 1991) reports that among many foraging societies, an infant is held by someone other than the mother 20-60% of the time, usually a close female relative or trusted babysitter. Further, in most cultures, women receive assistance from other women when giving birth (Rosenberg & Trevathan, 2002). Similar examples are derived from nursing behavior; among the Efe, women will sometimes nurse another woman's child if the mother is not available (Hewlett, 1989). Among the Ache, women cooperate while foraging for food resources by holding another woman's child, or by creating trails to collectible food (Hill, 2002). In foraging societies, after the birth of a child a woman's gathering production decreases and the deficit is mostly eradicated by friends and female relatives (e.g., Ache; Hill & Hurtado, 1996).

It is important to note that it is not just biological kin who provide care, but also female friends with no genetic relationship. As Sokol-Chang and colleagues (in press) review, women, more than men, form and maintain close, stable bonds with same-sex friends. Indeed, many women state that they love their same-sex best friends as much as their spouse (and often liking her more than a spouse) whereas men typically state they love and like their spouse the most (Sternberg & Grajek, 1984).

One mechanism that may underlie this cooperative behavior among unrelated women may be the tend-or-befriend stress response (Taylor, et al., 2000). Tend-and-befriend refers to behavior that occurs in response to a threat, in which one protects offspring (tends) and seeks out the mutual defense of others within a social group (befriends). While the traditional model of fight-or-flight describes a stress response more common among men, tend-and-befriend appears to be a better description women's typical response to stress. The emphasis on tending is not surprising, given classical attachment theory. Attachment is a social process that increases the proximity between a caregiver and offspring, thereby increasing the security for offspring (Bowlby, 1969). Indeed, there are hormonal similarities between attachment of the caregiver-infant relationship, and friendships, in that oxytocin may play an important role. Swain et al. (2014) report that oxytocin (as well as other hormones) acts upon neural pathways in the brain that are critical for mother-child bonding. In terms of social relationships, oxytocin promotes trust in those who experience emotional distress caused by social rejection, which may indicate that it leads people to seek social support following a stressful situation (Cardoso & Ellenbogen, 2014). It also has been shown to reduce reactive aggression in women with state anxiety; Campbell and Hausmann (2013) conclude that oxytocin may decrease stress and increase constructive behavior, even when dealing with provocation to behave aggressively. Indeed, oxytocin (and vasopression) appears to be important for the initiation of pair bonds and parental

behaviors, and thus, seems to underlie attachment behaviors (Insel, 1997). Hence, affiliative and tending behaviors may be linked to a biological stress response. Using this model, it is logical to propose that women's social networks (gained potentially via befriending) may function to provide childcare assistance, resource sharing, and protection from threats. While men might have been absent from a group for long periods during a hunt, women were present and cooperating with one another.

Indeed, the evidence clearly indicates that during human evolution, women have formed strong cooperative bonds with kin and with unrelated same-sex friends. There are many reasons why mothers may cooperate amongst themselves, or with others in the group. Shared childcare is a frequent commodity of exchange (Högnas, 2010); among the Fulbe, for example, women's social network size correlates with greater infant survival (Adams, Madhavan, & Simon, 2002). As well, women may rely on non-kin simply because there are no genetic relatives to offer help. Given the high historical (and perhaps contemporary) rates of female exogamy, where women moved into a new group of unrelated individuals once married (e.g., the Bari, see Lizarralde & Lizarralde, 1991), friends would have been critical for learning social norms and obtaining help. These alliances may rest upon reciprocal altruism, where there is a notable exchange of goods, time and energy, all of which improve the survival of both mother and child. Indeed, human's reliance on provisioning and shared care by non-kin has led Bogin, Bragg and Kuzawa (2014) to call humans biocultural reproducers, arguing that humans are unique in that alloparenting is defined culturally, rather than in strictly genetic terms.

MOTHERS AND COMPETITIVE BEHAVIOR

Given that there are powerful pressures on women to provide for themselves and their children, often without consistent or significant investment from mates, it is not surprising that women often rely on each other for support. However, humans also are prime candidates for competitive mothering behavior. According to Apicella and Dreber (2015), across species, females typically compete when there is a high level of maternal investment. This high investment includes when the female is pregnant and lactating, but also when she is trying to gain access to limited food resources, as well as status and dominance rank; see Stockley & Bro-Jørgensen (2011). Apicella and Dreber also argue that females compete when there are large aggregates of individuals living together which increases competition for local resources, and where paternal investment is necessary for the survival of offspring. Whereas the first two points (i.e., maternal investment and aggregated living conditions) are certainly accurate of humans, paternal investment is not necessary for child survival. However, it may decrease the likelihood of mortality (for a review, see Hurtado & Hill, 1992) yet remains notably variable and flexible compared to other species (Hrady, 2007). Therefore, we argue that mother's competitive behavior is aimed at securing access to resources involved in successful child-rearing, such as food, shelter, protection, and high quality mates.

Precisely what human mothers compete over remains unknown, and to date, there has been very little attention toward women's maternal competition. There has been a limited number of papers published; indeed, we can only locate one theoretical article by Fisher and Moule (2013). There has also been an empirical article by Linney and colleagues (2017) which reports on self-reported maternal attachment, as well as various

responses to a situation where a mother is making a point that she is a better mother than oneself, among other issues. Cox (2011; citing also Macdonald 2010) writes about competitive mothering as an ideology in terms of issues mothers face to maintain or enhance a child's social status. Aside from these articles, we do not know of any work that directly examines this topic.

Some of the most direct evidence for competitive mothering is yielded by studies of polygynous societies. In this mating system, co-wives may intrasexually compete for food and money, paternal care for their children, and for their children's inheritance (Burbank, 1987), and it still exists, albeit at a reduced level, among sororal co-wives (Jankowiak et al., 2005). Conflict between co-wives is often motivated by wanting the best for one's child; in 24 (35%) of the 69 cultures studied by Jankowiak et al. (2005), defending or advancing a child's interest was the source of co-wife conflict. Further, advancing a child's interest was often (23 out of 24 times) documented in conjunction with other motives leading to conflict. Pettay et al. (2016) report that among historical Finnish polygynous families (composed of related brothers and unrelated wives), the risk of child mortality before the age of 15 was increased by 23% if co-wives reproduced within two years of each other. This finding was attributed to resource competition. It must be noted, though, that generalized examinations of cooperation and competition within polygynous societies are not necessarily as accurate as examinations within specific sociocultural and personal contexts (Madhavan, 2002).

Competition for mates is linked to competitive mothering, in that high quality mates may themselves be considered a resource that is in limited supply in one's local mating environment. There has been a growing literature on women's competition for mates (see Fisher, 2013), and while mothers are not usually on the mating market per se, they cannot leave the market entirely. Once a woman becomes a mother, she has found and potentially secured a mate, however, she must engage in an array of retention behaviors to ensure that he does not leave the relationship. By doing so, she is also securing the resources that he will continue to provide to her and her child. Moreover, when mothers are competing with other mothers, they may be signaling a high level of investment in her child(ren) to her mate, thereby cementing his commitment to her and the child(ren), given she is advertising that she is a quality mother. Bjorklund and Pellegrini (2000) review some of the adaptive benefits of positive mothering behavior, which collectively, increase child survival. While finding, locating, obtaining access to, and retaining a mate is highly critical to a women's reproductive success, in that it leads to healthy children who ideally survive and reproduce, women compete in other arenas, as well. Indeed, Clutton-Brock (2009) proposes that in many species, females may compete more intensely for reproductive resources than for access to mating opportunities.

With respect to the influence of paternal investment, Gray and Anderson (2015) outline how paternally-provided resources positively influence a child's survival, health, socio-emotional outcomes, social competence, and educational attainment. At the same time, though, Mace (2013) argues that in some societies men actually increase, rather than decrease, women's workloads. Hence, a mixed strategy of relying both on other women and on mates seems advantageous. Thus, women may compete with each other to attain and retain a high quality mate who is willing to commit resources and time to the relationship, but also recognize that his investment may be intermittent or insufficient.

Although not directly related to competitive mothering per se, another strategy that mothers may use to increase her resources is to engage in opportunistic mating. Females can attempt to find other mates who are willing to invest when the primary male is absent or failing, allowing them to bridge gaps in resources by exchanging resources for sexual access (Thornhill & Gangestad, 1998). The observation that opportunistic mating is most likely to occur during phases marked by high estrogen (and hence, high fecundity) supports the idea that women are not just looking for resources, but also better biological fathers (Durante & Li, 2009). That said, during this phase, women also tend to maximize their sexual attractiveness (e.g., by dressing promiscuously) and are consequently more capable of obtaining a higher quality mate.

Generally, opportunistic mating behavior mirrors the interactions mothers have with other mothers, and men and women in their community. All of these relationships share the same flexible strategy that takes advantage of allies, relatives, and mates (using both competition and cooperation) to secure the greatest level of support and resources for themselves and their children. Indeed, Buss and Schmitt (1993) found that regardless of what resources women were able to procure for themselves, they prefer men that can provide additional resources. Furthermore, women allocate resources directly on children, and this allocation is associated with improvements in child health, household nutrition, and housing (Thomas, 1993). Given the profound investment that children require, women need, and use, all the assistance they can obtain.

INTEGRATING COOPERATION AND COMPETITION AMONG MOTHERS

We propose that high parental investment by women in their children directly causes intense cooperation and competition to occur within their relationships with other mothers, as well as other women in general. The majority of research on competition among women has been directed towards mating competition, and we propose that it applies to mothers. Hence, women must engage in competition for access and retention of high quality mates because the costs of losing out are significant. Men vary in meaningful ways, including their abilities and interest in caring for children, their level of commitment, their skills at accruing necessary resources, and so on. We predict that not only do women compete intrasexually to find a suitable mate, but once they become mothers, they must compete to retain him. Moreover, if mothers experience mate desertion or other reasons that lead to the loss of a mate, they may re-enter competition for access to a new mate. Mothers must further compete to secure the necessary resources that directly influence the quality of their lives, and the lives of their children (e.g., food, shelter, status).

In evolutionary terms, then, mothers are women who are translating reproductive effort into offspring who ideally survive and later reproduce. In sum, the core issue is the differential reproductive success of individuals, even at the cost of others in the group (Hrdy, 1999). With this in mind, we posit that mothers may engage in a mixed strategy of competition and cooperation, as so long as the combination advances them to achieve higher reproductive success.

Indeed, mothers need help from others, and their reproductive success is increased by such assistance, as we have reviewed. Some scholars have gone so far as to state that a vital part of human life history is the collective sharing that such a network provides (Bell, Hinde, & Newson, 2014). It has been proposed that cooperation for the purposes of infant care has shaped many human cultural practices. For example, marriage provides a formal framework around family responsibilities, sociocultural norms for the timing of births, the facilitation of cooperation and coordination of parenting effort, as well as the protection and feeding of infants (Ibid).

Thus, one of the most noteworthy decisions that members of all social species must make is to select when it is best to cooperate versus compete with others (LaFreniere, 1996). But how does one compete with allies yet still maintain friendly, cooperative relationships with them? We argue that a partial solution is to rely on indirect aggression, which reduces not only potential physical harm to mothers (e.g., Stockley & Campbell, 2013), but also allows for the aggression to be circuitous and thereby reduces retaliation to the attacker (Björkqvist, 1994). That is, by using indirect aggression, one may provide the illusion of remaining cooperative, while attempting to gain the benefits of behaving competitively. The situation is complex, however, as Linney and colleagues (2017) found that mothers who engage in nonspecific boasting (e.g., saying their children are good at everything) or brag about the academic achievements of their children often annoy or anger other mothers, and are consequently shunned or rejected. Mothers may therefore compete with other women, but it may be best if their identity remains obscured. Moreover, though, given the risks of competing and being shunned, they may use indirect aggression in socially sanctioned ways to compete to gain status, which might lead to increased resources. For example, as Sokol-Chang, Burch, and Fisher (in press) propose, mothers decades ago competed via baking contests and better baby contests, which were socially sanctioned events that were widely considered appropriate avenues for competitive behavior. Events such as these were contests, but indirect in that the women were engaging in a 'friendly' competition as part of community spirit, with the winner gained prize money or similar, rather than competing in direct confrontations over limited resources.

Research on friendships also provides some insight into integrating cooperative and competitive behavior, as such alliances usually involve a blend of prosocial strategies (e.g., cooperation, assistance, persuasion) and coercive strategies (e.g., aggression, threats, insults). Liesen (2013) suggested that this dual-strategy approach allows women to maintain a favorable outward appearance but simultaneously maintain their status in the peer group. Applying this idea to mothers, they may similarly use coercion to acquire the resources they need for their children, yet also be prosocial when it is advantageous.

There are many directions for future research, particularly given that competitive mothering has remained overlooked. One issue for future work is to explore how mothers employ both cooperative and competitive behaviors within their relationships with non-kin and kin. Moreover, future research needs to address the agents involved in these relationships; are mothers engaging mostly with other mothers, or with non-mothers? While competition with other mothers is expected, non-mothers are also consumers of limited resources that impact on mothers and their children (e.g., nutrient dense foods, high quality mates). Preliminary research on synchronicity in women's pregnancy (Worth & Fisher, 2011) suggests that they are often influenced by other

mothers, in which case their cooperative and competitive interactions are likely most often (but not necessarily exclusively) with other mothers. Moreover, among mothers, is such competition mostly observed with mothers of approximately the same age, or with similarly aged children, given that age may impact on the types of resources one requires, and hence, increases scarcity of such goods?

It would also be interesting to examine how maternal competition affects children. For example, do children who perceive their mothers as acting in a competitive manner in a positive way, given that it may signal dedication of investment? A cursory scan of the literature shows the topic of children's perceptions of their parents is much less studied than mothers perceptions of their children. However, Grolnick and colleagues (1991) report that children who perceive their mothers to be highly involved tend to have a better understanding of how to control their own behavior and believe themselves to be more competent, which leads to stronger academic achievement. Perceptions of maternal competition could indicate involvement in parenting effort, in which case, it may lead to stronger academic support. It remains unknown whether perceptions of maternal cooperation would yield the same result.

Another avenue for further exploration is the application of biological market theory to cooperative and competitive mothering behavior. According to this theory, individuals gain advantages by spending the most time in friendships or cooperating with those yielding the most benefits (see Barclay, 2013, for a review). When people give benefits to their allies, these benefits may become a resource akin to currency that is traded for other currencies (e.g., food for childcare). In situations where people are free to choose their allies, competition exists such that those who provide high quality currencies will be favored. Given that mothers may choose with whom they cooperate, perhaps there is competition to be selected as a good cooperator. Moreover, perhaps mothers cooperate only with the most beneficial cooperating partners, and generally compete with others.

CONCLUSION

Although there has been considerable research devoted to cooperative mothering behavior, the topic of competitive mothering has been relatively overlooked. Here we review the benefits of both cooperation and competition, individually, with the aim of showing the advantages they offer for enhancing a mother's reproductive success. We suggest that the most advantageous strategy is for mothers to be both cooperative and competitive with other mothers, for the purposes of increasing child survival and reproductive success. We propose that one behavioral tool for maintaining cooperative alliances and yet competing with the same individuals is indirect aggression, whereby the identity of the aggressor may be hidden. Future research is needed to explore competitive mothering behavior, and how it is intertwined with cooperative mothering behavior, as we predict the most advantageous strategy is an integration of both competitive and cooperative behavior.

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