

Huperzine-A capsules enhance memory and learning performance in 34 pairs of matched adolescent students¹

SUN Qing-Qi, XU Si-Sun², PAN Jian-Liang, GUO He-Ming³, CAO Wang-Qi⁴ (Xiaoshan Mental Hospital, Zhejiang 311201; ²Zhejiang Mental Health Institute, Hangzhou 311122; ³Zhaohui Junior Middle School of Xiaoshan, Zhejiang 311201; ⁴Huilan Junior Middle School of Xiaoshan, Zhejiang 311201, China)

KEY WORDS students; huperzine-A; memory; learning; aptitude tests; adolescent behavior; double-blind method; matched-pair analysis; cholinesterase inhibitors; Wechsler scales

ABSTRACT

AIM: To study the efficacy of huperzine-A capsules (Hup) on memory and learning performance of adolescent students. **METHODS:** Using double-blind and matched pair method, 34 pairs of junior middle school students complaining of memory inadequacy were divided into two groups by normal psychological health inventory (PHI), similar memory quotient (MQ), same sex and class. The Hup group was administrated orally 2 capsules of Hup (each contains Hup 50 μ g) bid, and the placebo group was given 2 capsules of placebo (starch and lactose inside) bid for 4 wk. **RESULTS:** At the end of trial, the Hup group's MQ (115 ± 6) was more than that of the placebo group (104 ± 9 , $P < 0.01$), and the scores of Chinese language lesson in the Hup group were elevated markedly too. **CONCLUSION:** The Hup capsules enhance the memory and learning performance of adolescent students.

INTRODUCTION

Hup, a new *Lycopodium* alkaloid first isolated from Chinese herb *Huperzia serrata* (Thunb) Trev by Chinese^[1], is a potent, centrally active, and reversible cholinesterase inhibitor^[2], it was reported to ameliorate

learning and memory retention in rodents^[3] and improve memory in aged^[4,5]. As to the efficacy in adolescents, it had not been reported at home and abroad yet, so we selected 68 junior middle school students to study that from April to June in 1997.

MATERIALS AND METHODS

Sample origin Sixty-eight students were selected from total of 1356 students of 23 classes of Zhaohui and Huilan junior middle schools in Xiaoshan City, where psychological health work had been done better.

Inclusive criteria The student complained of bad memory, the learning performance was getting worse, psychological health inventory (PHI) was normal, no mental symptom or sign, and no any nervous illness history was sampled in the study. All of them and their parents agreed to take part in this research.

Method of entering the group Sixty-eight students were matched in the same class, the same sex, and similar memory quotient (MQ), then, divided into two groups as the Hup group and the placebo (Pla) group randomly.

Method of taking medicine Students in Hup group were given 2 capsules of Hup (each contains Hup 50 μ g), and Pla group were given 2 capsules of Pla (starch and lactose inside), twice a day for 4 wk. Hup and Pla capsules, same in shape, color, weight, taste and the packaging, were provided by Ningbo Lihua Pharmaceutic Company Ltd. The clinicians, the teachers and the students were all blind.

Assessment All samples were evaluated with Wechsler memory scale (WMS) and treatment emergent symptom scale (TESS) at the beginning and the end of trial, we further took the quiz performance of English, Chinese, mathematics, and the average

¹ Project supported by Ningbo Lihua Pharmaceutic Co Ltd.

² Correspondence to Prof XU Si-Sun. Phn 86-571-704-6477.

E-mail xusisun@telebird.com.cn

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score of above three lessons at 'before' and 'after' trial as the another targets of efficacy.

Data analysis The statistical analysis of the results were performed by NDST (New Drug Statistical Treatment) software provided by Prof SUN Rui-Yuan. Paired *t* test was used for MQ, TESS and all the quiz performance, before and after the trial; group *t* test was used for comparison between Hup and Pla groups.

RESULTS

The intraclass correlation (ICC) ICC on WMS from 4 evaluators at the beginning of the trial was 0.82.

General data According to the matched criteria, 20 pairs of students were sampled from Zhaohui and 14 pairs from Huilan junior middle school, their background data were listed in Tab 1.

Tab 1. Comparison of the background data between two groups. $n = 34$ pairs of students. $\bar{x} \pm s$. $^aP > 0.05$ vs placebo.

Item	Huperzine	Placebo
Sex (M/F)	20/14	20/14
Age/a	15.0 ± 0.6 ^a	15.0 ± 0.8
Memory quotient	92 ± 7 ^a	94 ± 8
Psychological health inventory		
Lie	53 ± 9 ^a	54 ± 8
Fake	51 ± 12 ^a	48 ± 11
Question	46 ± 4 ^a	45 ± 5
Somatic disorder	51 ± 8 ^a	50 ± 7
Depression	56 ± 7 ^a	54 ± 7
Anxiety	55 ± 8 ^a	52 ± 7
Psychopathy deviance	52 ± 10 ^a	50 ± 9
Hypochondriasis	55 ± 11 ^a	52 ± 10
Unrealistic	51 ± 9 ^a	50 ± 9
Hypomania	54 ± 10 ^a	51 ± 9

It showed no statistical difference on sex, age, MQ, and PHI among them.

MQ assessment There were significant differences on MQ in both groups between 'before' and 'after' the 4-wk trial ($P < 0.01$), but the MQ of Hup group at end of trial was significantly more than that of Pla group ($P < 0.01$, Tab 2).

Group *t* test on each factor of WMS between 2 groups showed a significant improvement in 'accumula-

Tab 2. Comparison of memory quotient between 2 groups before and after trial. $n = 34$. $\bar{x} \pm s$. $^aP > 0.05$, $^cP < 0.01$ vs placebo.

Memory quotient	Huperzine A	Placebo
Baseline	92 ± 7 ^a	94 ± 8
4-wk trial	115 ± 6 ^c	104 ± 9
Odds	23 ± 7 ^c	11 ± 10

tion', 'recognition', 'reproduction', 'association', 'tactual memory', and 'number of recitation' ($P < 0.05$), (Tab 3).

Tab 3. Comparison of factors of Wechsler memory scale between 2 groups before and after trial. $n = 34$. $\bar{x} \pm s$. $^b P < 0.05$, $^c P < 0.01$ vs placebo.

Item		Huperzine A	Placebo
I→100	baseline	10.6 ± 2.5	10.9 ± 2.1
	4-wk trial	10.5 ± 2.8	10.9 ± 2.0
100→I	baseline	10.7 ± 2.3	11.3 ± 2.2
	4-wk trial	12.4 ± 1.3	12.6 ± 1.5
Accumulation	baseline	10.4 ± 1.8	10.0 ± 2.4
	4-wk trial	11.8 ± 1.2 ^b	10.7 ± 2.2
Picture memory	baseline	9.2 ± 1.8	9.9 ± 1.8
	4-wk trial	10.8 ± 1.8	10.3 ± 1.3
Recognition	baseline	10.0 ± 2.0	9.9 ± 2.2
	4-wk trial	10.5 ± 1.7 ^b	9.3 ± 2.7
Reproduction	baseline	9.6 ± 2.2	8.9 ± 1.9
	4-wk trial	11.5 ± 1.5 ^c	10.3 ± 1.6
Association	baseline	9.1 ± 2.8	9.6 ± 2.3
	4-wk trial	12.2 ± 1.4 ^c	9.9 ± 2.5
Tactual memory	baseline	10 ± 4	10.2 ± 2.8
	4-wk trial	13.7 ± 2.3 ^c	10.8 ± 2.7
Understanding	baseline	14 ± 4	14 ± 4
	4-wk trial	17.6 ± 2.5	17.4 ± 2.5
Number of recitation	baseline	10 ± 3	10.3 ± 2.3
	4-wk trial	12.8 ± 2.7 ^b	11.5 ± 2.6

Learning performance The quiz scores of Chinese language lesson in the Hup group were elevated significantly (Tab 4).

Side effects Both the scores of TESS in two groups were zero, it indicated that no any side effect was found in the 4-wk trial.

DISCUSSION

This study was designed as a double blind, matched

Tab 4. Comparison of learning performance between 2 groups before and after trial. $n = 34$. $\bar{x} \pm s$. ^b $P < 0.05$, ^c $P < 0.01$ vs baseline; ^d $P < 0.05$, ^e $P < 0.01$ vs placebo.

Item	Huperzine A	Placebo
English language		
baseline	59 ± 20	68 ± 18
4-wk trial	66 ± 18 ^c	70 ± 17 ^b
Odds	6 ± 8	3 ± 12
Chinese language		
baseline	59 ± 16 ^f	68 ± 9
4-wk trial	70 ± 12 ^c	70 ± 10
Odds	10 ± 9 ^f	2 ± 7
Mathematics		
baseline	58 ± 21	58 ± 22
4-wk trial	68 ± 21 ^e	68 ± 18 ^c
Odds	9 ± 11	10 ± 14
Average score of above 3 lessons		
baseline	59 ± 14	64 ± 12
4-wk trial	68 ± 14 ^c	70 ± 12 ^c
Odds	9 ± 6 ^e	6 ± 7

pair, and randomly grouping trial to observe the action of Hup in adolescent students. There was a considerable high ICC in evaluators, and comparable background data between 2 groups, we considered that the results of this study were relative reliable.

The results of this study exhibited that Hup obviously improved the memory function of adolescent students too. At the end of trial, the MQ of Hup group was significantly elevated than that of Pla group ($P < 0.01$). According to the further analysis of each factor of the WMS, Hup increased the scores of 'accumulation', 'recognition', 'reproduction', 'association', 'tactual memory', and 'number of recitation' five factors, but not 'understanding' factor. These findings were consistent with the finding of learning performance, that is, Hup enhanced the performance of English and Chinese language lessons, but not mathematics. So, we think that Hup is also a promising candidate drug for improving the memory function and learning aptitude in adolescent students.

Owing to the insufficient observation period and lack of biochemical experiments, the results of this study are preliminary, the next strict designed study will be undertaken for identifying the efficacy of the Hup in the adolescents.

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601-603

石杉碱甲胶囊提高 34 对青春期学生记忆和学习成绩¹

孙轻骑¹, 徐嗣荪², 潘建良, 郭鹤鸣³, 曹望祁⁴ (1. 萧山市精神病医院, 萧山 311201; 2. 浙江省精神卫生研究所, 杭州 311122; 3. 萧山市朝晖中学, 萧山市回澜中学, 萧山 311201, 中国)

关键词 学生; 石杉碱甲; 记忆; 学习; 才能测试; 青春期行为; 双盲法; 配对分析; 胆碱酯酶抑制剂; 韦氏量表

目的: 研究石杉碱甲胶囊对初中学生记忆和学习成绩的效能. **方法:** 采用双盲法, 按照心理健康正常、记忆商接近、同班、同性别的要求, 将 68 例初中生配对成两组, 随机各给石杉碱甲胶囊 2 粒(每粒含 50 μg)或空白胶囊 2 片(含淀粉和乳糖), 一日两次口服, 4 周为一疗程. 以记忆商及语文、英语和数学以及上述三课均分为观测指标评定疗效. **结果:** 石杉碱甲胶囊组疗末的记忆商明显高于空白组 ($P < 0.01$), 语文成绩也明显提高. **结论:** 石杉碱甲胶囊提高青春期学生的记忆和学习成绩. (责任编辑 李颖)