

<div>INDIAN JOURNAL OF MEDICAL SCIENCES</div>	VOLUME	62
	NUMBER	1
	JANUARY	2008

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IMMEDIATE EFFECT OF HIGH-FREQUENCY YOGA BREATHING ON ATTENTION

Sir,

Kapalabhati (KPB) is a yoga breathing technique characterized by forceful exhalation and high-frequency breathing, whose name (*kapala* = forehead, *bhati* = shining, in Sanskrit) suggests that it stimulates the brain.^[1] KPB is being practiced throughout India for health promotion and disease prevention.^[2]

The alpha- and beta-1 activity in the EEG increased during the first 5 minutes of a 15 minute KPB session in 11 advanced yoga practitioners.^[3] When practiced at high frequencies (i.e., approximately 120 breaths per min), autonomic changes, based on the heart rate variability spectrum, suggested increased sympathetic and reduced vagal activity.^[4] However, despite the supposed effect on the

brain, the effects of KPB on attention and cognition have not been reported.

Forty-six medical students (11 males; mean age \pm SD, 20.9 ± 2.3 years; mean experience of KPB, 3.3 ± 1.0 years) took part in the trial. The attention task was administered before and after KPB on one day and before and after an alternate intervention, i.e., breath awareness (BAW) on another day. BAW was chosen as it is believed to improve attention.

To understand whether similar results would be seen in different age groups, a similar trial was conducted in middle-aged adults (30-59 years, $n = 48$) with comparable gender distribution and experience of KPB (± 1 month). There was also a smaller number ($n = 16$) of older adults, over the age of 60 years (all males; comparable experience of KPB, ± 1 month). Both groups were studied as described for medical students.

A standard six-letter cancellation test was used. The worksheet specifies six target letters to be cancelled and has a working section, with letters of the alphabet arranged randomly in 22 rows and 14 columns. Participants were asked to cancel as many of the six target letters as possible in 90 s. The sheets were blind scored. The 'before' and 'after' values for (i) KPB and (ii) BAW were compared separately with Wilcoxon paired signed-ranks test.

For the medical students, total errors before KPB (group mean \pm SD, 11.4 ± 8.2) and before BAW (9.6 ± 6.2) were not different. However, after KPB, total errors decreased (5.0 ± 4.0 ; $P < 0.001$); with no change after BAW (8.7 ± 7.2). For the adults and older

persons, there were no changes in total errors after both sessions. However, for both groups of adults, the net scores (i.e., total letters cancelled minus errors) were higher after KPB. For middle-aged adults, the net scores after KPB were higher (37.5 ± 13.3 , $P < 0.001$, 32.5% increase) compared to those before KPB (28.3 ± 8.7). Also, the older persons showed higher net scores after KPB (33.4 ± 10.4 , $P < 0.05$, 16.4% increase) compared to those before KPB (28.6 ± 10.5). The net scores did not change in medical students.

Hence in all three age groups (medical students, middle-aged adults and older persons), the changes in cancellation scores (either total errors or net scores) after KPB suggested improvement. This task requires selective and sustained attention, as well as the ability to shift attention. The mechanism underlying the improvement is not known. It may be related to the fact that KPB is associated with increased sympathetic activity, and increased sympathetic tone is associated with better vigilance.^[5] The study is limited by the small sample sizes and the fact that the study did not attempt to assess how long the effect of KPB on attention lasted. Further research is required with larger numbers and with reassessments to understand how long the effects last so as to understand the therapeutic possibilities.

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