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Prevalence and Predictors of "Nesting": Solutions to Adaptive Challenges Faced during Pregnancy

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PREVALENCE AND PREDICTORS OF “NESTING”:
SOLUTIONS TO ADAPTIVE CHALLENGES FACED DURING PREGNANCY

BY
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ABSTRACT

Throughout ancestral times, women faced significant adaptive challenges during pregnancy, and thus evolution may have selected for psychological mechanisms designed to help women prepare for birth and motherhood. Previous researchers have conceptualized such mechanisms as comprising a form of “nesting,” which may consist primarily of a tendency to be highly selective in one’s social relationships and to prepare a safe physical space for childbirth (Anderson & Rutherford, 2013). The current study was aimed at replicating and extending previous evidence for nesting. Consistent with previous work, results demonstrated that pregnant women engaged in more nesting than nonpregnant women, and that degree of nesting increased across week of gestation. Among pregnant women, high levels of germ aversion and having relatively high socioeconomic status (SES) were both associated with high levels of nesting. High levels of progesterone were not responsible for observed variability in nesting. Although we measured a number of life history-related variables, none of those variables predicted nesting within pregnant women. The present work suggests that nesting is a pervasive phenomenon among pregnant women. Future directions are discussed

CHAPTER 1

INTRODUCTION

Throughout human history, women have faced significant social and physical challenges during pregnancy and in the time leading up to birth. Consequently, evolution has equipped women with a range of adaptations designed to help them face those challenges. Some of those adaptations involve physiological processes, such as lactation and increasing levels of progesterone across gestation, which are designed to prepare women's bodies and those of their offspring for childbirth. Other adaptations, however, may involve psychological changes aimed at preparing the social and physical environment in ways designed to protect women from dangers associated with pregnancy, as well as to facilitate childbirth and childcare in the immediate postpartum period. Those psychological changes may involve being selective with respect to their social relationships and increasing their desire for a clean and safe physical space – a pattern of prepartum psychological changes that has been referred to as “nesting” (Anderson & Rutherford, 2013; Hahn-Holbrook et al., 2011).

Although forms of nesting have been widely documented in a range of other species (e.g., Svare, 1981), far less work has examined the existence of nesting in humans. The current study advances the relatively small but growing body of research on nesting in human women. We collected data from a sample of pregnant women in the community, along with a sample of control (non-pregnant) women to assess the hypothesized presence of nesting. The primary goals of the present study were twofold. First, by comparing pregnant women to non-pregnant controls, we sought to replicate previous evidence for nesting in pregnant women (Anderson & Rutherford, 2013). Second, we moved beyond previous research by exploring a range of

potential predictors of nesting, including physiological (progesterone, oxidative stress), psychological (e.g., germ aversion), and social structural (e.g., socioeconomic status) predictors.

“Nesting”: Solutions to Adaptive Challenges Faced during Pregnancy

Throughout human ancestral history, women would have faced a number of challenges during pregnancy. For example, as pregnancy progressed, pregnant women would have faced increasing struggles with locomotion (Elek et al., 1997; Lee & Zafke, 1999; Lubin et al., 1975). The energetic costs of gestation also would have made it more difficult for women to pursue other goals such as foraging for food (Ghalambor et al., 2004; Kullberg et al., 2002; Shine, 2003). Reduced ability to forage for food would have been especially disadvantageous due to the increased caloric needs of women during pregnancy (Butte & Knig, 2005). Additionally, decreased locomotive ability would have made it challenging for expectant mothers to escape predators or similar threats (Schwarzkopf & Shine, 1992). Consequently, evolution may have selected for psychological processes designed to nurture supportive social alliances and avoid dangers during pregnancy.

One set of psychological and behavioral mechanisms involved expectant mothers’ strong need for social support. As women faced challenges in gathering enough food for themselves and their developing offspring throughout gestation, close others such as related females, as well as their male partner, could have provisioned food for the expectant mother (Taylor et al., 2000). Not only would close others have provided tangible material support, they also could have assisted the expectant mother by providing informational and emotional support. Stress negatively impacts the wellbeing of both mother and offspring, and emotional support of close others has been shown to buffer women from the stressors faced during pregnancy (Giurgescu et al., 2015; Hahn-Holbrook & Haselton, 2014; Hahn-Holbrook et al., 2013). Additionally, because

the birthing process itself involved considerable danger, expectant mothers would have benefited from having close others at the ready to help during parturition. Indeed, in most cultures across the world, women have the help of a few select others during the birthing process (Dennis et al., 2007; Essex & Pickett, 2008; Newton & Newton, 2003). In the modern world, it has become common for women to hire doulas to provide them with support in the time leading up to birth and during the birthing process itself (Klaus & Kennel, 1997). Having the support of close others during the prepartum period is associated with numerous positive outcomes for both mother and infant, including lower rates of postpartum depression and higher infant birth weight (Collins et al., 1993; Hoffman & Hatch, 1996; Sauls, 2002). By drawing in close others for social support, ancestral women would have increased their chances of reproductive success, and some work suggests that modern women engage in similar behaviors.

Expectant women's desire for social affiliation would have benefitted from being highly discriminating, however. Although the assistance of close others would have been valuable to pregnant women, individuals outside the immediate social circle posed a relatively high danger to expectant mothers during pregnancy. In many nonhuman animal species, newborns were a target for unrelated males hoping to mate with the new mother (Hahn-Holbrook et al., 2011). Anthropological evidence suggests that unrelated males are responsible for a relatively large proportion of infanticide in some groups (Hurtado & Hill, 1995). Even in modern society where infanticide by strangers is rare, many parents report high levels of fear over their child being harmed by a stranger and that fear may have evolved due to high ancestral risks (Hahn-Holbrook et al., 2010). Thus, although pregnant women had a strong need for allies and thus strong motives for social affiliation, those motives were likely to be selective, focusing on strengthening

existing social bonds while at the same time distancing themselves from others who were not a member of their inner social circle.

Aside from threats associated with physical violence, other people also posed a possible disease risk to mothers and their unborn offspring (Navarette et al, 2007). During pregnancy, women's immune systems are suppressed in order to protect the growing fetus from the mother's own immune defense (Fessler, 2002; Fleischman & Fessler, 2011). This leaves women more vulnerable to various forms of contagious illness (Robinson & Klein, 2012). Moreover, the growing fetus has a highly vulnerable immune system itself (Crockett, 1995). Unfamiliar people historically may have posed more potent disease threats than familiar people because unfamiliar others may have harbored pathogens to which one had not developed any immunity (Fincher & Thornhill, 2008, 2012). Coming into contact with contagious pathogens from a stranger posed a great risk to both mother and offspring during gestation. Thus, although pregnant women needed assistance from close others throughout gestation, this need was tempered by a need also to avoid pathogen threats posed by relatively unfamiliar people.

Because infants are so vulnerable in the days and weeks immediately following birth, a cluttered and dirty space would have posed potential dangers. As noted earlier, a newborn infant's immune system is particularly vulnerable to pathogens (Crockett, 1995), and any sources of pathogens in the immediate environment posed an immense risk to them. In order to provide a safe and clean space for the infant immediately following birth, women would have benefitted from preparing the birthing and living space in the time leading up to birth. In many nonhuman animal species, such as moose (Bowyer et al., 1999), mice (Lisk et al., 1969), and rabbits (Ross et al., 1963), pregnant females carefully select or build a safe birth site away from others. It is common for modern women to prepare a nursery in the home some time before birth (Leckman

et al., 2004). Many women take significant time to select the hospital and medical staff to assist during the birthing process, and it is becoming more and more common for women to opt for home births (Keirse, 2010; Morrison et al., 1998; Wax et al., 2010). These behaviors in modern women may have been shaped by the need for a clean and safe space for childbirth and the immediate time postpartum in the ancestral era.

The Present Study

Previous work suggests that women engage in prepartum preparatory behaviors (i.e., “nesting”) in the time leading up to birth. Anderson and Rutherford (2013) created a self-report scale to assess space preparation (motivations and behaviors associated with cleaning and organizing of the home) and social selectivity (motivations and behaviors associated with drawing in close others while avoiding unfamiliar people), during pregnancy. Those authors found that (a) pregnant women engaged in significantly more space preparation and social selectivity than nonpregnant women did, and (b) the degree to which pregnant women engaged in space preparation and social selectivity increased across trimester of pregnancy (Anderson & Rutherford, 2013).

In the present study, we replicated and extended this previous work on nesting behavior in pregnant women. Our first goal was to replicate previous evidence that pregnant women engage in relatively higher levels of nesting (compared with non-pregnant control women), and that nesting becomes more pronounced as gestation progresses. Our second goal was to explore variables (individual differences, physiological factors) that might predict the degree to which pregnant women engage in nesting. Possible predictors of nesting are described below.

First, one possible predictor of nesting is the hormone progesterone. Progesterone increases dramatically across gestation and plays a key role in many of the physiological changes

associated with pregnancy (Di Renzo et al., 2005). Previous work has linked high levels of progesterone to social affiliative motivation (Maner et al., 2009; Schultheiss et al., 2004). For example, in one study, positive social contact was related to heightened levels of salivary progesterone, which in turn were associated with prosocial behavior toward a social partner (Brown et al., 2009). Moreover, women in the high-progesterone luteal phase are highly sensitive to social cues, consistent with a desire for social affiliation (Maner & Miller, 2014). Some work also suggested a link between progesterone and pathogen avoidance behaviors. Women in the high-progesterone luteal phase of their menstrual cycle, for example, experience increased levels of disgust sensitivity and engage in behaviors aimed at avoiding contact with sources of pathogens (Fessler, 2002; Fleischman & Fessler, 2011). Thus, it is possible that increasing levels of progesterone during pregnancy underlie both the space preparation and social selectivity behaviors necessary to prepare mother and offspring for childbirth.

Second, another variable that might predict nesting involves individual differences in pathogen avoidance. Although all people benefit from avoiding sources of infectious pathogens, there are individual differences such that some people are more avoidant of pathogens than others (Tybur et al., 2013). Although the underlying causes of those individual differences are still being identified, some evidence suggests that they may stem partially from childhood experiences with illness (Makahnova et al., in press). More broadly, some researchers suggest that relatively high levels of pathogen avoidance may compensate for vulnerabilities in a person's immune system, such as those that occur during pregnancy (see Ackerman et al., 2018; Fessler, 2002; Miller & Maner, 2011). Thus, if individual differences in pathogen avoidance reflect the operation of mechanisms designed to protect people from pathogens during times of heightened vulnerability, one might expect that high levels of pathogen avoidance would be

associated with increased levels of nesting during pregnancy. Following previous research, we examined two facets of pathogen avoidance in the current study: germ aversion and perceived infectability. Germ aversion refers to one's desire to avoid sources of pathogens, such as used water bottles or public surfaces, whereas perceived infectability refers to one's perceived likelihood of contracting illness (Duncan et al., 2009). We assessed both constructs in the current study. The avoidance of pathogens has been linked more strongly with germ aversion than perceived infectability (e.g., Díaz et al., 2016), however, so we expected that germ aversion, in particular, might be associated with high levels of nesting during pregnancy.

Third, we considered variables reflecting a women's life history strategy or reproductive timing on levels of nesting. Life history theory suggests that ecological variables encountered early in development calibrate psychological processes in an adaptive manner throughout the lifespan. Those processes are designed to help people navigate tradeoffs (e.g., between mating and parenting) in ways that help them make the most of their limited bioenergetic resources and ultimately increase their reproductive success (Belsky et al., 1991; Ellis et al., 2009). Work from a life history perspective suggests that individuals who grew up in harsh and unpredictable environments (as compared with safe and predictable environments) tend to pursue a "fast" life history strategy, in which they invest less in individual offspring, instead distributing their investments more diffusely over a larger number of offspring (Pepper & Nettle, 2017). This strategy would serve to mitigate reproductive risks associated with investing "too much" in individual offspring in a dangerous and unstable ecology. Although previous work has examined implications of life history theory for investment in offspring, little work has examined how one's life history strategy might influence investment in offspring before they are born.

In the present study, we measured several markers of life history strategy. Oxidative stress is a measure of lifetime accumulated cellular damage due to stress, and is higher when individuals experience heightened stress growing up and thus serves as a valid marker of life history strategy (Griskevicius et al., 2013). Life history strategy is also associated with how restricted versus unrestricted a person is in their sexual and romantic desires; that is, how much they prioritize long-term committed relationships versus short-term sexual relationships, respectively (Simpson & Gangestad, 1992). Individuals who are relatively unrestricted in their sexual pursuits tend to invest less in their children (Buss & Schmitt, 1993), aiming instead for quantity over quality of offspring. Thus, an unrestricted sociosexual orientation is thought to reflect a fast life history strategy, and it is possible that women with an unrestricted sociosexual orientation engage in less nesting behaviors than their more restricted counterparts. Individuals pursuing a fast life history strategy tend to start having children at a relatively younger age (Belsky et al., 1991). Thus, it is possible that women who had their first child at a younger age will engage in fewer nesting behaviors than women who had their first child at an older age. Finally, we measured childhood socioeconomic status (SES), as it serves as a broad index of the level of adversity faced as a child, and has been used in many previous studies to tap into levels of childhood unpredictability and harshness, both of which tend to potentiate adoption of a fast life history strategy (e.g., Belsky et al., 1991).

Some previous work suggests that a person's life history strategy becomes most apparent under conditions of current stress, uncertainty, and hardship (Young et al., 2018). One major source of current stress, uncertainty, and hardship involves low SES; those living in low SES communities tend to face higher levels of environmental instability and hardship than do those living in relatively higher SES communities (Miller et al., 2009). Thus, in addition to testing for

main effects of life history variables, we also tested the possibility that current SES might interact with markers of life history strategy to predict nesting. We attended to the possibility that life history variables might predict nesting more strongly among women with relatively low SES as compared to those with relatively high SES.

CHAPTER 2

METHOD

Participants and Design

We recruited a community sample of women who were currently pregnant, as well as a sample of control (non-pregnant) women matched on age. Women were recruited via flyers, Facebook advertising, recruitment at a local OB/GYN clinic, and via email through another ongoing investigation of married couples. To be eligible for participation as part of the pregnant sample, women had to report being pregnant (pregnancy status was not medically verified). If not pregnant, women were only eligible if they had not used hormonal contraceptives within the past three months and had not been pregnant within the past year. These eligibility requirements were used to select women with a normal hormonal profile. Upon beginning recruitment, we had no age cap for the non-pregnant participants. However, soon we adjusted our criteria to exclude women over 40 years of age in order to match the samples on age. Participants' ages ranged from 19 to 40 years old, with an average age of 28.64 years old. Pregnant women were on average 29.71 years old ($SD = 5.09$), while nonpregnant were on average 27.96 years old ($SD = 5.70$). In total, 29 participants were single and 162 were currently in a relationship. Of the 193 participants, 91 were pregnant, with 17 in the first trimester, 49 in the second trimester, 23 in the third trimester, and two not reporting.

All women participated at a location of their choosing (e.g., their home, a public meeting place). Two female research assistants met the participant and explained the study to them. After providing informed consent, women completed a questionnaire and provided saliva and urine samples. Women were each compensated \$40.

Measures

Nesting. Nesting was measured with Anderson and Rutherford's (2013) 16-item nesting scale (see Appendix A). Items included "Currently, I prefer staying close to home," "Currently, I find that it is especially true that I prefer to spend time at home with close family and friends," and "In the past 6 months, I have spent a great deal of energy on home renovations." Participants responded to all items using a 7-item Likert scale (1 = Strongly Disagree, 7 = Strongly Agree). As in Anderson and Rutherford (2013), three additional items referring to lethargy (see items 17-19 in Appendix A) were excluded from the nesting composite.

Anderson & Rutherford (2013) relied on analyses that distinguished between two components of nesting: space preparation (items 1-8) and social selectivity (items 9-16). In their article, they reported a 4-factor structure in which each of the two overarching factors were broken down into two subfactors ((1) space preparation: cleaning and mental focus; (2) space preparation: energy burst; (3) social selectivity: familiarity preference; (4) social selectivity: novelty aversion). To confirm the factor structure of the nesting scale in our data, we used confirmatory factor analysis. This analysis suggested that the intended 4-factor structure did not fit the data, $\chi^2(98)=323.71, p<.001, RMSEA=.11, CFI=.73$. We also assessed a more parsimonious two-factor structure that combined across subfactors to produce a single space preparation factor and a single social selectivity factor, but this model did not fit the data either, $\chi^2(103)=559.13, p<.001, RMSEA=.15, CFI=.46$. Even within the sample of pregnant women, model fit was poor, $\chi^2(103) = 292.52, p<.001, RMSEA=.14, CFI=.54$. (We considered that allowing the error terms for the four reverse-scored items to correlate might improve model fit, but doing so still resulted in a poor-fitting model.) Given the questionable factor structure, we adopted what we viewed as the most conservative approach, and calculated a

single composite score based on all items ($\alpha = .74$). To provide an exact replication of Anderson and Rutherford's analyses, results based on the two intended subscales are provided in supplemental materials.

Perceived Vulnerability to Disease. Participants completed the 15-item Perceived Vulnerability to Disease (PVD) scale. This measure is comprised of two subscales: germ aversion ($\alpha = .71$) and perceived infectability ($\alpha = .90$). Germ aversion measures cognitive and behavior tendencies to avoid potential pathogen sources, and includes items such as "I prefer to wash my hands pretty soon after shaking someone's hand." Perceived infectability measures perceptions of susceptibility to infection, and includes items such as, "I have a history of susceptibility to infectious disease." Participants responded to all items using a 7-item Likert scale (1 = Strongly Disagree, 7 = Strongly Agree).

Life-History Related Variables. Age of first birth was calculated by subtracting the age of one's oldest child from the participant's age. For participants who were pregnant but did not already have children, we reported their current age as their age of first birth. Participants who did not report their age, or who were not pregnant and childless, were coded as missing data for this variable. Sociosexual orientation was measured using Simpson and Gangestad's (1992) nine-item sociosexual orientation inventory ($\alpha = .81$). Three items assessed the number of sexual partners one has had in the last 12 months, on only one occasion, and without any intent to pursue a committed relationship. Participants responded to those three items by indicating 0 partners, 1 partner, 2 partners, 3 partners, 4 partners, 5-6 partners, 7-9 partners, 10-19 partners, or 20 or more partners. Three items (e.g., 'Sex without love is ok') were responded to using a 9-item Likert scale (1 = Strongly Disagree, 9 = Strongly Agree). Three items (e.g., "In everyday life, how often do you have spontaneous fantasies about having sex with someone you just

met?") were responded to using a similar 9-item Likert scale (1 = Never, 9 = At least once a day). Childhood SES ($\alpha = .83$) was measured using three items (e.g., "My family usually had enough money for things when I was growing up."). Participants responded to these items using a 7-item Likert scale (1 = Strongly Disagree, 7 = Strongly Agree).

Current SES. Current SES was measured using two items: "I have enough money to buy the things I want" and "I don't need to worry too much about paying my bills." Participants responded to these items using a 7-item Likert scale (1 = Strongly Disagree, 7 = Strongly Agree). ($\alpha = .71$)

Progesterone. Saliva samples were gathered via passive drool. Saliva samples were frozen at -20°C immediately after each session. Before samples were assayed, they were thawed, centrifuged for 15 min at 3000 RPM, and the supernatant was refrozen in aliquots. Progesterone was assessed using commercially available enzyme-linked immunosorbent assay (ELISA) kits (Salimetrics, State College, PA). Samples were run in duplicate. The inter-assay coefficient of variability (7.92) and intra-assay coefficient of variability (2.00) were both acceptable.

Oxidative Stress. Following methods described by Griskevicius and colleagues (Griskevicius et al., 2013) we collected urine samples in sterile cups. Immediately after the research assistants returned to the lab they pipetted the samples into aliquots (200uL for oxidative stress; 20uL for creatinine) and froze them at -20°C . Urinary analyses were conducted using the High Sensitive 8-OHdG Check ELISA kit manufactured by the Japan Institute for the Control of Aging, purchased through Genox (Baltimore, MD). The sensitivity of this assay was approximately 0.125-10 ng/ml. To account for differences in urine concentration, all 8-OHdG were corrected for creatinine. Creatinine assays were conducted using a colorimetric detection

kit distributed by Enzo Life Sciences (Farmingdale, NY). Creatinine values ranged from 12.84 mg/dL to 302.38 mg/dL. We were able to obtain reliable values of oxidative stress corrected for creatinine for 165 participants. The mean 8-OHdG level was 5.57 ng/mg of creatinine (SD = 2.72), and levels ranged from 0.22 to 13.37.

CHAPTER 3

RESULTS

See Table 1 for descriptive statistics and correlations among all study variables.

Replication of Anderson and Rutherford (2013)

Although Anderson and Rutherford controlled for lethargy and parity (having at least one child) in all analyses, they provided little justification for that approach, so we did not control for those variables in the primary analyses reported below. See supplemental materials for exact replication of the statistical tests conducted in the original work (Anderson & Rutherford, 2013).

A t-test comparing levels of nesting between pregnant and nonpregnant women was significant, $t(191) = 4.87, p < .001, d = .717$, with pregnant women ($M = 4.23, SD = .71$) engaging in more nesting than nonpregnant women ($M = 3.71, SD = .76$). Within pregnant women, we assessed whether, consistent with findings from Anderson and Rutherford, the degree of nesting increased across pregnancy. To follow their procedures, we first assessed whether degree of nesting would increase across the three trimesters. In contrast to Anderson and Rutherford's findings, there was no effect of trimester on nesting among pregnant women, $F(2, 86) = 1.25, p = .292$. Moreover, specific contrasts among the trimesters revealed no difference in nesting between women in the first ($M = 4.11, SD = .67$) versus second trimester ($M = 4.18, SD = .76$), $p = .934$. Nor was there any difference between women in the second versus third trimester ($M = 4.42, SD = .62$), $p = .359$. And finally, there was no difference between the first and third trimester, $p = .347$. However, consistent with the overall hypothesis that nesting would increase across pregnancy, a regression model predicting nesting from week of gestation revealed a significant effect of week of gestation on nesting, $B = .02, p = .033, \text{semi-partial } r^2 = .05$, such that nesting increased across week of gestation (see Figure 1).

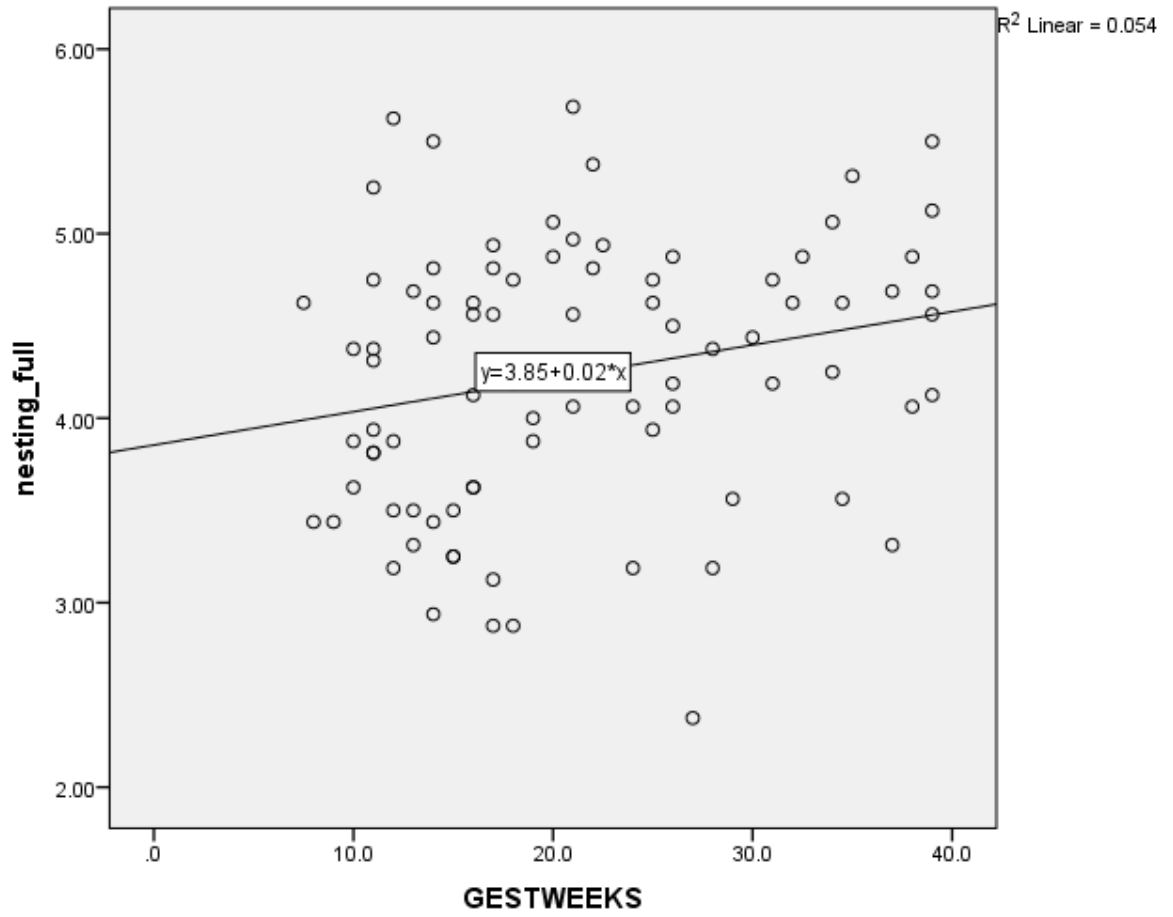


Figure 1. Relationship between weeks of gestation and self-reported nesting

Table 1. Descriptive statistics and correlation coefficients among predictors of nesting among pregnant women (above the diagonal) and non-pregnant women (below the diagonal).

	Pregnant Mean (SD)	Nonpregnant Mean (SD)	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Nesting	4.23 (.71)	3.71 (.76)	--	.02	.27*	.14	-.04	.07	.12	.23*	.14
2. Progesterone	629.61 (412.79)	122.50 (105.88)	-.18	--	-.21	-.16	-.20	-.06	.05	-.06	-.05
3. Germ Aversion	4.17 (1.09)	4.13 (1.10)	.41***	-.04	--	.06	-.21	.03	-.1	-.01	.03
4. Perceived Infectability	3.39 (1.36)	3.55 (1.35)	.03	-.17	.24*	--	.17	.00	.05	-.10	-.02
5. Oxidative Stress	5.40 (3.94)	5.38 (1.40)	.11	-.06	-.28**	-.16	--	-.01	.32*	.20	.04
6. Childhood SES	4.32 (1.55)	4.02 (1.58)	-.07	-.23*	.08	-.06	.01	--	.22	.03	.15
7. Age of First Birth	26.87 (4.92)	25.30 (3.72)	.32	-.39	.11	.05	.16	.42*	--	.25	.21
8. Current SES	4.81 (1.29)	4.26 (1.61)	-.16	.04	-.01	-.11	-.15	.40***	.30	--	-.15
9. SOI	2.29 (1.09)	2.81 (1.41)	-.15	-.04	-.33**	-.24*	.10	.05	-.11	.07	--

* $p < .05$, ** $p < .01$. *** $p < .001$

Exploration of Predictors of Nesting

In addition to replicating previous work on nesting behaviors, the present study sought to explore predictors of nesting among pregnant women. Analyses focused on the overall measure of nesting are below. Analyses focused on the two subscales of nesting are reported in supplemental materials.

Progesterone. We conducted two analyses to assess a possible role of progesterone. First, we assessed whether levels of progesterone might statistically mediate the higher levels of nesting in pregnant women, compared with non-pregnant women. As noted earlier, pregnancy status significantly predicted nesting, $B = .52, p < .001, 95\% \text{ CI } [.29, .75]$, with pregnant women engaging in more nesting than nonpregnant women. Pregnancy status also significantly predicted progesterone, $B = 507.12, p < .001, 95\% \text{ CI } [418.96, 595.27]$, with pregnant women having higher levels of progesterone than nonpregnant women. At the bivariate level, progesterone significantly predicted nesting, $B = 94.40, p = .010, 95\% \text{ CI } [22.52, 166.28]$, with higher levels of progesterone predicting higher levels of nesting. When both progesterone and pregnancy status were included in the overall model, however, pregnancy status significantly predicted nesting, $B = .55, p = .001, 95\% \text{ CI } [.25, .86]$, while progesterone did not, $B < .001, p = .743, 95\% \text{ CI } [-.001, .000]$, indicating that progesterone does not mediate the link between pregnancy and nesting.

The second analysis assessed whether, in pregnant women, progesterone predicted level of nesting. In addition to a linear effect of progesterone, we also assessed a possible non-linear effect by including a polynomial term in the model (i.e., progesterone squared). This model revealed neither linear, $B = .00, p = .313, \text{ semi-partial } r^2 = .01$, nor nonlinear, $B = .00, p = .186, \text{ semi-partial } r^2 = .02$, effects of progesterone on nesting among pregnant women.

Pathogen Avoidance Motives. To assess the possibility that level of nesting might be predicted by pathogen avoidance motives, we used multiple regression to predict nesting from both germ aversion and perceived infectability. There was no effect of perceived infectability on nesting among pregnant women, $B = .07, p = .226, \text{semi-partial } r^2 = .02$. There was, however, a significant effect of germ aversion on nesting, $B = .17, p = .013, \text{semi-partial } r^2 = .07$, such that women scoring higher on germ aversion reporting engaging in more nesting.

Life History Strategy and the Mating-Parenting Tradeoff. We tested four separate regression models predicting nesting among pregnant women from four separate markers of childhood unpredictability (SOI, childhood SES, oxidative stress, and age of first birth, respectively). Because nesting among pregnant women was positively associated with current SES, we controlled for current SES to ensure that any effects were independent of SES. In addition, to assess the possibility that any effects of reproductive timing variables might depend on current SES, we also tested the centered interactions between life history variables and current SES.

An overall model predicting nesting from childhood SES, current SES, and their centered interaction, was marginally significant, $F(3, 86) = 2.26, p = .087, R^2 = .073$. There was a significant main effect of current SES, $B = .13, p = .030, \text{semi-partial } r^2 = .05$, such that women high in SES engaged in relatively more nesting than did women low in SES. There was no main effect of childhood SES on nesting, $B = .03, p = .498, \text{semi-partial } r^2 = .01$, nor was there an interaction between childhood SES and current SES, $B = -.05, p = .188, \text{semi-partial } r^2 = .02$.

An overall model predicting nesting from oxidative stress, current SES, and their centered interaction was not significant, $F(3, 74) = .81, p = .492, R^2 = .032$. There was no significant main effect of current SES in this model, $B = .06, p = .346, \text{semi-partial } r^2 = .01$.

There was no main effect of oxidative stress, $B = -.01, p = .522, \text{semi-partial } r^2 = .01$. There was no significant interaction between current SES and oxidative stress, $B = -.03, p = .265, \text{semi-partial } r^2 = .02$.

An overall model predicting nesting from the age of first birth, current SES, and their centered interaction was not significant, $F(3, 55) = .84, p = .480, R^2 = .044$. The main effect of current SES in this model was not significant, $B = .08, p = .243, \text{semi-partial } r^2 = .02$. There was no main effect of age of first birth, $B = .01, p = .673, \text{semi-partial } r^2 = .00$. The interaction between age of first birth and current SES was not significant, $B = -.01, p = .534, \text{semi-partial } r^2 = .01$.

An overall model predicting nesting from SOI, current SES, and their centered interaction was significant, $F(3, 86) = 5.04, p = .003, R^2 = .150$. The main effect of current SES in this model was significant, $B = .16, p = .006, \text{semi-partial } r^2 = .08$. There was no main effect of SOI in this model, $B = .10, p = .148, \text{semi-partial } r^2 = .02$. There was a significant SOI by current SES interaction, $B = -.14, p = .009, \text{semi-partial } r^2 = .07$. To assess the form of this interaction, we calculated the effect of SOI among women high (1SD above the mean) and low (1 SD below the mean) of SES. Although no effect of SOI was observed among women high in SES, $B = -.08, p = .42, \text{semi-partial } r^2 = .006$, among women low in SES, having an unrestricted sociosexual orientation was positively related to nesting, $B = .27, p = .003, \text{semi-partial } r^2 = .09$. This simple slope is contrary to what one would expect based on life history principles, and should be interpreted with caution.

CHAPTER 4

DISCUSSION

The present study replicates and extends previous work suggesting that, in the time leading up to childbirth, women engage in a form of nesting. Although the nesting behavior of other species has been well-documented, ours is among the first empirical investigations of nesting in humans. Findings provide insight into adaptive psychological processes that might facilitate childbirth and early childrearing.

In the current work, we replicated Anderson and Rutherford's (2013) findings that pregnant women engage in more overall nesting than nonpregnant women. In addition, although we did not replicate their finding that nesting increased across trimester of pregnancy, we did find that nesting increased across weeks of gestation. It is possible that this inconsistency was due to relatively small numbers of women in each trimester in the current sample. Another possibility is that because week of gestation is a more granular measurement approach (36 weeks) than is dividing pregnancy into three trimesters, it provided for a more accurate means of assessing change over period of pregnancy. In either case, the general pattern observed by Anderson and Rutherford was replicated here, and we did find evidence that nesting becomes more prevalent as parturition approaches. Thus, the current work provides evidence that, like the females of many other species, human women may indeed engage in nesting during the prepartum period.

One aspect of the current findings that differs from those of Anderson and Rutherford pertains to the factor structure of nesting. In a factor analysis of the authors' measure of nesting, we did not replicate the primary four-factor structure. Nor did we see convincing evidence for a simpler two-factor structure – social selectivity and space preparation – used as a basis for

analyses in the original work (Anderson & Rutherford, 2013). Future work should replicate these findings in a larger sample to determine whether this failure to replicate might have been anomalous to the present sample. Although space preparation and social selectivity theoretically reflect distinct facets of behavior, they might nevertheless have stemmed from similar adaptive challenges in the ancestral environment. A worthwhile goal for future research would be assessing whether nesting reflects a set of psychologically and behaviorally distinct set of processes versus a more unified process.

Supplemental analyses assessed evidence for space preparation and social selectivity separately as distinct constructs (see supplemental materials). Those analyses provided relatively stronger evidence for the prevalence of social selectivity in pregnant women than they did for space preparation. While pregnant women displayed higher levels of social selectivity than did non-pregnant control women, they did not display higher levels of space preparation. Moreover, while social selectivity increased across weeks of gestation, space preparation did not. One possible interpretation is that social selectivity plays a more central role in the prepartum behavior of human women than space preparation does. Women can garner important social support, avoid strangers, and avoid many sources of pathogens by engaging in social selectivity (Anderson & Rutherford, 2013). Although preparing the home for parturition is important for maternal and infant health, social selectivity may account for greater variability in reproductive success. Alternatively, it is possible that the items comprising space preparation do not adequately capture this set of behaviors in pregnant women. Indeed, factor analyses did not find strong support for the various subscales of the nesting measure itself. Future work should focus on using a wider range of measures to assess space preparation and social selectivity in order to better understand the behaviors that pregnant women engage in to prepare for birth.

In addition to replicating previous evidence for the existence of nesting in humans, the current work explored possible predictors of nesting in pregnant women. One of the more surprising findings of the present work was that progesterone did not explain the link between pregnancy status and nesting, nor did it predict nesting among pregnant women. Progesterone is linked to a multitude of behaviors associated with nesting, such as disease avoidance (Fleischman & Fessler, 2011) and social affiliation (Schultheiss et al., 2004), and does increase sharply when women become pregnant and as gestation progresses. It is possible that the relatively small number of pregnant women in the current study did not provide adequate statistical power for detecting any true effects of progesterone on nesting. Because progesterone is a theoretically strong candidate for a physiological driver of nesting behaviors among pregnant women, future research should replicate the present work with a larger sample to attempt to detect potentially small but meaningful effects of progesterone that the present work was unable to capture.

An alternative interpretation for the lack of support for the role of progesterone in nesting is that nesting is driven primarily by high levels of oxytocin rather than high levels of progesterone. Like progesterone, oxytocin levels tend to rise throughout pregnancy (de Geest et al., 1985). Moreover, oxytocin is related to behaviors such as maternal aggression (Bosch et al., 2005) and nest-building in nonhuman animals (e.g., sows; Castren et al., 1993). Oxytocin has also been implicated in human social bonding (Carter et al., 1992). Future work would benefit from examining oxytocin as a potential physiological driver of nesting behaviors in pregnant women.

The current findings suggest that degree of nesting was predicted by women's level of germ aversion. Pathogen avoidance is closely linked to the avoidance of strangers, desire to

prepare the birthing space, and urge to stay at home, and women with a natural tendency to avoid sources of disease likely experience heightened protective nesting behaviors during pregnancy. Thus the current findings are consistent with the idea that during the prepartum period, nesting behaviors function in part to help women and their unborn offspring avoid threats associated with pathogens.

The current study provided an opportunity to apply a life history perspective to test possible predictors of nesting (sociosexual orientation, childhood SES, oxidative stress, and age of first birth). Yet, none of the life history strategy related variables in the current work predicted nesting behaviors among pregnant women. Life history theory suggests that women coming from unpredictable or harsh early childhood environments would invest less in their offspring (Ellis et al., 2009), and offspring care begins before birth during the prepartum period. It is possible, however, that initial maternal investment in offspring is so essential that all women would have benefit from engaging in them, regardless of their life history strategy. Another possibility, however, is that there was not adequate variability in our sample to detect individual differences in life history strategy. All women in the pregnant sample were in long-term romantic relationships, for example, and all came from relatively high SES backgrounds. Additionally, it is important to note that none of the life history-related variables in the current work were correlated with each other among the pregnant sample. It is possible that the variables as measured chosen did not adequately tap into a person's life history strategy, and future work would benefit from including a more comprehensive set of measures intended to more fully capture life history-related constructs.

A limitation of the current work pertained to differences between the sample of pregnant women and the sample of non-pregnant control women. Pregnant women had somewhat higher

SES than nonpregnant women, and while all pregnant women were in relatively stable relationships, some of the control women were not. It is possible that women from lower SES backgrounds, especially those without a partner or close family to aid in prepartum preparatory behaviors, experience barriers to engaging in nesting behaviors. Indeed, we observed that current SES was significantly associated with nesting behaviors among pregnant women, with women of higher SES engaging in more nesting than their low-SES counterparts. Future work should focus on recruiting larger and more diverse samples of women in order to better capture how women from differing backgrounds prepare for the time leading up to birth.

Another limitation of the current work is its reliance on a single self-report measure of nesting. Nesting behaviors could be measured in alternative ways that may better or more fully capture actual behaviors. For example, social network analysis could be used to track expectant mothers' type and amount of social contact with various members of their social group (Clifton & Webster, 2017). Interviewing the different people that pregnant women interact with would provide a more complete measure of social affiliation than simple self-reports of behavior from the pregnant women themselves.

Although the present study provided insight into how nesting behaviors vary with stage of pregnancy, it was limited by its cross-sectional design. To truly understand how space preparatory and social affiliative behaviors shift as women become pregnant and get closer to parturition, future work should utilize longitudinal designs to examine how nesting changes among pregnant women.

Another important avenue for future research would be to investigate implications of nesting for health and well-being outcomes in both mother and newborn following birth. Extensive work indicates that prepartum social support is an important buffer against postpartum

depression (Collins et al., 1993), and that pathogen avoidance behaviors such as morning sickness (Flaxman & Sherman, 2000) help to protect both maternal and fetal health. If nesting behaviors evolved to help women cope with the physical and psychological demands of pregnancy, it should be related to positive outcomes for both mother and infant, such as lower rates of postpartum depression and better infant health immediately following birth (Collins et al., 1993). A longitudinal study measuring nesting across gestation with postpartum follow-up measures of maternal and infant health would allow us to better understand how women's evolved nesting psychology may benefit them in the modern world.

In closing, evolution may have equipped human women with a valuable set of psychological and behavioral mechanisms designed to aid them in the prepartum period and to prepare for birth of their children. The present study replicates previous work highlighting the specific social and space preparatory behaviors that women engage in during the time leading up to birth, as well as highlights potential predictors of nesting among pregnant women. Future work should focus on more diverse sampling and longitudinal design to better understand how these adaptations aid women and their infants in the modern world.

APPENDIX A

NESTING QUESTIONNAIRE

Use the following scale to indicate how much you agree with each of the following statements:

1. _____ Recently, I have experienced an uncontrollable urge to re-organize and cleanse my home.
2. _____ I would rather focus on getting my work completed than on fixing up my home.
3. _____ I am too busy to spend time thinking about or planning my home.
4. _____ In the past 6 months, I have spent a great deal of energy on home renovations.
5. _____ Recently, I have spent a lot of time sorting through and purging household items.
6. _____ Currently, I would prefer if my partner/husband stayed close to home.
7. _____ I have experienced a burst of energy in the past week.
8. _____ I have experienced a burst of energy in the past 24 h.
9. _____ Currently, I find that it is especially true that I prefer to spend time at home with close family and friends.
10. _____ Currently, I prefer staying close to home.
11. _____ Lately, I've had a strong urge to withdraw into my house and get everything inside just the way I like it.
12. _____ Currently, I find being around strangers uncomfortable.
13. _____ Currently, I prefer familiar environments.
14. _____ I find myself imagining exotic places and wishing I could be traveling.
15. _____ I prefer not to travel at this time.
16. _____ At this time I find new places and people exciting.
17. _____ I find that I am constantly tired at this time.

18. _____ I enjoy working out and engaging in all of the physical activities I enjoyed before I became pregnant.

19. _____ Right now, I find it difficult to stand for extended periods of time.

APPENDIX B

SUPPLEMENTAL MATERIALS

Supplemental analyses provided exact replication of analyses reported in Anderson and Rutherford (2013). In an analysis of variance (ANOVA) predicting nesting from pregnancy status while controlling for lethargy and parity, the overall model was significant, $F(3, 192) = 11.91, p < .001, \text{partial } \eta\text{-squared} = .16$. Pregnancy status significantly predicted nesting, $F(1, 192) = 6.34, p = .013, \text{partial } \eta\text{-squared} = .03$. Lethargy also significantly predicted nesting, $F(1, 192) = 6.85, p = .010, \text{partial } \eta\text{-squared} = .04$. Parity did not predict nesting in this model, $F(1, 192) = 1.73, p = .190, \text{partial } \eta\text{-squared} = .01$.

Analyses examined the two nesting subscales separately. In an ANOVA predicting space preparation from pregnancy status while controlling for lethargy and parity, the overall model was not significant, $F(3, 192) = 2.05, p = .108, \text{partial } \eta\text{-squared} = .03$. In an ANOVA predicting social selectivity from pregnancy status while controlling for lethargy and parity, the overall model was significant, $F(3, 192) = 21.06, p < .001, \text{partial } \eta\text{-squared} = .25$. Pregnancy status significantly predicted social selectivity, $F(1, 192) = 4.01, p = .046, \text{partial } \eta\text{-squared} = .02$. Lethargy significantly predicted social selectivity, $F(1, 192) = 24.57, p < .001, \text{partial } \eta\text{-squared} = .12$. Parity did not predict social selectivity in this model, $F(1, 192) = .81, p = .370, \text{partial } \eta\text{-squared} = .003$.

In an ANOVA predicting nesting from trimester (including nonpregnant women as a fourth trimester category, as in Anderson & Rutherford, 2003) while controlling for lethargy and parity, the overall model was significant, $F(5, 190) = 7.45, p < .001, \text{partial } \eta\text{-squared} = .17$. There was a significant effect of trimester on nesting, $F(3, 190) = 3.20, p = .02, \text{partial } \eta\text{-squared} = .05$. There was also a significant effect of lethargy on nesting, $F(1, 190) = 6.93, p =$

.009, *partial eta-squared* = .04. There was no effect of parity on nesting in this model, $F(1, 190) = 1.59, p = .209, \text{partial eta-squared} = .01$. Contrasts among the trimesters revealed no difference in nesting between the first ($M = 4.11, SD = .67$) and second ($M = 4.18, SD = .76$) trimesters, $F(1, 65) = .38, p = .539, \text{partial eta-squared} = .002$. There was no difference in nesting between the first and third ($M = 4.42, SD = .62$) trimesters, $F(1, 39) = 2.74, p = .100, \text{partial eta-squared} = .02$. There was no difference in nesting between the first trimester and the nonpregnant group ($M = 3.71, SD = .76$), $F(1, 118) = .47, p = .494, \text{partial eta-squared} = .003$. There was no difference in nesting between women in the second and third trimesters, $F(1, 71) = 1.98, p = .162, \text{partial eta-squared} = .01$. There was no difference in nesting between women in the second trimester and the nonpregnant women, $F(1, 150) = 3.61, p = .059, \text{partial eta-squared} = .02$. There was a significant difference in nesting between women in the third trimester and nonpregnant women, $F(1, 124) = 8.61, p = .004, \text{partial eta-squared} = .04$.

In an ANOVA predicting space preparation from trimester (including nonpregnant women as a fourth trimester category) while controlling for lethargy and parity, the overall model was not significant, $F(5, 190) = 1.44, p = .211, \text{partial eta-squared} = .04$. There were no effects of trimester, $F(3, 190) = 1.84, p = .142, \text{partial eta-squared} = .03$, lethargy, $F(1, 190) = .32, p = .572, \text{partial eta-squared} = .002$, or parity, $F(1, 190) = .82, p = .37, \text{partial eta-squared} = .004$, on space preparation.

In an ANOVA predicting social selectivity from trimester (including nonpregnant women as a fourth trimester category) while controlling for lethargy and parity, the overall model was significant, $F(5, 190) = 12.64, p < .001, \text{partial eta-squared} = .26$. There was a significant effect of trimester on social selectivity, $F(3, 190) = 2.57, p = .040, \text{partial eta-squared} = .04$. There was also a significant effect of lethargy on social selectivity, $F(1, 190) = 22.86, p < .001, \text{partial eta-squared} = .11$.

eta-squared = .11. There was no effect of parity on social selectivity, $F(1, 190) = 1.22, p = .271$, *partial eta-squared* = .01. Contrasts among the trimester groups revealed no difference in social selectivity between women in the first ($M = 4.27, SD = .68$) and second ($M = 4.15, SD = .95$) trimesters, $F(1, 65) = .004, p = .948, \text{partial eta-squared} < .001$. There was no difference in social selectivity between women in the first and third ($M = 4.57, SD = .85$) trimesters, $F(1, 39) = 2.26, p = .135, \text{partial eta-squared} = .01$. There was no difference in social selectivity between women in the first trimester and women who were not pregnant ($M = 3.54, SD = .85$), $F(1, 118) = .51, p = .477, \text{partial eta-squared} = .003$. There was no difference in social selectivity between women in the second trimester and women in the third trimester, $F(1, 71) = 3.35, p = .069, \text{partial eta-squared} = .02$. There was no difference in social selectivity between women in the second trimester and nonpregnant women, $F(1, 150) = 1.31, p = .254, \text{partial eta-squared} = .01$. There was a difference in social selectivity between women in the third trimester and nonpregnant women, $F(1, 124) = 7.67, p = .006, \text{partial eta-squared} = .04$.

In a regression model predicting nesting from week of gestation while controlling for lethargy and parity, the overall model was not significant, $R^2 = .08, p = .064$. Week of gestation significantly predicted nesting, $B = .02, p = .026, \text{semi-partial } r^2 = .06$. Lethargy did not predict nesting, $B = .09, p = .099, \text{semi-partial } r^2 = .03$. Parity also did not predict nesting in this model, $B = -.02, p = .891, \text{semi-partial } r^2 < .001$.

In a regression model predicting space preparation from week of gestation while controlling for lethargy and parity, the overall model was not significant, $R^2 = .04, p = .382$. In this model, week of gestation did not predict space preparation, $B = .02, p = .152, \text{semi-partial } r^2 = .02$. Lethargy, $B = -.02, p = .727, \text{semi-partial } r^2 = .001$, and parity, $B = -.15, p = .441, \text{semi-partial } r^2 = .007$, also did not predict space preparation.

In a regression model predicting social selectivity from week of gestation while controlling for lethargy and parity, the overall model was significant, $R^2 = .15, p = .003$. Week of gestation significantly predicted social selectivity, $B = .02, p = .027, \text{semi-partial } r^2 = .05$, as did lethargy, $B = .20, p = .002, \text{semi-partial } r^2 = .10$. Parity did not predict social selectivity in this model, $B = .11, p = .556, \text{semi-partial } r^2 = .003$.

Exploration of Predictors of Space Preparation and Social Selectivity

In addition to replicating previous work on nesting behaviors, the present study sought to explore predictors of space preparation and social selectivity among pregnant women.

Progesterone. We assessed whether levels of progesterone might statistically mediate the higher levels of social selectivity in pregnant women, compared with non-pregnant women. As noted earlier, pregnancy status significantly predicted social selectivity, $B = .76, p < .001, 95\% \text{ CI } [.46, 1.05]$, with pregnant women engaging in more social selectivity than nonpregnant women. Pregnancy status also significantly predicted progesterone, $B = 507.12, p < .001, 95\% \text{ CI } [418.96, 595.27]$, with pregnant women having higher levels of progesterone than nonpregnant women. In this model progesterone predicted social selectivity, $B = .001, p = .004, 95\% \text{ CI } [.000, .001]$, with higher levels of progesterone predicting higher levels of social selectivity. When both progesterone and pregnancy status were included in the model, however, pregnancy status significantly predicted social selectivity, $B = .81, p < .001, 95\% \text{ CI } [.42, 1.20]$, while progesterone did not, $B = .000, p = .682, 95\% \text{ CI } [-.001, .000]$, indicating that progesterone does not mediate the link between pregnancy and social selectivity. There was no association between pregnancy status and space preparation, so we did not test for mediating effects of progesterone in that model.

We also assessed whether, in pregnant women, progesterone predicted level of space preparation. In addition to a linear effect of progesterone, we also assessed a possible non-linear effect by including a polynomial term in the model (i.e., progesterone squared). This model revealed neither linear, $B < .001, p = .183, \text{semi-partial } r^2 = .02$, nor nonlinear, $B < .01, p = .123, \text{semi-partial } r^2 = .03$, effects of progesterone on space preparation among pregnant women.

We also assessed whether, in pregnant women, progesterone predicted level of social selectivity. In addition to a linear effect of progesterone, we also assessed a possible non-linear effect by including a polynomial term in the model (i.e., progesterone squared). This model revealed neither linear, $B < .01, p = .780, \text{semi-partial } r^2 = .001$, nor nonlinear, $B < .01, p = .556, \text{semi-partial } r^2 = .004$, effects of progesterone on social selectivity among pregnant women.

Pathogen Avoidance Motives

To assess the possibility that level of space preparation might be predicted by pathogen avoidance motives, we used multiple regression to predict space preparation from both germ aversion and perceived infectability. There was no effect of perceived infectability on space preparation among pregnant women, $B = .02, p = .831, \text{semi-partial } r^2 < .001$. There was, however, a significant effect of germ aversion on space preparation, $B = .23, p = .007, \text{semi-partial } r^2 = .08$, such that women scoring higher on germ aversion engaged in more space preparation.

To assess the possibility that level of social selectivity might be predicted by pathogen avoidance motives, we used multiple regression to predict social selectivity from both germ aversion and perceived infectability. There was no effect of perceived infectability on social selectivity among pregnant women, $B = .11, p = .220, \text{semi-partial } r^2 = .02$, nor was there an effect of germ aversion on social selectivity, $B = .12, p = .089, \text{semi-partial } r^2 = .03$.

Life History Strategy and the Mating-Parenting Tradeoff

We tested eight separate regression models predicting social selectivity and space preparation within pregnant women from four separate markers of childhood unpredictability (SOI, childhood SES, oxidative stress, and age of first birth, respectively). Because nesting among pregnant women was positively associated with current SES, we controlled for current SES to ensure that any effects were independent of SES. In addition, to assess the possibility that any effects of reproductive timing variables might depend on current SES, we also tested the centered interactions between life history variables and current SES.

An overall model predicting space preparation from childhood SES, current SES, and their centered interaction, was marginally significant, $F(3, 86) = 2.60, p = .057, R^2 = .083$. There was a significant main effect of current SES, $B = .16, p = .026, \text{semi-partial } r^2 = .05$, such that women high in SES engaged in relatively more space preparation than did women low in SES. There was no main effect of childhood SES on space preparation, $B = .08, p = .173, \text{semi-partial } r^2 = .02$, nor was there an interaction between childhood SES and current SES, $B = -.05, p = .312, \text{semi-partial } r^2 = .01$.

An overall model predicting social selectivity from childhood SES, current SES, and their centered interaction, was not significant, $F(3, 86) = .98, p = .407, R^2 = .03$. There was no effect of current SES in this model, $B = .10, p = .192, \text{semi-partial } r^2 = .02$. There was no effect of childhood SES, $B = -.02, p = .806, \text{semi-partial } r^2 < .001$, nor was there an interaction between current and childhood SES, $B = -.06, p = .267, \text{semi-partial } r^2 = .01$.

An overall model predicting space preparation from oxidative stress, current SES, and their centered interaction was not significant, $F(3, 74) = 1.66, p = .182, R^2 = .06$. There was no effect of current SES, $B = .12, p = .155, \text{semi-partial } r^2 = .03$, nor was there an effect of

oxidative stress, $B = -.04$, $p = .092$, *semi-partial* $r^2 = .04$. There was no interaction between current SES and oxidative stress on space preparation, $B = .03$, $p = .367$, *semi-partial* $r^2 = .01$.

An overall model predicting social selectivity from oxidative stress, current SES, and their centered interaction was marginally significant, $F(3, 74) = 2.54$, $p = .063$, $R^2 = .09$. There was no significant main effect of current SES in this model, $B = .01$, $p = .876$, *semi-partial* $r^2 < .001$. There was no main effect of oxidative stress, $B = .02$, $p = .555$, *semi-partial* $r^2 = .004$. There was a significant interaction between current SES and oxidative stress, $B = -.08$, $p = .010$, *semi-partial* $r^2 = .09$. To assess the form of this interaction, we calculated the relationship between oxidative stress and social selectivity among women high (1SD above the mean) and low (1 SD below the mean) of SES. Although no effect of oxidative stress was observed among women high in SES, $B = -.08$, $p = .07$, *semi-partial* $r^2 = .04$, among women low in SES, high levels of oxidative stress were associated with higher levels of social selectivity, $B = .12$, $p = .013$, *semi-partial* $r^2 = .08$.

An overall model predicting space preparation from the age of first birth, current SES, and their centered interaction was significant, $F(3, 55) = 2.89$, $p = .044$, $R^2 = .14$. The main effect of current SES in this model was not significant, $B = .15$, $p = .077$, *semi-partial* $r^2 = .05$. There was no main effect of age of first birth, $B = .04$, $p = .082$, *semi-partial* $r^2 = .05$. The interaction between age of first birth and current SES was not significant, $B = -.004$, $p = .832$, *semi-partial* $r^2 < .001$.

An overall model predicting social selectivity from the age of first birth, current SES, and their centered interaction was not significant, $F(3, 55) = .59$, $p = .623$, $R^2 = .03$. There was no effect of current SES on social selectivity in this model, $B = .02$, $p = .861$, *semi-partial* $r^2 <$

.001 . There was no effect of age of first birth, $B = -.03, p = .280, \text{semi-partial } r^2 = .02$, nor was there an interaction between the two, $B = -.02, p = .412, \text{semi-partial } r^2 = .01$.

An overall model predicting space preparation from SOI, current SES, and their centered interaction was significant, $F(3, 86) = 3.82, p = .013, R^2 = .12$. The main effect of current SES in this model was significant, $B = .19, p = .008, \text{semi-partial } r^2 = .08$. There was no main effect of SOI in this model, $B = .10, p = .237, \text{semi-partial } r^2 = .01$. There was a significant SOI by current SES interaction, $B = -.13, p = .040, \text{semi-partial } r^2 = .04$.

An overall model predicting social selectivity from SOI, current SES, and their centered interaction was marginally significant, $F(3, 86) = , p = .056, R^2 = .08$. The main effect of current SES in this model was not significant, $B = .12, p = .090, \text{semi-partial } r^2 = .03$. There was no main effect of SOI in this model, $B = .09, p = .278, \text{semi-partial } r^2 = .01$. There was a significant SOI by current SES interaction, $B = -.14, p = .035, \text{semi-partial } r^2 = .05$.

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BIOGRAPHICAL SKETCH

Education

M.S. in Social Psychology, Florida State University Spring 2021

Advisor: Dr. Jon Maner

B.S. in Psychology, Berry College May 2019

Magna Cum Laude

Research Interests

Evolutionary psychology; pregnancy; parenting; pathogen avoidance; social networks.

Conference Presentations

Ketterman, A. B., Makhanova, A., Reynolds, T., Case, C., McNulty, J., Eckel, L., Flynn, H., & Maner, J. (2021, February). *Evidence for and predictors of nesting behaviors in pregnant women*. Poster session at the Society for Personality and Social Psychology Annual Convention Evolutionary Psychology Preconference, virtual.

Ketterman, A. B., & Maner, J. K. (2020, February). *How do people influence others? The role of dominance, prestige, and the dark triad*. Poster session at the Society for Personality and Social Psychology Annual Convention Evolutionary Psychology Preconference, New Orleans, LA.

Ketterman, A., & Bissonnette, V. (2019, May). *Does it matter who is watching? Altruism as a costly signal*. Poster session at the Association for Psychological Science 31st Annual Convention, Washington, DC.

Ketterman, A., & Bissonnette, V. (2019, May). *Does empathy mediate the relationship between the dark triad traits and altruism?* Poster session at the Association for Psychological Science 31st Annual Convention, Washington, DC.

Ketterman, A., & Bissonnette, V. (2019, April). *Does it matter who is watching? Altruism as a costly signal*. Paper presentation at Berry College's Annual Symposium on Student Scholarship, Mount Berry, GA.

Rusia, R., Dexter, C., **Ketterman, A.,** & Huskey, B. (2017, May). *The effect of text variation on parent-child interaction during shared reading*. Poster session at the Association for Psychological Science 29th Annual Convention, Boston, MA.

Ketterman, A., Bennett, G., & Bissonnette, V. (2017, April). *The dark triad personality traits and the experience of guilt and shame*. Poster session at Berry College's Annual Symposium on Student Scholarship, Mount Berry, GA.

Publications and Manuscripts in Preparation

Makhanova, A., **Ketterman, A. B.,** Plant, E. A., & Maner, J. K. (under review). Pathogen threat and outgroup prejudice using the minimal group paradigm: Evidence from a registered report.

Ketterman, A. B., & Maner, J. K. (2021) Complaisant or coercive? The role of dominance and prestige on social influence. *Personality and Individual Differences, 177*, 110814.

Ketterman, A. B., Makhanova, A., Reynolds, T., Case, C., McNulty, J., Eckel, L., Flynn, H., & Maner, J. (manuscript in preparation). Evidence for and predictors of nesting behaviors in pregnant women.

Teaching Experience

Research Methods in Psychology Lab

Grants and Scholarships

Ralph George Berry Scholars Fund Grant of \$4,000 awarded to Junior Psychology students to cover travel expenses, equipment, and other expenses involved in carrying out a research study of their choice under the supervision of a faculty mentor.	Fall 2017-Spring 2019
H. and B. Overstreet Scholarship Total of \$800 towards tuition awarded to an undergraduate Psychology major with a cumulative GPA of 3.3 or higher, recommended by the Dean of the Charter School of Education and Human Sciences at Berry College.	Fall 2018
Student Research Development Fund Internally funded grant of \$500 to cover travel expenses, conference registration, and related fees for students to travel to present research at a professional conference.	Spring 2017