Review of the Literature Comparing Mindfulness to Methylphenidate for ADHD

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Introduction

The past decades have seen a rise in the diagnosis of ADD/ADHD and the medicalization of the disease, according to Kristjansson, (2009). Black, Milman, and Sussman (2009) note that using sitting meditation practices with youth is an efficacious intervention and Zylowska, Ackerman, Yang, Futrell, Horton, Hale, and Smalley, (2008) have completed a pilot study with adults and adolescents using a form of mindfulness intervention. Singh, Lancioni, Joy, Winton, Sabaawi, Wahler, and Singh, (2007) and Singh, Wahler, Adkins, and Myers, (2003) use mindfulness based interventions with success with populations with aggression. This paper will examine the use of mindfulness-based interventions for youth with ADHD symptoms as an alternative to methylphenidate.

Mindfulness-based interventions and methylphenidate for the control of ADHD in youth approach the problem in similar ways in that they both work neurobiologically in similar fashions on similar areas of the brain. Both interventions work on both affected populations and typical populations. However, whereas methylphenidate is the first-line treatment for ADHD, mindfulness based interventions have only begun to be studied. Methylphenidate has decades of proven efficacy for ADHD, whereas mindfulness based interventions do not. Methylphenidate is considered optimal as a short term treatment, whereas mindfulness is considered a lifestyle, with treatment benefits being long lasting.

By systematically reviewing the criteria mentioned above, I hope to show that mindfulness is a potentially efficacious intervention for ADHD in youth, which should be further studied. At the same time, mindfulness holds no potential for unknown long-term negative

effects, no harmful side effects, and no potential for harm.

Because of the potential of over diagnosis of ADHD in youth Kristjansson (2009), I am concerned that when this is coupled with over medicalization, children may be harmed. I am concerned that, as Timimi, (2009), notes, a vulnerable population may be taken advantage of by unethical companies.

Though mindfulness based research for adolescents and children is in its infancy, with very few studies completed, the further study holds promise, if only because there are 20% of individuals with ADHD for whom stimulant medication does not work. There is also the long term treatment of individuals with ADHD to consider. With 60% of cases continuing into adulthood, what should rightly be considered a short term intervention often lasts much longer.

The potential benefits of a mindfulness based intervention are important to consider as well. Individuals using mindfulness receive the added benefits of controlling their behavior and not being controlled by it, and also by receiving the feeling of well being that is part of a mindfulness based program. Further, when the entire family is treated, there are added benefits of greater family cohesiveness, which are not possible with methylphenidate.

Methodology

The search for relevant research concerning Attention Deficit Hyperactivity Disorder (ADHD), Mindfulness based treatments, and Methylphenidate was conducted through Walden

University's Thoreau Database, by reviewing the bibliography of The Clinical Handbook of Mindfulness, and by reviewing the bibliographies of peer-reviewed articles. The searches were done in February 2011 by using key words "methylphenidate" "mindfulness" "ADHD" and "children". Priority was given to landmark articles on the subjects and most recent literature on the subject.

Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is a common childhood disorder that often (60%) continues into adulthood. Its rise in prevalence over the past decades coupled with a tandem increase in use of stimulants to treat ADHd has caused concern. Though methylphenidate, the most commonly prescribed stimulant, has been used effectively since 1950, its sharp rise in use in recent years (in developing countries, use is rising over 20% per year) makes scrutinizing its effectiveness necessary. At present, first-line treatment for ADHD is medication, usually stimulants, with the only other empirically-proven treatment being behavioural modification (BMOD).

ADHD is diagnosed in the United States using the DSM IV-TR (APA, 2000) which lists 18 criteria associated with the diagnosis. In the United States, a wide range of professionals is able to diagnose ADHD, which differs from Europe, where typically a child psychiatrist diagnoses exclusively. (Skounti, Philalithis, & Galanakis 2007)

Occurrence of ADHD ranges from 3% to 26%, with a wide variance within and between countries (Singh, 2009). The prevalence in Western countries is most likely due to differences in

categorizing behaviours (APA, 2000) An example from Northup, (2001) includes such criteria from the ADHD behaviour coding system (Barkley, 1998, as cited in Northup, 2001) as speaking when not acknowledged by an adult, being out of one's chair for more than 3 seconds, and touching any "object not associated with the assigned task"

There is also discrepancy based on who observes the child's' behaviour (Skounti, Philalithis, and Galanakis (2007) and notes that there is wide variance between criteria used to diagnose. Children are diagnosed using one setting, two settings, and using either the DSM III or the DSM IV.

ADHD is commonly considered to be heritable, and family history of ADHD is an important part of the diagnosis process (Pliszka, 2008) Genes are implicated based on the known co-relation between ADHD and activity of the neurotransmitters dopamine, cannabinoids, seratonin, and norepinephrine. Family, twin, and adoption studies also show heritability. However, environmental factors are also involved, and, according to Singh, (2009) those who feel that environmental factors are stronger than heritability focus on the importance of early intervention. Brain regions which are implicated in ADHD are also implicated in self control, and are also those areas which are involved in mindfulness and meditation.

Neurobiology

The action of methylphenidate on the brain of people with ADHD has been shown to affect the levels of dopamine available to the brain (Rosack, 2011). Although methylphenidate has been used for over 50 years, and is considered the first-line treatment for ADHD, the way it

worked has remained largely unknown. However, the PET scans completed by the Brookhaven National Laboratory show conclusively that methylphenidate acts in a similar way on dopamine transmitters that SSRIs act on seratonin.

It is known that those with ADHD have functional differences in certain areas of their brains, specifically the anterior cingulate cortex gray matter (Amico, Koutsouleris, Frodi, 2011) and lateral prefrontal cortex, dorsal anterior cingulate cortex, caudate, and putamen (Bush, Valera, & Seidman, 2005). One area that has been of concern regarding the longer term use of methylphenidate and other psycho stimulants is the possibility of a thinner cerebral cortex. This has not been proven to be the case, however. MRI scans of adolescents who had been treated with psycho stimulants were compared with those of adolescents not taking psycho stimulants between scans and these scans were then compared to "typically developing youth" without ADHD (Shaw, Sharp, Morrison, Eckstrand, Greenstein, Clasen, Evans, Rapoport, 2009, p.1).

The emerging knowledge on the neurobiology of ADHD brings with it some novel future directions. Beauregard, and Levesque (2006) used functional magnetic resonance imaging (fMRI) to study neurofeedback as a treatment for ADHD. One of the many interesting conclusions from this study is the effect of that dopamine may play in neuroplasticity. As our knowledge of the neurobiology of ADHD grows in tandem with our emerging knowledge of neuroplasticity, there is an exciting prospect of new treatment possibilities for ADHD.

Hozel, Carmody, Vangel, Congleton, Yerramsetti, Gard, and Lazar (2011) studied 17 people, with an average age of 39 years old, measuring gray matter density after mindfulness practice. Density did increase after mindfulness practice, even though total practice time was short (previous studies had measured gray matter of contemplatives such as Buddhist monks or

Carmelite nuns). Pagnoni, and Cekic (2007) have also noted differences in gray matter for those practicing mindfulness.

Schwartz, Stapp, and Beauregard, (2010) theorize that neurobiology must make a fundamental change from relying on classical physics to the physics of the twentieth century. Many of the mechanisms understood in neurobiology are based in flawed physics that has been proven incorrect for over 75 years, but which persists in the community. Schwartz, Stapp, and Beauregard (2010) note that by embracing modern physics, much research will be moved forward, including research into neuroplasticity.

Recent acknowledgement that people with ADHD have more self control than previously believed strengthens the validity for using treatments such as mindfulness (Klimkeit, Graham, Lee, Morling, Russo, & Tonge, (2006). Using mindfulness based treatments to control and permanently change the structure of the areas of the brain affected by ADHD theoretically takes advantage of the effect mindfulness can have on neuroplasticity and potentially end with a cure for ADHD and not simply symptom management.

Attention/Cognition

Methylphenidate has been shown to be useful for certain areas of attention and cognition, such as when performing tasks over and over, tasks that require long term, high levels of attention and effort, and when the person using methylphenidate needs to continue working even in the face of failure (Douglas, & Barr, 1999). In the 1970s, it was proven that methylphenidate works equally well on people who do not show symptoms of ADHD (Singh, 2009) and that

doses for cognitive improvement are different from those for behavioural improvement (Douglas & Barr, 1999). Baldwin, Flake, Meaux, Chelonis, Edwards, and Paule, (2004) noticed that methylphenidate increased performance on a task where participants needed to hold down a lever for a specified amount of time, with participants' timing becoming more and more precise, indicating a potential benefit to working memory for those using methylphenidate.

Zeidan, Johnson, Diamond, David, and Goolkasian, (2010) found that mindfulness mediation can improve cognition, even for those who are not adept at the practice. The study noted that with only 4 days of training and 20 minutes per day, participants increased scores significantly compared to the control group. The study tested participants on several cognitive tasks, in some ways similar to those studied by Douglas and Barr (1999) and Baldwin, Flake, Meaux, Chelons, Edwards, and Paule (2004). The study answered affirmatively whether people, who do not have the time or money to become monks, could receive benefits from short term mindfulness training.

This effectively relieves another barrier to using mindfulness based treatments with children for ADHD. Previously, studies had proven that long term mediation training shows increased attentional performance, and cognitive enhancements (Cahn & Politch, 2006, Jha, Krompinger, & Baine, 2007, as cited in Zeidan, Johnson, Diamond, David, and Goolkasian, 2010) There is growing evidence of mindful meditation's benefits in cognition and attention.

The difference between using methylphenidate to improve attention and cognition and using mindfulness based interventions is that with methylphenidate, when the medication wears off, the effect wears off. By learning mindfulness based interventions, the effect lasts long term, as the newly learned strategies stay with the individual. And as Baldwin, Flake, Meaux, Chelons,

Edwards, and Paule (2004) conclusively showed, mindfulness based interventions do not need a long term commitment to be successful.

Though methylphenidate is proven to be effective, and mindfulness based interventions have not yet been shown to be effective specifically for ADHD through rigorous clinical trials, theoretically, based on the other known outcomes of mindfulness based interventions, these methods would be helpful for not only reducing symptoms of ADHD in children and adolescents, but also improving their quality of life.

Affect

Methylphenidate has been shown to be useful in controlling the affect of boys with ADHD (Pelham, Waschbusch, Hoza, Pillow, & Gnagy, 2001). 137 boys participated in a study to test whether methylphenidate affected their social interactions with other boys at the summer camp. The use of methylphenidate helped to improve the boys' sociability.

Mindfulness Based Stress Reduction (MBSR) has been proven to be useful for acceptance (Baer, 2003) and fostering emotional well-being (Weinstein, Brown, & Ryan, 2009). Mindfulness based interventions seem warranted for further study to attempt to show that they could be helpful in improving the affect and the social skills in children and adolescents with ADHD.

Though both treatments successfully aid in improving affect, the one striking difference is that methylphenidate is a passive mechanism whereas mindfulness is active. The participant choosing mindfulness is actively engaging his body in the process of change. With the knowledge that people with ADHD have more self control than previously thought, mindfulness

may be an appropriate choice for further exploration as a treatment for ADHD.

Mindfulness based treatment

Mindfulness, defined by Kabat-Zinn as "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (Baer, 2003, 146) has been researched over the past 3 decades and is now used in over 240 programs across the United States and has been proven to be effective for a broad spectrum of disorders (Salmon, Santorelli, and Kabat-Zinn, 1998, cited in Lau, et al, 2009). The dual rise of both an increase in incidents of ADHD in youth and the application of mindfulness-based stress reduction as an appropriate intervention has happened in tandem over the past decades. Concern for the possibility of over diagnosis, and over medicalization of children showing signs of ADHD are discussed by Kristjansson, (2009) and Timimi (2009). However, as noted by Sciutto and Eisenberg, (2007), though there is a public perception of over diagnosis of ADHD in the media, there does not seem to be a sound basis for this conclusion. Singh, (2008), approaches ADHD from a multidisciplinary point of view. Answering the question, “What is ADHD,” through the lenses of science, social science and ethics, Singh attempts to bring a fuller understanding of both the disorder and the pharmaceuticals prescribed for it.

Baer, (2009) and Praissman (2008) begin to codify how mindfulness based stress reduction interventions work, and Kuyken, Watkins, Holden, White, Taylor, Byford, and Dalgleish, (2010) puts a framework around Mindfulness Based Cognitive Therapy. Avny and Boniwelly (2008) address and affirm that mindfulness is the activator in both mindfulness based

cognitive behavioural therapy and mindfulness based stress reduction. Smiht, Shelley, Dalen, Wiggins, Tooley, and Bernard (2008) show that mindfulness based stress reduction outperforms cognitive based stress reduction in a pilot study.

Evidence for using mindfulness as an intervention for ADHD in children comes from Klimkeit, Graham, Lee, Morling, Russo, and Tonge, (2006), who note that children with ADHD are more self aware than previously thought. This is an important consideration for using an intervention such as mindfulness, which necessitates a level of self-awareness in order to succeed.

Indeed, mindfulness as an intervention for ADHD has been shown to be effective in Alfano (2009). Black, Milman, and Sussman (2009) note that mindfulness is an efficacious intervention for diverse disorders in youth, including ADHD. Singh, Singh, Lancioni, Singh, Winton, and Adkins, (2010) note that parents and children being trained in mindfulness-based stress reduction helps children's' behaviour. Zylowska, Ackerman, Yang, Futrell, Horton, Hale, and Smalley, (2008, p. 737) note that mindfulness mediation is an appropriate intervention for adolescent ADHD sufferers, and that "a controlled clinical study is warranted."

Mindfulness based interventions for children and adolescents is in its infancy. There is not much known about the effects of mindfulness based interventions on this population, and because of this lack of information, it is not possible to make judgements about its efficacy. Biegel, Brown, Shapiro, and Schubert, (2009) studied adolescent psychiatric out patients and is the first randomized clinical trial to study this population. Singh, Lancioni, Joy, Winton, Sabaawi, Wahler, and Singh, (2007) and Singh, Wahler, Adkins, and Myers, (2003) developed a mindfulness based intervention using self control for aggression. Singh, Wahler, Adkins, and

Myers, (2003) used this intervention on a developmentally delayed individual with aggression issues. He successfully used this intervention and was able to change his behaviour. Singh, Lancioni, Joy, Winton, Sabaawi, Wahler, and Singh, (2007) then used the same mindfulness based intervention to help adolescents with aggression and conduct issues. The adolescents had successful long term results using this simple but effective intervention, where they learned to non-judgementally experience their anger, and then control it. One of the more significant things about this study is that the participants actively choose to change their behaviour, which seemingly would aid in long term success.

Thompson, and Gauntlett-Gilbert, (2008) note that though the evidence for using mindfulness based interventions with adults is robust, there is not yet the same stable of research with regards to children and adolescents. It makes sense to study this population further, to avoid the potential side effects and unnecessary dangers of using psychotropic medications with children. Further study of the efficacy of mindfulness based interventions with children and adolescents could help to add useful interventions for this population, whose brain and body development are so different to that of adults. Semple, Lee, and Miller (2006) note that though promising, much more work still needs to be done. The recent findings that short term mindfulness interventions have positive outcomes is especially potentially helpful for this population

Using mindfulness based interventions with children is still less documented than with adults and adolescents. However, new research is coming forth which gives promise to the possibility. Lee, Semple, Rosa, and Miller (2008) used mindfulness based cognitive therapy with a non clinical sample of children in a pilot study. In this study of non-referred, non clinical

children, results were promising and further study is warranted. The results of the study were positive, not only quantitatively, but also in the comments and enthusiasm of the participants. This outcome gives voice to another potential benefit of mindfulness as an intervention, should it prove to be as efficacious. Not only are there no negative side effects, participants actively enjoy the intervention, leading to better compliance rates, which is often an issue (Biegel, Brown, Shapiro, & Schubert, 2009). Comments included desire to be a better parent, positive feelings about the program, and the only negative was that it was not long enough. Semple, Reid, and Miller, (2005) treated anxiety in children with mindfulness based cognitive therapy and have begun to develop and manualize a program of mindfulness-based cognitive therapy for children. The children use similar methods to an adult program, but with more concrete instruction, such as, in the case of the children with anxiety, using a "worry warts wastebasket" to literally throw away worries at each session. The children were also explicitly instructed in the rules and expectations of their time together in a way that is not necessary with adults.

Though not at the stage yet where mindfulness based interventions for children can be recommended as a protocol, the positive outcomes of using mindfulness with children points, I think, to the need for more and more studies, moving into randomized trials. Though they are different populations, the fact that research into mindfulness for adults has returned such positive outcomes in such a short amount of time leads to the conclusion that there is a possibility that mindfulness for children is feasible as well.

Unfortunately, there are very few studies using mindfulness as an intervention for children with ADHD. Based on outcomes of studies of children with anxiety, adolescents with conduct disorder, and outpatient adolescent psychiatric patients, it seems that more studies of

children using mindfulness based interventions is warranted, and more studies specifically of children with ADHD using mindfulness based interventions should be undertaken.

Mindfulness for ADHD

Actual studies using mindfulness as an intervention for ADHD are very few. Two landmark dissertations, Moretti-Altuna, (1987, May) and Kratter, J. (1983, December) are noted in Zylowska, Smalley, Schwartz, (2010). Zylowska, Ackerman, Yang, Futrell, Horton, Hale, and Smalley, (2008) produced a feasibility study using a form of mindfulness intervention called Mindful Awareness Program for ADHD (MAPS for ADHD) This program, which currently runs as a 6-week psycho educational program for adults, works by educating participants about the neurobiology of ADHD and teaching meditation exercises.

One other area that currently is being studied for ADHD and mindfulness is involving parents in the mindfulness intervention. Not only is there a great deal of heredity in ADHD, but often simply because of the behavioural difficulties inherent in ADHD, families suffer.

And this is one area that is not helped by methylphenidate (Klassen, Miller, & Fine, 2004, May, & Kratochvil, 2010). Children who have been treated for ADHD still do not compare to healthy children in their quality of life measures, including self esteem.

Mindfulness based interventions consistently improve measures of quality of life (Baer, 2009), but one other concrete way that mindfulness based interventions could aid those with ADHD is by helping the parents learn mindfulness, thus improving the family structure. Duncan, Coatsworth, and Greenberg, (2009) ran a pilot randomized controlled trial and the

outcome showed substantial benefits to the mindfulness based intervention compared to the control group and compared to the non-mindfulness based intervention. After the trial, parent and child relationship improved as well as family cohesiveness. Through learning mindfulness based strategies, parents learn to observe without judgement, and begin to live in the present moment.

Van der Oord, Bogels, and Peijnenburg, (2011) combined mindfulness training for ADHD with mindfulness training for parents and had a successful outcome; while Singh, Singh, Lancioni, Singh, Winton, and Adkins, (2010) used mindfulness based interventions with children and their parents, and noted that the mindfulness based intervention increased children's compliance. Thus, when you train the parents, the children benefit with improved outcomes in behaviour.

This added benefit to using mindfulness based interventions cannot be highlighted enough. With methylphenidate, the best that can be hoped for is a reduction of symptoms, and these symptoms return as soon as the medication wears off. With mindfulness based interventions, the potential is there to transform the child with ADHD in the long term, and not only the child, but the entire family. Because of recent research into neuroplasticity, we also understand that the brain is fundamentally changed from the mindfulness practice.

Limitations/Concerns

Methylphenidate is dose dependant, and there is controversy regarding the appropriate dose. There are different outcomes and different doses required to obtain cognitive versus

behavioural outcomes. In a school setting, it can be difficult to administer the medication and to follow up on potential outcomes. With the short half life of the standard dose of methylphenidate, and the different reactions individual students may have to the medication, it can be difficult for a school to oversee the medication of up to 17% of their student body. A qualified school psychologist is important to use (Northup, Gulley, Edwards, & Fountain, 2001) Evans, Pelham, Smith, Bukstein, Gnagy, Greiner, and Baron-Myak, (2001) also note that the dose can vary from child to child, and the time from taking the dose to the time that the methylphenidate is effective can vary from one to two hours. With a four hour half life in the standard form of the drug, this can leave a short window for the children. This difficulty with dosing makes another effective argument for mindfulness, which is not dependant on uncontrollable forces, but rather relies on the individual affected with ADHD to succeed.

Another issue with methylphenidate is tolerance and sensitization. Volkow, and Swanson, (2003), McDougall, Collins, Karper, Watson, and Crawford, (1999). Marusich, Beckmann, Gipson, and Bardo (2010) all describe rat based experiments that show rats using methylphenidate increase their tolerance level, sensitization to the drug, and that they will escalate intake of methylphenidate over time. Abuse is a possibility with methylphenidate. Rush, and Baker, (2001) shows the similarities between cocaine and methylphenidate, raising some interesting questions about methylphenidate and its effects.

Mindfulness based interventions, however, are in their infancy, and results are not conclusive. Perhaps for the 20% of individuals who are not able to be treated with methylphenidate or other stimulant medication, there is a window of opportunity to use a mindfulness based intervention in the short term. Certainly, more study is warranted and I

believe the outlook is positive for more mindfulness based interventions to be formulated and studied.

Mindfulness based interventions take a commitment from the person with ADHD that is not required with medication. Though abuse, tolerance, and sensitization are not issues with mindfulness, there are things to consider. The intervention is only as good as the commitment of the person using it. Whereas with methylphenidate, the individual only needs to take the medication and wait for it to act, without practice, mindfulness based interventions will not work.

Conclusions

Mindfulness based interventions for children and adolescents are in their infancy. Not enough is known yet on whether these interventions will have the same or better efficacy as methylphenidate. Methylphenidate has been successfully used for decades for the treatment of ADHD. As a central nervous system stimulant, it effectively blocks the reuptake of dopamine in a similar way to SSRIs with seratonin.

However, the promise of using an intervention that also acts on the brain, but in a non-invasive way, where the person with the disorder learns strategies that can be stopped and stared at will, and adjusted by the person with the disorder on the spot, is hopeful. ADHD is a disorder that between 3% to 26% of people world wide must live with daily. Though behavioural modifications have been used to some success as an adjunct to stimulant mediations, the potential added benefits of using an intervention is not a drug, but actively works to improve cognition and attention, mood and well being, is promising.

Methylphenidate has a proven history of working to relieve symptoms of ADHD. Perhaps we are at a stage where its use is peaking, and perhaps there are concerns that methylphenidate is over prescribed. Perhaps those concerns are warranted. But there remains a place for using a medication, especially one with a long history such as methylphenidate, in the control of symptoms for ADHD. Though there is controversy about the prevalence of ADHD, with such a side variance between countries and within countries, no one questions the validity of the fact that there is such a disorder as ADHD. And for some children or adults, the short term use of a medications such as methylphenidate is unquestionably useful. To control symptoms for a short time, while, perhaps, the child or adolescent learns mindfulness based interventions, for example, may be a useful way to integrate methylphenidate and mindfulness based interventions; should mindfulness based interventions prove to be useful in the long term.

Concerns with methylphenidate revolve primarily around its long term use at higher doses. Abuse concerns, tolerance and sensitization concerns, for example, are not due to short term use. Using mindfulness based interventions as a long term solution for ADHD symptoms would bring about a potential change in the disorder and the outlook that people who suffer from it could not imagine.

Perhaps soon strong, randomized, controlled studies will be done to prove that mindfulness based interventions are a good alternative for children with ADHD.

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