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**Review of PhD thesis**

***“The relationship between the menstrual cycle, anxiety and cognitive functioning –  
The moderating role of oral contraceptives”***

prepared by Melanie Kowalczyk, MA,  
at the SWPS University of Social Sciences and Humanities Institute of Psychology  
under the guidance of dr hab. Izabela Krejtz, prof. SWPS University  
Auxiliary supervisor: dr Monika Kornacka

The aim of Melanie Kowalczyk's (MA) doctoral project was to examine the relationship between the menstrual cycle, anxiety, and executive functioning in women who use oral contraceptives and those who cycle naturally. Specifically, the project sought to determine whether anxiety levels and executive functioning differ between oral contraceptive users and naturally cycling women, and whether these measures fluctuate across the menstrual cycle. The doctoral dissertation comprises four articles presenting a series of three studies: a meta-analysis, a cross-sectional study, and a daily diary study.

The main finding of this research project is that there was no significant difference in overall anxiety levels between women with a natural menstrual cycle and women taking oral contraceptives. However, users of anti-androgenic oral contraceptives reported higher levels of worry. Regarding executive functioning, the meta-analysis did not reveal any differences between the two groups; it should be noted, however, that the composition of the oral contraceptives was rarely reported in previous studies and was therefore not considered. The inhibitory control study found that anti-androgenic oral contraceptive users exhibited lower inhibitory control compared to androgenic oral contraceptive users and naturally cycling women. Additional findings indicated that both groups of oral contraceptive users experienced higher daily levels of depression and lower daily self-esteem than naturally cycling women. The author concludes that these findings highlight the need for further research to provide healthcare providers with evidence to guide women in selecting the most appropriate contraceptive treatment for their individual needs.

At the outset of this review, I would like to underscore **several strengths of this doctoral dissertation**. First, I was impressed by the doctoral student's proficiency in applying and interpreting the advanced statistical methods necessary to address the complex research questions posed in her work. Second, her considerable organisational skills were evident in the effective management of her research team, which resulted in four publications in

internationally recognized journals ranked in the first or second quartile of the Web of Science database within the field of Psychology.

Nevertheless, as a reviewer, I must also highlight certain weaknesses in the dissertation. For clarity, I will present these in two sections: general comments and specific comments pertaining to each of the doctoral student's four articles.

### **General remarks**

Reviewing a doctoral dissertation composed of a series of scientific articles presents a particular challenge, as it requires re-evaluating work that has already undergone rigorous peer review in specific scientific journals. When the articles are published in prestigious journals, their quality, both theoretical and methodological, is typically beyond dispute. Consequently, the reviewer's primary role is to assess the coherence of the collection of articles as a unified dissertation and to evaluate the quality of the scientific argument presented in the accompanying self-report. This is precisely the case with Ms. Kowalczyk's doctoral dissertation. Below, I present my general reflections on the dissertation as a whole.

1. The self-report accompanying the doctoral thesis lacks a sufficiently detailed description of the theoretical framework and methodology underpinning the study. Specifically, the literature review does not provide adequate support for the general claim that anxiety levels and executive functioning differ between women using oral contraceptives and those with natural cycles. In particular, the dissertation does not present a clear theoretical model or framework directly linking anxiety symptoms and executive functioning in this specific population. From a cognitive perspective, it is typically cognitive schemas that are most closely associated with anxiety symptomatology, rather than executive functions *per se*. The null results reported in the meta-analysis are consistent with this observation.
2. Across the dissertation, there is a notable disproportion between the sophistication of the research methodology employed and the practical implications derived from the analyses (see the section "Social Impact of Research"). This is especially apparent in the discussion of individual study results, where descriptive summaries predominate over in-depth interpretation and application-oriented discussion. The conclusion section of the self-report, in particular, is relatively brief and could benefit from a more thorough exploration of the study's implications. I elaborate on this point further in the detailed comments below.
3. The use of oral contraceptives can be motivated by a variety of factors, including dermatological or endocrinological conditions. These medical indications themselves may be primary contributors to psychological distress, such as anxiety or depression. Consequently, it is essential to consider whether such factors were adequately controlled in the study, which remains somewhat unclear. Additionally, drawing broad conclusions about the general use of oral contraceptives, a method that is widely recognized as safe and reliable, carries potential societal risks. For instance, such conclusions could inadvertently increase women's apprehension about using contraception in line with current medical guidelines. These societal considerations are largely absent from both the self-report and the articles, which may contribute to sample heterogeneity and a somewhat narrow perspective on the association between contraceptive use and mental health.

## **Detailed Remarks**

### **Article 1**

The main aim of the meta-analysis, published in *European Psychologist* (IF = 4.2), was to examine the relationship between the menstrual cycle, the use of oral contraceptives, and executive functions (i.e., inhibition, updating, and shifting). The analysis included sixteen studies, which comprised a mixture of androgenic and anti-androgenic oral contraceptives, with the latter rarely analysed as a separate group. The results indicated no significant differences in core executive functions between oral contraceptive users and women with a natural menstrual cycle. However, the high level of heterogeneity among the studies reflects considerable methodological diversity.

Overall, I highly commend this work, particularly the rigorous approach taken in preparing the meta-analysis. I would, however, like to raise three general questions that could be addressed during the doctoral defence:

- a. Could the author provide explanations, in addition to study heterogeneity, for the null results of this meta-analysis?
- b. How might future research on this topic be improved, particularly with regard to increasing replication and standardizing methodology, given that randomized controlled trials are often not feasible due to ethical constraints?
- c. How might the findings of this meta-analysis be interpreted in light of the societal considerations regarding the general use of oral contraceptives?

### **Article 2**

This study, published in *Archives of Women's Mental Health* (IF = 2.7), aimed to examine whether the type of oral contraceptive (OC) influences the relationship between anxiety and its main maintenance factors: worry and perceived stress. The authors conducted an observational, cross-sectional study involving 908 women, of whom 499 were naturally cycling (NC) and 409 were taking oral contraceptives, including 277 in the anti-androgenic group and 132 in the androgenic group. The findings indicated that, aside from participant age, there were no significant differences between groups on the measured variables. However, women using anti-androgenic OCs reported significantly higher levels of worry than NC women, after controlling for stress and age.

Overall, this article represents a robust cross-sectional analysis of the variables investigated in this PhD project, and I commend the authors for successfully gathering such a large and relevant sample. Nevertheless, I would like to raise three questions:

- a. Could disclosing the study's aim, namely, to examine differences between women using OCs and those not using them, have influenced participants' responses to some extent?
- b. It is unclear how long participants had been using OCs or whether they had recently changed contraceptive methods. Given that an adaptation period to OC use is known to occur, this may affect mood fluctuations.
- c. Were other hormonal factors that could influence mood (e.g., hypothyroidism) adequately controlled for in the study?

### **Article 3**

This study, published in the *Journal of Cognitive Psychology* (IF = 1.2), aimed to compare anxiety levels and inhibitory control in response to emotional words, including anxiety-provoking stimuli, among women with a natural menstrual cycle (NC) and women using oral contraceptives (OC) containing either androgenic or anti-androgenic progestins. The authors conducted two studies: a cross-sectional study involving 240 women and a daily diary study involving 89 women. The results showed no differences in anxiety levels between OC users and NC women in either study. However, the daily diary study revealed significant group differences in inhibitory control, with anti-androgenic OC users consistently exhibiting the longest response times.

Overall, I rate this article highly, particularly given the intensive longitudinal design of the second study and the sophisticated statistical analyses employed. Nevertheless, as previously noted, three major issues should be addressed during the PhD defence:

- a. As with the cross-sectional study, please clarify how long participants had been using OCs and whether they had recently changed contraceptive preparations, as an adaptation period to OC use may influence mood and cognitive performance.
- b. What were the reasons for participants using either androgenic or anti-androgenic OCs? This factor may provide a primary explanation for the observed differences in inhibitory control.
- c. Considering that hormonal contraception is intended to suppress ovulation, how can menstrual cycle phases be meaningfully interpreted in women using OCs?

### **Article 4**

The final study of the PhD project, accepted for publication in *BMC Psychology* (IF = 3.0), aimed to examine differences in daily levels of anxiety, depressive symptoms, related negative factors (such as perseverative cognition and stress), and protective factors (such as self-esteem and life satisfaction) between women using oral contraceptives (OC) and naturally cycling (NC) women. The study involved 89 adult women who participated in a 15-day online diary study, divided into three phases corresponding to one menstrual cycle. OC users were further classified according to the androgenicity of their contraceptive (androgenic or anti-androgenic).

The results indicated no differences between groups in daily levels of anxiety, perseverative cognition, or stress. However, anti-androgenic OC users experienced higher daily levels of depression than NC women across all three phases, while androgenic OC users exhibited higher daily depression in two phases. Both groups of OC users reported lower daily self-esteem than NC women throughout all phases, and androgenic OC users showed higher daily life satisfaction than anti-androgenic OC users in one phase.

As with the previous studies, I would like to raise three general questions:

- a. Could the author provide a more detailed explanation of the temporal context in which participants completed the diary entries?
- b. To what extent might the observed results reflect artefacts arising from the inclusion of multiple variables in the diary measures and, consequently, from multiple comparisons in the statistical analyses?
- c. What precautions were taken during data collection and analysis to minimise the risk of type I error?

### **Final conclusion**

In summary, despite the relatively minor criticisms outlined above, which should be addressed during the doctoral defence, I hold the submitted doctoral dissertation in high regard. I can therefore confidently state that Ms. Melanie Kowalczyk's dissertation fulfills the requirements set forth in the Act of 20 July 2018 on Academic Titles and Degrees. Accordingly, I respectfully request that the Scientific Council of the Institute of Psychology at SWPS University of Social Sciences and Humanities in Warsaw proceed to initiate the next stage of the doctoral process.

Marcin Rzeszutek



