Effectiveness of an Autism-Specific Workplace Tool for Employers: A Randomised Controlled Trial. Journal of Autism and Developmental Disorders. DOI: http://doi.org/10.1007/s10803-018-3611-0

Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial

Abstract

A randomised controlled trial evaluated the effectiveness of the Integrated Employment Success Tool (IEST^{TM}) in improving employers' self-efficacy in modifying the workplace for individuals on the autism spectrum. Employers (N=84) were randomised to the IEST^{TM} or support as usual groups. Measurements of self-efficacy, knowledge and attitudes towards disability in the workplace were obtained at baseline and post-test. Results revealed a significant improvement in self-efficacy within the IEST^{TM} group between baseline and post-test (p=0.016). At post-test, there were no significant differences between groups in relation to self-efficacy in implementing autism-specific workplace modifications and employer attitudes towards disability in the workplace. Given the lack of significant outcomes, further research is needed to determine the effectiveness of the IEST^{TM} for employers.

Keywords

Autism spectrum disorder, complex intervention, hiring, vocational support, work environment

Introduction

Employment is a highly desirable social achievement for most individuals, including those on the autism spectrum (Hendricks 2010). Work facilitates economic independence, engendering a sense of purpose and accomplishment, providing opportunities for socialisation and a mechanism through which to contribute to society (Roux et al. 2013; Krieger et al. 2012; Chen et al. 2015). The importance of work in facilitating well-being for people with disabilities is recognised by the United Nations, who have enshrined the rights of people with disabilities to employment in the Convention on the Rights of Persons with Disabilities (CRPD). The CRPD mandates the right of people with disabilities to employment on a free and equal basis to others, to work in just and equally favourable conditions and to be protected against unemployment (United Nations 2006). In Australia, the Disability Discrimination Act 1992 (Australian Human Rights Commission 1992) advocates for the inclusion of individuals with disabilities in the workplace, requiring employers to remove administrative, environmental and procedural barriers to employment. Despite these legislative requirements, according to the Organisation for Economic Co-operation and Development (OECD), Australia has one of the lowest rates of employment of people with disabilities, with adults on the autism spectrum underrepresented in employment, even in comparison to other disability groups (Organisation for Economic Co-operation and Development (OECD) 2010; Australian Bureau of Statistics 2010). In Australia the unemployment rate for individuals on the autism spectrum of working age (15-64 years) is 32%, in comparison to 10% of all individuals with disabilities, and 6% for individuals without disabilities (Australian Bureau of Statistics 2015). While legislation is vital in mandating against discrimination and exclusion, it does not guarantee enactment by organisations and employers. Maximising the inclusive practices of workplaces in supporting individuals on the autism

spectrum requires a comprehensive understanding of the needs and challenges experienced by employers (Gilbride et al. 2003).

Employers are considered an environmental factor in the employment process, and play a central role in hindering or facilitating work participation for individuals on the autism spectrum (Unger 2002). Employer attitudes towards disability inclusion in the workplace are likely to underpin their hiring decisions. Attitudes are multidimensional and conceptualised as behavioural, cognitive and affective components that have been shaped by a variety of influences (Augoustinos and Walker 1995; Berry and Meyer 1995). Negative employer attitudes towards employees on the autism spectrum result from the perceived concerns relating to their work-related skills, reduced profits from poorer productivity, and incurring additional costs associated with workplace accommodations, supervision and training (Hartnett et al. 2011; Cimera and Cowan 2009; Hernandez and McDonald 2010). Many of these negative attitudes are underpinned by misperceptions and a lack of knowledge regarding autism (Unger and Kregel 2003; Livermore and Goodman 2009). In contrast, positive employer attitudes are influenced by previous experience with employees with a disability (Gilbride et al. 2000; Morgan and Alexander 2005) and an awareness of the potential benefits of retaining qualified, dedicated and meticulous employees on the autism spectrum (Ju et al. 2013; Scott et al. 2017). Employer attitudes are also influenced by organisational factors such as, the size of an organisation and type of industry. Larger organisations and public and social service industries are more likely to hire individuals with disabilities compared to smaller organisations or other industries due to increased resources, less concern in relation to potential costs, and greater awareness and compliance with corporate social responsibility (Australian Centre for Corporate Social Responsibility 2014; Morgan and Alexander 2005; Houtenville and Kalargyrou 2015). The

presence of external supports from disability employment support providers is also associated with positive employer attitudes (Hernandez et al. 2000). Disability employment service providers assist employers with recruitment, job placement, workplace modifications, education and training and ongoing support for employees on the autism spectrum (Smith et al. 2004; Gilbride et al. 2000). Clearly, there is a need to further understand the role of attitudes towards disability in influencing the employment of people with disabilities, including autism.

Employers' capacity, such as their knowledge and confidence in their ability to manage and support employees on the autism spectrum is another factor likely to influence employment outcomes (Rashid et al. 2017). While employer confidence is considered a critical factor in identifying and implementing appropriate and effective workplace modifications (Unger and Kregel 2003), it is often hindered by a limited knowledge of autism (Gates et al. 1996). Consequently, many employers feel uncertain and unprepared in identifying potential workplace difficulties and approaching their employees on the autism spectrum in relation to their specific support needs (Hagner and Cooney 2003). Given the critical role that employers play in job attainment and retention for individuals on the autism spectrum (Mawhood and Howlin 1999), strategies to enhance employer capacity, particularly their confidence, are essential. One such approach may include targeting employers' self-efficacy through education. Self-efficacy refers to an individual's confidence and belief in their ability to perform a task or manage a situation (Bandura 1997). According to Bandura, self-efficacy is a principle determinant of human behaviour (Bandura 1982, 1997), influencing self-knowledge and beliefs of self-determination (Bandura 1977, 2014), with the achievement of success and avoidance of failure contributing to perceptions of control (Bandura 1995). Perceived self-efficacy is considered to be a powerful motivator, mediating the relationship between knowledge and action (Bandura 1997).

Interventions that successfully have targeted self-efficacy, have been proven effective in promoting behaviour change (Sheeran et al. 2016).

Higher levels of perceived self-efficacy are associated with higher performance attainments (Bandura 2014). It is argued that employers with higher self-efficacy are more likely to engage in management practices that promote success (Blackman and Chiveralls 2011). Such practices require an understanding of the potentially mutually beneficial relationship between employers and employees on the autism spectrum (Jacob et al. 2015). In developing this relationship, effective employer management practices include a willingness to provide workplace accommodations, flexibility in modifying work tasks, providing regular supervision and fostering an organisational climate and culture of inclusivity and diversity (Erickson et al. 2014; Hendricks 2010; Scott et al. 2015). Such management practices are contingent on employers understanding the unique needs of their employee/s on the autism spectrum, those supports and interventions most appropriate in meeting their specific needs and when these should be applied and withdrawn (Hagner and Cooney 2005). Effective employers have confidence in recognising potentially challenging situations that may interfere with job performance such as, a planned fire drill or office party celebrations, intervening prior to the events and accommodating their employee's needs accordingly (Gates 1993).

If employers are to fulfill their responsibilities of creating inclusive work environments by enhancing employment opportunities and effectively providing support for individuals on the autism spectrum, then employer education is critical in developing the pre-requisite attitudes and self-efficacy beliefs (Kaye et al. 2011; Unger and Kregel 2003; Sheeran et al. 2016). Employers are currently an under supported and overlooked resource in the work environment (Erickson et al. 2014), with a paucity of studies exploring employers' capacity to support individuals on the

autism spectrum (Unger 2007; Hagner and Cooney 2003; Rashid et al. 2017; Wehman et al. 2016). In response to the need to address limitations in current approaches to disability employment support for autism and enhance employers' skills in hiring and supporting individuals on the autism spectrum, the Integrated Employment Success Tool (IEST^{TM}) was developed. The IEST^{TM} is a practical, autism -specific workplace manual developed for employers to assist them in hiring, supporting and retaining employees on the autism spectrum. The purpose of the IEST^{TM} is to increase employers' awareness and understanding of autism, including highlighting the strengths of employees on the autism spectrum, to assist employers in identifying potential environmental workplace challenges and to provide strategies, recommendations and modifications required to assist and resolve the environmental workplace challenges encountered by employees on the autism spectrum.

Aims

The primary aim of this study was to evaluate the effectiveness of an autism-specific workplace tool, the IEST^{TM}, in improving employers' self-efficacy and knowledge in modifying the work environment to meet the specific needs of their employees on the autism spectrum. The primary research hypothesis was that employers using the IEST^{TM} would demonstrate increased self-efficacy in modifying the work environment for employees on the autism spectrum. A secondary hypothesis was that employers using the IEST^{TM} would demonstrate more favourable attitudes towards disability in the workplace. Lastly, the study explored whether the post-test scores relating to self-efficacy, knowledge and attitudes towards disability were associated with demographic characteristics, autism experience, size of the organisation and the provision of external disability support in the workplace.

Methods

Design

In accordance with the CONSORT 2010 Statement (Schulz et al. 2010) (Appendix A), a two-armed randomised controlled trial (RCT) was employed to evaluate the effectiveness of the IEST™ intervention, in comparison to usual workplace supports for employers of adults on the autism spectrum.

Participants

Employers were eligible to participate if they were living in Australia; had adequate English to read and comprehend the IEST™ manual; and currently employed at least one adult on the autism spectrum who self-identified as having Asperger's syndrome (AS), high functioning autism (HFA) or autism, reportedly meeting the DSM-IV criteria for autism spectrum disorder (ASD) (American Psychiatric Association 2000). Employees on the autism spectrum were required to be over the age of 18 and working in open or supported paid employment in full-time, part-time or casual positions. While it is acknowledged that AS/HFA are now considered under the broader diagnosis of ASD, as outlined by the DSM-5 (American Psychiatric Association 2013), employees on the autism spectrum in this study were adults diagnosed under the DSM-IV criteria.

Recruitment

Between November 2015 and March 2017, employers were recruited through autism and not-for-profit organsiations, disability employment service (DES) providers, online advertisements using social media and community organisation websites, autism community forums and national conferences. In Australia, DES providers are government funded and assist

individuals on the autism spectrum with job searches and application, job placement, workplace accommodations and ongoing support. They also provide support to employers in relation to financial subsidies and disability awareness training. Initially, recruitment largely occurred through autism organisations and DES providers contacting employers registered in their databases as employing individuals on the autism spectrum. Eligible employers were invited to participate via their DES provider employment coordinator. The names of those agreeing to participate were provided to the first author, who contacted participants to discuss the study further. However, many DES providers were reluctant to share their employers' details, due to the sensitive nature of their relationship and concern for overloading the requirements of their client, resulting in a poor response rate. In response to the low response rate, secondary recruitment targeted employers via online advertisements, community forums and conferences, requesting employers to contact the first author directly to register their interest. This recruitment process relied on employees disclosing to their employers that they had AS/HFA.

Randomisation

Upon registration, using a simple randomisation technique of a computer-generated coin toss, participants were randomly allocated into the IEST^{TM} intervention group or control group. Participants were blinded to their group allocation and the trial hypotheses but were informed of the broader purpose of the trial to improve employment outcomes for individuals on the autism spectrum. While this study used individual randomisation to minimize the potential of contamination between groups, if new participants that registered in the trial were from the same organisation or business as a previously registered participant, but worked in a different state, or branch location, they were automatically allocated to the same study group. Randomising at both the individual and organisational level assisted in mitigating the risk of cross-contamination

between study groups, ensuring that the control group did not inadvertently receive the intervention, nor were they exposed to it (Portney and Watkins 2009).

Intervention group

Development of the IEST™

The IEST™ is a practical, autism -specific workplace manual that assists employers in hiring, supporting and retaining employees on the autism spectrum. The development of the IEST™ was in response to findings of a multifaceted needs assessment highlighting the importance of the environment in supporting employment outcomes for individuals on the autism spectrum. Overall, the needs assessment pointed to the potential utility of an intervention targeting employers that supported them in modifying the work environment and that could be applied across the employment continuum, from preparing for work to securing and maintaining a job. Subsequently, the needs assessment informed the five objectives of the IEST™ including: 1) creating an awareness of autism; 2) assisting employers to identify potential environmental workplace difficulties; 3) recommending the modifications or strategies to be implemented to resolves workplace difficulties; 4) facilitating a mutually beneficial relationship between employers and employees on the autism spectrum; and, 5) improving employment outcomes in relation to productivity and job retention. In addition, based on the needs assessment the development of the IEST™ was underpinned by a conceptual framework drawing upon three perspectives including: self-efficacy theory (Bandura 1977), the International Classification of Functioning, Health and Disability (ICF) framework (World Health Organization 2001), and a strengths-based approach (Russo 1999). Self-efficacy is a central tenet in Bandura's social-cognitive theory and was selected as it is considered an important determinant in human behaviour (Bandura 1997, 1982). Interventions targeting a change in self-efficacy have

demonstrated a medium-size effect on behaviour change, promoting the development of interventions targeting efficacy beliefs (Sheeran et al. 2016). While social-cognitive theory facilitates an understanding of employers' behaviours based on their autism-related confidence, the ICF framework has a particular utility in understanding the impact of environmental factors on the participation of individuals on the autism spectrum in the workplace, recognising the potential barriers and facilitators within the physical, social or attitudinal environment (Schneidert et al. 2003). Recent ICF Core Sets for ASD have identified a number of relevant environment factors (Bölte et al. 2017). Lastly, a strengths-based approach identifies and fosters the skills and abilities of individuals on the autism spectrum, rather than counteracting their weaknesses (Russo 1999; Lorenz and Heinitz 2014). Fundamentally, the IEST^{TM} intervention aims to encourage employers to recognise the strengths and difficulties of employees on the autism spectrum, and implement effective workplace modifications to support them accordingly.

Content of the IEST^{TM}

The IEST^{TM} is a practical manual consisting of eight modules each containing autism-specific information, checklists and goal setting activities, workplace modification strategies and additional work-related resources (Table 1). The first three modules provide employers with instructions regarding the implementation of the IEST in their workplace and information about autism and navigating the employment process. The latter five modules specifically address each phase of the employment process including: *Phase 1*: Advertising the job; *Phase 2*: The interview; *Phase 3*: Job commencement and placement; *Phase 4*: Workplace modifications; and, *Phase 5*: Ongoing support. Each phase contains three checklists prompting employers to consider: i) the different factors impacting each phase of the employment process; ii) the potential workplace difficulties that may arise; and, iii) a summary checklist ensuring the

appropriate modifications have been implemented and accounted for. In addition, three online video tutorials are provided as a means of guiding participants through the manual. The tutorials inform employers about the purpose of the IEST^{TM}, how to navigate the manual, and choose their stage in the employment process. The tutorials were designed to be succinct and informative and are no longer than four minutes.

<Insert Table 1 about here>

Implementation of the IEST^{TM}

The IEST^{TM} intervention was implemented in employers' work environment over a 12-week period. Participants chose to receive a paper-based or interactive PDF version of the intervention manual. A prescribed 'dosage' of the IEST^{TM} for employers was not feasible given the unique and varying needs of employees on the autism spectrum and the organisational differences likely to exist between work environments. Instead, employers were instructed to use those aspects of the IEST^{TM} most relevant to the needs of their employee on the autism spectrum and their work environment. In modifying the work environment to meet the needs of employees on the autism spectrum, employers were instructed to identify which stage in the employment process they were presently at, then subsequently evaluate the work environment; implement appropriate modification strategies; and re-evaluate the modified work environment. Throughout the 12-week trial period, participants were encouraged to contact the research team with regard to any support needs, questions and/or concerns relating to the use and implementation of the IEST^{TM} intervention. The research team responded to participant support needs via emails, phone calls or onsite visits accordingly.

Control group

Control group participants continued with their 'usual care of employment support' externally provided by community DES providers, without receiving any other additional interventions. 'Usual care of employment support' may have included on-the-job training, assistance accessing financial subsidies and the provisions of non-autism specific workplace accommodations. External support from DES providers was delivered approximately every four to six weeks, varying according to the employer's support needs. Control participants who were not associated with a DES provider did not receive any employment support, nor did the current study provide any support, strategies and recommendations or information.

Procedure

Data were collected online via the Qualtrics platform (Qualtrics 2005). Following randomisation, participants were sent an electronic questionnaire via email. These measures were administered at baseline and post-test, 12-weeks later. On completion of baseline measures, participants allocated to the intervention group were sent a copy of the IEST^{TM} in their preferred format (either paper-based or interactive PDF version) to begin using in their workplace. The 12-week timeline began from intervention implementation. The control group's timeline began on completion of baseline measures and continued with their workplace support as usual. At post-test, participants were given 2-3 weeks to complete the repeat questionnaires, receiving phone call and email reminders as required.

Outcome measures

In line with the theoretical underpinning of the IEST^{TM}, the primary outcomes of this study were self-efficacy and knowledge, with a secondary outcome exploring employer attitudes towards disability in the workplace.

Demographic characteristics

A structured questionnaire covering demographic characteristics, vocational history, organisational characteristics and experience supporting employees on the autism spectrum was completed by all participants.

Primary outcome measure-Employer Self-Efficacy Scale

Selecting an appropriate outcome measure is critical in evaluating interventions and may influence the value and usefulness of the results (Coster 2013). When no available measure with established reliability and validity exists to address the operationalised constructs of an intervention, the use of a purposefully developed measure is required (McBride 2016; Bartholomew et al. 2011). A comprehensive review of the literature revealed that there were no appropriate measures available to examine employer self-efficacy in relation to supporting employees on the autism spectrum according to the specific constructs of identification, provision and implementation of workplace modifications. This necessitated the development of the Employer Self-Efficacy Scale (ESES). The ESES consists of 20 items, comprising five dimensions representing the employment process including, recruitment, job interview, job placement and commencement, workplace modifications and ongoing support. Each item is scored using a 10-point Likert scale ranging from '*not at all confident*' to '*completely confident*'. A Cronbach alpha coefficient of 0.97 indicated excellent internal consistency of the scale.

Construct validity of the scale was established through expert review within the research team and externally through a community reference group comprising of adults on the autism spectrum, parents of individuals on the autism spectrum, teachers in transition planning, employment co-ordinators, clinicians and researchers. Following expert opinion, the ESES was piloted with a small group of participants (N=12) including adults on the autism spectrum (*n*=2), employers (*n*=4), DES provider employment co-ordinators (*n*=2) and expert researchers in autism (*n*=4), providing formative and process feedback on its feasibility and recommendations for change. The tool supports the calculation of an overall score and a score for each of the five dimensions, with a higher total score indicative of higher self-efficacy (Appendix B).

Secondary outcome-The Scale of Attitudes Toward Workers with Disabilities

In measuring employer attitudes towards employees on the autism spectrum, the absence of a 'gold-standard' outcome measure necessitated the use of a tool designed to measure attitudes towards disability in general within the broader population (McConachie et al. 2015). The Scale of Attitudes Toward Workers with Disabilities (SATWD) is a standardised tool used to quantify and measure employer attitudes towards employees with a disability in the workplace, consisting of 25 items rated on a 7-point (-3 to +3) Likert-type scale (Kregel and Tomiyasu 1992, 1994). Participants are required to rate their level of agreement with each item based on their feelings towards and experiences with employees with disabilities. The scale was designed to minimize the influence of individual responses, with items placed at relatively equal intervals. Ratings for each item are computed to provide a total universal score. The absolute value of each rating was used as the measure of intensity for each item, as several of the items were negatively worded, indicating that an item could have a negative mean rating, yet suggest a positive attitude towards disability in the workplace (Kregel and Tomiyasu 1994). Higher total scores indicate a more

positive attitude towards disability in the workplace. Weighted Cohen's Kappa scores ranging between 0.70 to 0.87 demonstrated high inter-rater reliability for the SATWD (Kregel and Tomiyasu 1992).

IEST™ feedback

A brief, structured questionnaire regarding fidelity and dose were obtained at post-test from participants in the IEST™ group only.

Sample size

A power calculation estimated that in order to identify a moderate to large effect size (*d*= 0.5 - 0.8), with 80% power and α=0.05, a total sample size of 80 (n=40 in each group) would be required. Given the fact that the IEST™ has not been tested as an intervention, this sample size also allowed for the expected 20% attrition rate that may occur throughout the study trial.

Statistical analysis

Data were managed and analysed using SPSS version 24 software (IMB Corporation 2016). Intention-to-treat analysis was conducted using the last observation carried forward (LOCF) method to account for missing data, and per-protocol analysis accounted for the comparison of groups for participants who completed the trial. Continuous data were checked for normality using the Kolmogorov-Smirnov test. Descriptive statistics such as, frequency and chi-square analyses were used to describe the demographic profile of employers. Paired and independent sample t-tests, in addition to Wilcoxon Signed-Rank and Mann-Whitney *U* tests were used to compare within and between-group differences in self-efficacy and employer attitudes towards supporting employees on the autism spectrum at baseline and post-test, respectively. In addition, a two-way between group analysis of variance analyses were conducted

to examine the main and interaction effects of sex and group allocation on employers' self-efficacy scores at baseline (baseline total ESES for group equivalence) and change due to the intervention (change in total ESES score). Following convention, a p-value < 0.05 was taken to indicate a statistically significant association in all tests.

Ethics

Registered participants were sent electronic information sheets outlining the purpose of the study and informed consent was obtained from all individual participants included in the study. Data collected from the study were de-identified and securely stored to maintain confidentiality and privacy of participants. Ethical approval was obtained from the university's Human Research Ethics Committee. The trial was also registered with the Australia and New Zealand Clinical Trial Registry. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

Participant characteristics

Of the 121 employers assessed for eligibility, 84 met the inclusion criteria. Participants were randomised to the intervention (n=43) or control (n=41) group prior to completing baseline measures. During the trial, two participants formally withdrew due to a change in employment, three participants from the intervention group withdrew, citing time constraints as their reason and nine participants were lost to follow-up. All participants were however, included in the intent-to-treat analysis. Flow of participants through the trial is shown in Figure 1.

<Insert Figure 1 about here>

Baseline comparison revealed that there were significant differences between the study groups in regards to sex, as shown in Table 2. Despite random allocation, more than two thirds of the intervention group consisted of men responding to the questionnaire, with the reverse being true for the control group. No other group differences in demographic characteristics were found. The industry distribution of participants was broad, with manufacturing (15.5%), health care and social assistance (13.1%) and financial and insurance services (7.1%) being most prevalent, and representative of the size and industry type of Australia generally (Department of Industry Innovation and Science 2016).

<Insert Table 2 about here>

Intention-to-treat analysis

For the ESES, there was a significant improvement within the intervention group between baseline and post-test (p=0.016), indicating the participants in this group experienced an increase in their confidence in supporting and implementing workplace modifications for employees on the autism spectrum (Table 3). The ESES scores for the control group did increase during the trial period, but this was not significant (p=0.41). While there was a noticeable difference in ESES scores at baseline between the intervention group (*M*=127.91) and control group (*M*=139.71), between-group analysis revealed no significant differences in confidence at baseline (p=0.18) and post-test (p=0.42), respectively. For the SATWD, there were no significant attitudinal improvements for within and between-group scores for participants. Both groups' total SATWD scores (intervention group means: 103.51 vs 104.67; control group means: 104.59

vs 104.41) consistently indicated generally positive attitudes towards employees on the autism spectrum across baseline and post-test.

<Insert Table 3 about here>

Per-protocol analysis

Per-protocol analysis was conducted for the remaining intervention (*n*=29) and control (*n*=39) group participants, who completed the 12-week trial, including both baseline and post-test measures. In general, the per-protocol analysis produced similar results to those of the intention-to-treat approach. For the ESES, there was a significant improvement in participants' confidence within the intervention group between baseline (*M*=127.24, SD=43.09) and post-test (*M*=141.31, SD=30.70; p=0.015), but no significant improvements within the control group between baseline (*M*=142.77, SD=33.82) and post-test (*M*=146.51, SD=27.10; p=0.41). Similarly, between-group analysis for ESES scores (intervention group means: 127.24 vs 141.31; control group means: 142.77 vs 146.51) indicated no significant differences in confidence both at baseline (p=0.1) and post-test (p=0.46). Per-protocol analysis of the SATWD required the use of non-parametric statistics. For the SATWD, a Wilcoxon Signed-Rank test indicated no significant attitudinal improvements within groups (intervention group: *Z*=-0.83, p=0.41; control group: *Z*=-0.40, p=0.69). Similarly, a Mann-Whitney *U* test indicated no significant attitudinal improvements between group scores at post-test (intervention group *Mdn*=108, control group *Mdn*=104, *U*=541, p=0.77). The per-protocol analysis also demonstrated generally positive attitudes to employees on the autism spectrum in the workplace for both groups (intervention group medians: 106 vs 108; control group medians: 106 vs 104) at baseline and post-test, respectively.

Subgroup per-protocol analysis for IEST™ users

IEST™ feedback results from intervention group (*n*=29) at post-test indicated 38% of the intervention group had not used the IEST™ at all during the 12-week trial period. Of the 62% who indicated that they used the intervention, only 24% had used it on a regular basis in their workplace. To explore whether the intervention dosage affected self-efficacy and attitudinal outcomes, further analyses were conducted comparing two subgroups to the control group. Subgroup 1 (*n*=18) consisted of participants who used the IEST™ at any frequency, including once, monthly, fortnightly and weekly use; and subgroup 2 (*n*=7) consisted of participants who used the IEST™ on a regular weekly to fortnightly basis, only.

Subgroup 1 analysis

Results for the ESES were found to be similar to those of both the intention-to-treat analyses and per-protocol analyses, with no significant differences between-groups at baseline (p=0.22) and post-test (p=0.83). The only significant improvement occurred within the intervention group's confidence between baseline (*M*= 130.44, SD=37.54) and post-test (*M*= 148.11, SD=21.79; p=0.038), indicating that the intervention group's confidence (*M*=148.11) was higher than that of the control group's (*M*=146.51) at post-test. The improvement in the intervention group's confidence a medium effect size (*d*=0.58), while improvement in control group was a small effect size (*d*=0.12). This finding appeared to be related to participants' use of the IEST™ in their workplace regardless of dosage. For the SATWD, there were no significant attitudinal improvements within groups (intervention group: *Z*=-1.72, p=0.09; control group: *Z*=-0.40, p=0.69) and between-groups (intervention group: *Mdn*=107; control group: *Mdn*=104, *U*=338.50, p=0.83 at post-test.

Subgroup 2 analysis

Results for the ESES and SATWD were found to be similar to that of the subgroup 1 analysis and revealed no significant differences between groups at baseline and post-test, respectively. Interestingly, within-group analysis for the intervention group at baseline and post-test indicated significant improvements in both participants' confidence in supporting employees on the autism spectrum (Z=-2.37, p=0.0018), and their attitudes towards disability in the workplace (Z=-2.38, p=0.018). These findings suggest that when participants used the IEST^{TM} on a regular weekly to fortnightly basis, the tool was effective in improving employers' self-efficacy and knowledge and promoting favourable attitudinal change towards employees on the autism spectrum. Given the small sample size, these results need to be interpreted with caution.

Analysis to determine whether total ESES scores vary by sex and group allocation

Following the analysis of baseline participant demographics and employment-related variables, significant differences between groups were found for sex (Table 1). Two-way ANOVA models were conducted to explore whether total ESES scores varied by sex and group allocation. The effect of group allocation and the interaction between sex and group allocation on total ESES scores at baseline (p=0.77) and over time (change in total ESES scores, p=0.74) was not significant. These findings suggest that while there were significantly more men in the intervention group in comparison to the control group at baseline, sex did not significantly impact on the change in total ESES scores over time. These findings assisted in understanding the potential impact of selection bias and reduced any threat to internal validity resulting from initial differences between the study groups with regard to biological sex.

Discussion

The purpose of this RCT was to evaluate the effectiveness of the IEST^{TM} in improving employers' self-efficacy, knowledge and attitudes towards modifying the work environment to meet the specific needs of their employees on the autism spectrum. Overall, when compared to employment supports as usual, the IEST^{TM} did not significantly improve employers' self-efficacy and attitudes towards autism in the workplace. While the implementation of the intervention under real life conditions in natural workplace settings may have enhanced the ecological validity of this study, it is possible that a number of factors have influenced the findings of the present study (Marchand et al. 2011).

The greatest degree of change reported by the intervention group was in employers' self-efficacy with regard to supporting individuals on the autism spectrum in the workplace, as measured by the ESES tool. Given that the intervention was underpinned by Bandura's social-cognitive theory, these findings are consistent with the concept that implementing an intervention that increases knowledge, increases self-efficacy (Bandura 1993). The intervention group's significantly improved self-efficacy scores, over the 12-week trial period reflects their perceived increase in ability to manage obstacles and challenges more efficiently, and remain in control of the situation (Bandura 1986, 1977). Improved self-efficacy is an essential component in developing effective and flexible management practices of employers, particularly regarding the unique and varying difficulties experienced by individuals on the autism spectrum in the work environment (Hagner and Cooney 2005). Employment success is not always dependent on an employee's ability to modify their behaviour, but is likely equally contingent on employers' knowledge of the autism, and confidence and capacity in identifying and providing appropriate and effective workplace supports (Hagner and Cooney 2005; Hillier et al. 2007; Unger and

Kregel 2003). In contrast, when exploring between group differences for self-efficacy, the control group's baseline ESES scores were noticeably, but not significantly, higher than the intervention group's. Interestingly, at post-test, ESES scores for the intervention group were similar to that of the control group's. While it possible that the intervention group simply regressed to the mean rather than indicating true improvement, the change in ESES scores for employers using the IEST^{TM} were characterised by a medium effect size (d=0.58) compared to the control group's small effect size (d=0.12). This finding suggests that the significant improvement demonstrated within the intervention group was likely attributable to the use of the IEST^{TM} in their workplace, indicating its usefulness in improving employers' self-efficacy.

The findings that the IEST^{TM} did not significantly improve employers' self-efficacy and attitudes compared to the control group may be explained by the issue of compliance in the study. More than two thirds of the intervention group only used the IEST^{TM} once, monthly or not at all, with the remaining participants using it on a regular to fortnightly basis. While the IEST^{TM} did not have a prescribed dosage due to the unique and varying support needs of employees on the autism spectrum and the differences likely to exist between work environments, the issue of compliance may be attributed to several factors. The IEST^{TM} was provided to employers either as a paper-based or interactive PDF version. The format may have been considered impractical and time-consuming given the delivery of the IEST^{TM} in the form of a comprehensive manual, particularly for time-poor employers driven by productivity, deadlines and profit (Domzal et al. 2008). Employers benefit from resources that are informative and practical, but can also be readily accessed and implemented (Unger and Kregel 2003). Many organisations access the internet on a daily basis to complete work tasks. The delivery of the IEST^{TM} as a web-based application, available on a variety of electronic devices may have increased its usability

(Wantland et al. 2004). Further, the IEST^{TM} is a comprehensive manual addressing autism in the workplace, designed to guide employers through a step-wise process of implementing specific workplace strategies. It is possible that for many employers reading the manual thoroughly, once, was sufficient in meeting their needs and concerns, rather than using it on a regular basis. Lastly, the phrasing of the question in relation to employers' use of the IEST^{TM} was, 'How often have you used the IEST^{TM} tool?', with responses categories including 'Not at all', 'Daily', 'Weekly', 'Fortnightly', 'Monthly', and an open response of 'Other-specify', which was open to interpretation. The question did not define the use of the IEST^{TM} to include activities such as, reading the manual, sharing it as resource with co-workers or using it to support staff training on disability awareness. In addition, measuring for the use of the IEST^{TM} was only assessed at post-test in the trial. A more accurate representation of the use of the IEST^{TM} may have been achieved with weekly or fortnightly phone calls requesting this information over the 12-week trial period. Collectively, these issues may have impacted in varying degrees on both the acceptability of the IEST^{TM} and measuring the fidelity of the intervention group.

With the exception of a small group of participants within the intervention group, who used the IEST^{TM} regularly, either weekly or fortnightly, no significant attitudinal improvements were found. Despite these results, participants generally held positive attitudes towards employees on the autism spectrum. Favourable attitudes towards disability in the workplace are associated with previous experiences, larger organisations and external support (Ju et al. 2013). Previous experiences influence employers' likelihood and willingness to hire individuals with disabilities in the future (Gilbride et al. 2000; Morgan and Alexander 2005), a finding supported in the present study, with almost 50% of all participants having previously worked with individuals with a disability, and 42% employing more than one employee on the autism

spectrum. Large organisations (250+ employees), of which more than a third of participants in this study were associated with, are more likely to hire individuals on the autism spectrum compared to medium or small organisations (Houtenville and Kalargyrou 2012). This may be attributed to the fact that large organisations have more resources, less concern with the perceived associated costs of supervision and workplace modifications, and a greater awareness and compliance with corporate social responsibility (Kregel and Tomiyasu 1994; Morgan and Alexander 2005; Australian Centre for Corporate Social Responsibility 2014). Another factor influencing positive attitudes may be external support from DES providers. In the Australian context, DES providers fulfill a necessary role in assisting employers with recruitment, job placement, accommodations and ongoing support (Gilbride et al. 2000), with 50% of participants in the present study receiving such support. It has been recognised that the collaborative approach between employers and DES providers is important in promoting effective and positive employment outcomes for employees with a disability (Greenwood and Johnson 1987; Luecking 2008; Smith et al. 2004). The IEST^{TM} did not improve employer attitudes, but given that attitudes predict behaviour (Glasman and Albarracın 2006), the consistently favourable employer attitudes reported by participants in this study over the 12-week trial period suggests that employees on the autism spectrum were likely to receive the support they needed.

Limitations

Sampling bias

Limitations potentially associated with sampling bias included the relatively small sample size and characteristics of participants. The process of identifying and recruiting employers with no previous autism-related experience and those without the support of DES providers was particularly difficult, due to the issues of disclosure and confidentiality in the workplace. It is

likely an autism-specific workplace tool would have been most beneficial to this group of employers. Given the complex nature of this research, particularly in relation to disability disclosure in the workplace and the current fluctuating Australian job market, recruitment necessitated a reliance on DES providers sharing employer contact details with the research team, many of which were already employing individuals on the autism spectrum and were not likely to demonstrate the most significant change in response to the IEST™. In addition, the small sample size may not have been representative of the broader population of Australian employers hiring and supporting individuals on the autism spectrum. Those recruited may have been employers with the most positive experiences of employees on the autism spectrum or had personal connections with an individual on the autism spectrum, making them more likely to have participated in this study. Participant characteristics may also impact the generalisability of the results, with 50% of participants in this study supported by DES providers and due to the nature of their supportive relationship and the financial assistance provided, may have felt obliged to participate in the trial.

Methodological issues

Randomisation was conducted prior to participants completing baseline measures in an attempt to prevent cross-contamination between groups. While randomisation reduces systematic bias in regard to study groups, significant differences were found between groups in relation to biological sex at baseline. This may have been the inadvertent result of randomisation occurring at the level of the workplace and not at the individual (employer) level. However, this was addressed through: i) the administration of baseline measures online, whereby participants completed measures independently, with no involvement from the research team; and, ii) an

analysis of the effect of sex demonstrated that it did not influence total self-efficacy scores between groups.

The lack of autism-specific outcome measures in employment necessitated the development of the ESES. This is not a standardised measure, and while internal consistency and construct validity were established, the results should be interpreted with caution as further validity, reliability and sensitivity and specificity of the self-efficacy constructs are yet to be established. Although subgroup analyses assisted in supporting the usefulness of the IEST^{TM} for some employers, a lack of clarity remains as to whether the IEST^{TM} intervention itself was effective, rather than an increase in frequency of its utilisation in the workplace. This is a limitation because 'dosage' of the IEST^{TM} intervention for subgroups of IEST^{TM} users is compared to all of the control group participants' dosage as per their 'usual care of employment support'. To better understand the usefulness of the IEST^{TM} it would have been more beneficial to compare subgroups of IEST^{TM} users to subgroups of control participants based on each groups' 'dosing' respectively. In addition, given that the IEST^{TM} is considered an educational intervention providing information to employers about autism in the workplace, it would have been optimal to gather data from the control group about any information provided to them by DES providers, co-workers or HR departments during the trial period. Autism-specific information provided to the control group may have influenced their outcomes, so this study may have overestimated the true impact of the IEST^{TM} over 'usual care of employment support' which may include standard practices in providing information to employers.

Lastly, it is acknowledged that both demographic information in relation to age, sex presence of intellectual disability, severity and education level; and employment outcomes including job satisfaction, work performance and retention for individuals on the autism

spectrum would have strengthened the methodological framework. This study did not collect this information as it focused environmental factors in employment, focusing on employers and their capacity to implement a workplace intervention, rather than concentrating on characteristics and outcomes of individuals on the autism spectrum themselves. However, this study did necessitate a reliance on employees declaring to their employer that they were on the autism spectrum (AS/HFA).

Clinical implications and future directions

The present study has important implications for both employers and DES providers. A needs assessment pointed towards a need for an autism-specific workplace tool for employers, with this current study indicating the IEST^{TM} as beneficial to employers, particularly those with no previous autism-related experience and those without the support of a DES provider. While many employers in the present study had previous experience with employees with a disability, future studies further exploring the effectiveness of the IEST^{TM} would benefit from an employer population with little to no previous experience in this area. The IEST^{TM} may also be a useful tool for DES providers in supporting new and existing employers between workplace visits. In Australia, very few autism-specific DES providers exist to support the unique needs of individuals on the autism spectrum in the workplace. Given the importance of the relationship between DES providers and employers, until such services are developed, the IEST^{TM} may be a helpful resource. Given one of the aims of the IEST^{TM} is to provide employers with recommendations and strategies to modify the work environment for their employees on the autism spectrum, it would be helpful to know what specific modifications were implemented by employers. Such information may be useful in refining and improving the IEST^{TM} for future

employers according to modifications found to be most effective, time-efficient and/or cost-effective.

Conclusion

To the authors' knowledge, this study is the first to explore the effectiveness of an employer-based intervention, under real workplace conditions, with the potential to improve employment outcomes for the autism population. While the current study found no significant differences between groups for employer self-efficacy preliminary evidence suggested that the IEST^{TM} was beneficial in improving employers' confidence and knowledge in modifying the work environment. The results of the present study highlighted the need to further evaluate the effectiveness of the IEST^{TM} in larger groups of employers with little to no previous experience. It would be beneficial to also consider alternative formats and delivery of the IEST^{TM} to the employer population. The current study revealed some of the difficulties associated with conducting an intervention study under real world conditions with employers. The difficulties encountered in this current study reinforced the continued need for new research approaches allowing a better understanding of employers' needs and the key role they play in the employment process (Ellenkamp et al. 2016).

References

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders (4th ed, text rev.)*. Washington, DC: Author.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed, text rev.)*. Arlington, VA: American Psychiatric Publishing.

Augoustinos, M., & Walker, I. (1995). *Social cognition: An integrated introduction*. London: UK: SAGE Publications Ltd.

Australian Bureau of Statistics (2010). Survey of disability, ageing and carers; cat. no. 4430.0. Canberra, ACT: Australian Government.

Australian Bureau of Statistics (2015). Disablity, ageing and carers, Australia: Summary of Findings. Canberra: ABS.

Australian Centre for Corporate Social Responsibility (2014). The 10th year-Progress and prospects for CSR in Australia and New Zealand: The state of CSR in Australia and New Zealand annual review 2014. (pp. 1-20). Docklands, Victoria: Australian Centre for Coporate Social Responsibility.

Australian Human Rights Commission (1992). Disability Discrimination Act. (Vol. 135, pp. 1-75). Australia.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. [Article]. *Psychological Review, 84*(2), 191-215, doi:10.1037/0033-295X.84.2.191.

Bandura, A. (1982). Self-efficacy mechanism in human agency. [Article]. *American Psychologist, 37*(2), 122-147, doi:10.1037/0003-066X.37.2.122.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Engelwood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1993). Percevied self-efficacy in cognitive development and functioning. [Article]. *Educational Psychologist, 28*(2), 117-148, doi:10.1207/s15326985ep2802_3.

Bandura, A. (1995). *Self-efficacy in changing societies*. New York: Cambridge University Press.

Bandura, A. (1997). *Self-efficacy : the exercise of control / Albert Bandura*. New York: W.H. Freeman & Co.

Bandura, A. (2014). Exercise of personal agency through the self-efficacy mechanism. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 3-38). New York: Routledge.

Bartholomew, L. K., Parcel, G. S., Kok, G., Gottlieb, N. H., & Fernandez, M. E. (2011). *Planning health promotion programs: an intervention mapping approach*. San Francisco: Wiley.

Berry, J. O., & Meyer, J. A. (1995). Employing people with disabilities: Impact of attitude and situation. *Rehabilitation Psychology, 40*(3), 211-222, doi:10.1037/0090-5550.40.3.211.

Blackman, I., & Chiveralls, K. (2011). Factors Influencing Workplace Supervisor Readiness to Engage in Workplace-Based Vocational Rehabilitation. *Journal of Occupational Rehabilitation, 21*(4), 537-546, doi:http://dx.doi.org/10.1007/s10926-011-9297-1.

Bölte, S., Mahdi, S., de Vries, P. J., Granlund, M., Robison, J., Shulman, C., et al. (2017). The Gestalt of Functioning in Autism Spectrum Disorder: Results of the International Conference to Develop Final Consensus ICF Core Sets. Manuscript submitted for publication.

Chen, J. L., Leader, G., Sung, C., & Leahy, M. (2015). Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. [journal article]. *Review Journal of Autism and Developmental Disorders, 2*(2), 115-127, doi:10.1007/s40489-014-0041-6.

Cimera, R. E., & Cowan, R. J. (2009). The costs of services and employment outcomes achieved by adults with autism in the US. *Autism, 13*(3), 285-302, doi:10.1177/1362361309103791.

Coster, W. J. (2013). Making the best match: Selecting outcome measures for clinical trials and outcome studies. [Conference Paper]. *American Journal of Occupational Therapy, 67*(2), 162-170, doi:10.5014/ajot.2013.006015.

Department of Industry Innovation and Science (2016). Australian Industry Report 2016. (pp. 1-170). Canberra, ACT: Office of the Chief Economist, Department of Industry, Innovation and Science.

Domzal, C., Houtenville, A., & Sharma, R. (2008). Survey of employer perspectives on the employment of people with disabilities: Technical report. (prepared under contract to the Office of Disability and Employment Policy, U.S. Department of Labor). McLean, Va: CESSI.

Ellenkamp, J., Brouwers, E., Embregts, P., Joosen, M., & Weeghel, J. (2016). Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation, 26*(1), 56-69, doi:10.1007/s10926-015-9586-1.

Erickson, W. A., von Schrader, S., Bruyère, S. M., & VanLooy, S. A. (2014). The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin, 57*(4), 195-208, doi:10.1177/0034355213509841.

Gates, L., Akabas, S., & Kantrowitz, W. (1996). Supervisors' role in successful job maintenance: A target for rehabilitation counselor efforts. . *Journal of Applied Rehabilitation Counseling, 27*(3), 60-66.

Gates, L. B. (1993). The role of the supervisor in successful adjustment to work with a disabling condition: Issues for disability policy and practice. [Article]. *Journal of Occupational Rehabilitation, 3*(4), 179-190, doi:10.1007/BF01097428.

Gilbride, D., Stensrud, R., Ehlers, C., Evans, E., & Peterson, C. (2000). Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. [Article]. *Journal of Rehabilitation, 66*(4), 17-23.

Gilbride, D., Stensrud, R., Vandergoot, D., & Golden, K. (2003). Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin, 46*(3), 130-190.

Glasman, L. R., & Albarracın, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude behavior relation. *Psychological Bulletin, 132*(5), 778–822.

Greenwood, R., & Johnson, V. A. (1987). Employer perspectives on workers with disabilities. [Review]. *Journal of Rehabilitation, 53*(3), 37-45.

Hagner, D., & Cooney, B. (2003). Building employer capacity to support employees with severe disabilities in the workplace. *Work, 21*(1), 77-82.

Hagner, D., & Cooney, B. (2005). "I do that for everybody': Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities, 20*(2), 91-97, doi:10.1177/10883576050200020501.

Hartnett, H. P., Stuart, H., Thurman, H., Loy, B., & Batiste, L. C. (2011). Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation, 34*(1), 17-23.

Hendricks, D. (2010). Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation, 32*(2), 125-134.

Hernandez, B., Keys, C., & Balcazar, F. (2000). Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation, 66*(4), 4-16.

Hernandez, B., & McDonald, K. (2010). Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation, 76*(3), 15-23.

Hillier, A., Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A. K., Cherry, L., et al. (2007). Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals, 30*(1), 125-134.

Houtenville, A., & Kalargyrou, V. (2012). People with disabilities: Employers' perspectives on recruitment practices, strategies, and challenges in leisure and hospitality. [Article]. *Cornell Hospitality Quarterly, 53*(1), 40-52, doi:10.1177/1938965511424151.

Houtenville, A., & Kalargyrou, V. (2015). Employers' Perspectives about Employing People with Disabilities: A Comparative Study across Industries. [Article]. *Cornell Hospitality Quarterly, 56*(2), 168-179, doi:10.1177/1938965514551633.

IMB Corporation (2016). IBM SPSS statistics for Windows. (24.0 ed.). Armonk, New York: IBM Corporation.

Jacob, A., Scott, M., Falkmer, M., & Falkmer, T. (2015). The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. *Plos One, 10*(10), e0139896, doi:10.1371/journal.pone.0139896.

Ju, S., Roberts, E., & Zhang, D. (2013). Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation, 38*(2), 113-123.

Kaye, H., Jans, L., & Jones, E. (2011). Why Don't Employers Hire and Retain Workers with Disabilities? *Journal of Occupational Rehabilitation, 21*(4), 526-536, doi:10.1007/s10926-011-9302-8.

Kregel, J., & Tomiyasu, Y. (1992). General Scale: [Form B.] Joint project of the Rehabilitation Research and Training Center on Supported Employment at Virginia Commonwealth University. Richmond, Virginia: Richmond, Virginia, and Keio University, Tokyo, Japan.

Kregel, J., & Tomiyasu, Y. (1994). Employers' attitudes toward workers with disabilities. *Journal of Vocational Rehabilitation, 4*(3), 165-173, doi:10.3233/JVR-1994-4305.

Krieger, B., Kinebanian, A., Prodinger, B., & Heigl, F. (2012). Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work, 43*(2), 141-157, doi:10.3233/WOR-2012-1392.

Livermore, G., & Goodman, N. (2009). A review of recent evaluation efforts associated with programs and policies designed to promote the employment of adults with disabilities. Ithaca, NY: Cornell University, Rehabilitation Research and Training Center on Employment Policy.

Lorenz, T., & Heinitz, K. (2014). Aspergers - Different, Not Less: Occupational Strengths and Job Interests of Individuals with Asperger's Syndrome. *Plos One, 9*(6), doi:10.1371/journal.pone.0100358.

Luecking, R. G. (2008). Emerging employer views of people with disabilities and the future of job development. *Journal of Vocational Rehabilitation, 29*(1), 3-13.

Marchand, E., Stice, E., Rohde, P., & Becker, C. B. (2011). Moving from efficacy to effectiveness trials in prevention research. [Article]. *Behaviour Research and Therapy, 49*(1), 32-41, doi:10.1016/j.brat.2010.10.008.

Mawhood, L., & Howlin, P. (1999). The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism, 3*(3), 229-254, doi:10.1177/1362361399003003003.

McBride, N. (2016). *Intervention research: A practical guide for developing evidence-based school prevention programmes*. Singapore: Springer.

McConachie, H., Parr, J. R., Glod, M., Hanratty, J., Livingstone, N., Oono, I. P., et al. (2015). Systematic review of tools to measure outcomes for young children with autism spectrum disorder. [Article]. *Health Technology Assessment, 19*(41), 1-538, doi:10.3310/hta19410.

Morgan, R. L., & Alexander, M. (2005). The employer's perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation, 23*(1), 39-49.

Organisation for Economic Co-operation and Development (OECD) (2010). *Sickness, Disability and Work: Breaking the Barriers* (A synthesis of findings across OECD countries). Paris: OECD Publishing.

Portney, L. G., & Watkins, M. P. (2009). *Foundations of Clinical Research: Applications to Practice* (3rd ed.). Upper Saddle River: New Jersey: Pearson: Prentice Hall.

Qualtrics (2005). Qualtrics (November 2015 ed., Vol. 2015). Provo, Utah, USA: Qualtrics.

Rashid, M., Hodgetts, S., & Nicholas, D. (2017). Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities. [Article]. *Review Journal of Autism and Developmental Disorders, 4*(2), 165-173, doi:10.1007/s40489-017-0105-5.

Roux, A. M., Shattuck, P. T., Cooper, B. P., Anderson, K. A., Wagner, M., & Narendorf, S. C. (2013). Postsecondary employment experiences among young adults with an autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(9), 931-939, doi:http://dx.doi.org/10.1016/j.jaac.2013.05.019.

Russo, R. J. (1999). Applying a strengths-based practice approach in working with people with developmental disabilities and their families. [Article]. *Families in Society, 80*(1), 25-33.

Schneidert, M., Hurst, R., Miller, J., & Ustun, B. (2003). The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation, 25*(11-12), 588-595.

Schulz, K. F., Altman, D. G., & Moher, D. (2010). CONSORT 2010 Statement: updated guidelines for reporting parallel group randomized trials. *Open Medicine, 4*(1), e60-e68.

Scott, M., Falkmer, M., Girdler, S., & Falkmer, T. (2015). Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *Plos One, 10*(10), e0139281, doi:10.1371/journal.pone.0139281.

Scott, M., Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., et al. (2017). Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One, 12*(5), 1-16, doi:e0177607. https://doi.org/10.1371/journal.pone.0177607.

Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M. P., et al. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. [Article]. *Health Psychology, 35*(11), 1178-1188, doi:10.1037/hea0000387.

Smith, K., Webber, L., Graffam, J., & Wilson, C. (2004). Employer satisfaction with employees with a disability: Comparisons with other employees. *Journal of Vocational Rehabilitation, 21*(61-69).

Unger, D. (2002). Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities, 17*(1), 2-10, doi:10.1177/108835760201700101.

Unger, D. (2007). Addressing employer personnel needs and improving employment training, job placement and retention for individuals with disabilities through public-private partnerships. *Journal of Vocational Rehabilitation, 26*(1), 39-48.

Unger, D., & Kregel, J. (2003). Employers' knowledge and utilization of accommodations. *Work, 21*(1), 5-15.

United Nations (2006). Conventions on the rights of persons with disabiltieis and optional protocol. New York: United Nations.

Wantland, D. J., Portillo, C. J., Holzemer, W. L., Slaughter, R., & McGhee, E. M. (2004). The effectiveness of web-based vs. non-web-based interventions: A meta-analysis of behavioral change outcomes. [Review]. *Journal of Medical Internet Research, 6*(4).

Wehman, P., Schall, C. M., McDonough, J., Graham, C., Brooke, V., Riehle, J. E., et al. (2016). Effects of an employer-based intervention on employment outcomes for youth with significant support needs due to autism. *Autism*, 1-15, doi:10.1177/1362361316635826.

World Health Organization (2001). *International Classification of Functioning, Disability and Health*. Geneva: WHO.

Table 1. IEST^{TM} manual overview

Modules	Description	Resources included
Introduction	Information explaining the purpose of the IEST^{TM} manual, the potential benefits its use and instructions detailing as to how it should be used in work environments	Video tutorial links, IEST^{TM} navigation key
Information on autism	Information explaining autism across 5 domains: 1) understanding autism; 2) strengths of individuals on the autism spectrum; 3) autism in the workplace; 4) understanding potential workplace difficulties; and, 5) creating an inclusive work environment	Information only module
The employment process	The employment process explained, factors for successful employment, identifying the stages in the employment process and implementing the IEST^{TM} in the workplace	Employment process decision tree Tips for implementing the IEST^{TM}
Phase 1: Advertising the job	Guides the recruitment approach including strategies for, the job description, job advertising approach, reasonable adjustments and financial assistance	To-do list prior to recruitment checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites
Phase 2: The interview	Guides the interview process including modification strategies according to three stages, prior, during and follow-up after the interview. The module explores interview structure, questions, disclosure and accommodations	To-do list prior to the interview checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites Additional resources on disability disclosure

Table 1. Continued

Modules	Description	Resources included
Phase 3: Job commencement and placement	Guides the commencement and placement of a new employee on the autism spectrum in the workplace including strategies for, orientation and training, job expectations, productivity requirements, connecting with a supervisors/mentor, developing a support plan and employer financial assistance	To-do list prior to job commencement and placement checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites Additional resources on employer financial assistance and workplace training Support plan template
Phase 4: Workplace modification	Guides the workplace modification process according to the unique and specific needs of the employee on the autism spectrum. Work modification occurs across 5 environments: 1) sensory; 2) social; 3) communication; 4) activity and task; and 5) physical	To-do list prior to workplace modifications checklist Identifying potential difficulties checklist Completed checklist per environment modification area Links to useful and practical websites Workplace modification interactive decision chart Hygiene checklist Goal planner template Priority task planner template
Phase 5: Ongoing support	Guides the process of providing ongoing support, adjusting to the employee's specific needs and regularly re-evaluating the effectiveness of the current workplace modifications	To-do list for ongoing support checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites Stress/anxiety management strategies Re-evaluate support plan template Supervisor/mentor handover template

Table 2. Baseline demographic characteristics and employment-related variables by group

	Intervention group (*n*=43)	**Control group (*n*=41)**	**df**	**X^2**	***p*-value**
Biological sex			1	12.17	0.0005*
Male	30 (69.8%)	13 (31.7%)			
Female	13 (30.2%)	28 (68.3%)			
Age			2	3.19	0.2
21-34	7 (16.3%)	5 (12.2%)			
35-44	17 (39.5%)	10 (24.4%)			
45+	19 (44.2%)	26 (63.4%)			
Organisation size[a]			2	2.42	0.3
Small (1-49)	14 (32.6%)	10 (24.4%)			
Medium (50-250)	12 (27.9%)	9 (22.0%)			
Large (>250)	15 (34.9%)	22 (53.7%)			
Job title [1]			2	3.39	0.18
Manager	21 (48.8%)	16 (39.0%)			
Supervisor	12 (27.9%)	8 (19.5%)			
Colleague	9 (20.9%)	16 (39.0%)			
Previous experience with employees with a disability			1	1.68	0.19
Yes	17 (39.5%)	22 (53.7%)			
No	26 (60.5%)	19 (46.3%)			
Experience supporting employees on the autism spectrum[a]			3	3.97	0.27
Less than year	13 (30.2%)	6 (14.6%)			
1-2 years	11 (25.6%)	9 (22.0%)			
3-4 years	5 (11.6%)	9 (22.0%)			
More than 4 years	12 (27.9%)	14 (34.1%)			
Number of employees on the autism spectrum currently being supported[a]			2	1.91	0.39
1	20 (46.5%)	15 (36.6%)			
2-3	7 (16.3%)	7 (17.1%)			
4+	8 (18.6%)	13 (31.7%)			
Hours of support provided per week			1	0.14	0.71
0-9[c]	34 (79.1%)	31 (75.6%)			
≥10	9 (20.9%)	10 (24.4%)			
Receive Disability Employment Service support[a]			1	2.41	0.12
Yes	18 (41.9%)	24 (58.5%)			
No	24 (55.8%)	16 (39.0%)			

Note. [a] Excludes missing cases; [b] Calculated using Fisher's Exact test; [c] Support provided may approximately be equivalent to 1 full day of work; *p<0.05

Table 3. Intention-to-treat analysis for self-efficacy and workplace attitudes

Variables	**Intervention group (*n*=43)**					**Control group (*n*=41)**					
	Baseline		Post-test		*p*-value (*within*)	Baseline		Post-test		*p*-value (*within*)	*p*-value (*between*)
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		
Total *ESES* scores	127.91	41.96	137.40	34.39	0.016*	139.71	36.80	143.27	31.43	0.41	0.42
Total *SATWD* scores	103.51	12.98	104.67	10.97	0.43	104.59	12.34	104.41	12.24	0.91	0.92

Note: ESES: Employer Self-Efficacy Scale; SATWD: The Scale of Attitudes Toward Workers with Disabilities; SD: Standard deviation; *p<0.05

Figure Captions

Figure 1. Flow of participants through the trial