THE EFFECTS OF NESTING ON GRANDPARENT INVESTMENT

A thesis presented to the faculty of the Graduate School of Western Carolina University in partial fulfillment of the requirements for the degree of Master of Arts in Clinical Psychology.

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ABSTRACT

THE EFFECTS OF NESTING ON GRANDPARENT INVESTMENT

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Grandparental investment in grandchildren is a topic of interest within the field of evolutionary psychology. Studies have shown a consistent pattern of differences when it comes to each grandparent's investment levels (Danielsbacka, Tanskanen, Jokela, & Rotkirch, 2011; DeKay, 1995; Laham, Gonsakorale, & Von Hippel, 2005; Michaski & Shackelford, 2005; Pollet, Nettle, & Nelisson, 2006). The pattern is as follows: the maternal grandmother invests the most, followed by the maternal grandfather, the paternal grandmother, and finally the paternal grandfather. The current hypotheses and theories behind this pattern are based on previous evolutionary theories of relatedness (Hamilton, 1964) and relational certainty (Trivers, 1972). The large and consistent difference between maternal grandmothers and paternal grandfathers can be explained relatively directly based on relational uncertainty, as the maternal grandmother is the most certain that the grandchild is her genetic relative and the paternal grandfather is least certain. This explanation is widely accepted. However, the smaller but consistent differences in investment patterns by maternal grandfathers versus paternal grandmothers, in favor of the former, is not as easily explained. The two currently competing theories are as follows: (1) although maternal grandfathers and paternal grandmothers are equally uncertain of their relatedness, they invest differently depending on which generation their uncertainty lies in – the

grandparent generation for the grandfather and the parent generation for the grandmother; and (2) paternal grandparents have other grandchildren for which they are maternal grandparents, and they will choose to invest more in these more certain relatives. The current research was designed to test a new hypothesis, that patterns of grandparent investment are affected by whether or not grandparents are nested (coupled and sharing resources). A survey measuring grandparent investment across four dimensions was administered and found no significant differences between certain nested and unnested grandparents in terms of investment. Results instead revealed a different overall pattern of investment entirely, indicating multiple design flaws and providing some direction for future research.

CHAPTER ONE: INTRODUCTION

Patterns of grandparent investment in grandchildren, including emotional support, financial support, time, energy, and so forth, is an area of interest in evolutionary psychology. One well-established finding is that, in humans, mothers invest far more than fathers. This is based in part on many well-known theories, including Hamilton's (1964) theories of relatedness and altruism, Trivers's (1972) theory of differential minimum parental investment, Laham et al.'s (2005) hypothesis of preferential investment in more certain kin, as well as on the more broad, related theories of "paternity uncertainty," inclusive fitness (Hamilton, 1964), and altruism as a function of genetic preservation.

From an evolutionary standpoint, greater investment by mothers than fathers is reasonable, even though both have exactly the same .50 coefficient of relatedness to the child (meaning half of the child's DNA is its mothers, and the other half is its father's). Prehistorically, providing for a child was an extremely risky investment, but worth it in order to perpetuate a person's genes. Above and beyond the significant impact of differential minimum parental investment, since a mother had no doubt (zero degrees of uncertainty) that the child she bore was indeed genetically hers, she would devote the most resources to the child's care. A father, however, was not so sure. He certainly didn't give birth to the child, and he had no way of knowing whether or not his mate had remained loyal to him, therefore he would devote less resources to the child's care (he had one degree of uncertainty). Extending this reasoning to grandparents, while all four grandparents have a .25 coefficient of genetic relatedness to a grandchild, the level of "relational certainty" varies. The mother's mother (MoMo), like the mother herself, has zero degrees of uncertainty. The mother's father (MoFa) and the father's

mother (FaMo) each have one degree of uncertainty, the same as the father. However, the father's father (FaFa) has two degrees of uncertainty. A likely prediction, then, is that the MoMo would invest significantly more resources in the grandchild than the FaFa. The two principles involved in this prediction, coefficient of relatedness and relational certainty, do not allow a prediction of the relative investment of the other two grandparents, MoFa and FaMo, who should both be intermediate in comparison to the first two as, again, they each have one degree of relational uncertainty.

DeKay (1995) examined grandparent investment with regard to four dependent variables, including money invested, time spent, emotional closeness, and knowledge imparted. Overall, the investment levels were as follows: the mother's mother (MoMo) invested the most, followed by the mother's father (MoFa), the father's mother (FaMo), and finally the father's father (FaFa). Across all but one of the variables (knowledge imparted), the MoFa invested significantly more than the FaMo, even though both have one degree of relational uncertainty. DeKay suggested the following hypothesis for this consistent finding: (1) the degree of uncertainty – and the potential break in the genetic link – lies in the younger generation for the FaMo, (2) rates of marital infidelity are generally greater in younger generations, and (3) people are somehow aware of this population change in frequency of infidelity. Laham, Gonsakorale, and Von Hippel (2005) offered another hypothesis, that FaMos are less invested than MoFas because FaMos are likely to have daughters in addition to sons, and thus maternal grandchildren to whom they could re-direct resources with no uncertainty.

The current study was based on a third hypothesis: rather than an innate sense of infidelity, differences in grandparent involvement are influenced by "nesting effects." The four grandparents are not independent of each other; rather, they are nested in two ways, financially

and in living arrangements (shared budget, shared time, shared travel, etc.). Because they must share their pooled resources, nested or coupled grandparents must be more selective when it comes to grandchild investment. Because a MoMo has a stronger desire to aid her daughter's children than her partner does (the MoFa), she puts pressure on him to give more to these grandchildren as well. Conversely, the FaFa, with the most uncertainty, puts pressure on his partner (the FaMo) to limit investment in the most uncertain grandchildren – their sons' children. The current study proposed that controlling for nesting effects would produce an observable change in the established pattern of investment.

CHAPTER TWO: LITERATURE REVIEW

In some ways, the concept of investing resources in order to ensure another organism's survival or comfort is counter-productive to the investor's own personal goal of survival. Investing in another means a loss of valuable resources that the organism could directly use for itself, such as food, shelter, time, and other more general forms of protection. In addition, an organism that invests too much in companions risks being seen as submissive or weak by competing organisms, and could possibly be taken advantage of by more dominant competitors. However, research suggests that the benefits of behaving altruistically far outweigh the risks in most cases.

The link between altruism and inclusive fitness was first proposed and modeled by Hamilton (1964). He suggested that patterns of altruistic behavior were directly linked to factors that increased an organism's chances of survival, as well as to level of genetic relatedness between organisms. Hamilton (1964) described a mathematical model that explained altruism in humans as a function of inclusive fitness. He suggested that altruism evolved as way of maximizing an individual's inclusive fitness, because it promoted "...a limited restraint on selfish competitive behavior and [possibly] limited self-sacrifices" (Hamilton, 1964). This is particularly important in group-living animals/organisms, humans included, because they take note of what contributions or hindrances are brought to the group by other members based on capacity, intelligence, involvement, and cooperation and friendliness (Burnstein, Crandall, & Kitayama, 1994; Preston, 2013). This makes logical sense, as all of these traits are crucial to group cohesion and survival. Behaving generously and investing in group members likely helps to increase a group-living animal's chances of acceptance and survival.

The benefits of altruism are even greater for genetically related individuals. These relatives are a much more worthwhile investment, as they are guaranteed to carry on the shared genes, which is a long-term benefit for the giver. Not only is it more beneficial to invest in kin, people are more likely to express such generosity towards those with who they share genetic material. Further, the higher the degree of relatedness between individuals (the more closely related people are), the more likely they are to behave altruistically towards each other. Hamilton first quantified the "coefficients of relatedness" as such, based on the amount of shared genetic material between pairs: the parent-child and sibling dyads have a .50 coefficient of relatedness, the grandparent-child and aunt/uncle-niece/nephew dyads have a .25 coefficient of relatedness, and cousins have a .125 coefficient of relatedness. All other non-related pairs have a coefficient of zero. These coefficients are directly proportional to the amount of resources a relative will be willing to invest, so long as the potential benefits outweigh the risk, of course (Burnstein et al., 1994; Hamilton, 1964).

Contrary to these findings, Trivers (1972) found that when it comes to *parental investment* – a form of altruism defined by Trivers "as any investment by the parent in an individual offspring that increases the offspring's chance of surviving (and hence reproductive success)" (p. 139) – mothers and fathers do not equally invest in their children, with mothers investing more than fathers, even though they both have the same .50 coefficient of relatedness. These differing investment patterns among parents could be related to differences in male and female mate preferences, since it is preferential for females to select mates who are more likely to be dedicated to offspring, while it is preferential for a male to mate with as many females as possible while investing as little as possible in order to increase his chance of reproductive success overall (Buss, 1995, 1996). Trivers (1972) offered a subsequent explanation for these

patterns of mate selection styles. Females, who are perfectly certain that any offspring the produce will be genetically theirs, are able to fully invest in their children and can afford to be more discriminatory in their mate selection. Males, on the other hand, do not have to carry and bear any offspring, so they can never be perfectly certain that they are fathers to their mates' children. This makes investing resources in offspring slightly riskier for males than for females, since males run the risk of ensuring the survival of a competitor's genetic material rather than their own.

This reasoning was later used to explain patterns of investment and altruism within grandparent-grandchild relationships. DeKay (1995) recognized a pattern in people's perceptions of closeness with their grandparents – that most reported feeling closer to their uterine (maternal) grandparents than their agnatic (paternal) grandparents. A study aimed at grandparents was devised to examine levels of investment based on four different measures: emotional closeness and support, time spent with grandchildren, financial support given, and practical advice/knowledge imparted. Grandparents indicated whether or not they were maternally or paternally related to grandchildren, and which grandchildren they would be most and least likely to interact with and invest in. Results revealed that, true to observations, maternal grandparents did invest significantly more than their paternal counterparts, with each individual grandparent investing at significantly different levels. The pattern of investment was as follows for all but one of the four variables: the maternal grandmother (mother's mother, or MoMo) invested the most, followed by the maternal grandfather (mother's father, or MoFa), the paternal grandmother (father's mother, or FaMo), and finally the paternal grandfather (father's father, or FaFa) who invested the least. The only variable for which this pattern differed was the “practical advice” variable, where the FaFa invested significantly more than the FaMo.

This pattern has been consistently verified by other researchers. Michalski and Shackelford (2005) found through subject self-report that even when controlling for proximity to grandchildren and grandchild age, MoMos still invested more in their grandchildren than the other three grandparents combined. In addition, all grandparents reported significantly greater levels of investment in and emotional closeness to uterine grandchildren than agnatic grandchildren (Michalski & Shackelford, 2005). Laham et al. (2005) were also able to replicate these findings. Using a "feeling thermometer," grandchildren rated feelings of closeness with each of their grandparents, revealing the same previously established pattern.

DeKay's (1995) findings suggested a few things about grandparental investment based on paternity uncertainty and coefficients of relatedness. As previously stated, mothers and fathers invest in their offspring differently based on kinship certainty; mothers are completely certain that their offspring are genetically related (zero degrees of uncertainty), but fathers are not certain and must trust that a mate remained loyal (one degree of uncertainty). By extending this reasoning to older generations, we can see why grandparents may invest differently as well. A MoMo is absolutely sure that her daughter is genetically related to her, and that all of her daughter's offspring are genetically related to her as well, meaning she has 0 degrees of uncertainty in both generations. While a MoFa is sure that his daughter's children are genetically related to his daughter, he is not certain that his daughter is related to him, leaving him with one degree of uncertainty in his generation. A FaMo is certain that her son is genetically related to her, but she is not sure that her son's children are related to him, giving her one degree of uncertainty in her child's generation. Finally, a FaFa is neither certain that his son is genetically related nor that his son's children are genetically related, leaving him with two degrees of uncertainty – one in each generation.

Since the MoMo has zero total degrees of uncertainty and the FaFa has a total of two, it makes sense that they would invest the most and least, respectively. However, if the MoFa and FaMo each have the same degree of uncertainty (one), why is there such a distinct, consistent difference in their investment levels? If they have equal uncertainty, they should invest equally as well. DeKay (1995) offered an explanation for this logical discrepancy: (1) although the MoFa and FaMo each have one degree of uncertainty, the uncertainty lies in a different generation for both of them, (2) rates of infidelity are higher in younger generations, and (3) humans are biologically, innately aware of these differences in infidelity rates. Because the MoFa's degree of uncertainty lies in the older generation, he is slightly more certain than the FaMo, whose degree of uncertainty lies in the younger, less faithful generation.

The idea that humans evolved to be aware of generational differences in infidelity seems a bit far-fetched, to say the least. One alternative hypothesis for the differences between MoFa and FaMo investment was proposed by Laham et al. (2005), which is that FaMos are also MoMos to some of their grandchildren, and because those grandchildren for which they are MoMos are more certain investments, the grandmothers will invest more in those more certain grandchildren. This idea of *preferential investment in more certain kin* makes more logical sense, and has been both supported and opposed by subsequent research. According to Danielsbacka, Tanskanen, Jokela, and Rotkirch (2011), for grandparents who had both uterine and agnatic grandchildren, grandparents readily invested more resources in their uterine grandchildren. They also found that when women did not have more certain alternatives for investment – no maternal grandchildren – the differences in investment level between the MoFa and the FaMo nearly disappeared. Pollet, Nettle, and Nelisson (2006) found that maternal grandparents invest significantly more time in their grandchildren than do paternal grandparents, and that they have

more overall contact with their grandchildren. However, one study found that “grandchildren did not rate the MoFa consistently higher on the direct behavioral indices or on closeness when more certain investment outlets were available to the FaMo” (Bishop, Meyer, Schmidt, & Gray, 2009). There was also no significant difference between ratings for the MoFa and the FaMo. One possible explanation for these anomalous results may be a difference in design; the questions may have been worded differently, or the sample of subjects an outlying group. All evidence in support of or refuting all hypotheses was considered in the development of this project.

Statement of the Problem

To expand on the DeKay (1995) and Laham et al. (2005) hypotheses, the following study was conducted suggesting that differences in grandparent involvement are influenced by "nesting effects." Nested grandparents – those that are living as a pair-bonded couple – are nested in two ways: financially and in living arrangements. They must share their budget and time, and must coordinate travel cooperatively. Because they have to share these resources, they must be more selective in which, if any, of their grandchildren they should invest in. Because the MoMo has the most kinship certainty, she will put pressure on her partner, the MoFa, to devote more resources to their daughter's children. Similarly, because the FaFa has the least kinship certainty, he will put pressure on his partner, the FaMo, to divert resources away from their son's children.

Specific hypotheses are as follows:

With <u>emotional closeness</u> as the dependent variable,

H_{1A}: Nested MoFas will be rated higher than nested FaMos. This is based on previous findings of DeKay (1995) and Laham et al (2005).

H_{1B}: Un-nested MoFas and un-nested FaMos will not be rated differently. This is based on the ideas that (a) these grandparents are un-nested and no longer pressured by partners to selectively withhold resources, and (b) because they have the same degree of uncertainty, they will be equally close with grandchildren.

With <u>time spent</u> as the dependent variable,

H_{2A}: Nested MoFas will be ranked higher than nested FaMos. This is based on previous findings by DeKay (1995) and Laham et al (2005).

H_{2B}: Un-nested MoFas and un-nested FaMos will not be ranked differently. This is based on the ideas that (a) these grandparents are un-nested and no longer pressured by partners

to selectively withhold resources, and (b) because they have the same degree of uncertainty, they will spend similar amounts of time with their grandchildren.

With financial support as the dependent variable,

H_{3A}: Nested MoFas will be ranked higher than nested FaMos. This is based on previous findings by DeKay (1995) and Laham et al (2005).

H_{3B}: Un-nested MoFas and un-nested FaMos will not be ranked differently. This is based on the ideas that (a) these grandparents are un-nested and no longer pressured by partners to selectively withhold resources, and (b) because they have the same degree of uncertainty, they will provide similar amounts of financial support for their grandchildren.

With practical advice as the dependent variable,

H_{4A}: Nested MoFas will be ranked higher than nested FaMos. This is based on previous findings by DeKay (1995) and Laham et al (2005).

H_{4B}: Un-nested MoFas and un-nested FaMos will not be ranked differently. This is based on the ideas that (a) these grandparents are un-nested and no longer pressured by partners to selectively withhold resources, and (b) because they have the same degree of uncertainty, they will instill similar levels of practical advice in their grandchildren.

CHAPTER THREE: METHODS

Participants

The participants were 201 college-aged students at a university in the southeastern United States. Participants were 65 men and 133 women – as well as 3 non-identifying respondents – aged 17 to 24 years (M =18, SD = .904). Subjects were predominately Caucasian (82.1%), with African-American, Native American, Latino, Asian-American, and non-identified subjects making up 17.9% of the sample collectively. They were recruited through the Sona research participation system and were awarded .5 credit towards their introductory psychology courses upon completion of the survey. No particular exclusion or inclusion criteria were used to recruit subjects.

Instruments

Computers with internet access. Computers with internet access were used by all participants in order to access the online survey.

Qualtrics survey software. An 18-item author-created survey (see Appendix, p. 27) of grandparent investment was made through Qualtrics (see Appendix A). The survey included both an informed consent form describing the study, and a variety of questions and rating scales related to the four dimensions of grandparent investment (time spent, emotional closeness, financial support, and practical advice instilled). For example, some items asked the subject their level of emotional closeness to particular grandparents, or whether or not a grandparent initiated quality time with the subject or provided them with financial support without being asked to. Reliability measures were not obtained for the survey because its scales were not all locally independent; three of the four investment dimensions were measured using ranks, rather

than ratings, and the remaining measurable scale contained only four items, preventing the use of anyreliability analyses that could have been used. Upon completion of the survey, subjects were redirected to a second survey in order to ensure that participants receive class credit for participation. This second survey contained questions regarding each subject's name and student identification number, but was not connected to the first survey, which remained anonymous and confidential.

Sona research participant system. Participants gained access to the Qualtrics survey through the Sona system. Credit was directly awarded to participants who successfully completed the survey.

Procedure

The survey was made active through the Sona system, and participants were able to freely access and complete the survey whenever time allowed. Upon accessing the survey, subjects first read through the informed consent form and indicated that they either accepted or did not accept the terms. If they did not accept, the survey was terminated. If they did accept, they continued on to complete the rest of the survey. They were then re-routed to the second survey where they provided their identifying information. Upon completing this portion, the survey ended. Data was collected from Qualtrics and class credit was awarded to each student individually by the researcher. From start to finish, both surveys took approximately 10 minutes to complete.

CHAPTER FOUR: RESULTS

The sample (n = 201) was broken down into 4 major groups: Group 1 (n = 25), which consisted of only nested grandparents; Group 2 (n = 57), which consisted of nested maternal grandparents and unnested paternal grandparents; Group 3 (n = 46) which consisted of unnested maternal grandparents and nested paternal grandparents; and Group 4 (n = 73), which consisted of only unnested grandparents. A repeated measures analysis of variance was first conducted to test for group differences in overall grandparent closeness rating. Significant differences were found between all four grandparents ($F(3, 690) = 12.600$, $p < .001$), with MoMo rated highest (M = 7.45), followed by FaMo (M = 6.74) and MoFa (M = 6.28), with FaFa rated lowest (M = 5.43). These results differ slightly from what the literature describes as the norm, with a medium effect size ($\eta^2 = .09$). Tukey's HSD revealed significant differences between each group, $p < .001$. Contrary to the previously stated hypothesis that MoFas would be rated higher than FaMos on emotional closeness regardless of their status, the opposite was observed

H_1

A one-way ANOVA was used to examine possible differences among the grandparent groups in terms of emotional closeness. Emotional closeness with each grandparent was compared group-by-group. For MoMos, no statistically significant difference was found between couple groups (F (3, 183) = 2.269, p = .082), implying that MoMos always invested more in terms of emotional closeness, independent of their marital status. The same was found for FaMos (F (3, 172) = 1.26, p = .340), contrary to the prediction that unnested FaMos would invest differently. Congruent with predictions, MoFas were rated differently between couple groups (F (3, 172) = 11.982, $p < .001$), with a moderate effect size ($\eta^2 = .61$; Cohen 1966) and perfect

power. A post-hoc analysis using Tukey's test of honestly significant differences (Tukey, 1953) revealed specific differences between groups 1 and 3 ($p < .001$) groups 1 and 4 ($p = .002$), groups 2 and 3 ($p = .001$), and groups 2 and 4 ($p < .001$). These results suggest, as expected, a difference in MoFa investment based on whether or not he is nested (groups 1 and 2) or unnested (groups 3 and 4). Another significant difference was found between groups for FaFas (F (3, 155) = 5.781, $p = .001$). Tukey's HSD revealed specific differences between only groups 3 and 4 ($p < .001$) with a very large effect size ($\eta^2 = 1.094$) and perfect power. This implies that, when it comes to emotional closeness, FaFas' ratings are dependent on whether or not maternal grandparents are nested.

H_2

Because data obtained for hypotheses H_2, H_3, and H_4 were all ranks and therefore nonparametric, a series of Friedman's (1940) rank tests for *k*-correlated samples was used to analyze grandparent investment levels across the dimensions of time, financial support, and practical advice. This test is the nonparametric analogue of the one-way repeated-measures analysis of variance (Howell, 2013) used to specifically test rank scores instead of rating scores. Significant differences were detected between all four grandparents (χ^2 (3) = 102.821, $p < .001$), with a large effect size ($\varphi = .72$), in terms of time spent with their grandchildren. However, no significant difference was found between FaMos and MoFas (χ^2 (1) = 3.472, $p > .05$) in general. More specific comparisons between nested FaMos and nested MoFas (χ^2 (1) = .220, $p > .05$), unnested FaMos and unnested MoFas (χ^2 (1) = 2.49, $p > .05$), nested FaMos and unnested MoFas (χ^2 (1) = 1.05, $p > .05$), and unnested FaMos and nested MoFas (χ^2 (1) = .525, $p > .05$) revealed no significant differences between any groups.

H_3

Significant differences were detected between all four grandparents (χ^2 (3) = 70.188, p < .001), with a large effect size (φ = .59), in terms of financial support given to their grandchildren. However, no significant difference was found between FaMos and MoFas (χ^2 (1) = 1.796, p > .05) in general. More specific comparisons between nested FaMos and nested MoFas (χ^2 (1) = .878, p > .05), unnested FaMos and unnested MoFas (χ^2 (1) = 3.041, p > .05), nested FaMos and unnested MoFas (χ^2 (1) = .304, p > .05), and unnested FaMos and nested MoFas (χ^2 (1) = 1.607, p > .05) revealed no significant differences between any groups.

H4

Significant differences were detected between all four grandparents (χ^2 (3) = 107.322, p < .001), with a large effect size (φ = .73), in terms of practical advice given to their grandchildren. However, no significant difference was found between FaMos and MoFas (χ^2 (1) = 0.403, p > .05) in general. More specific comparisons between nested FaMos and nested MoFas (χ^2 (1) = .09, p > .05), unnested FaMos and unnested MoFas (χ^2 (1) = 3.648, p > .05), nested FaMos and unnested MoFas (χ^2 (1) = .304, p > .05), and unnested FaMos and nested MoFas (χ^2 (1) = .525, p > .05) revealed no significant differences between any groups.

CHATPER FIVE: DISCUSSION

None of the four hypotheses were accepted, with results suggesting completely opposite rel ationships than were predicted. In all cases, MoFas and FaMos invested near equally in their grandchildren, regardless of whether or not they were nested. These results held true even when comparing one nested grandparent with an unnested grandparent, a match-up that should have, hypothetically, given one grandparent an advantage over the other in terms of investment potential. These findings are counterintuitive from an evolutionary viewpoint and based on previously established findings, but interesting nonetheless. The results suggest that biological nesting reduces MoFa investment levels in their grandchildren.

It is possible that being nested reduces a MoFa's sense of responsibility to invest. The MoMo is already investing more than he is, and since they share resources there is no need for a MoFa to doubly invest. When unnested, he may feel a stronger desire to maintain the bond formed with his uterine grandchildren through previous interactions – which were formerly mediated by the MoMo – and put forth more effort to invest on his own. Conversely, if a FaMo is unnested, she may decide to divert her now-reduced resources to more certain grandchildren, per Laham's (2005) hypothesis. Unfortunately, follow-up *t*-tests to check for differences across the four investment variables between nested MoFas and unnested MoFas as well as nested FaMos and unnested FaMos revealed no significant differences between these groups, so these explanations are unlikely.

If we consider parents to be possible "gatekeepers" between grandchildren and grandparents, acting as both a barrier to and facilitator of their children's relationships, another possible explanation is found. Here, the grandparent-grandchild relationship has been

examined as a closed system, ignoring the involvement of the parents. This is not an accurate reflection of the relationship in the real world. Parents are responsible for providing everything for their children – food, clothing, emotional and social support – including the opportunity to build relationships with their grandparents. If a parent is cut off from a grandparent, or if parents do not take initiative to provide their children access to their grandparents, then no relationship is built. Keeping this in mind, it is important to examine the social bonding patterns of women and men. Assuming that women, being more socially-involved and driven than men, are the initiators of this familial interaction, it makes sense that a mother will seek out her own parents for assistance and advice when raising her children. Fathers, on the other hand, may not feel as much of a need to maintain close contact and interactions with their parents as they are typically not the primary caregivers of their children. Separating the grandparents may further decrease the fathers' ability to keep their children connected with paternal grandparents. This is an issue that should be examined further in future research, from a social perspective.

Various problems lie within the design of the study. First, three of the variables - financial support, practical advice given, and quality time spent – were measured through a forced ranking system, wherein subjects had to rank their grandparents from most to least invested based on those variables. These rankings do not provide the same sort of detailed information that ratings would have, as was the case with the "emotional closeness" variable. Instead of subjects determining, on a scale of 1-10, how much they thought their grandparents invested, they had to broadly rank them by who invested most and least. The decision to measure these variables by ranking was admittedly short-sighted and a major flaw in study design. Should the questions posed by this study be reexamined, it is recommended that all variables be

measured on the same ratings scale rather than rankings.

Next, this was an unusual sample of subject responses. Rather than fitting with the traditional model of grandparent investment – (1) MoMo, (2) MoFa, (3) FaMo, and (4) FaFa – this sample reported that, overall, both grandmothers were rated higher than both grandfathers – (1) MoMo, (2) FaMo, (3) MoFa, and (4) FaFa. Based on prior research and findings, this implies that the sample was significantly different from the rest of the population. Results may have been skewed by this anomaly, and a larger sample size may have served to smooth out this issue.

Despite the numerous drawbacks of this study, the knowledge gained remains invaluable. In the future, great care should be taken when developing assessment tools, with preliminary analysis being utilized to guarantee acceptable levels of reliability and validity prior to launching the completed survey. This, in combination with a larger sample of subjects, should correct for more basic inconsistencies with the established pattern of results. Reexamining the current hypotheses with an improved study and sample may reveal different results. If the same results are found, further questioning and reformation of the hypotheses would be necessary.

CHAPTER SIX: CONCLUSION

Patterns of grandparent investment have been studied from an evolutionary perspective for decades, and some hypotheses have stood up to scrutiny. Maternal grandparents invest more than paternal grandparents, and grandmothers invest more than grandfathers. Preferred investment in uterine grandchildren over agnatic grandchildren by maternal grandmothers has also been found. The underlying biological and/or cognitive processes driving this behavior has proven trickier to parse out. This study's attempt to dispel one hypothesis – that generational differences in infidelity probability affect grandparent investment – and propose another – that sharing resources puts pressure on maternal grandfathers (MoFas) to support uterine grandchildren and paternal grandmothers (FaMos) to divert investment from agnatic grandchildren – was not successful. FaMos were expected to invest differently from MoFas when nested but equally when unnested, while results revealed no differences in investment regardless of the grandparents' relationship status. This provokes further questioning and invites the conduction of future research into the driving forces behind grandparent investment, likely examining the place of mothers as gatekeepers and encouragers of grandparent-grandchild bond-building.

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Appendix

Grandparent Nesting Effects

What is the purpose of this research?
This research examines how attached students are to their grandparents. Specifically, differences between maternal and paternal grandparents will be compared. Results will contribute to the basic foundation of evolutionary psychology, particularly the areas of family group structure and grandparent support.

What will be expected of me?

We are requesting your participation by completing a brief online questionnaire. There are 33 questions dealing with the relationships between you and your grandparents. The answer formats are multiple choice, multiple selection, ratings (sliding scale and drag-and-drop), and categorical. Finally, a short set of biographic/demographic questions will be presented.

How long with the research take?
The questionnaire takes 10-15 minutes on average.

How will you use my information?
Data are collected anonymously; thus, your individual results will not be associated with your personal identity in any way. Aggregate data will be examined in order to explore broad relationships among variables across the population.

Can I withdraw from the study if I decide to?
Your participation in this study is much appreciated but is entirely voluntary. You may withdraw at any time.

Is there any harm that I might experience from taking part in the study?
We anticipate no potential risk to you.

How will I benefit from taking part in the research?
You would be contributing new knowledge to the literature on human grandparent involvement and to related issues in evolutionary psychology.

Who should I contact if I have questions or concerns about the research?
Contact me, Stephanie Deese, at 910-206-5274 (or sldeese@wcu.edu), or Dr. David McCord, at 828-227-3363 (or mccord@wcu.edu) if you have questions about the study. If you have concerns

about your treatment as a participant in this study, contact the chair of WCU's Institutional Review Board through the office of Research Administration at WCU (828-227-7212). By clicking the first option below and continuing, I am indicating I consent to be a part of this research study.

- ❍ I consent
- ❍ I do NOT consent

Q1 Please indicate your:
Age:
Sex:
Race:

Q2 Your (biological) maternal grandmother is currently:

- ❍ Living
- ❍ Deceased
- ❍ N/A (if grandparent is unknown)

Q3 Your maternal grandmother is currently:

- ❍ Married (to your biological maternal grandfather)
- ❍ Single (due to divorce or death of partner)
- ❍ Remarried (to someone other than your biological maternal grandfather)

Q4 At the time of your maternal grandmother's death, she was:

- ❍ Married (to your biological maternal grandfather)
- ❍ Single (due to divorce or death of a partner)
- ❍ Remarried (to someone other than your biological maternal grandfather)

Q5 Your (biological) maternal grandfather is currently:

- ❍ Living
- ❍ Deceased
- ❍ N/A (if grandparent is unknown)

Q6 Your maternal grandfather is currently:

- ❍ Married (to your biological maternal grandmother)
- ❍ Single (due to divorce or death of a partner)
- ❍ Remarried (to someone other than your biological maternal grandmother)

Q7 At the time of your maternal grandfather's death, he was:

- Married (to your biological maternal grandmother)
- Single (due to divorce or death of a partner)
- Remarried (to someone other than your biological maternal grandmother)

Q8 Your (biological) paternal grandmother is currently:

- Living
- Deceased
- N/A (if grandparent is unknown)

Q9 Your paternal grandmother is currently:

- Married (to your biological paternal grandfather)
- Single (due to divorce or death of a partner)
- Remarried (to someone other than your biological paternal grandfather)

Q10 At the time of your paternal grandmother's death, she was:

- Married (to your biological paternal grandfather)
- Single (due to divorce or death of a partner)
- Remarried (to someone other than your biological paternal grandfather)

Q11 Your (biological) paternal grandfather is currently:

- Living
- Deceased
- N/A (if grandparent is unknown)

Q12 Your paternal grandfather is currently:

- Married (to your biological paternal grandmother)
- Single (due to divorce or death of a partner)
- Remarried (to someone other than your biological paternal grandmother)

Q13 At the time of your paternal grandfather's death, he was:

- Married (to your biological paternal grandmother)
- Single (due to divorce or death of a partner)
- Remarried (to someone other than your biological paternal grandmother)

Q14 On a scale of 0-10, with 0 being no familiarity or closeness and 10 being extremely close, how emotionally close are/were you with your biological grandparents? If you never knew the grandparent in question, please check "Not Applicable."

_____ Mother's Mother
_____ Mother's Father
_____ Father's Mother
_____ Father's Father

For all of the questions on this page, drag and drop each selection, which the most /highest being at the top, and the least/lowest being at the bottom.

Q15 Rank the following items in order of which of your biological grandparents you are/were most likely to turn to for financial support.

_____ Mother's Mother
_____ Mother's Father
_____ Father's Mother
_____ Father's Father

Q16 Rank the following items in order of which of your biological grandparents you are/were most likely to turn to for practical advice. (e.g., work-related problems, school decisions, how to manage time and money)

_____ Mother's Mother
_____ Mother's Father
_____ Father's Mother
_____ Father's Father

Q17 Rank the following items in order of which of your biological grandparents were/are most likely to provide support (financial, emotional) without you asking them.

_____ Mother's Mother
_____ Mother's Father
_____ Father's Mother
_____ Father's Father

Q18 Rank the following items in order of which of your biological grandparent(s) you spend/spent the most time with.

_____ Mother's Mother
_____ Mother's Father
_____ Father's Mother
_____ Father's Father