

Original research article

Prospective memory affects satisfaction with the contraceptive pill[☆]

Sibylle Matter, Beat Meier*

Department of Psychology, University of Bern, 3000 Bern 9, Switzerland

Received 6 December 2007; revised 3 April 2008; accepted 24 April 2008

Abstract

Background: Remembering to take the contraceptive pill regularly relies on prospective memory, the ability to carry out an intended action at the appropriate occasion. The aim of the present study was to investigate the relationship between satisfaction with the pill and prospective memory.

Study Design: A total of 111 nulligravid students from a Swiss University (mean age=21.6, SD=2.9) took part in a study about contraception. Contraceptive use, method and satisfaction with the method were assessed. In addition, a self-report measure of prospective and retrospective memory was administered. The sample of 70 women (mean age=21.36, SD=2.1) who used the birth control pill was divided by median split into a higher and a lower prospective memory ability group to assess the impact of prospective memory on satisfaction with the pill.

Results: Satisfaction with oral contraceptive use was higher (mean lower prospective memory=4.2, mean higher prospective memory=4.7, $p=.022$) and stress was lower (mean lower prospective memory=2.3, mean higher prospective memory=1.6, $p=.005$) among women with higher prospective memory ability.

Conclusions: Assessing prospective memory might be useful in contraceptive counseling. Strategies to improve prospective memory ability are discussed.

© 2008 Elsevier Inc. All rights reserved.

Keywords: Contraceptives; Contraceptive use; Contraception; Birth control pill; Prospective memory; Habitual prospective memory

1. Introduction

The contraceptive pill is one of the most popular reversible contraceptive methods [1,2]. However, the contraceptive efficacy of the birth control pill depends on consistent and regular use within a clearly defined time window and a large percentage of women report difficulties remembering to take the pill as required. In a study that addressed the effectiveness of oral contraceptives in a sample of 943 women, 47% failed to take the pill at least once during one cycle [3]. Although estimates of compliance vary across studies, in general, it is thought that the number of failures is underestimated by self-report measures [4]. Good compliance has been linked with a woman's satisfaction with the

clinician, the absence of side effects, establishing a regular daily routine for taking the pill and reading the information distributed with the pill packaging [5].

An important factor that has been largely neglected in the investigation of regular contraceptive pill administration is the ability to remember to perform an action as planned, that is, prospective memory [6–9]. In contrast to retrospective memory (i.e., the ability to remember episodes from the past), a special feature of a prospective memory task is that retrieval must be self-initiated. That is, remembering to perform an intended action at the appropriate occasion has to be accomplished without an explicit request or reminder to do so, and it is this feature that makes prospective memory tasks difficult in everyday life. If the prospective memory task is performed regularly, it is termed a habitual prospective memory task [10,11]. Adherence to a medication regimen is the most prominent example of a habitual prospective memory task, and so far, this type of task has been mainly investigated in older adults [12–14]. However, taking the contraceptive pill as

[☆] This research was supported in part by a grant from the Swiss National Science Foundation (Grant 100013-116213) to B. Meier.

* Corresponding author.

E-mail address: beat.meier@psy.unibe.ch (B. Meier).

planned is an important prospective memory task for young women and failures can have far-reaching consequences (i.e., unintended pregnancy).

In fact, several studies have shown that prospective memory failures are among the most frequent reasons why young women do not take the contraceptive pill as planned [15,16]. For example, in a study with a total of 141 young women, the most frequent reasons for failures to take the pill were “forgot” (12.9%), “away from home” (12.9%) and “no new pack” (10.5%) [15]. It is noteworthy that not only forgetting to take the pill but also forgetting to take the pill package along when away from home or forgetting to buy a new pill pack in time are examples of typical failures of prospective memory.

In a recent multicenter study [17] with nearly 10,000 women aged 18–49 years who consulted their doctors for starting or reinitiating combined hormonal contraception, it was found that the vaginal ring showed the highest acceptance (46%) compared with the pill (39%) and the skin patch (15%), particularly in women aged 35–39 years. For women in the youngest age group, the pill was the most accepted method. Importantly, the ring and the skin patch were mainly preferred because of the lower probability of inadvertent omission (62% of cases). As inadvertent omissions are typical examples of prospective memory failures, this result suggests a direct link between prospective memory demands and the choice of contraceptive method. In addition, the high demand on prospective memory caused by daily pill taking was the most important reason why the contraceptive pill was not chosen by all but the youngest women.

In light of these findings, a systematic investigation of the relationship between prospective memory and satisfaction with the choice of the contraceptive pill in young women is mandatory. The aim of the present study was to investigate whether satisfaction with the contraceptive pill is related to self-ratings of prospective memory. Investigating whether prospective memory ability influences satisfaction with the contraceptive pill may have important implications for contraceptive counseling. The goal of contraceptive counseling is to find the most appropriate contraceptive and to support women in the regular use of contraceptives.

2. Materials and methods

2.1. Subjects

A total of 111 female students aged 19–35 years (mean=21.6, SD=2.9, median=21) were recruited from the undergraduate subject pool of the University of Bern, Switzerland, for an experiment on perception. After this experiment, they were asked whether they would volunteer for a questionnaire study on contraception and all of them agreed. The study was approved by the Institutional Review Board, and written informed consent was obtained from all subjects.

Seventy women (63% of the sample) used the contraceptive pill, and the main focus of this article is on this subsample, aged 19–28 years (mean=21.4, SD=2.1, median=21). All were childless and unmarried, and none had a history of pregnancy or abortion. Twenty-seven of them lived at home with their parents, 28 lived in student housings/flat-sharing communities, 9 lived with their partner and 6 lived alone.

2.2. Materials and procedure

The students filled out a questionnaire consisting of different sections. In the first section, sociodemographic data were assessed (i.e., age, marital status, number of children, history of pregnancy, living circumstances). The second section contained questions on contraception in general, the contraceptive method used and satisfaction with this method. The reasons for choosing the particular method were assessed by an open-ended question with the possibility to give multiple answers. To assess satisfaction, participants had to rate on a 5-point scale (1=*strongly disagree* and 5=*strongly agree*) whether they were satisfied with the chosen contraceptive, whether this method caused stress and whether they considered changing the contraceptive.

Then, the Prospective and Retrospective Memory Questionnaire (PRMQ), a reliable and valid measure of prospective memory ability [18], was administered. It consists of 16 items of prospective and retrospective memory failures in everyday life (for the complete questionnaire, see Ref. [18]). Each scale consists of eight items, such as “Do you forget appointments if you are not prompted by someone else or by a reminder such as a calendar or diary?” (prospective memory) or “Do you forget what you watched on television the previous day?” (retrospective memory). Participants noted how often these failures happened to them on a 5-point scale (1=*never* and 5=*very often*). For each scale, scores range between 8 and 40. In a normative study with a sample of 551 participants, the scale mean for the prospective scale was 20.18 (SD=4.91, range=8–35) with a reliability (Cronbach’s α) of .84. For the retrospective scale, the mean was 18.69 (SD=4.98, range=8–33) with Cronbach’s α =.80 [18]. Construct validity and predictive validity of the instrument were demonstrated in subsequent studies [19–21].

A median-split analysis was planned in order to test the influence of prospective memory on satisfaction with the pill. This procedure is common in social and medical science to compare groups differing along a continuous variable [22,23]. Participants who scored above the median of the prospective memory scale (i.e., frequent prospective memory lapses) were classified as the lower prospective memory ability group. Participants who scored below the median (i.e., infrequent prospective memory lapses) were classified as the higher prospective memory ability group. Likewise, a median-split analysis was planned for the retrospective memory scale.

To test whether higher and lower prospective memory ability groups had an impact on satisfaction, we planned to

conduct *t* tests for independent samples, followed by Bonferroni–Holmes corrections for multiple comparisons (i.e., with α levels of .05, .025 and .0167). An a priori power analysis was calculated with G* Power 2, international MS-DOS version (available at <http://www.psych.uni-duesseldorf.de/aap/projects/gpower>) [24]. With a statistical power of .80, a sample size of 52 participants would be required to detect a large effect ($d=.8$) and a sample size of 128 participants would be required to detect a medium effect ($d=.5$). Therefore, with the given sample size of 70 participants, a medium to large effect can be detected with a power of .80.

3. Results

3.1. Contraceptive method and reasons for the choice

The descriptive data of contraceptive use and the reasons for the choice of the specific method are shown in Table 1. From the 85 women who used a contraceptive, 82.3% used the pill, either alone (44.7%) or in combination with condoms (37.6%). The other 17.7% chose a different contraceptive method (condoms, 7%; IUS, 7%; IUD, 2.4%; vaginal ring, 1.2%). The most common reason for the choice of nearly all these methods was their proven efficacy in preventing pregnancy. For women using the pill, the second common reason was a hormone benefit for the treatment of acne and aglomerorrhea. For women using a different contraceptive method, the second common reason was the lower demands on prospective memory compared to the pill (i.e., no necessity for regular remembering).

3.2. Satisfaction with the birth control pill and prospective memory ratings

For the analysis of the prospective memory scale, three participants had to be excluded due to missing values. Overall, the mean sum score of the prospective memory

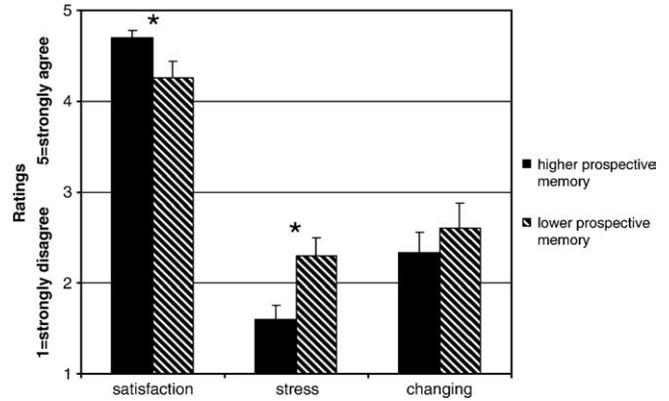


Fig. 1. Mean ratings of whether women were satisfied with the contraceptive pill, whether taking the pill caused stress and whether they considered changing the contraceptive. Error bars represent standard errors. Stars indicate significant differences (p values $<.05$).

rating was 21.1 ($n=67$, $SD=3.8$, median=21, range=13–33). To test the influence of prospective memory ratings on satisfaction with the pill, we performed a median split to create a higher and a lower prospective memory ability group. The mean prospective memory rating for the lower ability group was 24.2 ($SD=2.6$, range=22–33). The mean prospective memory rating for the higher ability group was 18.3 ($SD=2.2$, range=13–21).

Means for the entire sample of pill users for “satisfaction with the pill,” “stress caused by using the pill” and “thinking about changing the contraceptive method” were 4.5, 1.9 and 2.4, respectively. In order to test whether higher and lower prospective memory ability groups had an impact on these measures, we conducted *t* tests for independent samples, followed by Bonferroni–Holmes corrections for multiple comparisons. These analyses revealed a significant difference for satisfaction [mean lower prospective memory=4.2, mean higher prospective memory=4.7, mean difference=0.5, $t(65)=2.34$, $p=.022$] and for stress [mean lower prospective memory=2.3, mean higher prospective memory=1.6, mean difference=0.7, $t(65)=2.9$, $p=.005$] but not for considering to change the method [mean lower prospective memory=2.6, mean higher prospective memory=2.3, mean difference=0.3, $t(65)=0.785$, $p=.43$]. The results indicate that women with higher prospective memory ability were more satisfied with the pill and experienced less stress than women with lower prospective memory (see Fig. 1).

To test whether the influence on satisfaction with the pill is specific to prospective memory rating, we conducted the same analyses for the retrospective memory ratings. For the analysis of the retrospective memory scale, four participants had to be excluded due to missing values ($n=66$, mean=17.5, $SD=3.4$, median=18, range=9–24). The mean retrospective memory rating for the lower ability group (i.e., frequent retrospective memory lapses) was 20.8 ($SD=1.7$, range=19–24). The mean retrospective memory rating for the higher ability group (infrequent retrospective memory lapses) was 15.5 ($SD=2.6$, range=9–18). *t* tests for independent samples

Table 1
Use of contraceptives and reasons for choosing the particular method (multiple answers were possible)

Reasons for choosing the method	Contraceptive method			
	Pill only (n=38)	Pill/condoms (n=32)	Pill total (n=70), n (%)	Other total (n=15), n (%)
Efficacy in preventing pregnancy	21	21	42 (60)	6 (40)
Efficacy in protecting from venereal diseases	0	8	8 (11.4)	3 (20)
Hormone benefit	10	14	24 (34.3)	3 (20)
Easy to use	11	6	17 (24.3)	2 (13.3)
Recommendation	9	3	12 (17.1)	1 (6.7)
Available information	6	5	11 (15.7)	0 (0)
Low prospective memory demand	0	3	3 (4.3)	5 (33.3)
Relationship	5	1	6 (8.6)	1 (6.7)
Few side effects	3	2	5 (7.1)	2 (13.3)

revealed no significant differences for any of the three variables [all *t* values (64) <1.51; all *p* values >.14].

4. Discussion

The purpose of this study was to investigate whether prospective memory affects satisfaction with the birth control pill. The results showed that women lower in self-rated prospective memory ability were less satisfied with the pill and felt more stressed as a result of the demands of taking the birth control pill than did women with higher ratings of prospective memory ability. The results suggest that the cognitive demand of remembering to take the pill is not equally high for every woman. The prospective memory demand and the prospective memory abilities should be considered in order to find the most appropriate contraceptive method. Among other factors [5], the general ability to remember an intention is an important factor for satisfying pill use. However, further studies are needed to analyze the interplay of cognitive, motivational and social factors that potentially influence satisfaction with the pill.

The sample of our study consisted of young women from a developed industrial country. We believe that the validity of our results extends to other populations, but because the pill is most widely prescribed to young women, the relationship between prospective memory and satisfaction with the pill is most relevant to this specific population. In addition, for undergraduate students, the avoidance of pregnancy may be especially important. Therefore, the relationship between satisfaction with the pill and stress caused by taking the pill may be more accentuated in young, unmarried women.

The findings of the current study have important implications for contraceptive counseling. Prospective memory ability should be addressed in order to find the most appropriate contraceptive for each woman. The prospective memory scale from the PRMQ seems to be an efficient method to assess this ability. Further work is required to establish the validity of this questionnaire as a contraceptive counseling strategy.

In addition, research on cognitive strategies that improve prospective memory performance of daily pill taking is necessary. From the prospective memory literature, several factors have been established as effective in support of prospective memory. For example, factors that enhance the specificity of the retrieval situation (e.g., specificity of the target event, specificity of the target context, specificity of the target action) have been shown to improve prospective memory performance [25–27]. In addition, using implementation intentions (i.e., linking the intention to take the pill to a specific situation, e.g., before turning the lights off) has been recommended to improve performance in pill taking [28,29]. Moreover, the linkage of pill taking to a related routine event (e.g., taking the pill after teeth brushing) can create a processing overlap between the prospective memory task and the ongoing routine task, which is also known to enhance performance [30]. Finally, the use of external

memory devices, such as alarm clocks or pill reminders (e.g., the reminder card [31]), which provide obvious, attention-attracting cues, can be recommended.

Overall, the current study emphasizes the important role of prospective memory in the context of efficient contraception with the birth control pill. Recommendations based on the findings from experimental prospective memory research may be useful in aiding women to remember to take the pill regularly (i.e., daily and at the same time each day). They may also be able to help reduce the stress involved in taking the pill and enhance satisfaction with it as contraceptive method.

References

- [1] Scott A, Glasier A. Evidence based contraceptive choices. *Best Pract Res Clin Obstet Gynaecol* 2006;20:665–80.
- [2] Tanfer K, Cubbins LA, Brewster KL. Determinants of contraceptive choice among single women in the United States. *Fam Plann Perspect* 1992;24:155–61.
- [3] Rosenberg MJ, Waugh MS, Burnhill MS. Compliance, counselling and satisfaction with oral contraceptives: a prospective evaluation. *Fam Plann Perspect* 1998;30:89–92.
- [4] Potter L, Oakley D, Leon-Wong E, Canamar R. Measuring compliance among oral contraceptive users. *Fam Plann Perspect* 1996;28:154–8.
- [5] Rosenberg MJ, Burnhill MS, Waugh MS, Grimes DA, Hillard PJ. Compliance and oral contraceptives: a review. *Contraception* 1995;52:137–41.
- [6] Einstein GO, McDaniel MA. Normal aging and prospective memory. *J Exp Psychol Learn Mem Cogn* 1990;16:717–26.
- [7] Graf P, Uttl B. Prospective memory: a new focus for research. *Conscious Cogn* 2001;10:437–50.
- [8] McDaniel MA, Einstein GO. *Prospective memory. An overview and synthesis of an emerging field.* Thousand Oaks (Calif): Sage Publications; 2007.
- [9] Kliegel M, McDaniel MA, Einstein GO, editors. *Prospective memory. Cognitive, neuroscience, developmental and applied perspectives.* Mahwah (NJ): Erlbaum; 2007.
- [10] Meacham JA, Leiman B. Remembering to perform future actions. In: Neisser U, editor. *Memory observed: remembering in natural contexts.* San Francisco: W.H. Freeman; 1982. p. 327–42.
- [11] Meacham JA, Singer J. Incentive effects in prospective remembering. *J Psychol* 1977;97:191–7.
- [12] Einstein GO, McDaniel MA, Smith RE, Shaw P. Habitual prospective memory and aging: remembering intentions and forgetting actions. *Psychol Sci* 1998;9:284–8.
- [13] Vedhara K, Wadsworth E, Norman P, et al. Habitual prospective memory in elderly patients with type 2 diabetes: implications for medication adherence. *Psychol Health Med* 2004;9:17–27.
- [14] Park DC, Kidder DP. Prospective memory and medication adherence. In: Brandimonte M, Einstein GO, McDaniel MA, editors. *Prospective memory: theory and application.* Mahwah (NJ): Erlbaum; 1996. p. 1–22.
- [15] Smith J, Oakley D. Why do women miss oral contraceptive pills? An analysis of women's self-described reasons for missed pills. *J Midwifery Womens Health* 2005;50:380–5.
- [16] Fletcher PC, Bryden PJ, Bonin E. Preliminary examination of oral contraceptive use among university-aged females. *Contraception* 2001; 63:229–33.
- [17] Lete I, Doval JL, Pérez-Campos E, et al. Factors affecting women's selection of a combined hormonal contraceptive method: the TEAM-06 Spanish cross-sectional study. *Contraception* 2007;76:77–83.
- [18] Crawford JR, Smith G, Maylor EA, Della Sala S, Logie RH. The Prospective and Retrospective Memory Questionnaire (PRMQ):

- normative data and latent structure in a large non-clinical sample. *Memory* 2003;11:261–75.
- [19] Rönnlund M, Mäntylä T, Nilsson LG. The Prospective and Retrospective Memory Questionnaire (PRMQ): factorial structure, relations to global subjective memory ratings, and Swedish norm. *Scand J Psychol* 2008;49:11–8.
- [20] Mäntylä T. Assessing absentmindedness: prospective memory complaint and impairment in middle-aged adults. *Mem & Cog* 2003;31:15–25.
- [21] Kliegel M, Jäger T. Can the Prospective and Retrospective Memory Questionnaire (PRMQ) predict actual prospective memory performance? *Curr Psychol* 2006;25:182–91.
- [22] Dandeneau SD, Baldwin MW, Baccus JR, Sakellaropoulo M, Pruessner JC. Cutting stress off at the pass: reducing vigilance and responsiveness to social threat by manipulating attention. *J Pers Soc Psychol* 2007;93:651–66.
- [23] Gold SM, Zakowski SG, Valdimarsdottir HB, Bovbjerg DH. Higher Beck depression scores predict delayed epinephrine recovery after acute psychological stress independent of baseline levels of stress and mood. *Biol Psychol* 2004;67:261–73.
- [24] Erdfelder E, Faul F, Buchner A. Gpower: a general power analysis program. *Behav Res Method Instr Comput* 1996;28:1–11.
- [25] Brandimonte MA, Passolunghi MC. The effect of cue-familiarity, cue-distinctiveness, and retention interval on prospective remembering. *Q J Exp Psychol A* 1994;47:565–87.
- [26] McDaniel MA, Guynn M, Einstein GO, Breneiser J. Cue-focused and reflexive-associative processes in prospective memory retrieval. *J Exp Psychol Learn Mem Cogn* 2004;30:605–14.
- [27] Meier B, Zimmermann T, Perrig W. Retrieval experience in prospective memory: strategic monitoring and spontaneous retrieval. *Memory* 2006;14:872–89.
- [28] Gollwitzer PM. Implementation intentions. Strong effects of simple plans. *Am Psychol* 1999;54:493–503.
- [29] Chasteen AL, Park DC, Schwarz N. Implementation intentions and facilitation of prospective memory. *Psychol Sci* 2001;12:457–61.
- [30] Meier B, Graf P. Transfer appropriate processing for prospective memory tests. *Appl Cogn Psychol* 2000;14:S11–27.
- [31] Lachoasky M, Levy-Toledano R. Improving compliance in oral contraception: ‘the reminder card’. *Eur J Contracept Reprod Health Care* 2002;7:210–5.