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Article (Accepted Version)

Shahvisi, Arianne (2019) Nesting behaviours during pregnancy: biological instinct, or another way of gendering housework? *Women's Studies International Forum*, 78. a102329. ISSN 0277-5395

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Nesting behaviours during pregnancy: hormonal urge, or another way of gendering housework?

Abstract

Nesting is a hormonally-determined set of behaviours, observed in some animals, relating to the preparation of the space in which the offspring will be born and raised. Texts on childbirth and pregnancy advise women that they will experience nesting behaviours during pregnancy, causing them to tidy, clean, and prepare their living space. In this paper, I analyse the discussion of nesting behaviours on popular pregnancy websites. I then investigate the evidence base for nesting in humans through conducting a systematic review of the academic literature, and conclude that it is inadequate to ground the claims made in the popular discourse. The article concludes by presenting social explanations for nesting behaviours which are more plausible than the proposed biological narrative. These explanations make reference to the influence of gender stereotypes and the specific pressures experienced by women during pregnancy.

Word count 10751

Keywords nesting; pregnancy; housework; domestic work; biological essentialism.

Introduction

Theories of biological and evolutionary determinism [...] are deeply satisfying to a particular consciousness: things are as they are because they have to be so; our social institutions have their biological/evolutionary origins in the bits and pieces of behavioral repertoires seen in all other species, from

primates to bees, ants, fishes. These explanations preclude any drive for social change, but they assuage guilt about violations of a liberal humanistic tradition (Bleier 1978, 159).

Toward the end of my twenties, my social-media feeds began to present the pregnancies of peers, their ballooning bumps depicted alongside updates on their daily experiences and challenges. Several reported an urgent compulsion to clean, tidy, and modify their living space, and supposed that they must be “nesting.” Shifting attention to space preparation activities during pregnancy struck me as sensible and even predictable: just as one prepares for a house-guest, so too must the living space be arranged for a new permanent member of the household, especially one with very specific needs and vulnerabilities. Further, the birth of a child marks a new phase in the lives of her carers, so just as “spring cleaning” formalises the sense of a new beginning, so too may a revamped living space mark a new phase of life. Yet those are not the reasons typically used to explain this so-called “nesting instinct,” which is instead presented in pregnancy advice texts as an *evolutionary adaptation*—a human correlate of behaviours well-documented in other altricial animals—in which a pregnant woman’s¹ hormones cause her to engage in intensive cleaning, tidying and space-preparation in the third trimester.

Almost three-quarters of women polled on pregnancy site Baby Center claimed to have noticed nesting behaviours during their pregnancy; just over a quarter said they didn’t (Rosen 2016). Whatever its details or causes may be, nesting is a noteworthy aspect of many pregnancies. According to the UK Amazon book charts, “What to Expect When You’re Expecting” is the bestselling printed pregnancy and childcare manual. Its most

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¹ Some trans-men and non-binary people can also become pregnant. In this paper I only refer to “pregnant women,” by which I mean cis-women who are pregnant. I do so because I am specifically interested in those who are pregnant and gendered and socialised as women, as this is relevant to the gender stereotypes I will explore.

recent edition describes nesting as follows:

The need to nest can be as real and as powerful an instinct for some humans as it is for our feathered and four-legged friends. [...] For some it's subtle. All of a sudden, it becomes vitally important to clean out and restock the refrigerator and make sure there's a 6-month supply of toilet paper in the house. For others, this unusual burst of manic energy plays itself out in behavior that is dramatic, sometimes irrational, and often funny (Murkoff 2016, 383–84).

An article on the book's companion website describes the tendency to shift into "domestic overdrive," explaining that this "overwhelming compulsion to clean house [sic] [...] is a behavioral phenomenon that's not unique to human mothers." While the article attributes the phenomenon to "pregnancy hormones," it does acknowledge that the effect "could also have something to do with your subconscious desire to grab control over your life [...] before your life is taken over by your baby" (Murkoff 2005).

In this paper I am concerned with adjudicating the scientific and social bases for "nesting behaviours." I evaluate the strength of the claim that nesting behaviours are best explained by biology, and establish, via a systematic review of the academic literature, that this is not well-supported. I then propose an alternative social explanation which more satisfactorily explains the phenomenon in light of the intensifying of gendered pressures and expectations during pregnancy. Such an analysis is important as part of the broader work of ensuring that biological explanations are not erroneously used to reinforce gender stereotypes, in this case the stereotype of women as biologically-compelled to perform housework.

Major touchpoints in conducting this analysis are Emily Martin's (1991) study on the way in which gendered stereotypes constrain scientists' framing of the properties of sex cells in ways that obstruct scientifically-accurate descriptions of conception, and Elisabeth Lloyd's (1993) work on the way in which the reduction of female sexuality to its reproductive function, which derives from a set of social assumptions about women's

rightful role, leads zoologists to wilfully ignore examples of non-reproductive sexuality in non-human primates. In this tradition, I hope to demonstrate that in the case of nesting behaviours in humans, science is being relied upon to provide an explanation that it is not currently (and may never be) equipped to deliver. This is problematic because it risks making highly-gendered social behaviours seem necessary, rather than contingent. As in Martin's study, biology is being made to over-reach; as in Lloyd's study, a more plausible set of social explanations is being overlooked.

The paper is structured as follows: in section 1, I define nesting and provide examples of its description within popular online pregnancy resources, paying attention to the gender stereotypes that are found within these texts. In section 2, I systematically review the scientific literature on the nesting instinct in humans in search of scientific evidence for a nesting instinct, and critically evaluate the resulting studies. I conclude that, contrary to the claims in the sources in section 1, a biological basis for nesting behaviours is not well-supported. In section 3, I provide some contextual discussion on the gendering of housework and surveillance during pregnancy. I draw on this in section 4 in order to offer an alternative explanation for nesting behaviours which references gendered social pressures and practical considerations. Section 5 concludes.

1. Nesting in online pregnancy texts

In this section, I explore a sample of texts from popular English-language pregnancy websites, in order to give a sense of the popular discourse around nesting behaviours. The section concludes by summarising some themes emerging from these texts.

Pregnant women report feeling empowered by accessing large amounts of information from healthcare providers, pregnancy websites, discussion forums, antenatal

classes, and print pregnancy manuals, and the internet is considered to be the most authoritative, timely, and comprehensive source of pregnancy information (Sanders and Crozier 2018; Lagan, Sinclair, and Kernohan 2011; Fleming, Vandermause, and Shaw 2014). Kennedy *et al.* note that despite many pregnancy resources being written and/or endorsed by physicians, they do not systematically present the evidence base for their “facts” and recommendations, and inaccurate, outdated, and contradictory advice is commonly noted (2009).

In order to rigorously study the information on nesting within the popular discourse, I used web traffic analysis site *Alexa Internet, Inc.* to identify the highest-ranked websites globally in the pregnancy category. This search was conducted on the 22nd July 2019. I excluded any websites that were devoted to baby names, boosting fertility or becoming pregnant, or specific medical conditions in pregnancy, and also excluded forum websites and directory websites, since my aim was to examine pregnancy advice or resource websites which are likely to be perceived to be accurate, authoritative sources on the experience of pregnancy, written by experts or specialists. Applying these exclusion criteria, the remaining highest ranking websites in the pregnancy category were, in order of traffic volume: *American Pregnancy*, *Moms.com*, *National Childbirth Trust*, *Childbirth Connection*, *SureBaby*, *Pregnancy, Birth and Beyond*, *Pregnancy Calendars*, *Christian Mommies*, *Pregnancy Info* (Alexa Internet Inc. 2019). Of these, *Moms.com*, *Childbirth Connection*, *SureBaby*, and *Christian Mommies* did not contain any dedicated articles on nesting, and were therefore excluded. In what follows, I review the entries on nesting within the remaining five, which were identified by using the search function on each website to search for pages containing the word “nesting.” Advertisements and comments posted under articles were excluded.

The highest ranking pregnancy website globally was *American Pregnancy*, the

website of the US-based American Pregnancy Association, a “national health organization committed to promoting reproductive and pregnancy wellness through education, support, advocacy, and community awareness” (American Pregnancy Association 2005). Its major traffic comes from the United States (48.4%), India (9.4%) and Nigeria (3.0%).² It contained two articles which included the word “nesting.” The first is an article accompanied by an image of a woman dusting a cabinet. It states that nesting is “the overwhelming desire to get your home ready for your new baby [...] and is considered to be an instinct to prepare for birth” but does not firmly commit to any particular biological explanation, instead suggesting that nesting may be caused by boredom or frustration, excitement and anticipation, or the desire to sort out the living space before the baby arrives and overwhelmingly commands her parents’ attention. The pregnant reader is encouraged to: “direct some of the nesting responsibilities to your partner” (American Pregnancy 2013). The second article containing the word “nesting” states that nesting behaviours are an indication that labour will occur “within a few weeks or days” (American Pregnancy 2017), contradicting the first article’s contention that the idea that nesting indicates imminent labour is an “old wives’ tale.” No evidence is offered for either claim.

The second most popular pregnancy website was *National Childbirth Trust*, a UK charity which aims to support parents through pregnancy, birth, and the first stages of parenthood. There were two pages containing the word “nesting.” The first is the “Week 36” entry of a week-by-week overview of what pregnant women can expect. The advice is as follows:

You've got that 'nesting' feeling! You may start getting the urge to clean and prepare your home for your baby. It's a sign you'll be welcoming your new

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² No data was available on visitors for the other websites identified. This is an unfortunate limitation of the data, as it would be instructive to contrast different accounts of nesting according to the geographical distribution of their readers.

arrival soon. 'Nesting' is a much talked about symptom of pregnancy in the third trimester. It's very common to have the overwhelming need to decorate your house, organise your wardrobe and clean everything in sight (National Childbirth Trust 2011).

Women are advised to prepare meals which can be frozen, since there may not "be much time for cooking after the baby is born." While the preceding text implies a biological urge, this addendum seems to point to the pragmatic role served by nesting. The second page, which focusses on signs of labour, advises women that they may feel "unusually energetic, such as a sudden urge to start cleaning the house (also known as the 'nesting instinct')" (National Childbirth Trust 2012).

The third most popular website is Australian "public health information website" *Pregnancy, Birth and Beyond*, which aims to provide an "extensive source of well-known and up-to-date information and support throughout pregnancy, birth and parenting" (Pregnancy, Birth, and Beyond 2019). Three pages were found which discussed nesting. The first was written by a medical doctor, and is equivocal in its discussion of nesting, stating that there are "many more hormonal influences on birth that are not well understood" and that a nesting instinct "may be due to an increase in levels of prolactin, which is sometimes referred to as the nesting hormone" (Buckley 2018). The second page mentions nesting in passing, stating that "some women experience a surge in energy just prior to the birth" (Palmer 2018). The last page, written by Professor of Midwifery Hannah Dahlen, differs markedly in tone:

some women report habits such as 'nesting.' This involves cleaning and organising everything in sight in preparation for the imminent birth. Husbands get yelled at for dropping their socks in the wrong place and the pantry is cleaned and the products alphabetised! Women may also report feeling a bit spaced out and dreamy as hormones begin to surge (Dahlen 2018).

The fourth highest-ranked website was *Pregnancy Calendars*, which is a

Article pre-print. Cite as: Shahvisi, Arianne *Nesting behaviours during pregnancy: hormonal urge, or another way of gendering housework?* Women's Studies International Forum (forthcoming)

pregnancy information website registered in the United States. The only article which mentions nesting features a photograph of the body of a visibly pregnant woman as she sweeps a floor. Nesting is described as:

the uncontrollable urge to clean your house, and generally go crazy doing all sorts of things that will prepare the 'nest' for the new member of the family [...] This is a primal instinct and all the females of almost every species in the world will go through this same instinct in one way or another. [...] Nesting brings about some unique and seemingly irrational behaviors in pregnant women and all of them experience it differently. Women have reported throwing away perfectly good sheets and towels because they felt the strong need to have "brand new, clean" sheets and towels in their home. [...] There seems to be no end to the lengths a nesting mother will go to prepare for her upcoming arrival (Prenancy Calendars 2019).

The article goes on to make recommendations for pregnant woman to stay safe while engaging in nesting activities, i.e. being careful about using potentially toxic cleaning or decorating materials.

The last website identified by the *Alexa* search is *Pregnancy Info*, whose objective is to provide "articles, updates and research related to this special time in your life" (Pregnancy Info 2004). There is a single, dedicated page on nesting. It refers to a biological basis, but also considers the possibility of a social explanation, acknowledging the pressures pregnant women face:

It is believed that females are programmed to experience this nesting instinct in order to ensure that their offspring will be cared for properly after birth. [...] Pregnancy is a time of intense hormonal fluctuations, and these changes can cause you to act in crazy ways! [...] This can incite many women to begin cleaning, organizing, and planning for their baby's arrival. Furthermore, social expectations also play a role in the nesting instinct. Parents are often expected to do special things for their baby's arrival, including decorating a nursery, cleaning house, and purchasing new clothes (Pregnancy Info 2006).

The article also seeks to reassure those who do not experience nesting, and suggests that many may be too tired to engage in the behaviours compelled by this

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“instinct”:

Every pregnant woman's experience with the nesting instinct is different. If you don't experience the urge to clean or reorganize, you have no reason to feel guilty or abnormal. Many women are simply too tired and worn out by the end of their pregnancy to experience this instinct.

Later in the same article, nesting in expectant fathers is also briefly mentioned. It is claimed that they may “take a newfound interest in finding a new job, working on their car, or landscaping the garden.” Intrigued as to whether others had described this phenomenon, I used Google to hand-search for other articles which referred to “nesting” and “expectant father”. There were several relevant articles, all of which focussed on the idea that men must also prepare for their role as “protector and provider.” Interestingly, this role seems to only involve tasks that are stereotypically masculine: e.g. engaging in home improvements, or buying a new car or tools. Apparently some prospective fathers “find themselves preparing for many a housebound evening by investing in upgraded cable, bigger televisions or other man-cave luxuries” (Burnett 2012), behaviours that stand in stark (gendered) contrast to the tidying and cleaning reported by women.

While some websites reference social or practical causes, the dominant narrative is that nesting behaviours are hormonally regulated: a psycho-endocrinological relic of an evolutionary adaptation. While almost all information articles on nesting make reference to a biological basis which emerges as an evolutionary adaptation, none cite any specific scientific study. There seems to be an expectation that the causal link will be obvious, and a strong reliance on a seemingly common-sense piece of pregnancy folklore.

It is also interesting to note that many of the online articles advising women about nesting use the words “crazy,” “irrational,” “manic,” or “obsessed” to describe the behaviours women may exhibit in late pregnancy. One article describes nesting as a phenomenon that transforms “even the most laid-back housekeeper into a mop-wielding

maniac" (Skolnik 2003). There is a contradiction at the heart of this characterisation, because although these articles presume a hormonal cause deriving from an evolutionary adaptation, which indicates that a survival advantage is conferred by the behaviours in question, they are still presented as being illogical, or even pathological.

Several important themes can be identified from this overview of online pregnancy texts:

- (a) Nesting behaviours are intensive versions of household tasks that are stereotypically gendered as appropriate for women;
- (b) Nesting behaviours in women are usually attributed to biological instincts as a result of an evolutionary adaptation which is consistent with that in other mammals;
- (c) In the texts studied, no scientific evidence was offered for nesting in humans;
- (d) Social explanations which make reference to time constraints and pragmatic preparation are sometimes mentioned as secondary explanations;
- (e) Nesting behaviours are often described as necessary and irresistible, as: "impulses," "instincts," "urges," or "compulsions;"
- (f) Nesting behaviours are often described as "crazy," "irrational," "manic" and "funny;"
- (g) While nesting in men is sometimes noted, it is highly gender-stereotypical, differs markedly from nesting behaviours in women, and is not ascribed to a biological basis.

2. Nesting in the academic literature

Nesting behaviours are widely observed in female altricial mammals such as mice

(Lisk, Pretlow, and Friedman 1969), rats (Rosenblatt, Mayer, and Giordano 1988), rabbits (Zarrow et al. 1963), and pigs (Castrén et al. 1993). Nesting behaviour in non-human mammals is literal: its central feature is the preparation of a physical nest in which to bear and house the young. The nest facilitates a safer birth and protects the vulnerable offspring from hazards. The onset and cessation of nesting behaviours is understood to be endocrinological in origin, arising from changes in the levels of the hormones estradiol, progesterone, and prolactin in the third trimester of pregnancy (González-Mariscal et al. 1996).

For the sake of argument and in the interest of space, I will charitably assume that non-human animal studies conclusively demonstrate that nesting behaviours are generally observed during pregnancy, that they have been shown to be caused by hormonal changes, and that this phenomenon arose as an evolutionary adaptation.³ Even granting that, one cannot easily extrapolate these nesting behaviours to humans, whose living arrangements differ markedly to those of the animals just mentioned, and whose behaviours are so often and so strongly determined by the demands of living within complex human cultures, and even by the specific cultural mores of a particular human group. Further, sex differences in behaviour are very specific to particular species (Eliot and Richardson 2016), and it is important not to assume generalisability, but rather demonstrate the behaviour in each case independently. For this reason, specific human studies are required in order to support the claim that nesting behaviours in humans are primarily biologically-determined.

This section addresses the following question: are nesting behaviours in humans evidenced by scientific studies, and are they best explained as deriving from hormonal

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³ Even this is questionable, since studies of non-human animals have also been shown to be value-laden (e.g. Lloyd 1993), as all science can be argued to be (Longino 1987; Kuhn 1970).

changes which emerged as an evolutionary adaptation, as so many texts claim?

I undertook a systematic review of the academic literature to collect all research articles that have investigated or discussed nesting in human beings. On the 21st July 2019, I searched within the databases *Scopus* and *PsycINFO*, for articles that contained all the words “nesting,” “woman” or “women,” and “pregnant/pregnancy” or “hormone/hormonal.” No restriction was placed on publication date. Twenty-seven articles were identified. Duplicates were removed, and animal studies and those referring to nesting as its polysemous form (i.e. in informatics) were immediately excluded. Seven articles remained, which were read in their entirety. Those which only mentioned nesting in passing were excluded, as were those that referred only to “social nesting,” a term which describes the expansion of social networks prior to childbirth and is reported in women and men and not generally attributed to biological causes (see e.g. Gameiro et al. 2010). Only three papers remained which investigate the basis for space-preparation nesting behaviours in humans. Their bibliographies were cross-checked to ensure that no

relevant articles had been missed. The search strategy is presented visually in Figure 1.

Figure 1. Diagram of the systematic review process

An immediate finding is that nesting in humans is under-studied relative to its prominence in popular pregnancy discourses. Only one study has investigated the existence of nesting behaviours in human beings during pregnancy. This is an article reporting empirical work undertaken by psychologists Anderson and Rutherford (2013). As demonstrated by the dates of some of the online texts above, the idea of nesting in humans predates this 2013 study,⁴ so one must assume that earlier claims for a biological

⁴ Nesting in humans is mentioned in a midwifery textbook as early as 1981 (Myles 1981).

basis were merely presumptive, or extrapolated from animal studies. Their study was announced in a university press release with the claim that an “overwhelming urge that drives many pregnant women to clean, organize and get life in order—otherwise known as nesting—is not irrational, but an adaptive behaviour stemming from humans' evolutionary past” (McMaster University 2013). It also spawned a UK tabloid newspaper report entitled: “Why pregnant women are obsessed with tidying and nesting: It's all to do with their inner cavewoman” (Zolfagharifard 2013).

Anderson and Rutherford's study centred on a questionnaire which required pregnant and non-pregnant respondents to self-report their behaviours regarding re-organising their homes, cleanliness, renovations, purging household items, and social selectivity at various stages of pregnancy. They found that pregnant women were significantly more likely to report nesting behaviours, peaking in the third trimester. They state that this result is “consistent with the prediction that nesting is an adaptation in women” (Anderson and Rutherford 2013, 395).

There are significant problems with the study which may undermine its findings. The most serious, which Anderson and Rutherford do not register as a concern, is that they recruited participants via an online advertisement, publicised in part through parenting websites. This raises immediate concerns about the effects of selection bias. As I have shown above, parenting websites are major contributors to a popular discourse around nesting behaviours in pregnancy, therefore those spending sufficient time on these websites to notice and respond to a questionnaire are likely to be those who are also reading articles about their pregnancy on those same websites, which are likely to have described nesting behaviours.

Even those who came across the questionnaire while browsing other websites on which the link to the questionnaire was posted (e.g. Facebook, Google ads) are

presumably, by the fact of noticing the advertisement and following up, also likely to be regular users of online parenting websites and forums. This is problematic because their questionnaire is accordingly liable to mirror what women are *expecting* to be experiencing at the time of being questioned, as directed by pregnancy texts. It is a general challenge that participants sometimes respond to research studies by providing what they believe will be helpful to the researchers. This is known as “response bias,” and is well-documented as a limitation of questionnaires, which arises as a result of participants reacting not only to the questions as intended by the researchers, but also a whole host of other cues which the researchers may not have accounted for (Furnham 1986). The more specific version of this phenomenon which may be in operation here is the “social desirability effect,” which leads participants to respond in ways that they deem to be most socially acceptable (Van de Mortel 2008). In the case of pregnancy, with so much information regarding “what to expect” at various different stages, one wonders whether participants may be even more inclined to self-report in ways that represent their pregnancy as “normal,” and thereby emphasise their fitness for maternity.

Those choosing to engage with such a questionnaire may also be those most likely to see pregnancy as an important part of their identity, and thereby be primed in what to expect at the various different stages. The questionnaire is transparent in this respect: those already aware of nesting behaviours would be likely to register the relevance of nesting to the study, and their answers may have been responsive to that expectation. This is difficult to control for, since pregnant women tend to have a very good sense of their pregnancy stage. In other words, if nesting is performative in accordance with expectations as dictated by the popular discourse on pregnancy, Anderson and Rutherford's study cannot guarantee that it is documenting the “real” effect as they would

see it, rather than capturing some epiphenomenon.

In the discussion section of the article, they state that their results are “consistent with the prediction that nesting is an adaptation in women.” (Anderson and Rutherford 2013, 395). Their wording is tentative, which reflects the fact that their results are consistent with other explanations too. Later in the conclusion they point out that a “safe environment must be built during pregnancy; there is no time in the early postpartum period” (*ibid.*, 396). Yet this is could just as easily be a closing comment within an article which argues that nesting behaviours are simply pragmatic behaviours.

Even if we assume that Anderson and Rutherford have provided high-quality evidence for nesting behaviours in human pregnancy, it is still a leap to assume that these behaviours stem from a biological, rather than a pragmatic or social cause. Consider some of the questions included within their questionnaire: “Recently, I have experienced an uncontrollable urge to re-organize and cleanse my home”; “In the past 6 months, I have spent a great deal of energy on home renovations”; “Recently, I have spent a lot of time sorting through and purging household items.” It is likely that those unacquainted within the phenomenon of nesting would expect pregnant women to more readily answer these questions in the affirmative than non-pregnant peers simply because these are *prima facie* reasonable pragmatic behaviours during pregnancy.

Two other papers focus on nesting behaviours in humans. The first of these is an ethnography involving staff and patients at a freestanding (i.e. separate from a hospital) birth centre in the UK (Walsh 2006). The author speculates that patients’ descriptions of their motivation for choosing the birth centre (“...as soon as we walked in we thought — yep! This is the sort of place”; “I could picture myself there”; “A woman knows immediately when it’s the right atmosphere” [*ibid.* 232]) may indicate that a nesting intuition is at work. Walsh notes the “immediacy and certainty” with which women

decide that the centre is an appropriate site for birth, and contends that “the visualisation confirms the involvement of the non-rational, emotionally mediated brain function” (*ibid.* 232). Yet later in the article, the birth centre is praised for its “cleanliness, tidiness, and upkeep,” its hospitality, and the fact that patients are permitted to freely use all areas of the centre (233). It therefore seems plausible that patients were quite rationally selecting a space that seemed clean, welcoming, competently-run, and respectful of their autonomy, rather than reacting to a non-rational instinct. No further justification is offered for Walsh's nesting hypothesis, and no attempt is made to investigate the existence of a nesting instinct in humans.

The final paper identified by the systematic review examines human nesting behaviour outside of pregnancy. The authors found that ovulating women were more likely to engage in nesting, and therefore claim to have demonstrated a biological basis for these behaviours (Castagno, Lange, and Edlund 2017). Their questionnaire asked participants to self-report their personality traits in relation to organisation, routine, preparation, and cleanliness on a “high fertility” day—any day within three days of a luteinising hormone surge—and a “low fertility” day—any other day in the cycle, i.e. during menses, the follicular phase, or the luteal phase. Since participants were required to establish their fertility status (via a urine test), they will likely have been aware that the study was evaluating hormone-linked behaviours. Further, the study questionnaire was developed based on nesting behaviours as described in “popular media” (*ibid.*, 107). Both of these are limitations which may lead to a response bias akin to that described above. More concerning is the researchers' interpretation of their findings. They claim that “attention to environment” is one of several “overt behavioural changes” during a period of fertility which “may serve as information signals for men” (*ibid.*, 108). Specifically, they claim, this strategy is designed to “match men's preferences” by signalling an

“increase in grooming standards.” These behaviours “may have become linked with ovulation as a way to demonstrate a greater likelihood of offspring survival when conception is most likely” (*ibid.*, 109). Such claims seem speculative and far-fetched, especially since nesting behaviours in non-human animals have not been linked to attractiveness and fertility, and it is these animal studies that serve as a reference point (for better or worse). Moreover, alternative explanations for women's increased attention to their appearance and environment are not explored e.g. many women do not have sex with others during menses due to social stigma or concerns about staining sheets or furnishings, and there is a social expectation that women and their living spaces are well-groomed when they do have sex. It might therefore be the case that “nesting behaviours” are observed when women are more likely to expect sex: i.e. in non-menses phases, such as ovulation.

Through hand-searching in Google Scholar I identified another paper that investigated nesting in relation to menstruation (Dillon and Brooks 1992). The authors found that unusual cleaning was more likely to occur during the luteal phase, and suggest that this could be a result of changes in progesterone levels, which have been shown to induce nesting behaviours in other mammals. Their sample size was small (just eighteen people) and all of their participants were women undergraduates aged between 18 and 22. They did not measure ovulation, but rather inferred it from participants' reports of their last menstruation, so their findings cannot be claimed to accurately track progesterone levels, since, as they acknowledge, many women do not ovulate “normally.” These facts limit the generalisability of their findings. Further, the cleaning habits of undergraduates are not typical of adults as a whole. They live in rooms that they do not invest in long-term, and their activities are generally strongly influenced by the events of the academic terms and social calendars by which they live. They are likely to clean infrequently, which

may present, to them and others, as sudden bouts of “unusual cleaning.” While the authors do account for some external reasons (e.g. cleaning before leaving for the break), it is unlikely that all such factors could be accounted for. Since the questionnaire focussed on self-reporting cleaning activities over a two-month timespan, it is likely to have primed participants to be more aware of their cleaning habits, which may itself have prompted unusual spurts of cleaning, or may be another instance of the social desirability effect, since having an unclean living space is heavily stigmatised, especially for women. The paper nonetheless concludes that “What we may be witnessing in this study is a [...] hormonally driven need to clean in normal women” (*ibid.*, 39).

If the results of these last two studies are to be taken together, and their findings are assumed to be accurate, it seems that nesting behaviours are observed across six “fertile days” (Castagno, Lange, and Edlund 2017) and the fourteen days of the luteal period (Dillon and Brooks 1992). In other words, nesting is apparently observed over something between eleven and seventeen days (accounting for overlap) of the twenty-eight-day menstrual cycle. Either one (or both) of these studies is erroneous, or “nesting,” which is to say “unusual” organising and cleaning, begins to look more like *typical* behaviour than the quirky effect of some hormonal blip. One wonders whether a more useful study would be one that considers whether women ever *aren't* nesting.

In short, the studies which claim to have evidenced an endocrinological basis for nesting behaviours in humans are not of sufficiently high quality to ground such a claim, and are not entirely consistent with one another. This is not to deter further improved studies, but rather to emphasise the difficulties in studying complex human behaviours, and the importance of remaining open to the idea of sociocultural explanations. As Roy points out, in relation to the interminable quest to ground sex-differences in neuroscience,

socialisation will always stand in the way:

while sex differences may in fact exist in human brains and may also be meaningful, the current influence of brain organization theory and the impossibility of obtaining proper human control groups required for this kind of neuroscience research leave us trapped, without the possibility of ever approaching this difference (Roy 2016).

Difficulties are posed by the confounding factors that (a) nesting is now widely documented and read within pregnancy texts, regardless of its evidence-base, and (b) preparing one's home for the arrival of a new-born, and one's own life for a major change, is an entirely sensible undertaking in the third trimester of pregnancy, which needs no hormonal incitement. This presents an obstacle to designing a study which can pick apart the three factors: the biological, the cultural, and the practical.

3. Discussion

In this section I reflect on the texts described in sections 1 and 2, with a view to providing some context relating to the gendered nature of housework, and the specific expectations that women face during pregnancy. Nesting behaviours are an immediately charged topic because they make reference to a highly-gendered set of behaviours—cleaning and tidying within the home—which is ostensibly traced to an inescapable biological cause. Studying apparently gendered behavioural traits means stepping into highly ideological territory, where scientific findings are apt to be influenced or co-opted by other agendas. Consider that:

Whether in animals or humans, sex/gender difference is a high-profile research area where primary findings quickly make their way into public discussion and both scientists and nonscientists have contributed to inflation and oversimplification of findings (Eliot and Richardson 2016, 11827).

It has been shown that studies of sex-differential evolutionary adaptations in plants and animals are liable to be distorted by the anthropometric assumptions of the investigators, who may import gender-stereotypical words and concepts into their studies, to the detriment of best scientific practice (Karlsson Green and Madjidian 2011).

Examples include the erroneous inscription of gender stereotypes onto biological objects as fundamental as cells, thereby entrenching the stereotype as biologically mandated (Martin 1991), or the repetition of outdated sex-dualistic models of steroid hormones in science textbooks (Nehm and Young 2008).

As Ruth Bleier says, the mission to “find anatomical differences in the brains of females and males has a long tradition as an explanation for observed differences in social roles and status” (Bleier 1984). There are countless cases of science being relied upon to make claims about women's suitability for gender-stereotypical labour, and undefended scientific claims regarding women's suitability for housework abound (see e.g. Fine 2010). Apparently, working women perform the majority of housework because they are otherwise short of oxytocin, which can be replenished by engaging in “domestic routine duties like laundry, shopping, cooking, and cleaning” (Gray 2008, 123). Men, on the other hand, must avoid such tasks and instead focus on testosterone-boosting tasks. Likewise, it is claimed elsewhere (also without evidence) that the female brain processes more sensory data, enabling women to more readily recognise the need to tidy the house (Gurian 2003, 219).

Women still do the lion's share of domestic work and reproductive labour throughout the world. In France, Germany, the UK and Australia, men spend half as much time on housework as women, and in Sweden, which is so often celebrated for its progressive gender roles, men spend just 71% of the time women spend on housework (Sayer 2010, 28). Further, studies show that in households in which women become the higher-earners, men do even less housework, as a way of fending off “gender role threat,” and undertaking “gender deviance neutralisation,” to reinforce their masculinity (Besen-Cassino and Cassino 2014; Bittman et al. 2003). Sociologist Veronica Tichenor shows that in these situations, couples often cooperate in maintaining the man's dominance in

order to recover conventional gender identities for themselves and thereby protect the relationship (Tichenor 2005).

Predictably, women's increased housework load results in less leisure time. In the UK, men have an extra five hours of leisure time a week compared with women (Office for National Statistics 2018), and over the past fifteen years, men's leisure time has increased, while women's has decreased. This reflects the fact that women are more likely than ever to be engaged in paid work, but the gender disparity in housework is yet to be eliminated, leaving women committing a greater proportion of their free time to chores, while men spend theirs on leisure. A study was conducted to investigate physiological recovery—in the form of falling levels of stress hormone cortisol—in married couples at the end of the working day. Unsurprisingly, women spent more time on housework, and men on leisure. The study found that the most relaxing arrangement for a woman at the end of a working day was to share the housework with her husband, while the most relaxing set-up for a man was to engage in leisure while his wife did the housework. As the authors note this seems to evidence women “identifying more closely with the task of household maintenance and feeling less autonomy over the decision to spend time in chores” while men do not think of housework as *theirs* to do, though they do expect it to be done by somebody (Saxbe, Repetti, and Graesch 2011).

The tasks to which nesting behaviours refer, i.e. cleaning and tidying, are particularly gendered household chores, with women judged more harshly by peers for unclean, untidy houses than their male counterparts (Thébaud, Kornrich, and Ruppanner 2019). Although the overall trend is towards men progressively contributing more time to housework, their participation in more stereotypically feminine tasks is making much slower progress (Tai and Treas 2013). Tasks which are most likely to be stereotyped as “women's work” tend to be those that are most repetitive and least rewarding, cleaning

and tidying amongst them. Mainstream media contributes to these stereotypes by promoting an ideal in which women are devoted to the domestic sphere, and men still rarely feature in adverts for baby food, nappies, or cleaning products (Gentile 2011).

Linking women to housework through biology is worrying because it threatens to entrench the widespread inequality in unpaid domestic labour. Women do not do more housework because they are better-suited to it, they do more housework because they have less power to object, and have therefore been burdened with more than their share of work that is repetitive, dirty, and invisible, even if deeply necessary to human flourishing. Because housework occurs in the private domain, it has been resistant to some of the more encouraging changes to women's position in more public roles (Shahvisi 2018).

Whatever the expectations on women under ordinary circumstances, these are magnified during pregnancy, as women's bodies are subject to heightened surveillance. Adrienne Rich (1995) describes the "invisible violence of the institution of motherhood" with its strict and often contradictory expectations. Pregnancy and motherhood are times when a woman's body may be treated primarily as a reproductive vessel, and other parties seek to advise, intervene, or judge, supposedly in the interests of the foetus or infant (Grant, Mannay, and Marzella 2017). Lupton describes the way in which pregnancy renders women's bodies as public property, "on display for others to comment upon, and even to touch" (Lupton 2012, 332). Intense monitoring by others often causes women to engage in self-surveillance, and a commitment to displaying observable behaviours that are appropriate to the role of (expectant) mother (consider Foucault 1975). Docility is expected, especially in relation to medical interventions that are deemed to be in the best interests of the foetus, and the projection of "good motherhood" is deemed to require commodification: good mothers set aside other considerations and buy the "correct"

products for their children (Cummins 2014). Normative motherhood requires that a woman's own needs be second to the needs of the foetus or child, preferably in ways that are visible to the appraisal of others. The personal preferences of a pregnant woman are seen as "greedy and excessive," she is instead required to "efface her own subjectivity" (Bordo 1993). An important part of this is the performance is the visible adoption of the selfless role of caregiver. Pregnancy and motherhood accentuate the biological differences between bodies, and with the realities of biological difference come the imposed fictions of gender difference.

Motherhood is portrayed as a critical component of ideal femininity, and many women experience negative feelings as they are disappointed with their inability to meet its ideals (see e.g. Lazarre 1997). Part of this negativity emanates from the need to attend to a range of different, often competing, demands, as new mothers felt they "should be able to cope with the caring of a new baby, but also with domestic tasks and the caring of others" (Choi et al. 2005, 177). "Mother blaming," in which mothers are disproportionately blamed for any problems relating to their children, is a well-documented phenomenon, particularly in relation to health-care (Jackson and Mannix 2004). While postnatal depression is well-studied, antenatal distress is less-often discussed, yet is widely-reported (Staneva, Bogossian, and Wittkowski 2015). Rather than (just) the hormonal explanations that are so often offered, it is plausible that both ante- and postnatal depression are caused by social factors relating to the expectations placed on women, and the lack of support they receive (Jebali 1993; Beck 2002).

Pregnancy manuals play some role in producing these expectations. They describe the features of a typical pregnancy, which may be interpreted to mean a "normal" pregnancy, or even an "ideal" pregnancy. Even the famous tome "What to Expect When You're Expecting" (Murkoff 2016) by its own titular admission rules how a typical

pregnant woman should feel at each stage of the pregnancy, which is liable to influence the behaviours that women expect and perform. Consider the following personal account of extensive cleaning in the third trimester of her pregnancy, published in the *Huffington Post*:

I understood that I was “nesting”—*the pregnancy books told me so*. It was one more reminder that we are all, at our core, just mammals, ruled by hormones and electrolytes as much as personality and free will (Belkin 2013, my emphasis).

These expectations seem to precede and direct women's behaviour. To see how this kind of directive can operate, consider “premenstrual syndrome,” a widely-reported condition which links the premenstrual phase with negative mood. A systematic review found no clear link between the premenstrual phase and any negative mood syndrome (Romans et al. 2012). It has been suggested that culturally-held attitudes may be responsible for the way women experience their cycles (Jarvis and McCabe 1991), or in other words, that aspects of premenstrual syndrome may be socially constructed (Rodin 1992). It has also been claimed that premenstrual syndrome is a uniquely Western affliction which is only observed and accepted in certain cultural contexts (Johnson 1987). Even within Western contexts, the extent and experience of premenstrual syndrome has been shown to correlate with the extent to which a person views menstruation as a “debilitating and predictable event” (Friedman et al. 1980). Its social construction is not merely an interesting anthropological artefact, but is damaging because it portrays women in ways that undermine their agency (Chrisler and Caplan 2002; DeLuca 2017). Nesting may be charged with having the same consequences. None of this is to doubt the reality of premenstrual syndrome, or to suggest that women are dishonest or unreliable in their reporting of it, but rather to emphasise the importance of

social and cultural norms.

It is also worth considering the effect that the internet has had in proliferating unsupported information about nesting behaviours, particularly in light of the observation made by midwifery scholar Denis J. Walsh, that nesting was “mentioned in midwifery textbooks up to the mid-1980s [...] For reasons that are not immediately apparent, references to nesting disappeared from midwifery textbooks around this time, and only rarely appear in midwifery books [...] They survive in populist magazines on new motherhood (www.parents.com) and in the self-help literature around childbirth” (Walsh 2006). Examining a popular pregnancy manual from the mid-1980s, nesting is only mentioned once, in passing, and in relation to a man performing space-preparation activities (Phillips, Jacobs, and Lean 1983, 103). One wonders whether nesting, given its weak evidence base, felt like old-fashioned folklore from the mid-1980s onwards, only to be revived by an internet community that is less apt to require an evidence-base, especially in an age of such rampant mistrust of science (Rutjens 2018).

I am not questioning the experience of nesting behaviours; I am questioning their cause. And even if nesting behaviours are ultimately attributed to a social explanation, that need not detract from the experience being felt as a *compulsion*. Social forces are just as capable of compelling us to behave in certain ways as are biological forces. In some ways, they are more powerful: consider that one's biological urge to defecate is always over-ruled by the presence of company, so strong is the social rule that one does not defecate in the company of others. Social compulsion is strong because social punishment is serious.

4. From biological to social: alternative explanations

As Nelson points out, “*making the case that a given trait or capacity is an adaptation requires ruling out alternative explanations that are equally viable*” (2003,

261, her italics). Further, in cases in which the hypothesis has social or political significance, it is responsible to increase the evidential burden for a biological explanation (Kitcher 1985). It is also worth noting that the sort of phenomena that are good candidates for evolutionary explanation are those that do not *prima facie* appear to be rational, whose “present *maladaptive* nature suggests historical, and in this case, evolutionary, origin” (Nelson 2003, 270, her italics). While popular discourses on nesting behaviours *do* describe nesting behaviours as irrational, any common-sense analysis of the practical effects of nesting behaviours renders them rational. In this section I therefore consider only the first criterion: are there equally viable non-evolutionary explanations for nesting behaviours?

One obvious explanation is that women engage in excessive housework in the third trimester in anticipation of being unable to find time for housework in the post-birth period, and in the awareness that—if the housework statistics in the previous section are anything to go by—help is unlikely to be forthcoming. A pregnancy manual cites one pregnant woman as wondering “what are all the other things I should be fitting into these next six weeks? Because it’s the last time in my life I’m going to have six weeks free” (Phillips, Jacobs, and Lean 1983, 102–3). Given strong cultural expectations of a clean, tidy house, and the intensifying of that expectation in relation to new mothers, who are so vociferously surveilled, it makes sense for a pregnant woman to undertake some unusually rigorous housework immediately prior to birth. After all, the household is likely to have a higher number of visits from friend and relatives once the infant is born.

There are other crucial considerations. Many women take their maternity leave in the third trimester (indeed, it is legally mandated in the UK that maternity leave can begin no sooner (Baby Centre 2014)), which may explain the practicality of undertaking intensive housework then, in between the end of paid work and the beginning of labour.

Indeed, the sense of emptiness between leaving work and giving birth may cause some pregnant women to engage in “nesting behaviours” in order to fill the time. Quoted in a pregnancy manual, one woman described how “You feel so useless. Whereas at work you’ve always got people depending on you all the time, decisions to make. Now I’m Hoovering, dusting, doing all the housework—which doesn’t take long. I feel lost” (Phillips, Jacobs, and Lean 1983, 102).

Further, the risk of miscarriage only falls off significantly at 20 weeks, which means that it makes sense to leave any serious and specific space preparation or shopping until the second half of the pregnancy. In many cases, it might make sense to wait as long as possible in order to ensure that the investment will pay off, which may push such preparations into the third trimester.

Nesting behaviours are pragmatic and reasonable in late pregnancy, when the reality of the imminent life changes becomes apparent and women start to make preparations in light of inevitable restrictions on their time and energy once the infant is born. As such, the creation and naming of “nesting” as a phenomenon is a form of social construction. It is merely a special case of an entirely rational and explicable human tendency to prepare spaces for human habitation, the only specific difference being that the human for whom the space is prepared is extremely vulnerable, with very specific needs, and there is limited time for preparation. On the view just described, nesting needn’t be seen as independent of any other rational preparatory activity: making beds and cleaning bathrooms before guests arrive, child-proofing one’s house for a visit from friends or relatives with small children. One might argue that if a pragmatic explanation was in order, then fathers (or other parents) ought also to engage in nesting behaviours, but this overlooks the tremendous gendering of household tasks, as discussed in the

previous section.

Naming nesting produces the phenomenon as a socially-constructed trait of pregnant women, and describing it in pregnancy manuals leads women to apprehend their (otherwise evidently rational) behaviours as belonging to this particular category with its particular cause, or may even lead them to unconsciously perform the expected behaviours.

In short, then, a social explanation for nesting is highly plausible, in light of which it is too early, and arguably misguided, to assume that nesting behaviours are best explained via psycho-endocrinology and evolutionary biology. The following factors suggest the plausibility of a social explanation:

- (a) Women are under social surveillance with respect to their perceived gender-appropriate domestic duties, and more intensely than usual during pregnancy and after childbirth. There is social pressure to have a clean, tidy house and a child-appropriate living environment;
- (b) Maternity leave generally begins in the third trimester of pregnancy, leaving a narrow window before childbirth during which space preparation can occur;
- (c) The risk of miscarriage is very low in the third trimester; it therefore makes sense to delay space preparation until then;
- (d) Space-preparation aspects of nesting—house renovations, nursery preparation—are highly consumer-focussed, therefore the role of advertising and the pressure to show competence as a parent through purchasing paraphernalia must be considered;
- (e) Pregnancy may well be the most manifestly sexed and embodied state that a woman experiences. As such, concomitant gender expectations are also liable to

rise, and a set of highly-gendered activities is expected in order to fulfil the ideals of motherhood.

In summary, there is no shortage of compelling social explanations for the behaviours known as “nesting” during the third trimester of pregnancy. As such, those behaviours are not good candidates to be explained via biological explanations, especially in the absence of a persuasive body of evidence.

5. Conclusion

In this article I have summarised the way in which nesting behaviours are described and explained in online pregnancy resources, and have conducted a systematic review of nesting behaviours in the academic literature. I have shown that the evidence for nesting as a psycho-endocrinological compulsion, deriving from an evolutionary adaptation, is weak, and have offered an alternative explanation which suggests that nesting behaviours are a response to multiple practical and cultural constraints during pregnancy, which are strongly gendered. Far from being an irrational set of behaviours mandated by a hormonal change, it therefore seems judicious to instead understand nesting behaviours as rational space-preparation behaviours undertaken in response to imminent life changes, which are patterned according to ideals of femininity.

In this case, as in many others, it is important to debunk unverified claims of a biological basis for gender-stereotypical behaviour, and be mindful of the power dynamics that are bolstered by the myth that women are automata acting out the will of their hormones, in accordance with men's sexual preferences and society's reproductive needs.

Reflecting on the causes of nesting behaviours in humans raises many other questions. This article only studies texts in English, which report behaviours observed within Western cultures. Might nesting behaviours, like premenstrual syndrome, be

unique to, or manifest in particular ways within, Western cultures? Accordingly, or alternatively, might they be reflective of the additional pressures placed on pregnant women in nuclear family arrangements, while elsewhere, pregnant women may not take primary responsibility for space-preparation? Further, it would also be interesting to study whether surrogate mothers, who are pregnant but do not expect to raise the eventual child, also report experiencing nesting behaviours.

Nesting behaviours in humans are under-studied in the academic literature given their attention with popular discourses. Yet, rather than recommending that scientists double down on discovering biological explanations for nesting behaviours, I suggest, given the findings of this paper, that cross-disciplinary scholars study the ways in which gender stereotypes conspire with misuses of biology to leave women relegated to the roles that society has cast them in.

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Article pre-print. Cite as: Shahvisi, Arianne *Nesting behaviours during pregnancy: hormonal urge, or another way of gendering housework?* Women's Studies International Forum (forthcoming)

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