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The Central Auditory Processing and Continuous Performance of children with Attention Deficit Hyperactivity Disorder (ADHD) in the medicated and non-medicated state

By

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Dedicated to children with Attention Deficit Hyperactivity Disorder and their families

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Knowledge is proud that he has learned so much;
Wisdom is humble that he knows no more
(Cowper, 2000: 1)

ABSTRACT

Title: *The Central Auditory Processing and Continuous Performance of children with Attention Deficit Hyperactivity Disorder (ADHD) in the medicated and non-medicated state*

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Attention Deficit Hyperactivity Disorder (ADHD), the most commonly occurring neurobehavioral disorder in children, has received increasing attention in the past decade. The lack of congruity in defining ADHD as a disorder has lead to controversy surrounding the prevalence, diagnosis and treatment of ADHD in children. This lack of congruity is reflected in the wide variations in the diagnostic tools and criteria currently employed by different professionals in different clinical settings across countries in diagnosing ADHD.

Recently, there has been a shift in conceptualising ADHD as a behavioral regulation or executive function disorder rather than a primary attention disorder. It has also been suggested that tests of central auditory processing and continuous performance may be helpful in differentiating between ADHD and Central Auditory Processing Disorders (CAPD).

The aim of the research was to determine the central auditory processing and continuous performance patterns of children with ADHD in the medicated and non-medicated state. Three research groups were used to represent the three different types of ADHD (as outlined in the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV) of the American Psychiatric Association, 1994). Research group 1 consisted of 10 participants with the combined type of ADHD, research group 2 consisted of 10 participants with the predominantly inattentive type of ADHD, and research group 3 consisted of one participant with the predominantly hyperactive-impulsive type of ADHD.

A Between group (combined ADHD group, inattentive ADHD group and hyperactive-impulsive ADHD group) within-subjects design was used for two test conditions (with and without medication). The test conditions were counterbalanced to control for the order effect of the test conditions. A specific multi-dimensional test battery comprising of the CAPD test battery (recommended by Bellis and Ferre, 1999) and the Integrated Visual and Auditory Continuous Performance Test (IVA CPT) (Sandford and Turner, 2001) was administered to the participants in the medicated and non-medicated state. The SAS Program (SAS Institute Inc., 1999) was used in the statistical analysis of the results.

The results of the study show that:

- The incidence of the hyperactive-impulsive type of ADHD in children appears to be lower than for the combined and inattentive types of ADHD.

- Children with ADHD perform normally or poorly across all measures of CAPD, or with no clear error pattern emerging in the test results that can be linked to the primary subprofiles of CAPD. Some overlap was, however, noted between ADHD and one of the secondary subprofiles of CAPD.

- The attention and impulsivity deficits observed in children with the three different types of ADHD are supramodal in nature.

- Stimulant medication enhanced the performance of the children with the combined and hyperactive-impulsive types of ADHD on both the CAPD test battery and the IVA CPT, but did not appear to have a significant effect on the performance of children with the inattentive type of ADHD.

The results of the study thus provide some insights into the theoretical constructs underlying the three different types of ADHD and guidelines for clinical management. The importance of congruity in defining ADHD is underscored.

KEY WORDS: Attention Deficit Hyperactivity Disorder (ADHD), Inattention, Hyperactivity, Impulsivity, Central Auditory Processing Disorders (CAPD), Continuous performance, Stimulant medication, Medicated and non-medicated state, Executive dysfunction, Hyperkinetic disorder.

OPSOMMING

Titel: *"The Central Auditory Processing and Continuous Performance of children with Attention Deficit Hyperactivity Disorder (ADHD) in the medicated and non-medicated state"*

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Aandagafleibare Hiperaktiwiteits Afwyking (AHA), die mees algemene neurogedragsafwyking onder kinders, het toenemend meer aandag ontvang oor die afgelope dekade. Die gebrek aan ooreenstemming in die definiëring van AHA het gelei tot kontroversie met betrekking tot die prevalensie, diagnose en behandeling van kinders met AHA. Hierdie gebrek aan ooreenstemming word weerspieël in die groot verskeidenheid diagnostiese middels en kriteria wat tans gebruik word deur verskillende professionele persone in verskeie kliniese kontekste in verskillende lande in die diagnose van AHA.

Onlangs het veranderings begin onstaan in die konseptualisering van AHA as `n gedragsregulerings- of `n uitvoerendefunksie-afwyking, eerder as `n primêre aandagafleibare-afwyking. Daar word voorgestel dat toetse vir die evaluering van sentrale ouditiewe prosessering en volgehoue uitvoering moontlik waardevol kan wees in die differensiëring tussen AHA en Sentrale Ouditiewe Prosesserings Afwykings (SOPA).

Die doel van die navorsing was om die sentrale ouditiewe prosessering en volgehoue uitvoeringspatrone van kinders met AHA met en sonder medikasie te bepaal. Drie navorsingsgroepe verteenwoordigend van die drie verskillende tipes AHA (soos uiteengesit in die "Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV)" van die "American Psychiatric Association", 1994) is gebruik. Navorsingsgroep 1 het bestaan uit 10 deelnemers met die gekombineerde tipe AHA, navorsingsgroep 2 het bestaan uit 10 deelnemers met die oorwegend aandagafleibare tipe van AHA, en navorsinggroep 3, uit 1 deelnemer met die oorwegend hiperaktief-impulsiewe tipe AHA.

`n Tussengroep (gekombineerde AHA groep, aandagafleibare AHA groep en `n hiperaktief-impulsiewe AHA groep) binne-deelnemersontwerp is gebruik vir twee toestande (met en sonder medikasie). Die toetstoestande is teen mekaar opgeweeg om beheer uit te oefen oor die volgorde-effek van die toetsomstandigehede. `n Spesifieke multi-dimensionele toetsbattery bestaande uit `n SOPA toetsbattey (soos aanbeveel deur Bellis en Ferre, 1999) en die "Integrated Visual and Auditory Continuous Performance Test (IVA CPT)" (Sandford en Turner, 2001) is toegepas op die deelnemers met en sonder medikasie. Die SAS Program ("SAS Institute Inc.", 1999) is gebruik vir die statistiese analise van die resultate.

Die resultate van die studie toon die volgende:

- Die insidensie van die hiperaktief-impulsiewe tipe AHA onder kinders is laer as vir die gekombineerde en aandagafleibare tipes AHA.

- Kinders met AHA presteer normaal of swakker oor alle metings van SOPA, of toon andersins geen duidelike foutpatroon in die toetsresultate wat gekoppel kan word aan die primêre SOPA subprofiele. Daar is egter `n mate van oorvleueling tussen AHA en een van die sekondêre subprofiele.

- Die aandag- en impulsiwiteitsafwykings wat waargeneem word by kinders met die drie tipes AHA is supramodaal van aard.

- Stimulant medikasie het die prestasie van kinders met die gekombineerde en hiperaktief-impulsiewe tipes AHA verbeter op die SOPA toetsbattery asook die "IVA CPT", maar het nie `n betekenisvolle verskil gehad op die prestasie van kinders met die aandagsfleibare tipe AHA nie.

Die resultate van die studie verskaf sekere insigte in die teoretiese konstrukte onderliggend aan die drie tipes AHA asook riglyne vir kliniese hantering. Die belang van ooreenstemming in die definiëring van AHA word onderstreep.

SLEUTELWOORDE: Aandagafleibare Hiperaktiwiteits Afwyking (AHA), Hiperaktiwiteit, Impulsiwiteit, Sentrale Ouditiewe Prosesserings Afwykings (SOPA), Volgehoue uitvoering, Stimulant medikasie, Met en sonder medikasie, Uitvoerendefunksie-afwyking, Hiper-kinetiese afwyking.

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LIST OF ABBREVIATIONS

ADHD	Attention Deficit Hyperactivity Disorder
CAPD	Central Auditory Processing Disorder
dB	Decibel
dBSL	Decibel Sensation Level
dBSPL	Decibel Sound Pressure Level
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994)
Hz	Hertz
ICD-10	International Classification of Diseases-Tenth Edition (World Health Organization, 1992)
IQ	Intelligent Quotient
IVA CPT	Integrated Visual and Auditory Continuous Performance Test (Sandford and Turner, 2001)
IVA STAR	Integrated Visual and Auditory STAR (a narrative report writer for the IVA CPT)
MLD	Masking Level Difference
SA	South Africa
SABS	South African Bureau of Standards