Effects on Cognitive Functioning of Methylphenidate and Clonidine in Hospitalized Children

Diane Petrac, R. Matt Alderson, M.S., M. D. Rapport, Ph.D
Department of Psychology, University of Central Florida

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is characterized by developmentally inappropriate levels of attention, impulsivity and hyperactivity, with prevalence estimates in school age children varying between 3% - 7% (American Psychiatric Association, 2000). The first line of treatment for ADHD is pharmacotherapy, in particular the psychostimulant methylphenidate (MPH), which is effective for 70% - 80% of children. Alternative treatments are sought for children who fail to respond to psychostimulants, or who experience unacceptable side effects. Clonidine (CL), an alpha-2 adrenergic agonist, has gained acceptance as a treatment for refractory cases of ADHD, in particular when ADHD is comorbid with other disorders such as conduct disorder (Connor, Barkley, & Davis, 2000). Extant studies indicate that children undergoing clonidine therapy experience durable, but not consistent change. This study compares the effects of methylphenidate and clonidine on core cognitive processes in a sample of psychiatrically disabled children admitted to Stony Brook Children’s inpatient unit. The children all were diagnosed with ADHD of a chronic and protracted nature combined with a variety of childhood disorders, and prorated on multiple conditions combined with a variety of childhood disorders.

METHODS

Participants

Children were between six and ten years of age with mixed diagnoses, and participated in a 16 week within subject cross-over design. Each child was examined under baseline, multiple MPH dosages (10 mg, 15 mg, and 20 mg), placebo and clonidine (titrated to tolerance). Children were examined under each condition using two cognitive measures: the Continuous Performance Test (CPT) (Rosvold et al., 1956); and the Matching Familiar Figures Test (MFFT) (Kagan et al., 1960). The CPT was developed by Kagan et al. (1960) and is a continuous measure of impulsivity and cognitive tempo. Children were shown a card with black letters on it and asked to identify the identical letter from a set of six alternatives, which included one exact reproduction and five very similar drawings. Latency to initial response and total errors served as the dependent measures, respectively.

RESULTS

All analyses were conducted using SPSS for Windows 11.0 (SPSS, 2002). The alpha level was set to .05. Repeated measures within subjects ANOVA's were used to analyze the data across the 6 conditions: baseline, MPH 10mg (10mg), 15mg (15mg), and 20mg (20mg), CL (titrated to tolerance) and placebo.

No significant differences were found in the number of omission errors across the CPT’s 3 x 3-min blocks. In contrast, the CPT’s 3 x 3-min blocks were all found to have a significant difference in the number of omission errors. The first 3-min block was significant $F(1,40) = 2.30$, $p < .05$. Pairwise post hoc comparisons revealed that children emitted significantly fewer errors under 10 mg ($p <.049$), 15 mg ($p <.032$), and 20 mg ($p <.014$) compared to baseline. All analyses were conducted using SPSS for Windows 11.0 (SPSS, 2002). The alpha level was set to .05. Repeated measures within subjects ANOVA's were used to analyze the data across the 6 conditions: baseline, MPH 10mg (10mg), 15mg (15mg), and 20mg (20mg), CL (titrated to tolerance) and placebo.

No significant differences were found in the number of omission errors across the CPT’s 3 x 3-min blocks. In contrast, the CPT’s 3 x 3-min blocks were all found to have a significant difference in the number of omission errors. The first 3-min block was significant $F(1,40) = 2.30$, $p < .05$. Pairwise post hoc comparisons revealed that children emitted significantly fewer errors under 10 mg ($p <.049$), 15 mg ($p <.032$), and 20 mg ($p <.014$) compared to baseline. All analyses were conducted using SPSS for Windows 11.0 (SPSS, 2002). The alpha level was set to .05. Repeated measures within subjects ANOVA's were used to analyze the data across the 6 conditions: baseline, MPH 10mg (10mg), 15mg (15mg), and 20mg (20mg), CL (titrated to tolerance) and placebo.

No significant differences were found in the number of omission errors across the CPT’s 3 x 3-min blocks. In contrast, the CPT’s 3 x 3-min blocks were all found to have a significant difference in the number of omission errors. The first 3-min block was significant $F(1,40) = 2.30$, $p < .05$. Pairwise post hoc comparisons revealed that children emitted significantly fewer errors under 10 mg ($p <.049$), 15 mg ($p <.032$), and 20 mg ($p <.014$) compared to baseline. All analyses were conducted using SPSS for Windows 11.0 (SPSS, 2002). The alpha level was set to .05. Repeated measures within subjects ANOVA's were used to analyze the data across the 6 conditions: baseline, MPH 10mg (10mg), 15mg (15mg), and 20mg (20mg), CL (titrated to tolerance) and placebo.

DISCUSSION

Results indicate that all 3 levels of MPH were associated with reduced impulsivity on both the Continuous Performance Task and MFFT, with a non-significant trend for improved attention. The failure to find significant improvement in attention may be due to the homogeneity of the data and corresponding small sample size. No change in children’s cognitive function was observed under Clonidine relative to baseline and placebo. Collectively, these results suggest that Clonidine is not a preferred treatment for ADHD if improved cognitive function is a desired outcome.