

**Reproductive Hormonal Status as a Predictor of Precognition:
A Confirmatory Experiment**
Research Protocol Registry Document

Protocol Title: Reproductive Hormonal Status as a Predictor of Precognition: A Confirmatory Experiment

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Abstract

Previous evidence and three exploratory experiments suggest a correlation between reproductive hormones in women and performance on precognition tasks. In the proposed confirmatory experiment, we will examine how markers of reproductive hormonal status are related to unconscious psychological prediction of future events (i.e., *implicit precognition*). This experiment could allow us to gain a toehold on understanding the currently unknown physiological mechanisms correlated with precognitive effects.

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 drastically 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. Comparison groups are:

Women:

- known pregnant (1st half of pregnancy) and between ages 18-44
- known pregnant (2nd half of pregnancy) and between ages 18-44
- menopausal (last menses at least 6 months ago) and between ages 45 and 100
- no uterus and between ages 45 and 100

Men: No men are included in this confirmatory study

Participants: At least 450; the goal is at least 350 women over age the of 45 (about 10% hysterectomy rate will yield the 33 women needed to have 90% power to test our hypotheses about women without uteri, and we need only 80 women who are menopausal to be at 90% power for our hypotheses there), 100 pregnant women (need ~50 in each half of pregnancy to have 90% power). However, the online platform creates a situation in which sometimes more participants than expected complete the experiment. We will take all participants who complete the experiment without discarding any data, but no data analysis will be completed until after it is clear that the minimum number of participants in each group has been met. These participant numbers are based on power analysis of previous results, providing a 90% probability of getting a significant effect if it exists in the experiment. Men and women who are under the age of 45 and not pregnant will be excluded. Analyses that include "all participants" refer to all recruited participants (in this case, excluding men and women under the age of 45 who are not pregnant).

Recruitment: Participants will not be told that this is a precognition or ESP experiment; the experiment will be described as a verbal memory study (which it is). All participants will be recruited via the Prolific platform, which targets 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 will be 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), but here a subset of it will be used to assess cycling hormonal state. We have already established that the sum of the 7 items on this subset is higher in cycling women than either noncycling women or men, so this measure gives us a second check on self-reported data about cycling vs. noncycling hormones in women. All participants will be asked to complete the questionnaire.

Big5 Questionnaire

The brief Big-5 Inventory (Rammstedt & John, 2007) will be administered online 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 will be instructed to follow an online link, using their computer to access web software that will guide the participants through four phases of the task, which will take approximately 10 minutes: 1) an initial brief presentation of each of 48 words that participants will be instructed to memorize, 2) a 48-trial two-alternative forced-choice test where participants are 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 will be paid for their time. All payments will be paid through the Prolific platform. Note that the software is 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)

Data cleaning

Participants who do not complete the entire experiment will be excluded from the data set (though their data will be recorded for potential later analysis). Participants who complete the experiment more than once will be excluded from the data set. Finally, participants who make more than 90% of their button presses on either the left side or the right side of the screen (indicating they are not performing the task) will be excluded from the data set. Participants having hysterectomies (no uterus on self report) who are using supplementary hormones will be excluded from the dataset. The number of participants obtained will be calculated after these exclusions, and more participants will be added to each group as needed, until the final number of participants after making these exclusions reaches the planned amount in each group or greater, where possible. In the past we have found that certain groups (hysterectomized women not taking hormones and pregnant women) are more difficult to obtain than others, so 5 days of experimental collection will be run -- and will be considered complete at midnight on the fifth day. No data analysis will be performed until after all groups have met their quotas (or the 5 days have ended). We think we can get close to these quotas, but can't be sure, and the risk of keeping

the experiment open for longer is that it appears moon phases may influence the results -- so a longer period of time risks muddying the data with shifts in moon phase.

Prior to calculating the dependent variables on the data set, data from any participant who had an average response time on the first test of 2500 ms or greater ($> \text{average RT} + 3 \times \text{SD Avg RT}$ on both of the first two experiments) will be excluded. Further, participants who score lower than 28 correct on the second test (which has 48 2-alternative questions -- this is $> \text{average total correct} + 3 \times \text{SD of the total correct}$) will be removed from analysis. This means in some cases the final number of participants in each group could be less than the quota, though this is unlikely given the rarity of these participants.

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

Following are the results from the first three exploratory experiments (note: the third experiment is the only one in which week of pregnancy data were consistently obtained, so any results referencing week of pregnancy refer to the third experiment).

Psi-related effects

- 1) Pregnant women – CorrDiff – more positive than women with no uterus without hormones -- this is true quantitatively in all 3 experiments and the 3rd experiment, it is clear that it is most true for the first four months of pregnancy (up to and including week 16)
- 2) Pregnant women – RTDiff – more positive than women with no uterus who don't take hormones versus women in first half of pregnancy (up to and including week 16; true quantitatively with all pregnant women in all 3 experiments)
- 3) RTDiff -- more positive in the first half (up to and including week 16) versus the second half of pregnancy
- 4) RTDiff -- in the first half of pregnancy (up to and including week 16) is positive
- 5) RTDiff and CorrDiff -- No uterus women not taking hormones – both are negative versus chance (zero)
- 6) CorrDiff and RTDiff -- No period in last 6 months but not pregnant more negative than first half of pregnancy (up to and including week 16)
- 7) RTDiff -- week of pregnancy is negatively correlated with RTDiff
- 8) RTDiff and CorrDiff – in all participants -- either one is correlated with menopause score

Non-psi-related effects

- 1) All participants – Menopause score – negatively correlated with age (significant)
- 2) All participants – AvgRT – positively correlated with age (significant)
- 3) All participants – conscientiousness – positive correlated with AvgRT (significant)
- 4) All participants – Menopause score – positively correlated with neuroticism, negatively correlated with agreeableness, extraversion, and conscientiousness (significant)

Predictions for this fourth confirmatory experiment:

These psi-related effects seem robust and are predicted to replicate in this confirmatory experiment. However, some are more likely to replicate than others. Each effect is marked exploratory or confirmatory accordingly.

- 1) EXPLORATORY: Pregnant women – CorrDiff – more positive than women with no uterus without hormones -- this is true quantitatively in all 3 experiments and the 3rd experiment, it is clear that it is most true for the first half of pregnancy (up to and including week 24; independent groups t-test)
- 2) CONFIRMATORY: Pregnant women – RTDiff – more positive than women with no uterus who don't take hormones versus women in first half of pregnancy (up to and including week 24; true quantitatively with all pregnant women in all 3 experiments; independent groups t-test)
- 3) CONFIRMATORY -- RTDiff -- more positive in the first half versus the second half of pregnancy (independent groups t-test)
- 4) EXPLORATORY -- RTDiff -- in the first half of pregnancy is positive (paired samples t-test)
- 5) EXPLORATORY -- RTDiff and CorrDiff -- No uterus women not taking hormones – both are negative versus chance (paired samples t-test)
- 6) EXPLORATORY -- CorrDiff and RTDiff -- No period in last 6 months but not pregnant more negative than women in the first half of pregnancy (independent groups t-test)
- 7) CONFIRMATORY -- RTDiff -- week of pregnancy is negatively correlated with RTDiff (linear regression, IV: week of pregnancy, DV: RTDiff)
- 8) EXPLORATORY -- RTDiff and CorrDiff – in all participants -- either one is correlated with menopause score (linear regression; IV: menopause score, DV: RTDiff or CorrDiff [two independent regressions])

Non-psi-related effects

- 1) CONFIRMATORY --All participants – Menopause score – negatively correlated with age (linear regression; IV: age, DV: menopause score)
- 2) CONFIRMATORY --All participants – AvgRT – positively correlated with age (linear regression; IV: age, DV: AvgRT)
- 3) CONFIRMATORY --All participants – AvgRT– positively correlated with conscientiousness (linear regression; IV: conscientiousness, DV: Avg RT)
- 4) CONFIRMATORY --All participants – Menopause score – positively correlated with neuroticism, negatively correlated with agreeableness, extraversion, and conscientiousness (multiple linear regression; IV: agreeableness, extraversion, and conscientiousness, DV: menopause score)

Data Analysis

Participant recruitment has already begun but no data analysis will be performed until this protocol is approved.

Statistical standards

An alpha of 0.05 and two-tailed tests will be used for all analyses. Pre-planned t-tests and linear regressions will be used as described above, in parentheses next to each prediction.

References

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