

# Brief Communication

## Effects of Ramadan fasting on time perception task

*Habibolah Khazaie, MD, Masoud Tabmasian, MD, Hamed Ekhtiari, MD, Homan Safaei, MD, Habib Ganjgahi, MSc, Mohammad R. Ghadami, MD.*

Ramadan fasting is one of the 5 pillars of Islam. During the Ramadan month, healthy Muslims abstain from eating, drinking, and sexual intercourse from sunrise to sunset. The changes in meal and activity schedules induce chronobiological and metabolic modifications, also related to behavioral changes.<sup>1</sup> Behavioral changes, marked by an increased irritability and a decrease in subjective alertness has been attributed to the abstinence from nicotine and coffee.<sup>1,2</sup> The relation between cognitive function and Ramadan fasting has not been investigated clearly yet. The main aim of the present study was to assess the effects of Ramadan fasting on time perception task (TPT) as one of the important cognitive functional tasks in human behaviors.

This study was performed during Ramadan of September 2007 (Islamic year 1428) at the Department of Psychiatry in Kermanshah University of Medical Sciences, Kermanshah, Iran. We included a fasting (n=23) and none fasting (n=25) group. Ethical approval from the relevant body at our institution was received to perform this study, and informed consent was taken from all participants. The mean age was 31.3±11 in the fasting group, and 26.6±6 in the none fasting group. Both groups underwent TPT during the seventh to twenty-eight of Ramadan. The TPT was taken in a similarly quiet and comfortable place for all volunteers. In the fasting group, TPT was undertaken between 1-2 p.m. (between 8-9 hours of fasting). We matched our volunteers for age, gender, education, marital status, and excluded those with any acute or chronic medical or psychiatric disease or on medications during the study, and any substance dependency, or abuse. Furthermore, none of the female subjects were pregnant or using contraceptives. The TPT consists of 2 series of trials on time estimation and time reproduction. In the estimation series of trials (7 trials), subjects were asked to estimate time length presented by a lamp picture, with some small red circles as a distractor and the subject is ask to count up to 7 to push the key. In the reproduction trials, the subject is asked to reproduce the same time length presented to him/her in a similar manner in the estimation trials by pressing a key (7 trials). Errors in counting the distractors are calculated. Statistical analysis was performed by sample T-Test

using SPSS software (version 15). A *p*-value of <0.05 was considered to indicate statistical significance.

The results are summarized in Table 1. As shown in the table, there is a general pattern in both estimation and reproduction sessions. In the estimation session, the fasting group had lower means of estimated time in all 7 trials compared with the non fasting group. In other words, the fasting group, under-estimate time trials, compared with the non-fasting group, although there are no statistically significant differences between the 2 groups in these trials. In the reproduction session, the fasting group had higher means of reproduced time in all 7 trials, in other words, the fasting group over-reproduced time trials compared with the non-fasting group. In this session, only one trial showed a significant difference. There are no significant differences in mean number of errors in estimation and reproduction sessions, between fasting and non-fasting groups (data not shown).

Our findings may be due to some factors such as metabolic or behavioral changes during Ramadan fasting.<sup>2</sup> Roky et al<sup>1</sup> showed an increase in daytime sleepiness, this increase in sleepiness, especially in the morning, could be due to the decrease of the nocturnal sleep duration, the delay in rising time, and the absence of breakfast and caffeine intake. The intermittent fasting of Ramadan delays sleep onset, impairs sleep structure, especially REM sleep, in relation to a delay in the acrophase and bathyphase of temperature and concomitant alterations in the metabolic and endocrine status of the individual.<sup>1</sup> Lopez et al<sup>3</sup> suggested that missing breakfast does not affect the accuracy of the cognitive performance of children. Nutritionally affected

**Table 1 -** Means and *p*-values of compared estimation and reproduction trials between fasting and non-fasting groups.

Trial	Fasting group mean (seconds)	Non-fasting group mean (seconds)	<i>P</i> -value
<i>Estimation trial</i>			
5 seconds	5.30	6.20	0.230
8 seconds	6.65	8.24	0.045
11 seconds	8.70	9.76	0.275
14 seconds	9.48	10.88	0.178
17 seconds	11.61	14.20	0.110
21 seconds	13.70	14.20	0.721
23 seconds	13.96	16.40	0.122
<i>Reproduction trial</i>			
5 seconds	4.013	3.223	0.034
8 seconds	6.060	5.861	0.726
11 seconds	6.921	6.875	0.957
14 seconds	9.350	8.104	0.242
17 seconds	11.172	10.608	0.642
21 seconds	11.893	10.620	0.402
23 seconds	15.197	12.321	0.107

children did not show a particular vulnerability to the fasting condition, but did show a specific cognitive deficit. Behavioral changes, marked by increased irritability,<sup>2</sup> and a decrease in subjective alertness,<sup>1</sup> have been attributed to the abstinence from nicotine and coffee.<sup>1,2</sup> In a previous study, Ramadan fasting is accompanied by impairment in alertness, assessed by visual analogue scales (VAS), at 09:00 and 16:00 hours without any change in psychomotor performance estimated from movement reaction time and critical frequency fusion tests.<sup>1</sup> Some studies have shown that psychomotor performance, such as memory, is impaired by Ramadan fasting.<sup>4</sup> For Lagarde et al,<sup>5</sup> subjective alertness decreased only at the beginning and not at the end of Ramadan, suggesting an adaptation mechanism to intermittent fasting. However, our team did not retrieve such an adaptation. This divergence may be due to the different methods of assessing subjective alertness.

In general, we found differences in time perception during Ramadan, although it has some limitations such as small sample size and only using one cognitive task. Further studies should investigate other aspects of Ramadan fasting on human cognition.

Received 26th August 2008. Accepted 21st December 2008.

From the Sleep Research Center (Khazaie, Tahmasian, Ghadami), Department of Psychiatry, Kermanshah University of Medical Sciences, and the Neurocognitive Assessment Laboratory (Ekhtiari, Safaei, Ganjgahi), Iranian National Center for Addiction Studies. Address correspondence and reprint requests to: Dr. Habibolah Khazaie, Associate Professor of Psychiatry, Sleep Research Center, Department of Psychiatry, Research Affairs, Building Number 2, Kermanshah University of Medical Sciences, Blvd. Shaheed Beheshti, Kermanshah, Iran. Tel. +98 (918) 8332426. Fax. +98 (831) 8360016. E-mail: ha\_khazaie@yahoo.com

## References

1. Roky R, Iraki L, HajKhlifa R, Lakhdar Ghazal N, Hakkou F. Daytime alertness, mood, psychomotor performances, and oral temperature during Ramadan intermittent fasting. *Ann Nutr Metab* 2000; 44: 101-107.
2. Kadri N, Tilane A, El Batal M, Taltit Y, Tahiri SM, Moussaoui D. Irritability during the month of Ramadan. *Psychosom Med* 2000; 62: 280-285.
3. López I, de Andraca I, Perales CG, Heresi E, Castillo M, Colombo M. Breakfast omission and cognitive performance of normal, wasted and stunted schoolchildren. *Eur J Clin Nutr* 1993; 47: 533-542.
4. Hakkou, F, Wast D, Jaouen C. Does Ramadan impair vigilance and memory? *Psychopharmacol* 1988; 96: 213.
5. Lagarde D, Batejat D, Boussif M, Pradella S, Girault S, Huppe M. Ramadan et vigilance. *Médecine aéronautique et spatiale* 1996; 35: 175-182.

### Related topics

Khammash MR, Al-Shouha TF. Do road traffic accidents increase during the fasting month of Ramadan. *Neurosciences* 2006; 11: 21-23.

Abdul-Zehra IK. Headache in Ramadan. *Neurosciences* 2003; 8 Suppl: 75-75.

Al-Mahdawi AM. Epilepsy and Ramadan fasting. *Neurosciences* 2002; 7: 207-209.