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Title: **Reproductive Hormonal Status as a Predictor of Precognition**

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Researchers: Julia A Mossbridge, Daryl Bem

Institution: Institute of Noetic Sciences, Cornell University

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Abstract:

Previous evidence suggests there is a relationship between reproductive hormones in women and performance on tasks requiring the unconscious psychological prediction of random future events (i.e., *implicit precognition*). We tested this relationship indirectly by examining how markers of reproductive hormonal status are related to performance on a retroactive-facilitation-of-recall task. We conducted four experiments, in which we compared precognitive performance across cycling women, pregnant women, menopausal women, women who do not have uteruses and who do not take replacement hormones, and men. The general trend was that precognitive effects on this task are most regularly apparent for pregnant women and women without uteruses who do not take replacement hormones. Because both pregnancy and not having a uterus are extreme hormonal states for women, the results suggest that taking into account extreme states in reproductive hormone status, at least in women, can further reduce the signal-to-noise ratio of implicit precognition experiments.

Published work resulting from the project supported with the present grant separated in abstracts (proceedings and meetings), full papers and contributions included in books:

[Article] Mossbridge, J. A. and Radin, D. A. (March 2018 [in press]) Precognition as a Form of Propection: A Review of the Evidence in *Psychology of Consciousness Theory, Research, and Practice*

[Article] Mossbridge, J. A. and Radin, D. A. (March 2018 [in press]) Plausibility, Statistical Interpretations, Physical Mechanisms and a New Outlook: Response to commentaries on a Precognition Review in *Psychology of Consciousness Theory, Research, and Practice*

[Book} Cheung, T. and Mossbridge, J.A. (October 2018 [in press]) *The Premonition Code*. London: Watkins Media.

Dr. Mossbridge also presented these experiments and related ideas at a Second Life Conference in February 2017, the SRI Consciousness & Technology Conference (Menlo Park, CA) in June 2017 as well as in a lecture at University of California, Berkeley in November 2017.

Researchers' Contacts:

jmossbridge@gmail.com
d.bem@cornell.edu

**Reproductive Hormonal Status as a Predictor of Precognition:
Scientific Summary for Bial Grant 97/16**
Research Protocol Registry Document

Principal Investigator: Julia Mossbridge, PhD, Institute of Noetic Sciences
Co-Investigator: Daryl Bem, PhD, Cornell University

Abstract

Previous evidence suggests there is a relationship between reproductive hormones in women and performance on tasks requiring the unconscious psychological prediction of random future events (i.e., *implicit precognition*). In the research covered under this grant, we tested this relationship indirectly by examining how markers of reproductive hormonal status are related to performance on a “fast-thinking” retroactive-facilitation-of-recall task. We conducted two exploratory experiments, one pre-registered exploratory experiment, and one pre-registered confirmatory experiment, all of which used online participants. In each experiment, participants memorized a list of 48 words and took a forced-choice recognition test on these words immediately after viewing of the word list. After this test was complete, 24 of the original 48 words were randomly selected and designated as “practice words.” Participants then practiced these words in two different ways that reinforced word recognition of the practice words alone. Then participants performed a final word-recognition test. Some previous results from experiments in which hormonal status was not taken into account showed that average response times and the number of correct words on the initial test (before practice) differed significantly between words that will later be practiced versus those that will not be practiced in the future. We compared precognitive performance across cycling women, pregnant women, menopausal women, women who do not have uteruses and who do not take replacement hormones, and men. The general trend that emerged was that precognitive effects on this task are not apparent for cycling women, men, and menopausal women, while they are more regularly apparent for pregnant women and women without uteruses who do not take replacement hormones. Although this general trend was consistent across all four experiments, it was rarely statistically significant, likely due to the limited number of participants we were able to recruit in these two relatively unusual physiological states. Because both pregnancy and not having a uterus are extreme hormonal states for women, the results suggest that taking into account extremes in reproductive hormone status, at least in women, can further reduce the signal-to-noise ratio of implicit precognition experiments.

Objective

The objective of the study is to confirm previous results indicating that indicators of reproductive hormonal status in women are associated with precognition performance.

Background

Recent empirical evidence strongly suggests that people can have access to information about future events that are generally considered to be unpredictable. While many anecdotal experiences suggest that this is the case, controlled laboratory evidence is required to verify this phenomenon, called *precognition*. In the laboratory, precognition seems to occur only in certain

circumstances, such as when individuals are in a relaxed state, they are responding quickly, and/or future events are salient.

The reverse-time nature of precognition violates everyday intuitions about the order of events in time, and it is therefore regarded as controversial by most scientists. Nonetheless, according to the results of two recent meta-analyses examining different types of precognitive effects (D. Bem, Tressoldi, Rabeyron, & Duggan, 2015; J. Mossbridge, Tressoldi, & Utts, 2012), precognition is statistically reliable. While the cumulative evidence for precognition is quite strong relative to most other psychological and psychophysiological phenomena, there is still no agreed-upon explanation for it.

When the mechanism underlying an effect is unknown, any consistent parameter dependencies in the effect can help shed light on the mechanism. For instance, recently it has become clear that some forms of precognition are more likely to be revealed when participants respond quickly rather than deliberating over a choice (D. Bem et al., 2015), implying that at least these forms of precognition may not dependent on conscious analysis.

We recently discovered what we believe to be another parameter dependency in precognition, specifically a gender difference, in which men and women show opposing patterns. There is also partial evidence that this gender difference declines with age in women. Over their lifespans, women's reproductive hormones change more dramatically than men's, so the observation of the reduction of a gender difference with age in women could suggest that reproductive hormones may be tied to the mechanisms underlying precognition. To our knowledge no one has empirically assessed the relationship between reproductive hormonal status in women and precognition.

Design: Online data collection, blind (participants blind to the purpose of the study), across-participant design. Due to financial constraints on participant recruitment, comparison groups varied somewhat across the four experiments, so each comparison group is listed below, followed by numbers in parentheses showing the experiments that used the specified group.

Women:

- known pregnant and 18 years or older (Exp. 1 and 2)
- known pregnant and 18 years or older (Exp. 3)
- known pregnant and 18-44 years old (Exp. 4)
- cycling and 18 years or older (Exp. 1, 2, and 3)
- cycling and 18-44 years old (Exp. 4)
- menopausal (last menses at least 6 months ago and not pregnant) and 18 years or older (Exp. 1, 2, and 3)
- menopausal (last menses at least 6 months ago and not pregnant) and 45 years or older (Exp. 4)
- no uterus, not on replacement hormones, and 18 years or older (Exp. 1, 2, and 3)
- no uterus, not on replacement hormones, and 45 years or older (Exp. 4)

Men:

- 18 years and older (Exp. 1, 2, and 3)

Participants: We analyzed data from 2469 total participants, the final number across all four experiments (each participant only participated in one of the four experiments; see Table 1). These numbers represent the total participant numbers after taking into account the following exclusions:

- Participants who did not complete the entire experiment.
- Participants who completed the experiment more than once.
- Participants who made more than 90% of their button presses on either the left side or the right side of the screen (indicating they were not performing the task).
- Participants having hysterectomies (no uterus on self report) who report they are using supplementary hormones, reported current pregnancy, or reported a date of their last menstrual period within 6 months (indicating recent hysterectomy).
- Cycling participants who reported simultaneous pregnancy and menstruation or who reported they did not have a uterus.
- Men reporting pregnancy or any other response to questions about pregnancy or menstruation other than “I do not have a uterus.”
- Participants who did not fit the requested age range.
- Participants who got zero practice words or zero non-practice correct on the first word recognition test (so a mean correct response time could not be calculated for either practice or non-practice words).
- Participants who had a mean correct response time across all words ≥ 2500 ms (3 times the standard deviation above the mean correct response time in the first two experiments).
- Participants who scored lower than 28 correct on the second test (which had 48 2-alternative questions; this is $>$ average total correct + $3 \times \text{SD}$ of the total correct in the first two experiments).

Recruitment: Participants were not told that this was a precognition or ESP experiment; the experiment was described as a verbal memory study (which it is). All participants were recruited via either the mTurk or the Prolific platform, which target studies to people who have signed up to be workers on the service and who answer pre-screening questions that are appropriate to the study (here, questions about gender, age, and pregnancy status).

Tasks and Procedures:

Menopause questionnaire

All participants were asked to complete 7 items of a 12-item menopause symptom questionnaire after completing the experimental task. Results from this questionnaire have been shown correspond to actual menopausal status and have high convergent validity for women (Freeman, Sammel, Liu, & Martin, 2003). However, we established that the sum of the 7 items on this subset is higher in cycling women than either noncycling women or men, thus is not a good predictor of menopause. All participants were asked to complete the questionnaire.

Big5 Questionnaire

The brief Big-5 Inventory (Rammstedt & John, 2007) was administered to all participants following the experimental task, using the following 10 questions:

English version.

Instruction: How well do the following statements describe your personality?

I see myself as someone who ...	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
... is reserved	(1)	(2)	(3)	(4)	(5)
... is generally trusting	(1)	(2)	(3)	(4)	(5)
... tends to be lazy	(1)	(2)	(3)	(4)	(5)
... is relaxed, handles stress well	(1)	(2)	(3)	(4)	(5)
... has few artistic interests	(1)	(2)	(3)	(4)	(5)
... is outgoing, sociable	(1)	(2)	(3)	(4)	(5)
... tends to find fault with others	(1)	(2)	(3)	(4)	(5)
... does a thorough job	(1)	(2)	(3)	(4)	(5)
... gets nervous easily	(1)	(2)	(3)	(4)	(5)
... has an active imagination	(1)	(2)	(3)	(4)	(5)

Fast-thinking retroactive-facilitation-of-recall task

In the fast-thinking retroactive-facilitation-of-recall task, participants were instructed to follow an online link, using their computer to access web software that guided them through four phases of the task, which took in total approximately 10-15 minutes. These phases were: 1) an initial brief presentation of each of 48 words that participants were instructed to memorize, 2) a 48-trial two-alternative forced-choice test in which participants were asked to quickly choose a real vs. distractor word from the original word list, 3) two forms of memory practice on a randomly selected 24 of the 48 words (with the words selected only **after** the test in step 2), and 4) a two-alternative forced-choice test similar to that in step 2. Participants were paid for their time. Note that the software was written in Javascript with the KISS07 pseudorandom number generator, with a period greater than 10^{36} , and which passes the DieHard and BigCrush tests for randomness. It combines the shift, Xor, and, and add operations (all of which are individually biased, but together are not) using any integer seeds that follow certain rules (see <https://github.com/nquinlan/better-random-numbers-for-javascript-mirror#kiss07> for more information).

Psi-related dependent variables: We are concerned with two psi-related dependent variables derived from performance on this task. Note that RTs will not be transformed in any way (the distributions in these relatively large data sets tend to be normal). Here are our psi-related dependent variables:

- 1) CorrDiff – the mean number of correct words on the first test (step 2) that become practice words in step 3 minus the number of correct words on this same first test that do not become practice words.
- 2) RTDiff – the mean response time on correct practice words on the first test minus the response time on correct nonpractice words on the first test.

Non-psi-related dependent variables

- 1) Menopause symptom score – the sum of the scores on the subset of the menopause questionnaire

- 2) Big-5 scores – scores on the brief Big-5 inventory on openness, conscientiousness, extraversion, agreeableness, neuroticism
- 3) Average RT – mean response time on all correct words on the first test

Hormonal Status Groups: Participants were separated into hormonal status groups according to the following criteria, based on self-report on required questions in the questionnaire. These questions asked about gender, age, date of last menstrual period, pregnancy status (and week of pregnancy¹), and supplemental hormone status.

- Cycling women: Any self-reported female who identified a menstrual period between 0 and 60 days previous and did not report a hysterectomy or pregnancy
- Pregnant women: Any self-reported female who reported currently being pregnant and who did not report a hysterectomy or a period within 60 days
- No uterus women: Any self-reported female who reported having no uterus, not being on replacement hormones, not being pregnant, and not having a period within 60 days
- Menopausal women: Any self-reported female who did not report not having a uterus, not pregnant, and not having a period within 60 days, and who did report having her last period more than 6 months previous
- Men: Anyone who identified as male and claimed to not have a uterus

Statistical standards: An alpha of 0.05 and two-tailed tests were used for all analyses, which were simple pre-planned t-tests and linear regressions.

Results

Confirmatory Analyses: The fourth experiment was registered as a confirmatory experiment, with three confirmatory analyses proposed. Two of these analyses relied on effects related to the week of pregnancy. Unfortunately, due to a typo discovered in the questionnaire after completion of the fourth experiment, two of the responses contained overlapping choices in the week of pregnancy, making these two analyses impossible to perform as the responses in the second half of pregnancy included some weeks in the first half of pregnancy. However, the third pre-registered confirmatory analysis was a comparison between RTDiff in no-uterus women versus pregnant women, so we performed this comparison. The prediction was that an independent groups *t*-test would produce a significant effect showing that RTDiff is more negative in no-uterus women than pregnant women. The result was quantitatively the same, but this differences did not near significance. The means and standard errors of the mean (SEM) for all five hormonal groups are given in Tables 2 and 3 for all four experiments. Here it is worth noting that a power analysis on this effect from experiment indicated that the minimum number of participants required for 90% confidence of getting the effect was 33 women and 100 pregnant women. In the fourth experiment, we were only able to recruit 18 no-uterus women and 42 pregnant women, even after extending the recruitment period another week and a half. So this comparison is underpowered.

In the registration for the fourth experiment, there were also five exploratory analyses. Two of them were ruled out, as they pertained to the week of pregnancy. However, we performed the other four. We outline them briefly below.

- 1) CorrDiff – in pregnant women will be more positive than no-uterus women. This was quantitatively true, but not significant (Table 2, Figure 1).

¹ Week of pregnancy turned out to not be useful as an indicator because after the fourth experiment, a typo was discovered in the questionnaire such that two responses included overlapping weeks of pregnancy.

- 2) CorrDiff and RTDiff – in no-uterus women, both will be more negative than predicted by chance. This was quantitatively true for both measures (Tables 2 and 3, Figures 1 and 2), though this comparison was only significant for CorrDiff ($p < 0.032$, $t = 2.34$).
- 3) CorrDiff and RTDiff – across all participants, one or the other will be positively correlated with menopause score. This was incorrect, across the participants in experiment 4 there was no significant correlation between either CorrDiff or RTDiff with menopause score.

Non-psi-related effects

We also registered four confirmatory analyses in experiment 4 that were not related to precognition, but were of general interest. Three of the four were confirmed.

- 1) Menopause score – across all participants, will be negatively correlated with age. This was confirmed in experiment 4, again verifying that the menopause questionnaire used here was not a precise predictor of menopause.
- 2) Average response times – across all participants, will be positively correlated with age. This was confirmed in experiment 4, supporting the well-documented phenomenon of the increase in response time with aging.
- 3) Menopause score – across all participants, positively correlated with neuroticism, negatively correlated with extraversion, conscientiousness, agreeableness, and openness. This was confirmed in experiment 4, suggesting that the menopause score was a proxy for personality type.
- 4) Average response times – across all participants, positively correlated with conscientiousness. This did not replicate.

Table 1. Number of participants in each hormonal group, per experiment.

N per group	Exp 1	Exp 2	Exp 3	Exp 4
Cycling	223	319	343	111
Pregnant	3	17	43	42
No Uterus	33	20	17	18
Menopause	166	162	155	190
Men	181	202	224	0
Totals	606	720	782	361

Table 2. Grand means and standard errors of the mean (SEMs) for CorrDiff in each hormonal group, per experiment. Bolded items indicate significantly different from chance ($p < 0.05$). Peach shading indicates consistent direction of the effects across all experiments in which that hormonal group was tested.

CorrDiff	Exp 1	Exp 2	Exp 3	Exp 4
Cycling	0.05 (0.18)	-0.19 (0.16)	0.03 (0.14)	0.29 (0.24)
Pregnant	3.00 (1.00)	-0.06 (0.71)	0.19 (0.42)	-0.43 (0.35)
No Uterus	-0.06 (0.42)	-0.60 (0.59)	-0.29 (0.57)	-1.3 (2.54)
Menopause	0.02 (0.23)	-0.12 (0.20)	-0.4 (0.22)	0.06 (0.18)
Men	0.23 (0.21)	0.16 (0.19)	0.02 (0.19)	

Table 3. Grand means and SEMs for RTDiff in each hormonal group, per experiment. Bolded item indicates significantly different from chance ($p < 0.05$). Peach shading indicates consistent direction of the effects across all experiments in which that hormonal group was tested.

RTDiff	Exp 1	Exp 2	Exp 3	Exp 4
Cycling	-16.05 (10.25)	7.63 (8.41)	2.41 (10.37)	5.59 (13.47)
Pregnant	84.87 (41.46)	38.38 (38.87)	6.27 (24.06)	5.27 (25.47)
No Uterus	-16.73 (21.67)	19.38 (33.97)	-80.67 (36.44)	-2.54 (132.61)
Menopause	7.42 (12.66)	20.76 (20.77)	-6.25 (13.86)	-1.85 (13.15)
Men	3.37 (13.92)	18.54 (13.71)	-1.58 (10.03)	

Unregistered Exploratory Analyses: In an exploratory analysis, we analyzed each experiment independently and found no precognitive effects when the data were analyzed without regard to

hormonal groups. CorrDiff and RTDiff were essentially at chance across participants in each of the four experiments. Combining all data from the four experiments together produced the same result, even after creating new proportional difference scores to ease comparison across experiments (PropCorrDiff: (correct practice words - correct nonpractice words)/total correct on test 1; PropRTDiff: (RT on correct practice words - RT on correct nonpractice words)/total average RT on test 1. These proportional difference scores revealed an overall borderline significant difference between no-uterus women and men across all experiments ($p < 0.082$). However, it appears that, despite our previous results, the fast-thinking retroactive-facilitation-of-recall task is not consistently sensitive to implicit precognition performance when this performance is examined across the general population, without regard to hormonal status.

We also performed exploratory correlations across participants in all four experiments combined, examining any relationships between the PropCorrDiff and PropRTDiff and Big-5 personality types as well as menopause scores. We found that extraversion and agreeableness were weakly negatively correlated with PropRTDiff, and that openness was weakly positively correlated with PropCorrDiff (all p -values < 0.05). All three of these effects would be considered to be in the psi-hitting direction corresponding to better precognition with higher extraversion, agreeableness, and openness, but none of them would survive Bonferroni correction.

Due to the under-powering of comparisons in the two smallest hormonal groups (pregnancy women and no-uterus women), we examined the data in Tables 2 and 3 and Figures 1 and 2 for promising trends. We used the rule that a trend is considered “promising” if, for a given dependent variable and within a hormonal group, all experiments including that group showed a consistent direction of its deviation from chance (positive or negative). Given those criteria, three of the five hormonal groups showed promising trends (peach-colored shading in Tables 1 & 2). For CorrDiff, no-uterus women showed a promising negative trend and men showed a promising positive trend, though because men were not included in the fourth experiment, the standard for “promising” in this case was de facto lower than in the other groups. For RTDiff, pregnant women showed a promising positive trend. Within each of those 3 promising groups, we also compared scores across groups to look for consistent differences between these groups across all four experiments. Taken together, most consistent effects related to comparisons of implicit precognition performance across hormonal groups are:

1. No-uterus women have consistently negative CorrDiff scores, in one experiment significantly lower than chance.
2. Pregnant women have consistently positive RTDiff scores.
3. No-uterus women have consistently lower RTDiff scores than pregnant women.
4. No-uterus women have consistently lower CorrDiff scores than pregnant women and men.
5. Men have consistently positive CorrDiff scores.

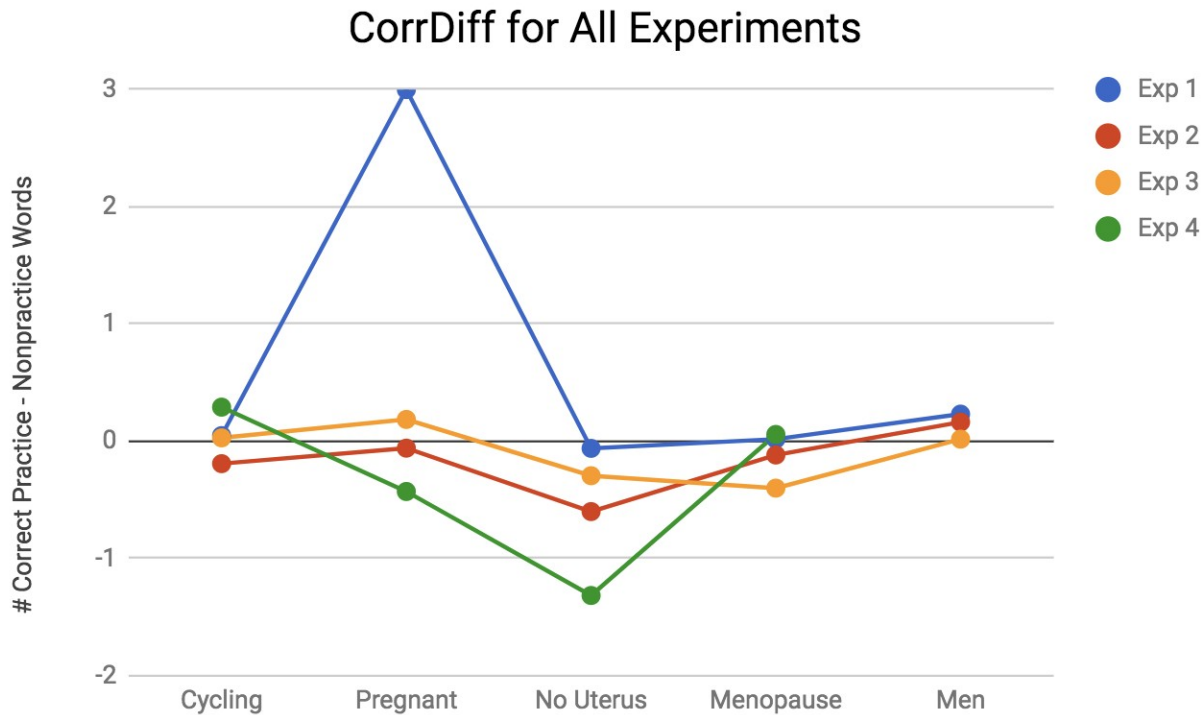


Figure 1. Grand means in the CorrDiff dependent variable (practice minus nonpractice words correct on test 1) for the five hormonal groups in each of the four experiments.

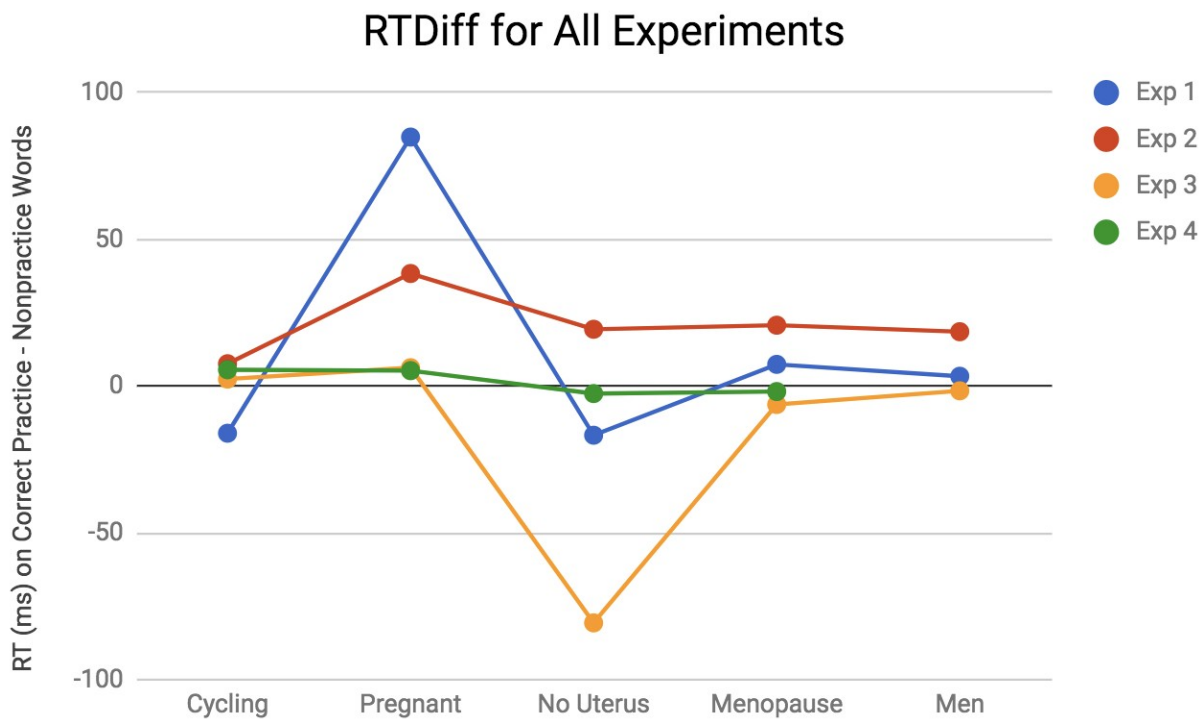


Figure 2. Grand means in the RTDiff dependent variable (response time on correct practice minus response time on correct nonpractice words on test 1) for the five hormonal groups in each of the four experiments.

Conclusions and Recommendations

We can draw a mix of informative conclusions from these results. First, we will discuss conclusions about methodology, followed by conclusions about how implicit precognition might work. The first methodological conclusion we draw from these four experiments relates to the use of the retroactive-facilitation-of-recall task. Although we had previously seen significant results overall on this task as well as results seemingly influenced specifically by gender, such was not the case with this iteration of the task. The only difference between the task we used in these experiments and the ones we (JM) previously used is that previously, the practice words were selected randomly prior to the first word-recognition test. While participants were not told what the practice words were until after the first word-recognition test, it is possible that clairvoyance rather than precognition was used to produce a bigger overall effect in those cases. Here we conclude that in order to study precognition on a broad scale, it is important to create an online precognition task that consistently produces results on a massive scale (thousands of participants).

The second methodological conclusion we draw from the present experiments is that online datasets are very useful for hypothesis development but may be lacking when it comes to hypothesis testing. For hypothesis testing, recruiting participants in less common demographic groups and assuring the quality of self-reported information and performance are perhaps better served in a laboratory setting. However, we would not discourage an eager researcher from attempting to replicate the quantitative group differences found in the comparisons between no-uterus women, pregnant women, and men, as these seem to be the most consistent results we obtained.

Taken together, we draw two conclusions related to how precognition might work. First, we replicated, albeit weakly, the previously obtained correlations between extraversion and openness with precognition performance² (Bem, 2001; Hitchman, Roe, & Sherwood, 2012; Palmer & Carpenter, 2001; Zdrenka & Wilson, 2017), and we found an additional positive correlation with agreeableness. This additional correlation would need to be replicated to become convincing. Our conclusion from these correlations is that however weak at revealing precognition, our experimental task does in fact show some correspondence to previous results in a direction that seems sensible.

Second, the most impressive effect we found was that no-uterus women show consistently more negative CorrDiff and RTDiff effects than pregnant women. Note that while the average age of the no-uterus women (55.9 years) was statistically significantly higher than the average age of the pregnant women (30.1 years), it is not likely that the difference we saw in these four experiments was due to age. We draw this conclusion because the mean age of the cycling women (35.9 years) was similar to the pregnant women, and the mean age of the menopausal women (53.68 years) was similar to the no-uterus women, but no consistent differences were found between these groups across the four comparisons. Further, the two groups that

² Several studies have shown the relationship between extraversion and/or openness to experience and either spontaneous precognition or precognitive skill in the lab. Note that not all studies show this relationship, and the relationship is likely to depend on the type of experience or task being used to assess precognition.

presumably differed the most in indicators of reproductive hormonal status were no-uterus women not taking supplementary hormones and pregnant women. This is because when the uterus is removed, the ovaries are often (but not always) removed as well. If no supplementary hormones are taken, the woman will have very low levels of both female and male reproductive hormones compared to both menopausal and cycling women (Laughlin, Barrett-Connor, Kritz-Silverstein, & von Mühlen, 2000). In contrast, in pregnant women, female reproductive hormones are at exceedingly high levels, and the male reproductive hormone can rise as well (Wilke & Utley, 1987). While the previous two observations suggest that reproductive hormones might be the instigator of the difference between no-uterus and pregnant women, no-uterus women had consistently more negative CorrDiff scores than men, and men have significantly more testosterone than even pregnant women. Further, testosterone in men is reduced with age, but in an exploratory analysis we saw no clear correlation between age and CorrDiff or RTDiff in men or across all participants. Taken together, we conclude that *extremes* in reproductive hormonal status that are unusual for the body may be involved in producing the promising trends observed here.

This conclusion also suggests a reason why for two of the groups we saw no promising trends. In cycling women and in menopausal women, hormonal status is largely dependent on multiple factors (in cycling women, dependent on time in the menstrual cycle, in menopausal women, dependent on time from last menses and whether supplementary hormones are taken). Even in pregnancy, hormonal status varies with the number of weeks of pregnancy. Meanwhile, in men, extreme states of reproductive hormone status (comparable to hysterectomy or pregnancy) are rare. Thus, the most consistent non-extreme hormonal status group, men, showed a consistent trend to differ from the most consistent extreme female hormonal status group, no-uterus women.

If the difference between no-uterus, pregnant women, and men is replicated in future studies, this would suggest that extremes in reproductive hormone status are tied into the mechanisms related to precognition. Examining precognition in transgender participants who take hormones on a daily basis, or in women who choose to use hormonal replacement could be promising future directions for understanding the nature of implicit precognition.

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Table highlighting the differences between expected and achieved output indicators

Expected and achieved output indicators (number of actions)

Output indicators	Expected (according to application)	Achieved
Advanced training: PhD theses	0	0
Advanced training: Master theses	0	0
Advanced training: Other	0	0
Organization of seminars and conferences	0	0
Book	0	1
Book chapter	0	0
Conference presentation	3	3
Conference paper	0	0
Journal article	1	2
Other (specify)	0	0

Notes:

Dr. Mossbridge presented these experiments and related ideas at a Second Life Conference in February 2017, the SRI Consciousness & Technology Conference (Menlo Park, CA) in June 2017 as well as in a lecture at University of California, Berkeley in November 2017.

List of publications

[Article] Mossbridge, J. A. and Radin, D. A. (March 2018 [in press]) Precognition as a Form of Prospection: A Review of the Evidence in *Psychology of Consciousness Theory, Research, and Practice*

[Article] Mossbridge, J. A. and Radin, D. A. (March 2018 [in press]) Plausibility, Statistical Interpretations, Physical Mechanisms and a New Outlook: Response to commentaries on a Precognition Review in *Psychology of Consciousness Theory, Research, and Practice*

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