A systematic review of mindfulness intervention for individuals with developmental disabilities: Long-term practice and long lasting effects

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Abstract

Can individuals with developmental disabilities learn mindfulness? If so, with what result? A systematic literature review identified 12 studies that taught mindfulness practice to individuals with mild to severe developmental disabilities, demonstrating that mindfulness intervention could significantly reduce the behavioural and/or psychological problems of this population. The majority of these mindfulness intervention studies were longitudinal, featuring long intervention periods and long lasting intervention effects. This paper analyses the characteristics and objectives of mindfulness interventions, along with their effects, focusing on the adjustments made to intervention content and instruction strategies to meet the specific requirements of individuals with developmental disabilities. The potential for improving mindfulness interventions for people with developmental disabilities is also discussed.

Keywords

Mindfulness; Aggression; Self-Management; Intervention; Developmental Disabilities; Autism Spectrum Disorders; Intellectual Disabilities

Introduction

The concept of “mindfulness” became known in psychology during the 1980s, primarily due to the pioneering work of Jon Kabat-Zinn. The creator of Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 1980), he has defined mindfulness as “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p. 145). A voluminous literature has emerged around mindfulness and its application to clinical populations. Many “mindfulness-based” approaches to psychology and psychotherapy have been developed, including Acceptance and Commitment Therapy (ACT) (Hayes, Strosahl, & Wilson, 1999), Dialectical Behaviour Therapy (DBT) (Linehan, 1993) and Mindfulness-Based Cognitive Therapy (MBCT) (Segal, Williams, & Teasdale, 2002). In addition, mindfulness approaches have been applied to treat mental health problems such as suicidal depression (e.g., Hargus, Crane, Barnhofer, & Williams, 2010) and mood disorders (e.g., Raes, Dewulf, Van Heeringen, & Williams, 2009).

Mindfulness has also made its presence felt in the field of disabilities, beginning with Singh et al. (2003). They conducted a mindfulness intervention study for an adult with intellectual disabilities (ID) and psychotic disorder who presented uncontrolled aggression. The outstanding results of this study, reduction of aggressive behaviour to zero and a community living arrangement, showed the potential of mindfulness practice as an alternative to behavioural intervention for individuals with developmental disabilities (DD). Follow-up studies confirmed its use as a self-management strategy for aggressive behaviours (e.g., Adkins, Singh, Winton, McKeegan, & Singh, 2010; Singh et al., 2011a; Singh et al., 2011b; Singh et al.,

2007a), deviant sexual arousal (Singh et al., 2011c) and anxiety and obsessive thinking (Brown & Hooper, 2009).

It is possible that mindfulness can be applied to addressing issues in the field of DD that have so far proven resistant to effective interventions, such as maladaptive behaviour. The aim of this review paper is to examine systematically the nature and results of mindfulness interventions for individuals with DD. It is to be noted that in the use of the terms developmental, intellectual and learning disabilities, this paper follows Australian and US practice, based on Australian Commonwealth Disability Discrimination Act (DDA, 1992) and Individuals with Disabilities Education Act (IDEA, 2004).

Methods

Search Strategy and Selection Procedure

Publications were selected from ProQuest, PsycINFO, Web of Science, Medline and Scopus. A multi-field search was conducted using the keywords of mindfulness and various types of disabilities. Keywords referring to intervention were not included, to prevent exclusion of publications that applied mindfulness without using the term “intervention” in their title or abstract. Together, these yielded the following keyword combinations (Table 1).

<Insert Table 1>

The selection procedure comprised three steps. Initially, it included mindfulness intervention studies relating both to individuals with DD and their families or carers (step 2). Subsequently, studies relating to families and carers were excluded in order to focus on the value of mindfulness practice for individuals with DD (step 3). The

rationale for this procedure was to develop a review that focuses on the purpose, methods and effects of mindfulness practice for individuals with DD, while also exploring the scope of mindfulness applications in the field of disabilities

The search was conducted throughout April 2012. Journals and publications in English were considered. Given the novelty of mindfulness intervention studies for individuals influenced by DD, all publication years up to 2012 were included. A publication was excluded if it contained mental health issues (e.g., anxiety disorder & psychotic disorder), unless these symptoms were co-presented with DD.

The search initially resulted in 386 publications. Of these, 27 publications met all criteria. Full text selection resulted in 19 publications. Excluding seven studies concerning mindfulness intervention for families and professional carers of individuals with DD, the completed search resulted in 12 publications being included in this study.

Results

This review analysed 12 intervention studies that directly applied mindfulness for individuals with DD (Table 2). Of these, nine explored the application of mindfulness for 22 individuals with ID, two for six learners with Autism Spectrum Disorder (ASD), and one for 34 learners with learning disabilities (LD). The analysis findings are organised according to the following seven categories; 1) learner characteristics, 2) intervention objectives, 3) intervention content, 4) instruction characteristics, 5) instructor characteristics, 6) intervention effects, and 7) research methods. The first six categories concern the learning and teaching of mindfulness for this population. The last category addresses the methodological features of these intervention studies, including design, methods, and strengths and limitations.

<Insert Table 2>

Learner characteristics

The individuals participating in these interventions were classified by age, gender, types of disabilities and co-presentation with mental health issues. A total of 62 individuals (49 males & 13 females) from 12 studies learned mindfulness. Their chronological age (CA) ranged between 13-43 years (mean CA 20.82). Of 62 learners, 34 (24 males & 10 females) had LD, and 22 had mild to severe ID (19 males & three females). Of these 22, 17 (14 males & three females) also had mental health issues (e.g., impulse control disorder, schizophrenia). The most frequently experienced mental health issues were bipolar and psychotic disorders. Six autistic learners (all males, three Aspergers & 3 ASD) demonstrated severe and chronic aggressive behaviour problems, such as kicking, hitting and biting family members.

Intervention objectives

The most frequent objective of mindfulness interventions was to reduce aggressive behaviour. Of the 12 studies, seven taught mindfulness to 16 learners with ID (16 learners in five studies) and ASD (six learners in two studies) to reduce their aggressive behaviour. Reduction of aggressive behaviour was sometimes associated with community placement. For example, learners with mild and moderate ID who also had mental health issues were taught mindfulness to reduce aggressive behaviour so they could enter or maintain community living situations (Adkins et al., 2010; Singh et al., 2007a; Singh et al., 2008b).

Reducing anxiety was the aim of two intervention studies, along with secondary objectives. A young adult with severe ID (Brown & Hooper, 2009) practised

mindfulness to reduce anxiety and control obsessive thoughts. The other study aimed to reduce anxiety in 34 learners with LD (Beauchemin, Hutchins, & Patterson, 2008), and also targeted improvements in their social skills and academic performance.

Mindfulness was also used for three adult offenders with ID and mental health issues to control deviant sexual arousal (Singh et al., 2011c), for a heavy smoker with ID to cease smoking (Singh et al., 2011d) and for an adult with ID and Prader-Willi syndrome to lose weight (Singh et al., 2008a).

Intervention content

Mindfulness practice is variously defined in the studies under review. In three studies (Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2011e), mindfulness practice is defined specifically as the Soles of Feet practice (SoF), directing attention to a neutral part of the body (e.g., the soles of the feet) when the practitioner is disturbed by emotions or thoughts. Singh et al. (2008b, p. 629) use Nyanasobhano's definition of mindfulness as "pure attentiveness, an alert, impartial function of mind that simply notes whatever appears by way of the senses".

Mindfulness is also more broadly described as a "generic term used to cover a wide range of procedures" (Singh et al., 2007a, p. 810), and as a "global term that encompasses a variety of psychological and meditation procedures" (Singh et al., 2011c, p. 177). While definitions vary, in all studies mindfulness entails the training of attention to selected or spontaneously occurring aspects of one's own physical and mental experience. This provides practitioners with an opportunity to develop a new relationship to their behavioural or psychological problems.

Analysis yields five elements characteristic of mindfulness training in these studies; 1) awareness of breathing, 2) awareness of bodily sensations, 3) awareness of actions,

4) awareness of mental states (e.g., thoughts and feelings), and 5) shifting attention.

These elements were variously employed in order to meet specific objectives (Table 3).

For example, meditation on SoF, the most frequently used mindfulness intervention program (10 studies, seven as a single program & three combined with other activities), contains the elements of 1) awareness of breathing, 2) awareness of bodily sensations, 4) awareness of mental states, and 5) shifting attention. SoF begins by asking individuals to breathe naturally and then remember an anger-provoking incident. They are then asked to notice bodily signs of anger and to control their anger by shifting their attention to a neutral part of the body, the soles of the feet.

<Insert Table 3>

SoF was sometimes combined with other mindfulness activities. Singh et al (2008a), for instance, taught an individual with ID and Prader Willi syndrome SoF for weight reduction, in combination with awareness of bodily sensations (i.e., hunger) and awareness of actions (i.e., mindful eating).

Of the remaining two studies that did not apply SoF, one taught 34 high school students with LD to focus on their breathing to calm their minds (i.e., awareness of breathing) and then to note any arising thoughts and feelings (i.e., awareness of mental states) with the aim of reducing anxiety and increasing social skills and academic performance (Beauchemin et al., 2008). The other study (Brown & Hooper, 2009) used awareness of bodily sensations and thoughts allied with Acceptance and Commitment Therapy (ACT) for a female with moderate to severe ID.

Characteristics of instruction

How did individuals with DD learn mindfulness? Individual training, mostly through direct verbal instruction, characterised 11 of the 12 studies. To fully answer this question, however, the duration of intervention, intervention activities and instruction strategies are discussed according to the types of mindfulness program. SoF, adopted in 10 studies, had two intervention stages, 1) an initial intensive training period and 2) a self-practice period, often assisted by audio recordings. The initial intensive training period was usually between 5 days and 1 week, with daily intervention sessions lasting from less than 30 minutes to an hour.

The duration of self-practice periods varied. The shortest was less than 12 weeks (e.g., Adkins et al., 2010; Singh et al., 2011d). Four studies reported a self-practice period between 6 months and a year (Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2007a; Singh et al., 2011e) and the other four (Singh et al., 2008a; Singh et al., 2008b; Singh et al., 2011c; Singh, Wahler, Adkins, & Myers, 2003) reported periods between 1 and 2 years. These durations appeared to reflect the severity of disabilities or the nature of the problems demonstrated by participants. While participants of studies that reported shorter self-practice periods tended to have a single disability (e.g., mild ID or ASD only), those of studies with longer self-practice periods had dual disabilities (e.g., ID and mental health issues) and resided in a psychiatric hospital or forensic mental health facility (Singh et al., 2008b; Singh et al., 2011c; Singh et al., 2003).

SoF was taught through individual training, using direct verbal instruction, role-play and homework practice. Role-play allowed participants to deliberately remember a situation that provoked anger so they could practise shifting attention to the soles of the feet within this context. SoF practitioners had homework practice, often assisted by audio recordings (e.g., iPod). Modeling and prompts represented two additional

instruction strategies specifically used to teach SoF for individuals with ASD (e.g., Singh et al., 2011a; Singh et al., 2011b).

SoF was also supported by other mindfulness activities. For example, an adult with Prader Willi syndrome learned to visualise and label concepts and symptoms of hunger (Singh et al., 2008a), aided by a cartoon character comprising food items. SoF was also supported by observing thoughts, including those concerning sexual arousal or the desire to smoke. The metaphor of thoughts as clouds in the sky illustrated their transient nature, and participants were instructed to “let the thought clouds drift out of your attention” (Singh et al., 2011c, p. 1182; Singh et al., 2011d, p. 171).

Awareness of mental states was taught independently without using SoF in two studies. In one study, 34 adolescents with LD were asked to note their thoughts and feelings for 5 to 10 minutes at the beginning of each class for 5 weeks (Beauchemin et al., 2008). Only this study provided group instruction on mindfulness.

The other study taught awareness of bodily movements and thoughts to a learner with moderate to severe ID (Brown & Hooper, 2009) in 17 individual sessions over 6 months. No information was given on the duration of sessions or on how awareness of bodily sensations was taught. Awareness of thinking was taught through metaphor. For example, a “river of thoughts” described how thoughts flow and “stickiness” conveyed how one gets “stuck” on thoughts (Brown & Hooper, 2009, p. 198). These metaphors were assisted by activity-based exercises using real objects and drawings, such as constructing a river with floating leaves.

Instructor characteristics

According to Segal, Williams and Teasdale (2002), the instructor is a crucial factor in the outcomes of mindfulness intervention. Instructor characteristics are discussed according to the number of instructors per individual study along with their knowledge and experience of mindfulness and of the participants. Of 12 studies, 11 provided information regarding the mindfulness intervention instructor. Of these, two studies employed two instructors (e.g., first author and classroom teacher for Beauchemin et al., 2008; more experienced and less experienced therapists for Singh et al., 2011c), although only one instructor delivered the intervention at any given time. The remaining nine studies used a single instructor.

Regarding the experience and knowledge of instructors, while six studies had instructors who were experienced in mindfulness (Adkins et al., 2010; Brown & Hooper, 2009; Singh et al., 2007a; Singh et al., 2008b; Singh et al., 2011c; Singh et al., 2011d) but possibly less exposed to the personal features of the participants, five studies employed instructors who were new to or less experienced in mindfulness but who had a comprehensive understanding of the participants (Beauchemin et al., 2008; Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2008a; Singh et al., 2011e). In studies using experienced instructors, little information was provided about the instructor's degree of knowledge and depth of practice regarding mindfulness. For example, while two studies (Singh et al., 2011c; Singh et al., 2011d) clearly indicated that their instructor, the first author, had extensive experience in mindfulness meditation and in service delivery to individuals with ID, the remaining four studies described their instructors simply as a therapist (Adkins et al., 2010; Brown & Hooper, 2009; Singh et al., 2007a; Singh et al., 2008b), without further explanation.

Studies with novice mindfulness instructors employed people who were personally related to the participants. For example, mothers of participants taught their child with

ASD or ID with Prader Willi syndrome (Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2008a). Classroom teachers led a brief daily mindfulness meditation session for their 34 learners with LD (Beauchemin et al., 2008). Most notably, a male adult with ID and mental health issues, a participant in a previous mindfulness intervention study (Singh et al., 2003), taught SoF to his friends with mild ID upon their request (Singh et al., 2011e). Prior to beginning their teaching, the novice instructors were provided with short but intensive training (2 hours to 1 day) in intervention content (e.g., SoF) based on face-to-face encounters (Beauchemin et al., 2008; Singh et al., 2011a; Singh et al., 2011b) or email correspondence (Singh et al., 2008a).

Mindfulness intervention effects

All studies reported positive effects for individuals with DD from mindfulness practice, demonstrated through fulfilment of the intervention objectives. In seven studies where the objectives were to reduce aggression in people with ID or ASD, aggressive behaviour decreased to zero (Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2007a; Singh et al., 2008b; Singh et al., 2011e; Singh et al., 2003) or near zero (Adkins et al., 2010) levels. A study with an obese adult with ID and Prader Willi Syndrome demonstrated weight reduction from 242.8 lb to 200 lb (Singh et al., 2008a). A 3-year follow-up of continued mindfulness practice revealed weight loss continuing to 190.7 lb. A similar effect was reported for a smoker with ID who showed reduction in the number of cigarettes smoked from 12 to zero per day (Singh et al., 2011d). The follow-up measurement showed that this person remained free of smoking for the next three years.

The use of mindfulness to control deviant sexual arousal appeared less clinically successful than its use to reduce aggressive behaviour. Offenders with ID and mental health issues, the participants of the Singh et al. study (2008b), reported reduced levels of sexual arousal, from 12 (a maximum level) for all three participants to 2.95, 3.03 and 1.51 respectively. The participants reported that it was harder to apply SoF for sexual arousal than for aggression because of their attachment to the pleasure associated with the arousal.

For adolescent students with LD, the Social Skills Rating System and State-Trait Anxiety Inventory demonstrated statistically supported effects of mindfulness intervention in the form of reduced anxiety and increased social skills and academic performance (Beauchemin et al., 2008). Reduction of anxiety and obsessive thinking was the aim of another intervention study for a female adolescent with moderate to severe ID (Brown & Hooper, 2009). Parent reports indicated that the participant became calmer and less affected by thinking. The following section discusses research methods of mindfulness intervention for individuals with DD.

Research methods

Design and methods With the exception of one study with a pre-post no-control group design (Beauchemin et al., 2008), the studies all took the form of single subject design (seven multiple-subject and four single-subject studies). Of these, 10 studies, conducted by the same research group, adopted a multiple baseline design (e.g., baseline, intervention and follow-up phase). They demonstrated the effects of mindfulness intervention through self-reports and/or staff-reports regarding targeted dependent variables (e.g., aggressive behaviour, smoking or sexual arousal).

The other single subject design study used an adjusted version of the Acceptance and Action Questionnaire-9 (AAQ9) and parent reports to demonstrate intervention effects (Brown & Hooper, 2009). As the only intervention study with a group design, Beauchemin et al. study (2008) used a standardised measure, Social Skills Rating System, and a self-report measure, State-Trait Anxiety Inventory, to demonstrate statistically (e.g., *t*-test) the effects of mindfulness practice for 34 learners with LD.

The majority of mindfulness intervention studies were longitudinal, featuring long intervention periods and long lasting intervention effects. While the actual training periods were less than a week, they had prolonged self-practice periods. For example, four studies (Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2007a; Singh et al., 2011e) had practice periods of 6 months to a year, and four studies had practice periods of 1 to 2 years. In addition, seven studies reported follow-up effects of mindfulness intervention lasting longer than a year.

Reliability, validity and fidelity of intervention A total of seven studies (Singh et al., 2011a; Singh et al., 2011b; Singh et al., 2008a; Singh et al., 2007a; Singh et al., 2008b; Singh et al., 2011d; Singh et al., 2011e) reported the reliability of assessments (range 92-100%) between two data collectors. Although none of the reviewed studies reported on validity, most of them demonstrated all three types of validity required for single subject research (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005).

Internal validity was established by demonstrating the effect of mindfulness through time using frequent measurements. External validity was established through replication of the effects of mindfulness across multiple participants within individual studies. Finally, the effects of mindfulness interventions, for example reductions in psychological and behavioural problems, are socially significant and therefore indicated a strong social validity.

Furthermore, three studies (Singh et al., 2011b; Singh et al., 2011d; Singh et al., 2011e) reported that they ensured the fidelity of mindfulness intervention by adhering to the SoF training manual. Only one study (Singh et al., 2011b) provided data on fidelity assessment (i.e., 100%), through a trainer's review of the video recordings containing SoF taught by the mother of the participant with AS.

Discussion

This systemic literature review identified 12 studies that successfully addressed the behavioural and/or psychological problems of individuals with mild to severe DD using mindfulness interventions. The findings of this review are discussed in relation to the nature of mindfulness intervention, including strengths and areas for improvement, and implications for future research.

Nature of mindfulness intervention: Strengths and areas for improvement

Early mindfulness interventions first focused on individuals with ID, often combined with mental health issues. Subsequent studies diversified to participants with LD and more recently to those with ASD. Mindfulness was applied to physical and mental experience. The Soles of the Feet (SoF) is an example of a mindfulness of body practice. It entails shifting one's attention from emotionally provocative situations or mental states to a neutral part of one's body, here the soles of the feet. It was proved to be beneficial for reducing the aggressive behaviour of individuals with mild to moderate ID and ASD (e.g., Singh et al., 2011a; Singh et al., 2003). Mindfulness of mind practice included awareness of the transient nature of thoughts, which allows the practitioner to realise the futility of attaching to or identifying with them. Although it appeared hard to practise, some recipients (e.g., sexual offenders) found it liberating because it allowed them to know "I am not my thoughts" (Singh et al., 2011c, p. 173).

Mindfulness intervention presents two distinctive features, prevention and self-management. Mindfulness practice functions preventatively when it is applied to an individual who is not currently angry in order to neutralise potential anger. By revisiting a memory of anger, it becomes possible to practise shifting attention away from anger to a neutral sensation, the soles of the feet. Over time the individual develops the capacity to apply the same procedure when anger arises in real time. This practice also develops self-management skills, as the recognition of the symptoms of anger and the conscious response of directing awareness elsewhere come from within the individual rather than any external intervention. This self-practice component nurtures the self-understanding of individuals with DD (Beauchemin et al., 2008).

Intervention strategies were adjusted to meet the requirements of their participants. Abstract concepts such as observing thoughts were concretised through metaphors, like thoughts as clouds or a running stream (Brown & Hooper, 2009; Singh et al., 2011d), in one case supported by arts-based activities (e.g., constructing a river with concrete materials) (Brown & Hooper, 2009). The most frequently used instruction strategy was individually presented direct verbal teaching (e.g., guided meditation). Other strategies included modelling, role-play, discussion and prompts.

The mindfulness interventions suggested two areas where improvements could be made, relating to mindfulness practice itself and the intervention studies. For the first, teaching mindfulness to individuals with DD was labour-intensive and time-consuming, which created the problem of lack of intervention accessibility. Of 12 studies, 11 provided one-on-one individual intensive intervention for people with DD for between 1 and 6 weeks. This was followed by extensive self-practice periods ranging from 3 months to 2 years.

This difficulty may also be affected by the type and severity of disability. The only study that applied a group intervention was for individuals with LD who did not demonstrate ID. The recipients in 11 studies, however, presented dual disabilities (e.g., ID and mental health issues) or severe behavioural problems (e.g., offenders). Not surprisingly, analysis indicates that the more intellectually constrained the participants were, the more concrete and labour-intensive was the instruction (e.g., Brown & Hooper, 2009). Also, the more severe the behaviour problems, the longer the intervention periods (e.g., Singh et al., 2007a; Singh et al., 2008b). Alternatively, this difficulty may be related to the particular research design adopted by the group of researchers who conducted 10 of the 12 intervention studies.

To date, the effects of mindfulness practice have mostly been investigated through single subject research with multiple baseline across participants combined with a longitudinal approach (e.g., Singh et al., 2003). This has contributed to establishing the soundness of the effects of the mindfulness intervention for individuals with various types of DD. Thoroughly planned and carefully documented single subject research provides sound evidence of an educational and behavioural intervention (Horner et al., 2005), especially when testing a new concept (Odom et al., 2005). Since people with severe DD require individualised training, single subject research design is most relevant to their needs. However, while useful at the individual level, single subject research design is limited in its application to numbers of people. If research methods can be diversified to a group design, for example in school settings, mindfulness applications can be expanded to a wider range of people.

Analysis of the quality indicators of single subject research (Horner et al., 2005) in the 10 intervention studies that adopted this design reveals two difficulties, the

absence of both a clear definition of mindfulness and assessment of intervention fidelity. The remaining two intervention studies shared the same problems.

As the concept of mindfulness is relatively new in the field of disabilities, a clear definition of it is essential for validity testing. Yet such a definition is absent in the studies under review. Of the 12 studies, four made no attempt to define mindfulness. The other studies spoke of mindfulness in terms of different forms of attention training, ranging from the very general (e.g., Singh et al 2007a; 2011c) to the more specific (e.g., Beauchemin et al., 2008; Singh et al., 2008a), but even in these latter cases the single term “mindfulness” covered a variety of attention training practices. It could be that while the word mindfulness suggests a specific mental factor, it actually refers to a family of practices within which intentional awareness is brought to inner and outer experience. In any event, the conceptual confusion surrounding the term means that these mindfulness studies lack any clearly described independent variable, and this in turn threatens internal validity (Horner et al., 2005).

In addition, the review indicates a lack of consideration regarding the fidelity of mindfulness intervention. Of the three studies (Singh et al., 2011b; Singh et al., 2011d; Singh et al., 2011e) that mentioned intervention fidelity, only one study reported the actual data on it (Singh et al., 2011b).

Implications for future study

Despite these problems, the intervention studies demonstrated the usefulness of mindfulness for individuals with DD. There are four areas that mindfulness intervention research needs to address to strengthen these already strong applications of mindfulness practice. Diversifying intervention methods and research methodology is the key. While individual intensive intervention has been proven to be effective,

this limits the number of individuals who can be exposed to mindfulness intervention at any given time. This problem can be addressed by exploring different types of mindfulness intervention, including group intervention.

The quality of instructors is another area that needs attention, particularly in regard to their understanding and experience of mindfulness and their knowledge of the participants. Understanding and experience of mindfulness is closely related to internal validity, while knowledge of participants enables contextualised intervention. With both these attributes, a researcher can creatively adjust mindfulness intervention content and instruction strategies to meet the educational requirements of individuals with DD.

Mindfulness intervention has so far focused on addressing problems (e.g., aggression) and this has been invaluable. However, mindfulness practice may provide other benefits. Future mindfulness studies need to broaden the range of intervention objectives by looking at general life issues such as quality of life. Listening to the voices of individuals with DD can deepen our knowledge of the mindfulness practice process and its effects from the perspectives of the learners themselves. This can be achieved through collecting qualitative data and diversifying research methodology.

Last but not least, future studies need to present both successful and unsuccessful outcomes of mindfulness intervention for individuals with DD. Knowing the characteristics of participants, settings, intervention content and instruction strategies of studies that have resulted in unsuccessful intervention outcomes is as vital as knowing those of successful studies. With this kind of information, mindfulness can be applied to particular individuals in appropriate ways, avoiding any unnecessary mistakes.

Conclusion

Can individuals with DD learn mindfulness? According to the 12 mindfulness intervention studies, people with DD can not only learn mindfulness, but also learn to use it to free themselves from certain behavioural and psychological difficulties. This has great potential for enhancing the quality of life of people influenced by DD, including their families and carers. While the 12 studies under review consistently demonstrated the positive effects of mindfulness practice for individuals with DD, mindfulness intervention is still in its infancy in the field of disabilities. This potential warrants further investigation of mindfulness applications for individuals with DD.

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Table 1. Results of search strategy

Combinations of keywords	ProQuest	PsycINFO	Web of Science	Medline	Scopus	Step 1 Duplicated references	Step 2 Not meet criteria 1-3 (Abstract)	Step 2 Meet criteria 1-3 (Abstract)	Step 2 Meet criteria 1-3 (Full text)	Step 3
mindfulness and disabilit*	22	50	46	32	50	227->97	74	23	15	10
mindfulness and autis*	5	9	8	1	4	20->14	12	2	2	1
mindfulness and asperger*	2	5	2	0	1	10->6	4	2	2	1
mindfulness and impairment	9	18	25	10	25	89->39	39	0		
Duplicated references	7	13	18	5	19	Total: 156	Total: 129	Total: 27	Total: 19	Total: 12

Table 2. Mindfulness intervention for individuals with developmental disabilities

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2003)	27 year old male with mild ID and psychotic disorder	Psychiatric hospital Intervention for 5 days Follow-up for 12 mths	Reduce aggressive behaviour	Meditation on the soles of the feet (SoF)	Individual training 30-minute role- play & practice twice a day for 5 days 1 week of homework practice assignments	Not stated	1) Staff & self reported incidents of aggression 2) Staff & self reported incidents of self-control 3) Physical restraints used 4) Staff & resident injuries 5) PRN medication applications 6) Physically & socially integrated community activities	Single subject Baseline: 5 mths Intervention: 12 mths Follow-up: 12 mths	Major decreases in 1) Incidents of aggression 3) Use of physical restraints 4) Staff & resident injuries 5) PRN medication Increases in 2) Self-control 6) Physically & socially integrated community activities Drug therapy discontinued Psychotic Disorder NOS withdrawn Community placement

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2007a)	3 young adults (CA: 27, 43 & 39 yrs) (Gender: 2 males & 1 female) with moderate ID and mental health issues (bipolar disorder, schizophrenia & psychotic disorder respectively)	Group home 35 weeks	Reduce aggressive behaviour to maintain community placement	Meditation on SoF	Individual training with guided meditation (1 wk) & rehearsing several times per day Imagine past episodes of aggression Audiotape of instructions for self- practice	First author	Staff records of target behaviours in the group home & vocational settings Reliability (95%) between 2 staff members	Multiple baseline Baseline: 3, 5 & 10 wks Intervention: 35 wks Follow-up: 2 yrs	Aggressive acts declined Community placement maintained

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2008a)	A 17-year-old male adolescent with Prader-Willi syndrome and mild ID	Home 5 years	Lose weight	1) Mindful eating 2) Visualising & labelling hunger 3) Meditation on SoF	1) Not stated 2) Use of a cartoon character 3) Individual training for a week	Participant's mother assisted by senior author via email	Participant's weight Reliability (100%) between two data collectors, the participant's mother and father	ABCD design A: Baseline (12 mths) B: Intervention exercise only (12 mths) C: Intervention exercise & food awareness (12 mths) D: Intervention exercise, food awareness & mindfulness (24 mths) Follow-up: every 3 mths for 3 yrs	Mean weight A: 256.3 lb B: 249.8 lb C: 242.8 lb D: 200 lb Follow-up 197.8 lb in year 1 192.3 lb in year 2 190.7 lb in year 3

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2008b)	6 aggressive male adult offenders (CA: 25, 28, 34, 23, 25 & 36 yrs) with ID and mental health issues (e.g., bipolar, impulse control disorder, paedophilia & paraphilia)	Forensic mental health facility 27 months	Reduce aggressive behaviour for transition to community placement	Meditation on SoF	Individual training with guided meditation Practise twice a day (27 months)	Therapist	Staff records of target behaviours Inter-rater agreement (92%) between 2 staff members	Multiple baseline	Physical aggressive behaviours decreased to zero across the 27 months of training Lower verbal aggression No requested medication or restraint No staff or peer injuries
Brown & Hooper (2009)	1 female adolescent (CA: 18 yrs) with moderate/severe ID and neuro- psychiatric disorder	Not stated 6 mth intervention	Reduce anxiety and obsessive thoughts	Body and thought awareness Cognitive Behaviour Therapy (CBT)	17 individual training sessions Activity based exercise using drawings and real objects	First author implied, but not explicitly stated	Adapted version of Acceptance & Action Questionnaire-9 (AAQ9) Parental reports	Single subject 6 mths intervention 4 mth follow- up	Less avoidant of cognitions, emotions and motives (AAQ9) Calmer, less affected by thinking, more socially confident and better empathy (parental reports)

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Adkins et al. (2010)	3 adults (CA: 42, 25 & 22 yrs) (Gender: 2 males & 1 female) with mild ID and mental health issues (e.g., obsessive compulsive disorder & depression)	Two in group home for 2 wks and 4 wks respectively One at home with mother for 5 wks	Reduce verbal & physical aggression	Meditation on SoF	Individual training for 1 hr a day, 5 days a week Twice daily practice & when a trigger was present Prompts	Community based therapist (no further explanation)	Maladaptive behaviour collected by caregivers & therapist at home & work Specialist staff administered psychological measures No reliability data collected	Multiple baseline Baseline: 2-4 wks Intervention: 2-5 wks Self practice: 12-26 wks Follow-up: 4-8 wks	Maladaptive behaviours reduced to near-zero levels Improved collateral measures Community placement maintained

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2011c)	3 male adults (CA: 34, 23 & 25 yrs) offenders with ID & mental health issues (e.g., paedophilia & sexual abuse of child)	Forensic mental health facility About 60 wks	Control deviant sexual arousal	1) Meditation on SoF 2) Mindful observation of thoughts	1) Use pictures to induce sexual arousal & switch attention to SoF 2) Individualised instruction, self practice homework & discussion with the therapist	Two therapists: Very experienced & newly established in meditation practice	Self-report on level of sexual arousal Individual interviews Discussions	Multiple baseline 1) 4 sessions (0.5 - 1 hr) for 4 wks 2) 4 individual meetings for the remaining intervention period 3) 13 wk SoF phase 4) 35-40 wk observation of thoughts phase	Sexual arousal levels Baseline: max. 12 levels for all three SoF phase: 7.77, 7.38, & 6.92 respectively Observation of thought phase: 2.95, 3.03 & 1.51 respectively Helped to be more calm

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2011d)	A 31-year-old heavy smoker with mild ID	Not stated 82days	Cease smoking	1) Intention 2) Mindful observation of thoughts 3) Meditation on SoF	1) Discussion with group home staff & self affirmation regarding intention to quit smoking 2) Observation of arising, lingering & passing away of desire to smoke 3) Role play & self practice for SoF	Therapist with extensive experience in mindfulness meditation & in service delivery to people with ID	Interviews with group home staff & the participant Observations of staff at work place Informal inquiries with the participant's neighbours Reliability (100%) between an independent rater	A single subject changing criterion design Pre-baseline: 10-15 minute breathing meditation twice a day for 3 mths Baseline: 14 days Intervention: 82 days Maintenance: 12 mths Follow-up: 3 yrs	Baseline: 12 cigarettes per day Gradual reduction to zero over 82 intervention days No smoking during 12- month maintenance period & 3-year follow-up period

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2011e)	3 male adults (CA: 28, 28 & 32 yrs) with mild ID who were friends of the trainer	Workplace 52-39 wks	Reduce aggressive behaviour & control anger	Meditation on SoF	<p>Intervention initiated on request of participants</p> <p>Discussion with the trainer on antecedents of anger & aggression</p> <p>Step-by-step repeated instruction on SoF</p> <p>Social gatherings with the trainer</p>	<p>A 33-year-old man with mild ID & mental health issues (the participant of the study conducted by Singh et al., 2003)</p>	<p>Self reported incidents of anger & aggression</p> <p>Reliability (100%) for incidents of aggression between the participant & co-workers</p>	<p>Multiple baseline</p> <p>Baseline: 8-21 wks</p> <p>Intervention: 52-39 wks</p> <p>Follow-up: for 2 years</p>	<p>Incidents of anger & aggression declined during overall practice period</p> <p>No incidents of anger & aggression during last 4 wks of practice period</p> <p>Occasional instances of anger but no instances of aggression during informal follow-up period</p>

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Beauchemin, Hutchins & Patterson (2008)	34 adolescent students (CA: 13 – 18, mean 16. 61 yrs) (Gender: 24 males & 10 females) diagnosed with LD	Classroom 5 week intervention	Reduce anxiety, & improve social & academic performance	1) Focusing on breathing 2) Noting thoughts and feelings	Modelling Discussion Self practice	Primary investigator; teachers (after receiving 2 hr training on mindfulness meditation by an expert in this field)	Social Skills Rating System (SSRS) State-Trait Anxiety Inventory (STAI) Post- intervention questionnaires	Pre-post no- control 2 introductory sessions (45 mins) Teachers led short sessions (5-10 mins) at the beginning of each class every day for 5 wks	Declined Trait anxiety and State anxiety Improved social skills (Teacher ratings) Improved academic performance (Teacher ratings) Decreased problem behaviours (Teacher ratings) Positive experience associated with mindfulness meditation (Student questionnaires)

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results
Singh et al. (2011a)	3 male adolescents (CA: 14, 16 & 17 yrs) with ASD and aggressive behaviour	Home life	Reduce aggressive behaviour	Meditation on SoF	Verbal instructions	First author taught mothers	Family recorded physically aggressive behaviour	Multiple baseline	Aggressive behaviour per week
		Intervention (5 days)			Prompts	Mothers taught sons	Reliability (100%) between two data collectors, the participant's siblings and parents	Baseline: 3, 5 & 10 wks respectively	Baseline: 14, 20 & 16
		Practice: 23- 29 wks			Self practice with iPod audio recording			Intervention: Daily 30 min mindfulness training for 5 days	Training: 6.3, 4.1 & 4.7
								Practice: 23, 26 & 29 wks	Follow-up: 4, 3 & 3
								Follow up: 3 yrs	

Reference	Participant	Settings/ Duration	Objective	Content	Methods	Instructor	Measures	Design	Results		
Singh et al. (2011b)	3 male adolescents (CA: 15, 13 & 18 yrs) with AS and aggressive behaviour	Home life	Reduce aggressive behaviour	Meditation on SoF	Verbal instructions	First author taught mothers	Parents recorded aggression	Multiple baseline	Zero instances of aggression for 3 consecutive weeks in 17, 22 & 24 weeks respectively		
		Intervention (5 days)			Modelling	Mothers taught sons	provoking incidents & aggressive behaviour	Baseline: 3, 4 & 6 wks respectively			
					17-24 wk practice		Prompts	Reliability (100%) between two data collectors, the participant's siblings and parents	Intervention: Daily 15 min mindfulness training (5 days)	No aggressive behaviour during 4-year follow-up	
							Self practice with iPod audio recording				Practice: 17, 22 & 24 wks
											Follow-up: 4 yrs

Table 3. Elements of mindfulness practice

	Element 1 Awareness of breathing	Element 2 Awareness of bodily sensations	Element 3 Awareness of actions	Element 4 Awareness of mental states	Element 5 Shifting attention
SoF (Adkins et al., 2010; Singh et al., 2007a; Singh et al., 2008b; Singh et al., 2011e; Singh et al., 2003)	✓	✓		✓	✓
SoF + observe bodily sensation of hunger + mindful eating (Singh et al., 2008a)	✓	✓	✓	✓	✓
SoF + observe desire for smoking (Singh et al., 2011d)	✓	✓		✓	✓
SoF + observe sexually aroused thoughts (Singh et al., 2011c)	✓	✓		✓	✓
Observe breath, thoughts and feelings (Beauchemin et al., 2008)	✓			✓	
Observe bodily movements and awareness of thoughts (Brown & Hooper, 2009)		✓		✓	