Introduction

Autism spectrum disorders (ASD) is a neurodevelopmental disorder that is currently being diagnosed in as many as 1 in 50 children in the United States. And according to the fifth edition of the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders, individuals with ASD present symptoms that vary across the spectrum, but in general, anxiety in autistic individuals is caused by over-sensitivity to particular stimuli that vary on a case-by-case basis and changes in routine. Autistics typically have social and language deficits that also differ in severity across the spectrum, with some individuals who have difficulty producing any language at all, while others are able to initiate and maintain a conversation, albeit with problems detecting certain social cues and eye gaze adjustment. And while ASD used to be categorised into four distinct conditions (autistic disorder, Asperger’s disorder, childhood disintegrative disorder or pervasive developmental disorder not otherwise specified), all individuals diagnosed on the spectrum will now receive the same diagnosis of ASD without the distinctions, according to the new diagnostic criteria proposed in DSM-V. Rett syndrome is no longer classified as an ASD.

Currently, there is no known cure to autism, and the understanding of its biological basis is limited. Treatment interventions for autistic patients are often individualised based on the particular case presenting, as symptoms vary greatly across the spectrum of diagnosed cases. Neuropharmacological interventions have been proposed and implemented, such as the use of risperidone to reduce repetitive behaviours and the prescription of haloperidol or propranolol to sedate autistic children. All pharmacological approaches also are designed to develop approaches to standardise such interventions to make them more feasible to implement in the clinic.

Results

Of the 23 publications from the CBT search, 11 studies were selected for the purposes of discussion in this review. Of the 196 publications on OT, 10 studies met the criteria discussed above and tested a variety of occupational therapeutic interventions. And of the 289 manuscripts discussing speech or language therapy, 9 studies met all of the above criteria and examined a range of linguistic therapeutic treatment options.

Conclusion

CBT has been shown to improve overall cognitive performance while controlling challenging behaviour, and OT has been demonstrated to be an effective intervention for providing autistic children with the appropriate day-to-day behavioural and social skills that they will need for adulthood. And certain speech/language therapies can be effective ways of generating socially appropriate speech in verbal autistics, while eliciting basic language in nonverbal autistics. As the three interventions discussed in this review appear to have positive effects on the majority of autistic symptoms, there is an urgent need to conduct more randomised controlled trials to convince clinicians and parents of their validity and effectiveness, and to develop approaches to standardise such interventions to make them more feasible to implement in the clinic.

Abstract

Introduction

While no ‘cure’ for autism spectrum disorders (ASD) currently exists, individuals with the diagnosis must depend on an individualised treatment strategy to improve symptoms commonly associated with the disorder, such as deficits in social, behavioural and language skills. Neuropharmacological options have been proposed as means to ameliorate these symptoms, although their effectiveness is currently unclear, and such agents often induce a variety of side effects. At the same time, psychological interventions have recently shown a great potential to enhance cognitive and behavioural abilities in autistic children without any costs to their health. The aim of this review was to discuss the methodology and efficacy of cognitive behavioural therapy, occupational therapy and speech/language therapy.

Materials and Methods

Searches were conducted through PubMed, selecting for studies that intended to test the following interventions specifically in a sample consisting of children with ASD: cognitive behavioural therapy (CBT), occupational therapy (OT) and speech/language therapy. Only research published in the past 5 years (2009–2013) and written in English was used for this review.

* Corresponding author
Email: mgranove@princeton.edu

1 Department of Psychology, Princeton University, Princeton, NJ, USA
2 Princeton Neuroscience Institute, Princeton University, Princeton, NJ, USA

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with the intention to ameliorate the effects of social impairment in individuals with ASD. However, these agents not only have unclear benefits due to a lack of double-blind, randomised controlled trials in the literature, but also they induce a host of side effects, including, but not limited to, weight gain, fatigue, extrapyramidal symptoms and seizures.

At the same time, psychosocial interventions have demonstrated a marked improvement in individuals with ASD with no reported side effects. Because ASD is quickly becoming a prevalent condition among children worldwide, and since today’s high proportion of children with the affliction will ultimately become adults who might need to enter the workplace, providing and perfecting optimal treatment interventions for individuals with ASD is a crucial goal. And since neurobiological information about the disorder is lacking, while the effects of pharmacological interventions remain unjustified, research in the field has turned to several psychosocial therapeutic options that can be used in conjunction with one another to improve cognitive, social and language deficits in individuals on the spectrum. The goal of this review is to, therefore, outline the basic methodology and efficacy of three of the most crucial therapeutic options being researched and provided to autistics: cognitive behavioural therapy (CBT), occupational therapy (OT) and speech/language therapy.

**Materials and Methods**

Searches were conducted through PubMed, selecting for studies that intended to test the following interventions specifically in a sample consisting of children with ASD: CBT, OT and speech/language therapy. In four separate searches, the following were used as key word pairs: ‘autism’ ‘occupational therapy’ ‘speech therapy’ ‘language therapy’. Only research published in the past 5 years (2009–2013) and written in English was used for this review.

**Results**

For the three interventions of interest, CBT, occupational therapy and speech/language therapy, the PubMed search yields a total of 23, 196 and 289 publications, respectively. Manuscripts were then selected based on the criteria outlined above. Of the 23 publications from the CBT search, 11 studies were selected for the purposes of discussion in this review. Of the 196 publications on OT, 10 studies met the criteria discussed above and tested a variety of occupational therapeutic interventions. And of the 289 manuscripts discussing speech or language therapy, nine studies met all of the above criteria and examined a range of linguistic therapeutic treatment options.

All excluded studies were not used, because either their samples did not specifically test autistic subjects or the intervention could not be clearly categorised as one of the three interventions discussed in this review (CBT, OT or speech/language therapy). Certain reviews and commentaries from the search results were also excluded because of their lack of focus on particular interventions, which made these publications not suitable for the overall aim of this review.

**Discussion**

The variety of approaches to each type of treatment intervention discussed in this review demonstrates how there is no current consensus on the best types or combinations of therapeutic treatment plans for autistic children. However, the majority of studies chosen for this review shows the effectiveness of psychosocial interventions over treatment as usual.

All three interventions discussed in this review have been shown to improve social communication skills and to be effective in managing challenging behaviour in children with ASD, although different interventions will target different symptoms in order to make these changes. For instance, CBT is most effective at reducing anxiety (and ultimately challenging behaviour), while language therapy works to enhance communication skills in a variety of social settings.

The results of this literature search show that CBT is an optimal treatment intervention as it is one that is most standardised one, whereas occupational and speech/language therapeutic options vary, and a variety of approaches for these latter two therapies are still continuing to be investigated. Nonetheless, for all three interventions, there continues to be a lack of randomised controlled trials to determine their efficacy, and many of the studies that investigate the benefits of therapeutic approaches are either single-subject case reports or uncontrolled clinical trials.

Each patient’s overall treatment strategy typically remains individualised depending on the severity of the handicap and the resources available to a particular child’s family. Some therapeutic techniques have been shown to be even more effective on high-functioning autistics.

Below is a detailed analysis of the most current research and tested approaches to the following three core psychosocial interventions for autistic children: CBT, OT and speech/language therapy.

**Cognitive behavioural therapy**

CBT is rooted in the fundamental principle that emerged with Alan Kazdin’s early definition of ‘cognitive-behavioural modification’ that he developed during the 1970s. That is, cognition can have an effect on behaviour. And since cognitive processing...
is relatively plastic, a behaviour can be changed by altering one’s cognition in order to generate a desired behaviour. However, in recent times, the theory has expanded to suggest that changes in cognition can not only alter one’s behaviour, but also have an effect on emotional and psychophysiological processes. CBT can be distinguished from another traditional gold standard for autism treatment, applied behavioural therapy (ABT), in that CBT’s implementation does not involve a classical conditioning approach, but rather uses cognition as a mediator for behaviour. Mahoney and Arnkoff established three subcategories of CBT that continue to be used today: coping skills therapy, cognitive restructuring therapy and problem-solving therapy. Coping skills therapy addresses the alleviation of external stressors, while the focus of cognitive restructuring therapy attempts to target internal sources of anxiety. Problem-solving therapy utilises the benefits of coping skills therapy and cognitive restructuring therapy to allow an individual to confront a variety of personal and social problems.

While CBT has been practised in the clinic with a variety of patients for several decades, only recently has there been an increasing focus on how such a therapeutic approach can ameliorate anxiety in individuals with ASD. Researchers began conducting randomised controlled trials after several single-subject studies demonstrated positive effects of CBT in reducing anxiety and obsessive compulsive disorders in autistic children. In the past five years, all randomised controlled trials that have tested the efficacy of this intervention with autistic children have shown significantly positive results. Wood et al. conducted a pilot study with 19 children ages 7–11, diagnosed with both ASD and an anxiety disorder in 2009, and the investigators showed that CBT significantly improved social skills and significantly reduced anxiety. However, the generalisability of the study’s results was limited due to the small sample size and the facts that the dependent variable was measured and reported by parents of the subjects outside of the lab. In fact, in an additional study conducted by Wood et al., subject-reported anxiety did not significantly differ between the CBT condition and the control (waitlist) group. In an additional study, Drahota et al. conducted a randomised controlled trial of 40 children aged 7–11 with ASD and showed that parents perceived a significant increase in the performance of daily living skills (including grooming, toileting and dressing) in their children, when the children were assigned to the CBT condition. Storch et al. showed a significant reduction in anxiety symptoms in autistic children receiving CBT compared with those receiving treatment as usual, in a randomised controlled trial of 45 participants.

Other recent research has focused on specific CBT programmes as interventions as opposed to a broad, integrative therapeutic approach, to reduce anxiety in autistic children; for instance, the Coping Cat programme, a coping skills therapy that educates subjects on being able to identify indicative cues of anxious arousal and to use this signals as a prompt to utilise anxiety-management techniques. Another study demonstrated that a CBT programme targeted for a non-autistic population—facing your fears: group therapy for managing anxiety—could be modified and implemented in a population of individuals with ASD, although this study lacked a control group and thus the interpretation of the significant results is ambiguous. Bauminger–Zviely et al. have shown that a combined CBT–computer-mediated social intervention can have a significantly positive effect on social cognitive features, such as motivation, collaboration, conversation and problem-solving abilities, although again no control group was used in this research.

Moreover, many of these studies are limited in the fact that the control group consisted of ASD subjects placed on a waitlist, and thus do not accurately reflect whether CBT is a causal explanation for changes in autistic symptoms or whether any such behavioural or psychosocial intervention can generate such an effect. In another recent randomised controlled trial, Sung et al. compared the effects of a 16-week CBT programme with a Social Recreational (SR) programme of the same length in 70 autistic adolescents (9–16 years) with an anxiety disorder. According to the study’s authors, the main difference in the SR group was the fact that these subjects did not have any instructions that pertained to emotional regulation, problem solving techniques, repeated practice and exposure tasks, although the overall environment and activities were similar between both groups. After a 6-month follow-up period, there was a significant increase in the proportion of clinicians who rated participants in both the CBT and SR conditions as ‘Normal’ and ‘Borderline,’ as well as a significant decrease in those who rated participants in both groups as ‘mildly ill,’ ‘moderately ill,’ or ‘markedly ill.’ Thus, based on this literature, it is unclear whether CBT or the structured and social environment of a particular setting is the cause of alterations in anxiety levels or social and behavioural symptoms in children with ASD.

Occupational therapy
OT is an intervention that first appeared nearly a century ago as a strategy for conditioning individuals to be able to function and behave properly in their day-to-day lives. In recent decades, OT has become a fundamental component of an autistic’s overall treatment plan, as OT
helps autistic children develop the skills that they will need for adulthood. But as OT is often defined in broad terms, the approach to implementing this intervention varies greatly from child to child. According to a recent review from the American Journal of Occupational Therapy, in young autistic children, the target goals of the intervention include: sensory processing, sensorimotor performance, social performance, behavioural performance, self-maintenance and participation in play. In adolescents, however, the focus shifts to using the skills gained from OT sessions over time to transition to independence in the adult workplace and community. Ultimately, OT is able to enhance children’s crucial developmental skills, including joint attention, memory, problem solving and decision-making. Here, examples of OT strategies from the most recent literature are presented as examples of the variety of individualised approaches to OT.

Sensory integration (SI) is a key component of most autistics’ OT individualised treatment strategies, as oversensitivity to sensory stimuli is one of the primary symptoms of ASD. SI theory suggests that the integration of multiple sensory stimuli can have an effect on and can potentially interfere with mental processing, as well as executive functioning or behaviour. For instance, some individuals on the spectrum have reported that they use self-stimulation to help process sensory information from the environment, although by doing so, these individuals find it more difficult to be socially accepted by or engaged with others. In SI, patients are exposed to particular sensory stimuli and are taught to become adaptable to these environmental stimuli, while they are required to perform tasks. Preliminary research has, in fact, shown that SI techniques, particularly those that follow Ayres Sensory Integration® Fidelity Measure, can have a more influential effect on improving sensory processing and regulation, sensorimotor skills and social-emotional function than fine motor therapy or group therapy, and such strategies have been shown to be not only effective, but also safe and practical. In fact, one of the first randomised controlled trials that examined the effects of SI showed a significant increase in the goal attainment scale (an individualised measure for progress), as well as a significant improvement in self-maintenance and social behaviour in subjects who received the OT intervention compared with those who did not. OT can introduce tasks that teach proper sensorimotor performance. Imagine, for example, in order to teach an individual with ASD how to multitask, a therapist might have the child hang from a swing trapeze or rope ladder and have the child simultaneously attempt to complete a jigsaw puzzle—an exercise that would be intended to improve one’s tolerance for a sensory overload. Motor-based interventions are also an important OT technique as it has been proposed that autistics might have a deficiency in their mirror neuron systems, which monitor the appropriate motor, social and emotional responses to performing an action or perceiving others perform an action. Single-subject studies have, in fact, shown an overall improvement in social and emotional skills and behaviours after the introduction of a motor-based social skills intervention. Even physical activities such as yoga have been shown to have a significant improvement in social and challenging behaviours in autistic individuals.

Moreover, another goal of occupational therapists is to coach parents to interact with their autistic children at home in such a way so that individuals can continue to practice the appropriate social behaviours learned during OT sessions. Recent research has in fact shown that by introducing parents to a coaching intervention, their children’s Goal Attainment Scale and Canadian Occupational Performance Measure (another individualised measure for progress) can significantly increase. In fact, while the effect of floor time play has only been shown to enhance communication skills in a therapeutic setting, it is a simple OT intervention that parents could potentially introduce at home in addition to other OT techniques that can be taught by trained therapists.

Speech/language therapy
According to the American National Institute of Neurological Disorders and Stroke, a speech therapist is a crucial member of an autistic’s treatment team, after a psychologist, neurologist and psychiatrist. A primary cause for problems with communication skills in individuals on the spectrum is deficient language development. About 20%–30% of individuals with autism are nonverbal, and ~25% of autistics regress to lose previously acquired language skills. Therefore, language-based interventions are individualised for each case, with particular differences between therapeutic methods for nonverbal patients as opposed to patients on the spectrum who are verbal but use speech in a socially inappropriate way. Individualising autistics’ speech therapy sessions are important due to the variability of language ability across the spectrum. Some studies in this area have produced inconclusive results due to the heterogeneity of their relatively small subject pools. Single-subject study designs have investigated a variety of therapeutic techniques to produce language or responsiveness in autistic children and adults. For example, Valentino et al. showed how the coupling of echoic prompts with a modelled cue expressed in the form of sign language could enhance responsiveness, but not language acquisition or production, in a 13-year-old girl with autism and Down syndrome. And other research has demonstrated that the direct

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