Managing Challenging Behaviour using Applied Behavioural Analysis and Positive Behavioural Support in Forensic Settings: A Systematic Review

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Abstract

Applied Behavioural Analysis (ABA) and Positive Behavioural Support (PBS) are frequently reported in the literature as successful interventions to reduce challenging behaviour. However, there has been no comprehensive review of the effectiveness of ABA and PBS within forensic settings. The purpose of this review was to systematically examine and synthesise existing research to investigate the effectiveness of ABA and PBS in forensic settings, and to identify any potential barriers and facilitators associated with implementing PBS.

Databases including PsychINFO, PsychARTICLES, Medline, CINAHL Plus with Full Text, Criminal Justice Abstracts, were searched. ABA/PBS journals in the field were targeted with ancestry searches conducted to identify relevant articles. The methodological quality of studies was assessed using the Mixed Methods Appraisal Tool.

Searches resulted in 29 articles that met the specific inclusion criteria. Findings indicated that behavioural modification techniques and behavioural analysis have been implemented within forensic settings with some degree of success. Although several challenges to the implementation of PBS were highlighted (e.g., barriers to collaborative work, inconsistent practice and a lack of resources). However, current research is limited and generally of poor methodological quality, significantly reducing our ability to understand the effectiveness of ABA and PBS in forensic settings.

Introduction

Traditional methods of managing challenging behaviour within forensic services (i.e., prison, probation or forensic inpatient services) include the use of restraint, seclusion, and sedative medication (Kynoch, Wu, & Chang, 2011). However, these methods have been criticised for being aversive, unethical, ineffective and 'counter-therapeutic' (Allen, James, Evans, Hawkins, & Jenkins, 2005; Riahi, Thomson, & Duxbury, 2016). In addition, a number of scandals in the UK concerning the abuse of people with intellectual and other developmental disabilities have highlighted the need for reform (e.g., Winterbourne View, BBC News, 2012; Whorlton Hall, BBC News, 2019). Consequently, a number of policies and guidelines have been released that aim to reduce the use of restrictive practices across health and social care services (e.g., Building the Right Support, 2015; Ministry of Justice, 2013; Transforming Care, 2012). Services are encouraged to manage challenging behaviours through the implementation of Positive Behavioural Support (PBS; Department of Health, 2014). Furthermore, services are evaluated on their ability to effectively implement PBS, for example the Care Quality Commission (CQC) obtains evidence of the use of PBS to manage challenging behaviour in a provider's strategy, policy, and procedures. Evidence is sought from service-user care records, observations, records of staff activity, discussions with staff, as well as records of audits, monitoring, staff training, and supervision (CQC, 2017).

PBS evolved from ABA in the 1980s and 1990s as an approach with a specific focus on enhancement of quality of life along with minimizing the occurrence of challenging behaviour (Carr et al., 2002). ABA emphasises the importance of understanding the antecedents and consequences of behaviour and uses reinforcement to encourage behaviour change (Kazdin, 2002). The core concepts of ABA have been historically used within forensic settings to implement token economy programmes, whereby tokens are earned and exchanged for rewards (e.g., Kazdin, 1982). However, ethical issues have been raised, for

example, the withholding of commodities during a token economy programme (e.g., Begelman, 1975).

In the UK, PBS has been defined as a: "Multi-component frame-work for (a) developing an understanding of the challenging behaviour displayed by an individual, based on an assessment of the social and physical environment and broader context within which it occurs; (b) with the inclusion of stakeholder perspectives and involvement; (c) using this understanding to develop, implement and evaluate the effectiveness of a personalised and enduring system of support; and (d) that enhances quality of life outcomes for the focal person and other stakeholders" (Gore et al., 2013, p15). PBS emphasises the importance of teaching individuals adaptive behaviours to replace the challenging behaviours in a non-punitive way, thereby having a positive impact on service-users' quality of life (LaVigna & Willis, 2012). Unlike ABA, PBS is considered to adopt a more holistic and systematic approach (Carr et al. 2002).

Individuals in forensic settings have complex social, emotional, and behavioural needs, which require specialist support (Alexander et al., 2016). Support and intervention for offending behaviour is vital for reducing risk, promoting rehabilitation, and facilitating opportunities for discharge. However, individuals in secure settings, including those with intellectual and developmental disabilities, spend the majority of their time not engaging in criminal offending but may well continue to engage in challenging behaviour, and it is these behaviours which can be problematic for the individuals themselves and the staff supporting them (Wardale et al., 2014). Thus, within a secure environment for those individuals whose behaviour means they may be at risk of committing criminal offences, specialist support and intervention is required for both offending behaviour itself and other challenging behaviour which may occur during an individual's stay (Barnoux & Langdon, *in press;* Wardale et al., 2014).

Within this context, current UK policy guidance advocates the use of Positive Behaviour Support (PBS) as part of a model of care based on proactive and preventative strategies for managing behaviours that challenge for vulnerable people within various settings, including those who are in secure forensic care (Department of Health, 2014; National Offenders Management Services (NOMS), 2013; NICE., 2015a; NICE., 2015b; Social Care, Local Government and Care Partnership Directorate., 2014). However, research conducted to date has predominantly focused on evaluating the effectiveness of PBS in reducing challenging behaviour in people with intellectual disabilities and in educational settings with children (e.g., Heyvaert et al. 2012, Chitiyo et al., 2011). Consequently, it has been argued PBS is being implemented within forensic settings with limited evidence pertaining to its effectiveness (Tolisano, 2017). Furthermore, requirements to provide a therapeutic environment that promotes rehabilitation and facilitates effective treatment within a forensic setting may be more challenging for staff who also have to manage risk and ensure the safety and security of themselves, service-users, and the community (Brunt & Rask, 2005).

The current systematic review was conducted to explore the existing literature on the implementation of ABA and PBS in forensic settings. Debate continues as to whether ABA and PBS are one in the same or distinctive approaches (e.g., Johnston et al., 2006). Therefore, to ensure a comprehensive review of the literature, both terms were included. The aim was to address the following research questions: 'What does the evidence tell us about the effectiveness of ABA and PBS in forensic settings?' and 'What are the barriers to implementing PBS in forensic settings?'

Aims

The specific aims of the systematic review were to:

- Determine the effectiveness of ABA and PBS in forensic settings.
- Identify the barriers associated with implementing PBS in forensic settings.

Method

Design

Following the PRISMA framework (Moher et al., 2010), a systematic review of the research on ABA and PBS in forensic settings was conducted, incorporating quantitative and qualitative data. Database and ancestry searches resulted in 29 articles that met the inclusion criteria. Data was extracted and a quality assessment was conducted using the Mixed Methods Appraisal Tool (Hong et al., 2018; 2019). There are five criteria for appraising studies and ratings vary from 0* (none of the criteria are met) to 5* (all of the criteria are met).

A data extraction template was used to record relevant information under the following headings: title, author, year of publication, country, aims, sample, study design, measures, main findings. The quantitative and qualitative findings are then summarised thematically according to those that evaluated an ABA/PBS intervention and those that evaluated staff training.

Search Strategy

A systematic search of the literature was conducted by the 1st author on 7th January 2021 using electronic databases (PsychINFO, PSYCHarticles, MEDLINE, CINAHL Plus with Full Text, and Criminal Justice Abstracts). The search terms are provided in Table 1. Ancestry searches were also conducted, as were specific searches in relevant journals (i.e., International Journal of Positive Behavioural Support, Journal of Applied Behavioural

Analysis, Behavior Modification, Behavior Analysis in Practice, European Journal of Behavior Analysis, Behavior Analyst, Behavior Therapy, Behavioral Interventions and Journal of Positive Behavioural Interventions).

Table 1
Search Terms

Applied Behavioural Analysis Terms	**Forensic Settings Terms**
ABA	forensic
applied behav* analysis	secure hospital
positive behav* intervention	prison
positive behav* support	probation
PBS	custod*
	crim*

Inclusion Criteria

This review aimed to consolidate and evaluate the current research on ABS and PBS in forensic settings. Articles were reviewed to ensure they met the following inclusion criteria:

- Published in English
- Empirical research (i.e., published or unpublished articles that include primary or secondary data)
- Research is conducted in a forensic setting (i.e., a community forensic service, a secure inpatient setting, probation service, or prison establishment)

Articles were excluded if:

- They were not published in English

- Were non-empirical (i.e., book, book chapter, commentary, magazine, abstract only, letter, literature review, descriptive case study).
- The article did not specifically refer to ABA or PBS.

Identification of studies

The initial search resulted in 5,094 articles being identified. After duplicates were removed, 4,852 titles and abstracts were reviewed against the eligibility criteria and 4,802 articles were excluded. One full text article could not be located, but 49 full text articles were further reviewed against the eligibility criteria resulting in 29 articles being included in the review (see Fig. 1).

Data Extraction

Table 2 provides a summary of the key characteristics of the 29 articles included in the review (i.e., aims, sample, research design, intervention, measures, main findings, and MMAT rating). Authors of 20 studies used quantitative research designs, including cohort studies (e.g., Edgemon et al., 2020; McDougale et al., 2019; O'Rourke et al., 2019), quantitative non-randomised controlled trials (e.g., Davies et al., 2015; Hobbs & Holt, 1976; Lawson et al., 1971), and quantitative randomised controlled trials (e.g., Burkhart et al., 1976; Davies et al., 2019; Maley et al., 1973). Authors of six studies used qualitative research designs (e.g., Hughes & Davies, 2018; Karger et al., 2018). Authors of three studies used a single case report design (Dodds et al., 2015; Foxx et al., 1980; Langdon et al., 2017). Authors of one study used a mixed methods approach conducting both semi-structured interviews and a short questionnaire (Panczak et al. 2015).

Authors of 18 articles focused on the implementation and evaluation of interventions for service-users that were grounded in ABA. Token economy programmes were

implemented and evaluated in 10 studies (Bassett et al. 1975; Bassett & Blanchard, 1977; Foxx et al. 1980; Hobbs & Holt, 1976; Lawson et al. 1971; Losada-Paisey & Paisey, 1988; Maley et al. 1973; Milan & McKee, 1976; Nelson & Cone, 1979; Seymour & Stokes, 1976), and tolerance training, group contingencies, and behavioural skills training were implemented and evaluated in a further three studies (Brogan et al. 2019; Edgemon et al. 2020; McDougale et al. 2019). Authors of four studies evaluated staff training packages focused on antecedents and behaviour modification (Burkhart et al. 1976; Jones et al., 2001; Luna & Rapp, 2020; Stumphauzer et al., 1976). Authors of 11 articles focused on the evaluation of PBS training or intervention (Davies et al. 2015; 2016a; 2016b; 2019; Dodds et al., 2015; Houchins et al. 2015; Hughes & Davies., 2019; Karger et al., 2018; Langdon et al., 2017; Panczak et al., 2015; Wardale et al., 2014).

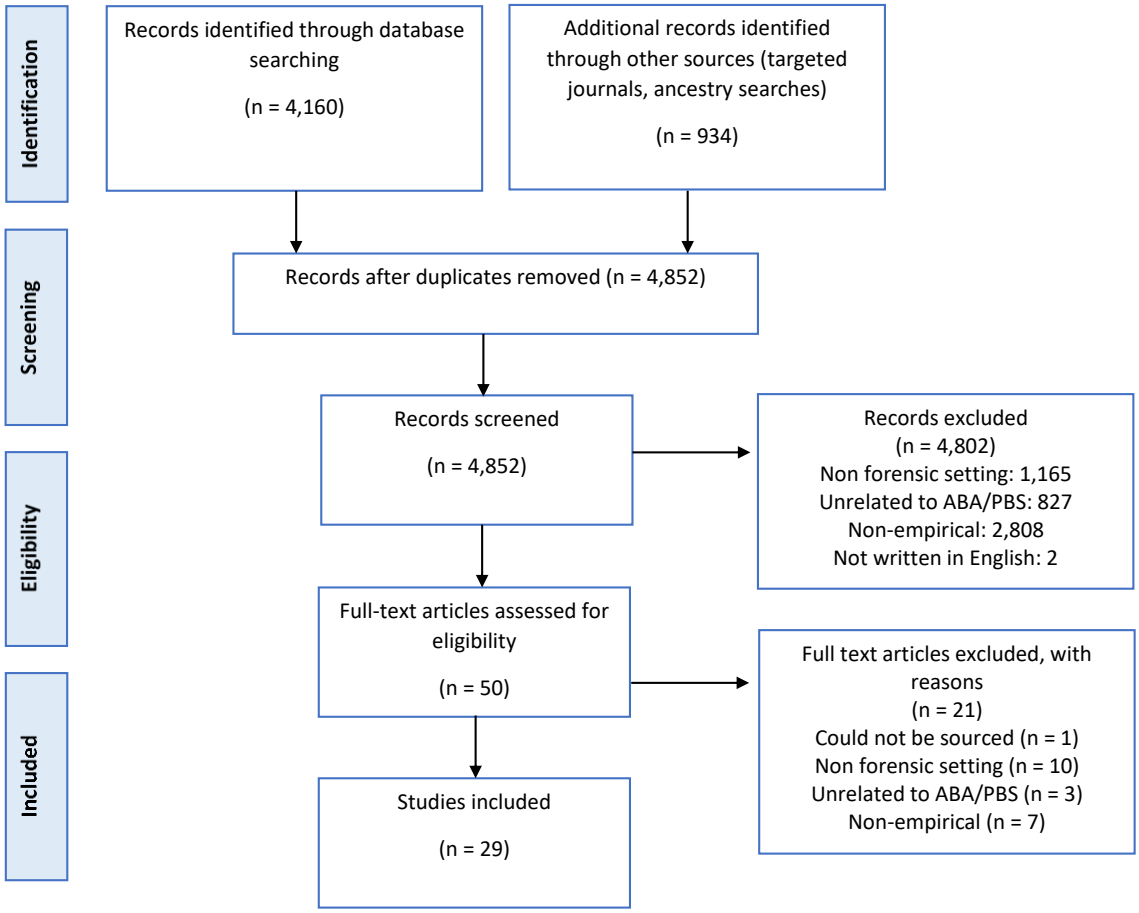

Figure 1: PRISMA chart of search results.

Results

Quality Appraisal

Each study underwent a standard critical appraisal process using the Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018; 2019) by the first author. An independent rater appraised the methodological quality of 20% of all included articles. Inter-rater reliability on the quality appraisal ratings was 89%. Any disagreements were resolved through discussion and standards set were applied to all studies included. Studies were appraised based on four areas relating to the appropriateness of methodology, data analysis techniques and data

collection techniques, the representativeness of the sample, reliability of outcome data, and the researchers' interpretation of research findings (see Appendix. A). Of the 29 studies included in the review, 3.4% were rated 0*, 17.2% were rated 1*, 10.3% were rated 2*, 3.45% rated 3*, 24.1% rated 4*, and 10.3% rated 5*. The majority of research took a quantitative non-randomized approach. Common methodological limitations of included studies were: (i) unrepresentative samples in which study outcomes were likely to be influenced by the characteristics of the participants and the service from which they were recruited (e.g., Bassett et al., 1975; Dodds et al., 2015; Edgemon et al., 2020; Foxx et al., 1980; Langdon et al., 2017; Wardale et al., 2014), (ii) the use of inappropriate outcomes measures, whereby variables indicative of the effectiveness of PBS, quality of life and the frequency of challenging behaviour were not robustly measured (e.g., Davies et al., 2015; Davies et al., 2016a; Lawson et al., 1971), (iii) missing data (e.g., Davies et al., 2016a; Edgemon et al., 2020; Hobbs & Holt, 1976; Milan & McKee, 1976; O'Rourke et al., 2019), and (iv) a risk of confounding variables not accounted for in the design or analysis of the study (e.g., Davies et al., 2015; Davies et al., 2016a; Lawson et al., 1971, Milan & McKee, 1976; Wardale et al., 2014).

The quality of included studies was limited somewhat, as demonstrated by only three studies being designed as a randomised controlled study (RCT), although assessors were not blind to the intervention provided (e.g., Burkhart et al. 1976; Davies et al., 2019; Maley et al., 1973). The quality of studies which took a qualitative approach were generally rated highly, although three qualitative studies did not meet all five criteria of the MMAT (Houchins et al., 2005; Panczak et al., 2015; Stumphauzer et al., 1976). Furthermore, the findings that can be drawn from the qualitative studies are limited in their reliability, validity and generalisability. The range of settings from which participants were recruited was limited with five studies conducted within the same medium secure service (Davies et al., 2015; 2016a; 2016b; 2019;

Hughes & Davies, 2018). In addition, the majority of studies were conducted in the US where local laws and policy differ from those of other countries. Furthermore, limited demographic and background information concerning participants was reported, making findings difficult to compare (e.g., age, diagnosis, cognitive functioning, offending history). Overall, the research lacks ecological validity and no long term follow up of participants was conducted to ensure changes in behaviour were maintained over time.

Table 2

Characteristics of included studies

Author. (Date). Title	Aim	Sample	Design	Intervention	Measures	Main Fi
1. Bassett et al. (1975). Applied behaviour analysis in a penal setting: Targeting free world behaviours.	To increase adaptive "free world" behaviours among male prisoners in a penal setting.	Total: 39 prisoners Gender: Male Age: 18-34 (M = 22.5) Ethnicity: White 23-50% White (M = 33%) Setting: Prison (minimum security)	Quantitative cohort study. ABAB design for 2 studies: (1) 3 conditions (baseline, instructions, instructions and noncontingent quiz/contingent quiz) (2) baseline attendance, attendance when bonus points paid.	Token economy	Percentage of time watching television news (observation). Number of correct responses on a quiz. Attendance at a remedial education centre.	Study 1: other rein responses news wat Study 2: attendanc Token ec for both s
2. Bassett & Blanchard. (1977). The effect of the absence of close supervision on the use of response cost in a prison token economy.	To evaluate the impact of supervision on the implementation of a behavioural management program using reinforcement.	Total: 39 offenders, ranging between 7-19 (M = 13). Gender: Male Age: 18-34 (m = 22.5) Ethnicity: 23-50% White (M = 33%) Same sample as Bassett et al. (1975) Setting: Shelby County Penal Farm	Quantitative descriptive.	Token economy.	Number of points earned and response costs	In the abs aversive increased
3. Brogan et al. (2019). Behavioural Skills Training to Increase Appropriate Reactions of Adolescent Males in Residential Treatment.	To use behavioural skills training to teach adolescents to respond appropriately to staff directives.	11 adolescents Gender: Male Age: 14-18 years (M = 15.6) Ethnicity: NR Settings: Secure residential facility for adolescents	Quantitative non-randomised study. Four tiered nonconcurrent multiple baseline design across students and several A-B designs.	Behavioural Skills Training	Percentage of trials with appropriate reactions.	All 11 ad trials wit high perc reactions sessions.
4. Burkhart et al. (1976). Training juvenile probation officers in behaviour modification: Knowledge, attitude change, or behavioural competence?	To evaluate a training program in behaviour modification, Principles of Behaviour Therapy (Stumphauzer, 1974) delivered to probation officers.	Experimental group: 9 probation officers who received training. Control group: 9 probation officers who received no training. Age: NR Gender: NR Ethnicity: NR Setting: Juvenile probation service	Quantitative randomised controlled trial	Staff training in behaviour modification	Measure of knowledge (30 item multiple choice test adapted from Becker (1971). Measure of attitudes toward behaviour modification Behavioural competence measure of the effectiveness of the training.	No signif experime knowledg modifica competer were trai
5. Davies et al. (2015). Changes in staff confidence and attributions for challenging behaviour after training in	To measure the effectiveness of PBS training, confidence in managing challenging behaviour and	79 staff (60 nurses, 2 student nurses, 5 occupational therapists, 4 clinical psychologists, 4 assistant psychologists) Gender: 35 males, 44 females Age: NR Ethnicity: NR	Quantitative non-randomised control trial. Repeated measures.	PBS staff training	Pre- and post-training: Confidence in Coping with Patient Aggression Instrument (Thackrey, 1987) -	Staff con behaviou by trainin forensic

positive behavioural support within a forensic medium secure service.	attributions for causality, control, and stability before and after training.	Setting: Forensic mental health setting (medium secure service)			Challenging Behaviour Attributions Scale (Hastings, 1997) Causal Dimension Scale II (McAuley et al., 1992).	
6. Davies et al. (2016a). Changes in staff confidence and attributions for challenging behaviour after training in positive behavioural support, within a forensic mental health setting: a replication study with follow-up.	To assess the effectiveness of PBS training by measuring changes to staff confidence and attributions for challenging behaviour before training, post training and at six-month follow up.	117 staff Gender: 45 male, 69 female staff Age: 20-64 years (M = 38) Ethnicity: NR Setting: Forensic mental health setting (medium secure service)	Quantitative non-randomised controlled trial. Repeated measures.	PBS staff training.	Pre, post training and at 6-month follow up: Confidence in Coping with Patient Aggression Instrument (Thackrey, 1987) Challenging Behaviour Attributions Scale (Hastings, 1997) Causal Dimension Scale II (McAuley et al., 1992).	Staff con challengi training, month fo male, and for challe training; at follow
7. Davies et al. (2016b). 'Supporting me through emotional times, all different kinds of behaviour' Forensic mental health service users understanding of positive behavioural support.	To explore service-users' experiences of positive behavioural support within a medium secure mental health service.	10 service-users Gender: Male Age: 18-60 Ethnicity: NR Diagnosis: Paranoid schizophrenia (n = 8), emotionally unstable personality disorder (n = 2), antisocial personality disorder (n = 2), bipolar affective disorder (n = 1), other psychosis related disorder (n = 1) Setting: Forensic mental health setting (medium secure service)	Qualitative Phenomenological	PBS	Semi-structured interviews	Four mai (Understa days, bac How I un Accessib PBS has my behav and (4) M the plan; Impleme
8. Davies et al. (2019). An evaluation of the effectiveness of positive behavioural support within a medium secure mental health forensic service.	To evaluate the impact of PBS in a medium secure forensic mental health service.	Total: 39 service users Gender: 28 males, 11 females Age: 20-79 years (M = 36.5) Ethnicity: NR Diagnosis: Borderline personality disorder (n = 11), Antisocial personality disorder (n = 11), Bipolar affective disorder (n = 4), depressive mood disorder (n = 4), schizophrenia (n = 23), schizoaffective disorder (n = 4), Delusional disorder (n = 1) Setting: Forensic mental health setting (medium secure service)	Quantitative randomised control trial. Intervention full group (n = 22): 5 participants discharged 6 months post implementation of PBS intervention. Intervention sub-group (n = 17) Control group (n = 17).	PBS	Measures obtained on four occasions for treatment groups and two occasions for the control group: An adapted version of the Checklist of Challenging Behaviour (Harris et al., 1994).	Significa managem challengi managem challengi months f sub-grou challengi There we challengi
9. Dodds et al. (2015). The application of a positive behavioural support framework in a low secure adolescent inpatient unit.	To present outcome data for a young person where a PBS framework was utilised to inform assessment and intervention. To evaluate the effectiveness and impact of skills teaching on the young person's quality of life.	1 service-user Gender: Male Age: 16 Ethnicity: NR Diagnosis: Autism spectrum disorder, attention deficit hyperactivity disorder, moderate/severe intellectual disability Setting: Low secure adolescent inpatient setting	Quantitative descriptive. Single case study.	PBS	Functional Assessment	Reductio evident a admissio of coping including skills. A seclusion access to life. The PBS a low sec
10. Edgemon et al. (2020). Behavioural skills training to increase interview skills of adolescent males in a juvenile	To evaluate the extent to which Behavioural Skills Training improved interview skills for adolescents who had been	7 adolescents Gender: Male Age: 16-20 years Ethnicity: NR Setting: Juvenile residential treatment facility	Quantitative cohort study. Multiple baseline design.	Behavioural Skills Training	Behaviour scored by observers as appropriate/ inappropriate. Frequency of appropriate questions.	Behaviou appropria 4 student modifica prompts) questions Behaviou appropria

residential treatment facility.	convicted for sexual offenses.					smiling, students.
11. Foxx et al. (1980). Twenty-Four Hour Social Isolation: A Program for Reducing the Aggressive Behaviour of a Psychotic-Like Retarded Adult.	To evaluate a treatment program designed to reduce one resident's violent behaviour.	1 service-user Gender: Male Age: 23 Diagnosis: 'severely retarded', psychosis Setting: Forensic psychiatric inpatient service	Quantitative. Single case study.	Token economy	Target behaviours (aggression towards others, self & property recorded on a coded observation form. Social interactions and activities withheld for a period of 24 hours when target behaviours displayed. Tokens for appropriate behaviour provided positive reinforcement.	Aggressi baseline program occurred was 1.9- reduced. isolation isolated 6
12. Hobbs & Holt. (1976). The effects of token reinforcement on the behaviour of delinquents in cottage settings.	To evaluate the effects of a token economy in the cottage program of an institution for delinquent boys.	125 adolescents Gender: Male Age: 12-15 years (M = 14.3) Ethnicity: 65% black, 35% white Diagnosis: 30% mild/moderately intellectual disability, 42% borderline intellectual disability Setting: A state correctional institution	Quantitative non-randomized controlled trial. Multiple-baseline design in 3 independent cottages; a 4th group served as a comparison cottage.	Token economy	Data were collected over 14 months: Appropriate behaviour measured using observations of social behaviour (peer interaction), rule following, and task completion. Boys rated on the daily behaviour chart.	Appropri program
13. Houchins et al. (2005). Stakeholders' view of implementing positive behavioural support in a juvenile justice setting.	To provide data on the implementation of PBS in a juvenile justice setting.	Total: 22 staff (6 administrators, 9 teachers & 7 clinical staff) Gender: 8 males, 14 females Age: 26-63 years (M = 45.9) Ethnicity: NR Setting: Juvenile justice setting	Qualitative. Grounded Theory	PBS	3 focus groups with administrators, teachers, & clinical staff.	Eight int issues to juvenile congruen shift and (5) consi based de outcomes
14. Hughes & Davies. (2018). Developing a ward ethos based on Positive Behavioural Support within a forensic mental health 'psychiatric intensive care unit'.	To co-produce a ward ethos founded upon the PBS model.	6 service-users Gender: 1 female, 5 males Age: 35-54 years Ethnicity: 5 White British, 1 mixed British Diagnosis: Psychosis (n = 6), personality disorder (n = 3) 14 staff Gender: 12 male, 2 females Age: NR Ethnicity: 13 White British, 1 Asian Setting: Medium Secure Forensic Mental Health Psychiatric Intensive Care Unit	Qualitative. Thematic analysis	PBS	Semi-structured interviews with service-users Focus Groups with staff	Several a PBS moc challengi frustratio related to interactic behaviou personal primary p to detenti awarenes escalatio modifyin resources us in a cr
15. Jones et al. (2001). Teaching social-learning procedures to paraprofessionals working with individuals with severe mental illness in a maximum-security forensic hospital.	To train staff to implement a behavioural rehabilitation program.	9 Staff Gender: 5 male, 4 females Age: 29-60 years (M = 45.61) Ethnicity: NR Setting: Maximum security psychiatric facility	Quantitative non-randomised. Cohort study	Staff training in facilitating a behavioural rehabilitation program	Observational assessment. The Staff-Resident Interactive Chronograph (Paul, 1988)	Followin staff wer with clie lower rat much mo reflective
16. Karger et al. (2018). Staff perceptions of positive behavioural support in a	To identify how staff within a secure forensic mental health setting perceived	11 staff (2 mental health nurses, two ward managers, 2 healthcare support workers, 1 psychiatrist, 1 occupational therapist, 1 occupational therapist technician,	Qualitative. Thematic analysis	PBS	Semi-structured interviews	PBS tran and is ge There are impleme identifie (Providin

secure forensic adult mental health setting.	the application of PBS.	1 specialist trainee in psychiatry, 1 clinical psychologist) Gender: 5 males, 6 females Age: 18-60 years Ethnicity: NR Setting: NHS Secure forensic mental health setting				escalatio individua positive a approach approach (Engager variables Resistanc issues (M Resource
17. Langdon et al. (2017). Using positive behavioural support as a treatment for trauma symptoms with a man with intellectual disabilities.	To describe the case of a man with intellectual disabilities, trauma symptoms and challenging behaviour, drawing on positive behavioural support as the mechanisms for the delivery of treatment.	1 service-user with intellectual disabilities who had a history of early trauma. Gender: Male Age: Adult Ethnicity: NR Setting: Forensic mental health inpatient setting	Descriptive case report	PBS plan, including psychological therapies & medication	Number of incidents of serious aggression per month	Challeng eventuall with an i activities symptom
18. Lawson et al. (1971). Token economy program in a maximum-security correctional hospital.	To implement a token economy program in a correctional hospital.	41 low functioning service users Gender: Male Age: M = 47 years Ethnicity: NR Diagnosis: Schizophrenic (n = 36), paranoid type (n = 23), chronic undifferentiated schizophrenics (n = 7), hebephrenic (n = 3), mixed type (n = 3), psychotic with psychopathic personality (n = 5) Setting: Maximum security forensic inpatient facility	Quantitative non-randomized controlled trial	Token economy	Attendance at sessions outlined on activity schedule.	Behaviou reinforce reinforce effective security c
19. Losada-Paisey & Paisey. (1988). Program evaluation of a comprehensive treatment package for mentally retarded offenders.	To evaluate a behaviourally engineered residential treatment program for adults detained in a forensic psychiatric inpatient unit for adults with low IQ.	7 service-users with low IQ and offending behaviour Gender: Male Age: 20-41 years Ethnicity: NR Setting: Forensic psychiatric inpatient hospital	Quantitative Descriptive	Academic and vocational training, sex education, a unit token economy & individual behaviour therapy.	Inappropriate behaviour measured using staff observation. Treatment outcome assessed on social-sexual knowledge, monitoring of overt paraphilic behaviours across settings and participant self-monitoring of deviant and age-appropriate heterosexual fantasy resulting in sexual arousal. The "Stacking the Deck" (Foxx * McMorrow, 1983) game was used to evaluate participant aptitude in responding appropriately to a variety of social and sexual stimuli and to monitor skills acquired during sex education.	The beha needs of gains are or be ma to treatm unsuperv activities supervise job site a supervise and had 3 communi and 1 par unit staff having ac progress targets.
20. Luna & Rapp. (2020). Increasing Praise Delivery Within Dorms of a Juvenile Justice Facility.	To examine the extent to which an antecedent-based staff-training package would increase staff	Experimental groups = 25 staff working with male residents aged 16-21. Comparison group (n = unknown) working with 12 residents. Gender: NR Age: Above 21 years	Quantitative non-randomised study. Nonconcurrent multiple baseline design.	Antecedent based staff training	Rate of staff attention delivery to residents, instructional delivery, and praise delivery, negative attention delivery,	Staff mer residents Antecede members three gro following compared

	members' praise delivery.	Ethnicity: NR Setting: Juvenile justice facility			reprimands, appropriate behaviour of residents	disruptiv than the
21. Maley et al. (1973). Evaluation of patient improvement in a token economy treatment program.	To investigate improvement in chronic mental patients who were assigned to a token economy treatment ward compared to a control group.	Total: 40 service-users Gender: Female Age of experimental group (n = 20, M = 37.5 years). Age of control group (n = 20, M = 36 years). Ethnicity: NR Diagnosis: Schizophrenia (n = 40) Setting: Psychiatric inpatient unit	Quantitative randomised controlled trial	Token economy	Standardised interview composed of 5 tasks. Behaviour rated using a 20-item questionnaire of which 12 items taken from the MACC Behavioural Adjustment Scale (Form II; Ellsworth, 1971)	Participa intervent in makin discrimin comman cooperati desirable less psyc
22. McDougale et al. (2019). Group procedures for decreasing problem behaviour displayed by detained adolescents.	Study 1: To evaluate the extent to which programmed staff check-ins decreased problem behaviour. Study 2: To evaluate the effects of group contingency on increasing appropriate line waking (the target problem behaviour) during transition periods.	Study 1: 6-12 (M = 7.45) detained adolescents convicted for illegal sexual behaviour. Gender: Male Age: 13-16 years Ethnicity: 50% White, 50% Black. Study 2: 8-12 students (M = 11) detained adolescent male students Gender: Male Age: 13-16 years Ethnicity: NR Setting: Secure residential treatment setting.	Quantitative. Cohort study. Study 1: A-B Design. Study 2: Variation of a changing criterion design combined with a modified reversal design.	Group contingencies Study 1: A-B design Study 2: A variation of a changing criterion design combined with a modified reversal design	Study 1: Observations-data collected on horse playing, inappropriate vocals, and staff check-ins. Observers scored problem behaviour. Study 2: Observations of appropriate line walking and vocalizations during transitions.	Study 1: detained impleme Study 2: appropria adolesce
23. Milan & McKee. (1976). The cellblock token economy: Token reinforcement procedures in a maximum-security correctional institution for adult male felons.	To explore the application of token reinforcement procedures in a maximum-security correctional institution for adult male felons and to determine to what extent the reinforcement procedures disrupted the day-to-day lives of inmate participants.	56 offenders Gender: Males Age: 16-54 years (M = 23.6) Ethnicity: White (n = 3), Black (N = 24) Setting: Maximum security state institution	Quantitative non-randomised.	Token economy	Behaviour Observation Checklist	The comb reinforce combinat award or institutio performa reinforce subjectin form of i intercour recreatio
24. Nelson & Cone. (1979). Multiple-baseline analysis of a token economy for psychiatric inpatients.	To evaluate the effectiveness of a token economy on 12 target behaviours categorised as personal hygiene, personal management, ward work and social skills.	16 psychiatric inpatients Gender: Males Age: 19-61 years (M = 44.5) Ethnicity: NR Diagnosis: Psychosis (n = 13), 'mentally retarded' (n = 3) Setting: Locked forensic inpatient psychiatric hospital	Quantitative non-randomised. Cohort study. Multiple Baseline design	Token economy	Treatment variables monitored (prompting, token delivery, token store operation). Target behaviour (personal hygiene, personal management, ward work, social skills) rates, levels of global individual functioning, general ward behaviour, off ward behaviour assessed.	Abrupt a of most t improver positive increases activities
25. O'Rourke et al. (2019). Tolerance training with adolescents in a residential detention facility.	To evaluate the effects of a procedure to increase tolerance of aversive situations for four adolescents who were receiving	4 adolescents adjudicated for illegal sexual behaviour. Gender: Males Age: 12-18 years (M = 14.75) Ethnicity: NR Setting: Residential juvenile detention facility	Quantitative non-randomized study. Single subject experimental design Trial-based changing criterion designs embedded in two-tiered	Tolerance Training	Latency to intolerance measured in seconds.	Tolerance ability to

	treatment for sexual offences in a residential detention facility.		nonconcurrent multiple baselines across participants designs			
26. Panczak et al. (2015). Evaluation of the Positive Behavioural Support model with female forensic inpatients.	To conduct a service evaluation of the Positive Behavioural Support model with female forensic inpatients.	20 staff (Care Assistants & Nurses) Gender: NR Age: NR Ethnicity: NR Setting: Low secure female forensic mental health hospital	Mixed methods. Thematic analysis	PBS	Semi-structured interviews and a short evaluation form (five-point Likert scale) rating six statements about PBS.	Staff rep impact a address c approach have a pe disabiliti
27. Seymour & Stokes. (1976). Self-recording in training girls to increase work and evoke staff praise in an institution for offenders.	To increase work and comments that evoked staff praise during vocational training sessions in a maximum-security institution for offenders.	4 adolescents Gender: Female Age: 14-17 years (M = 15.25) Ethnicity: NR Setting: Forensic maximum-security institution	Quantitative non-randomized Multiple baseline design	Token economy	Observations: Participant behaviour classified according to 5 categories (work, interrupted work, non-work, cues, attention). Staff behaviour classified according to 3 categories (praise, attention, & no response)	Work an recording evoked h and staff short foll given for failed to participa was term
28. Stumphauzer et al. (1976). A follow-up of probation officers trained in behaviour modification	To determine to what extent behaviour modification was being utilized in day-to-day casework, and what changes in the training or in the probation department would have to be made to fully utilize behaviour modification principles.	9 probation officers Setting: Probation service for juveniles Sample recruited from Burkhart et al. (1976)	Qualitative	Staff training in behaviour modification	Interviews	7 reporte in their d had been the traini officers c Use of po contracti was usefu involved behaviou emphasis familiaris supervisc existing t the appro trainers v
29. Wardale et al. (2014). Positive behavioural support training in a secure forensic setting: the impact on staff knowledge and positive behavioural support plan quality.	To evaluate staff knowledge and PBS plan quality following training and consider the outcomes for participants who work in a secure forensic disability setting.	6 staff (2 provisional psychologists, 1 Registered Psychologist, 3 with an undergraduate degree). Gender: NR Age: NR Ethnicity: NR Setting: Forensic mental health setting (medium secure service)	Quantitative cohort study	PBS staff training	Pre and post-tests of staff knowledge, using a specific test developed by Wardale et al (2014) and based on the key elements proposed by O'Neil et al (1997). PBS plan quality was quantified using the Behaviour Support Plan Quality Evaluation guide, Version two.	Staff kno the traini training v

Study Characteristics

Countries

Eighteen of the 29 studies were conducted in the United States, 9 in the United Kingdom, and 2 in Australia.

Sample

A total of 420 service-users within forensic services were recruited to 19 studies. Service-users were recruited from adult prison establishments (n = 95; Bassett et al., 1975; Bassett & Blanchard, 1977; Milan & McKee, 1976), adult forensic psychiatric inpatient services (n = 161; Davies et al., 2016b; Davies et al., 2019; Foxx et al., 1980; Hughes & Davies, 2018; Langdon et al., 2017; Lawson et al., 1971; Losada-Paisey & Paisey, 1988; Maley et al., 1973; Nelson & Cone, 1979), adolescent forensic psychiatric inpatient services (n = 1; Dodds et al., 2015), and adolescent forensic secure services (n = 163; Brogan et al., 2019; Edgemon et al., 2020; Hobbs & Holt, 1976; McDougale et al., 2019; O'Rourke et al., 2019; Seymour & Stokes, 1976). Authors of 15 studies reported recruiting male only service-users (n = 331; Bassett et al., 1975; Bassett & Bllanchard, 1977; Brogan et al., 2019; Davies et al., 2016b; Dodds et al., 2015; Edgemon et al., 2020; Foxx et al., 1980; Hobbs & Holt, 1976; Langdon et al., 2017; Lawson et al., 1971; Losada-Paisey & Paisey, 1988; McDougale et al., 2019; Milan & McKee, 1976; Nelson & Cone, 1979; O'Rourke et al., 2019). Authors of two studies reported recruiting female only service-users (n = 44; Maley et al., 1973; Seymour & Stokes, 1976). Authors of two studies recruited both males and females, although a higher proportion of males (n = 33) compared to females (n = 12) was evident (Davies et al., 2019; Hughes & Davies, 2018).

A total of 321 staff working within forensic services were recruited to eleven studies, six of which reported the gender of participant (males = 110; females = 139; Davies et al., 2015; 2016a; Houchins et al., 2005; Hughes & Davies, 2018; Jones et al., 2001; Karger et al., 2018). Staff were recruited from adult forensic mental health inpatient services (n = 256; Davies et al., 2015; Davies et al., 2016a; Hughes & Davies, 2018; Jones et al., 2001; Karger et al., 2018; Panczak et al., 2015; Wardale et al., 2014), adolescent forensic secure service (n

= 47; Houchins et al., 2005; Luna & Rapp, 2020), and probation services (n = 18; Burkhart et al., 1976; Stumphauzer et al., 1976).

Regarding overlapping samples, Bassett & Blanchard (1977) reported on the same sample of 36 male offenders as Bassett et al. (1975). Similarly, Stumphauzer et al. (1976) reported on 9 of the 18 probation officers recruited to a study conducted by Burkhart et al. (1976). Papers which made use of a previously reported sample were not included when calculating the total number of participants across studies to avoid inflating the sample size.

Participants

Age

Authors of 18 studies reported on the age of service-users (n = 419; Bassett et al., 1975; Bassett & Blanchard, 1977; Brogan et al., 2019; Davies et al., 2016b; Davies et al., 2019; Dodds et al., 2015; Edgemon et al., 2020; Foxx et al., 1980; Hobbs & Holt., 1976; Hughes & Davies., 2018; Lawson et al., 1971; Losada-Paisey & Paisey, 1988; Maley et al., 1973; McDougale et al., 2019; Milan & McKee, 1976; Nelson & Cone, 1979; O'Rourke et al., 2019; Seymour & Stokes, 1976), which ranged between 12-79 years (M = 25.8, SD = 3.1). Authors of four studies reported on the age of staff (n = 577; Davies et al., 2016a; Houchins et al., 2005; Jones et al., 2001; Karger et al., 2018), which ranged from 18-64 years (M = 43.2, SD = 9.4).

Ethnicity

Authors of 6 studies reported on the ethnicity of service-users (n = 183; Bassett et al., 1975; Bassett & Blanchard, 1977; Hobbs & Holt, 1976; Hughes & Davies, 2018; McDougale et al., 2019; Milan & McKee, 1976). Ethnicities reported were White (n = 66), White British (n = 5), Mixed British (n = 1), Black (n = 111). Authors of one study reported on the ethnicity

of staff (n = 14; Hughes & Davies, 2018). Ethnicities included White British (n = 13) and Asian (n = 1).

Psychopathology

Authors of eight studies, all of whom recruited from psychiatric inpatient services, reported the diagnosis of service-users-see Table 3 (n = 154; Davies et al., 2016b, 2019; Dodds et al., 2015; Foxx et al., 1980; Hughes & Davies, 2018; Lawson et al., 1971; Maley et al., 1973; Nelson & Cone, 1979). Reported diagnoses including schizophrenia (n = 107), personality disorder (n = 29), bipolar affective disorder (n = 5), psychosis (n = 21), psychosis with psychopathic personality disorder (n = 5), depressive mood disorder (n = 4), schizoaffective disorder (n = 4), delusional disorder (n = 1), autism spectrum disorder (n = 1), attention deficit hyperactivity disorder (n = 1).

Cognitive Functioning

Authors of five studies reported IQ scores of service-users (n = 186; Hobbs & Holt, 1976; Langdon et al., 2017; Losada-Paisey & Paisey, 1988; Milan & McKee, 1976; Seymour & Stokes, 1976), ranging from 50-137 (M = 76.6). A further four studies (Dodds et al., 2015; Foxx et al., 1980; Lawson et al., 1971; Nelson & Cone, 1979) reported service users to have moderate-severe intellectual disability (n = 1), or learning disability (n = 1), or were described as low functioning (n = 41), or mentally retarded (n = 4)-see Table 3.

Table 3

Psychopathology of service-users

Author	Setting	Sample	Diagnosis	Cognitive Functioning
Davies et al. (2016b)	Forensic mental health setting (medium secure service)	10 adult males	Paranoid schizophrenia (n = 8), emotionally unstable personality disorder (n = 2), antisocial personality disorder (n = 2), bipolar	NR

			affective disorder (n = 1), other psychosis related disorder (n = 1)	
Davies et al. (2019)	Forensic mental health setting (medium secure service)	28 males, 11 females (adults)	Borderline personality disorder (n = 11), Antisocial personality disorder (n = 11), Bipolar affective disorder (n = 4), depressive mood disorder (n = 4), schizophrenia (n = 23), schizoaffective disorder (n = 4), delusional disorder (n = 1)	NR
Dodds et al. (2015)	Low secure adolescent intellectual disability inpatient setting	1 adolescent male	Autism spectrum disorder, attention deficit hyperactivity disorder	Moderate-severe intellectual disability
Foxx et al. (1980)	Forensic psychiatric inpatient service	1 adult male	Psychosis	Severely retarded
Hobbs & Holt. (1976)	A state correctional institution	125 adolescent males	NR	30% mild/moderately intellectual disability, 42% borderline intellectual disability
Hughes & Davies. (2018)	Medium Secure Forensic Psychiatric Intensive Care Unit	1 female, 5 males (adults)	Psychosis (n = 6), personality disorder (n = 3)	NR
Langdon et al. (2017)	Forensic mental health inpatient learning disability service	1 adult male	NR	Intellectual disability
Lawson et al. (1971)	Maximum security forensic inpatient facility	41	Schizophrenic (n = 36), paranoid type (n = 23), chronic undifferentiated schizophrenics (n = 7), hebephrenic (n = 3), mixed type (n = 3), psychotic with psychopathic personality (n = 5)	Low functioning (n = 41)
Losada-Paisey & Paisey. (1988)	Forensic psychiatric learning disability inpatient hospital	7 adult males	NR	Low IQ ranging between 59-75 (n = 7)
Maley et al. (1973).	Psychiatric inpatient unit	40 adult females	Schizophrenia (n = 40)	NR
Nelson & Cone. (1979)	Locked forensic inpatient psychiatric hospital	16 adult males	Psychosis (n = 13)	Mentally retarded (n = 3)

ABA in Forensic Settings

Authors of 10 studies implemented and evaluated token economy programmes within a prison (Bassett et al., 1975; Bassett & Blanchard., 1977; Milan & McKee., 1976), a

psychiatric facility (Foxx et al., 1980; Lawson et al., 1971; Losada-Paisey & Paisey., 1988; Maley et al., 1973; Nelson & Cone., 1979), or a forensic facility for adolescents (Hobbs & Holt., 1976; Seymour & Stokes., 1976). Three of the five studies conducted in psychiatric facilities provided treatment specifically to people with intellectual disabilities (Dodds et al. 2015; Langdon et al., 2017; Losada-Paisey & Paisey., 1988).

Token economy programmes aimed to modify the behaviour of service-users through the use of operant conditioning, whereby tokens or points were earned and exchanged for 'privileges' (e.g., caffeinated drinks, cigarettes, telephone calls, food, visits, leave, a television, magazine, games, stereo). Findings suggested token economy programmes led to an increase in service-users' level of engagement and attendance at activities, work, and education (Bassett et al., 1975; Lawson et al. 1971; Seymour & Stokes, 1979). Improvements in communication, mood, social interaction, cooperation, and rule following were also reported (Hobbs & Holt, 1976; Maley et al., 1973; Nelson & Cone, 1979). In addition, the findings suggested token economy programmes led to service-users' exhibiting less psychotic or aggressive behaviour (Foxx et al., 1980; Maley et al., 1973).

However, findings regarding the effectiveness of token economy programmes were inconsistent and lacked generalisability across different contexts (e.g., Fox et al., 1980; Losada-Paisey & Paisey, 1988; McDougale et al., 2019). The findings suggested the changes in behaviour due to token economy programmes were maintained at follow-up, but only for short periods (Seymour & Stokes, 1979). Furthermore, Bassett & Blanchard (1977) reported that without staff supervision during the implementation of a token economy programme, the use of aversive techniques to manage behaviour actually increased amongst staff.

More recent studies using ABA techniques within forensic settings were focused on teaching and developing skills (e.g., interview skills; Edgemon et al., 2020) or aimed to replace inappropriate behaviour (e.g., verbal aggression, physical aggression, eye-rolling)

with more appropriate behaviour (e.g., using a neutral tone of voice, the absence of eye rolling; Brogan et al., 2019). Similarly, O'Rourke et al. (2019) evaluated the use of tolerance training for four adolescents detained in a residential facility. Findings suggested tolerance training increased all participants' ability to tolerate having to wait for access to an event or having access to an event withheld, and decreased problem behaviours during wait periods for all four adolescence.

Staff Training in ABA Informed Interventions

Authors of four of the 19 studies included in the review evaluated staff training grounded in ABA rather than PBS (Burkhart et al., 1976; Jones et al., 2001; Luna & Rapp, 2020; Stumphauzer et al., 1976) . Training focused on either behaviour modification techniques or antecedents of behaviour within services for adults without intellectual and other developmental disabilities, including a probation service (Burkhart et al., 1976; Stumphauzer et al., 1976), a maximum security psychiatric facility (Jones et al., 2001) and a justice facility for adolescents (Luna & Rapp, 2020). Burkhart et al. (1976) reported that probation officers who received training in behaviour modification techniques showed significant behavioural competence in comparison to probation officers who did not receive training, although, no significant differences on measures of knowledge and attitudes towards behaviour modification were found. In a follow-up study, Stumphauzer et al. (1976) conducted interviews with the nine probation officers who received training and found that they continued to use some aspect of the training in their day-to-day work. Jones et al. (2001) evaluated the impact of staff training on facilitating a behavioural rehabilitation programme for service-users with severe and persistent mental illnesses within a maximum security psychiatric facility. Following training and program implementation, staff (5 males, 4 females) were more active, more interactive with service-users in ways that were reflective of

learning based interventions, and engaged in lower rates of 'job irrelevant activity'. However, researchers who evaluated antecedent-based staff training found that although staff engaged in higher levels of praise following training, when compared to baseline, levels of disruptive behaviour persisted amongst male residents aged 16-21 years within a juvenile justice facility in the US (Luna & Rapp, 2020).

PBS in Forensic Settings

Service User Experiences of PBS

Only one study conducted by Davies et al. (2016b) focused on the experiences of service-users following the implementation of PBS, whereby service-users with PBS plans were asked about their experiences of the model. Although PBS plans were formulated using a functional assessment of the person's behaviour and plans developed included service user goals, the development of coping skills, triggers for distress, and service users involvement, it is unclear whether authors implemented all elements of PBS as described by Gore et al. (2013), such as stakeholder involvement or implementation support, and monitoring and evaluation of interventions over the long term. Authors recruited 10 adult males from a forensic medium secure psychiatric service and reported that their experiences of PBS were positive. Staff had a better understanding of their behaviours and needs, leading to improvements in appropriate support received. However, a lack of staff consistency in implementing PBS and a lack of clarity concerning the purpose of PBS were noted. None of the included studies reported on the experiences of service-users with intellectual and other developmental disability within forensic settings.

Service User Outcomes

Authors of three studies reported service user outcomes following the implementation of key components of PBS (e.g., PBS support plans for service-users), these involved one group design (n = 39; Davies et al., 2019) and 2 single cases studies (Dodds et al., 2015; Langdon et al., 2017). However, it was unclear if the multiple components of PBS were implemented or evaluated, making findings across studies difficult to compare. Nevertheless, these studies suggested PBS was effective at reducing challenging behaviour, including aggression and violence, increasing skills development, improving mental health, and reducing trauma-related symptoms. Increased access to activities and an increased quality of life for males and females detained in psychiatric inpatient settings were reported (Davies et al. 2019; Dodds et al., 2015; Langdon et al., 2017).

Davies et al. (2019) reported significant decreases in challenging behaviour, as measured by an adapted version of The Checklist of Challenging Behaviour (Harris et al., 1994), three months after the implementation of PBS, amongst 39 service-users detained in a forensic medium secure mental health service. Following PBS intervention, the group that received PBS showed significantly lower scores in aggression frequency, management difficulty, severity, other challenging behaviour frequency and management difficulty, when compared to the control group who received treatment as usual. Other challenging behaviours included taking belongings from others, eating inappropriate things, non-compliance, expressing antisocial views, or directly influencing and controlling others. However, no significant differences were found between baseline and 12 months post implementation of PBS in relation to other challenging behaviour management difficulty (Davies et al., 2019). Supporting these findings, Dodds et al. (2015) reported a reduction in the frequency of challenging behaviour (including physical and verbal aggression, inappropriate sexual behaviour) for one autistic male aged 16 with diagnosed attention deficit hyperactivity disorder and moderate/severe intellectual disability detained in a low secure adolescent

inpatient setting. Reductions in challenging behaviour were evident at six months and 11 months after admission. Furthermore, findings suggested an increase in the service-users use of coping strategies and replacement skills, including positive self-talk and problem-solving skills. A reduction in physical intervention, seclusion, medication, and risk led to increased access to activities and arguably an improved quality of life. In a similar case study, Langdon et al. (2017) reported a reduction in challenging behaviours (frequency of aggression), which eventually ceased following the implementation of PBS with one male with intellectual disabilities detained in a forensic intellectual disabilities inpatient service. A decrease in challenging behaviour was associated with an increase in engagement in a variety of activities and a reduction in trauma-related symptoms. However, the research uses small sample sizes and it is unclear if changes in challenging behaviour over time were significant or reliable given the lack of empirically validated assessment measures used.

Staff Experiences of PBS

Authors of three studies explored the experiences of staff working within services in which PBS was implemented, including a juvenile justice setting in the US, and two secure mental health inpatient services in the UK, one of which was for females. However, although Panczak et al. (2015) reported using a positive behavioural support model, a structured day routine and individualised de-escalation strategies were implemented rather than the multiple components of PBS as described by Gore et al (2013). Nevertheless, findings suggested PBS impacted service-users and staff positively by reducing the occurrence of challenging behaviour or preventing its escalation, providing a clear framework from which to work and increasing staff engagement (Karger et al., 2018; Panczak et al., 2015). The functions of PBS were perceived as providing accessible information, supporting staff to manage risk, and taking a person centred approach to care and treatment (Karger et al., 2018). More

specifically, staff reported PBS being a useful approach to use when working with service-users who have a personality disorder and intellectual disabilities (Panczak et al., 2015). Interestingly, these findings are in contrast to Karger et al. (2018) who reported PBS as not being suitable for individuals with a personality disorder. Staff also experienced PBS as not being fully embedded within the service (Karger et al., 2018) and highlighted the importance of staff support to develop self-awareness and opportunities to reflect on practice (Houchins et al., 2005).

PBS Staff Training

Authors of three studies implemented and evaluated PBS training to staff working in psychiatric inpatient services (Davies et al., 2015; Davies et al 2016a; Wardale et al., 2014). One service cared specifically for adults with intellectual disabilities (Wardale et al., 2014). Davies et al. delivered one full days training to qualified staff, which covered basic education and practicing skills associated with PBS (e.g., functional analysis, identifying prevention strategies). In addition, half a day's training was delivered to unqualified staff, which covered basic education around PBS and an introduction into antecedent, behaviour, and consequences charts. Findings suggested training led to a significant increase in confidence, and positive changes in attributions related to causality and stability of challenging behaviour. However, no significant reduction in attribution to internal causes of behaviour were reported. Only qualified staff showed changes in attributions for locus of causality, control and stability, with findings suggesting staff attributed the causes of challenging behaviour to external environmental factors more than internal factors post training and showed more optimism that change is challenging behaviour is possible (Davies et al., 2015). Findings of a second study showed that increases in staff confidence but not changes in attributions were maintained at six month follow up (Davies et al., 2016a).

In another study, the impact of PBS training delivered in a medium secure forensic disability service on staff knowledge and PBS plan quality using the Functional Assessment and Positive Behavioural Intervention (FAPBI; Wardale et al., 2014) was evaluated. The training package was condensed to three days training, instead of four, and delivered over a period of 5 weeks to allow for additional work between sessions. Training incorporated practical support and focused on coaching and mentoring in which PBS plans were developed in small groups with an experienced course facilitator. Findings suggested staff knowledge in PBS developed as a consequence of the training and PBS plan quality was good, as determined by the Behaviour Support Plan Quality Evaluation guide-version two (Browning-Wright et al., 2006).

Assessments Tools

Authors of seven studies report on the use of objective assessment tools to evaluate the impact of ABA/PBS interventions within forensic services (Burkhart et al., 1976; Davies et al., 2015; 2016; 2019; Jones et al., 2001; Maley et al., 1973; Wardale et al., 2014). Assessments used included: (i) a multiple choice test adapted from Becker (1971) to measure knowledge and attitudes of behaviour modification; (ii) Confidence in Coping with Patient Aggression Instrument (Thackrey, 1987), (iii) Challenging Behaviour Attributions Scale (Hastings, 1997), (iv) Causal Dimension Scale II (McAuley et al., 1992), (v) an adapted version of the Checklist of Challenging Behaviour (Harris et al., 1994), (vi) the Staff-Resident Interactive Chronograph (Paul, 1988), (vii) a 20-item questionnaire of which 12 items were taken from the MACC Behavioural Adjustment Scale (Form II; Ellsworth, 1971), (viii) a specific test developed by Wardale et al (2014) based on the key elements proposed by O'Neil et al (1997) to measure staff knowledge of PBS, and (ix) the Behaviour Support Plan Quality Evaluation guide, Version two (Browning-Wright et al., 2006).

Barriers to Implementing PBS

Authors of seven studies identified several barriers to implementing PBS within forensic services, which can be summarised as a lack of resources, conflicting models of care, difficulties working collaboratively, a lack of communication, inconsistent practice, and the need for an organisational approach to the implementation of PBS (e.g., Davies et al., 2016; 2019; Karger et al., 2018; Panczak et al., 2015; Stumphauzer et al., 1976).

Findings suggest services require additional resources when implementing PBS, including money, time, and additional staff (Davies et al., 2016; Karger et al., 2018; Stumphauzer et al., 1976). These findings were related to a desire for ongoing PBS training, the time it took staff to collaborate, communicate, and coordinate with each other and with service users, to conduct detailed data gathering, devise and revise individualised PBS plans and interventions (Davies et al., 2016; 2019; Panczak et al., 2015; Stumphauzer et al., 1976). Other challenges included working with conflicting policies between those developed under the more dated correctional model and those developed under the PBS model of care (Houchins et al., 2005). The nature of a forensic environment led to reports of tensions arising between the inherently empowering, values-based nature of PBS, taking place within a restricted environment and a culture of disempowerment. Staff reported resistance to the PBS approach due to safety concerns, which led to inconsistencies in practice particularly in times of crisis (Houchins et al., 2005; Karger et al., 2018). Nevertheless, overlap between the PBS approach, traditional care planning and risk assessment within services was highlighted (e.g., Karger et al., 2018). Consequently, difficulties evaluating PBS within services arose due to multiple interventions being implemented for service users at the same time (Karger et al., 2018).

Collaborating and co-production with service users was identified as a challenge to the effective implementation of PBS and reported to be difficult due to service-users' low motivation, mental health difficulties, and a low level of insight (Karger et al., 2018). Other difficulties when working collaboratively arose due to staff knowledge, attitudes and values, including difficulties discussing challenging behaviour with service-users, perceptions that some service users are unsuitable for PBS (e.g., those with a personality disorder), beliefs concerning the need for behaviour to have consequences and PBS being perceived as an additional burden on staff workload (Karger et al., 2018). Other challenges included the difficulties staff experienced when implementing a systemic plan, whereby PBS was a service wide philosophy and staff worked collaboratively with each other and with service users at each stage of the intervention (Houchins et al., 2005; Hughes & Davies, 2018; Panczak et al., 2015; Stumphauzer et al., 1976). Professionals were frequently reported to have different levels of involvement, with psychology being highlighted as the leaders of PBS, working collaboratively with nurses (Karger et al., 2018).

Due to difficulties adopting the traditional PBS approach within a forensic service, Hughes and Davies (2018) developed, implemented, and evaluated a novel application of the PBS model taking a ward ethos based approach. Their approach aimed to promote the values of the service, increase staff and service user awareness of common triggers of challenging behaviour, support mutual understanding of perspectives and identify appropriate interventions to prevent and manage behaviours that challenge. PBS was implemented in a psychiatric intensive care unit but a number of adaptations needed to be made to enable a better fit between the model and the context. One of these was to co-produce, between staff and service users on the unit, a ward ethos based on the PBS model. Both staff and service users were able to identify triggers for challenging behaviour, primary and secondary prevention strategies, and crisis management interventions. Themes derived from the data

were developed into a poster displayed on the ward, promoting the primary model and values of the service (Hughes & Davies, 2018). Further findings suggested other forensic services also made several adaptations to the PBS framework during implementation to meet the needs of their service and service-users. For example, Karger et al. (2018) provided guidance that a PBS plan will be followed unless a person's safety becomes at risk (Karger et al., 2018). However, safety and security can be strong components of the PBS model rather than in opposition. Nevertheless, accessing reinforcers that are not restricted was reported to be difficult and required staff to be creative when identifying strategies and reinforcers that motivate but do not compromise security efforts (Houchins et al, 2005). Furthermore, the presentation of service-users detained in either prison establishments or forensic inpatient settings are often complex and require the support of multiple professionals. Consequently, prior to working collaboratively with service users to design and implement a PBS plan other interventions may be required, including motivational interviewing and the importance of developing a therapeutic relationship with the service user was highlighted (Karger et al., 2018).

Discussion

The current review is the first to systematically review and quality appraise the literature on the implementation and evaluation of ABA and PBS in forensic settings. Findings of the current review suggest that limited research has been conducted in the area. The research that has been conducted is generally dated and precludes more recent advancements in the field concerning the management of challenging behaviour that advocates for a more person-centred approach to care and treatment. Furthermore, the methodological quality of studies that have been conducted is generally low leading to an increased risk of bias. Findings lack validity, reliability, and generalisability and therefore should be interpreted with some degree

of caution. Nevertheless, the evidence does suggest behavioural modification techniques and behavioural analysis have been implemented within forensic settings with some degree of success. Although several challenges to the implementation of PBS were highlighted.

Token economy programmes grounded in the principles of ABA have been implemented with varying degrees of success in forensic settings. Positive changes following the implementation of a token economy programmes have been reported (e.g., increased engagement, communication, cooperation; Bassett et al., 1975; Hobbs & Holt, 1976; Lawson et al. 1971; Maley et al., 1973; Nelson & Cone, 1979; Seymour & Stokes, 1979). However, evidence is inconsistent, with some participants not responding and behaviour change not being generalised across contexts. Furthermore, measures used to assess the effects of token economy programmes on individual behaviour and skill development are of poor quality and lack validity. In line with more recent policy and guidance (e.g., Care Act, 2014) service-users should be given the opportunity to engage in their care and treatment plans. However, more historic studies implementing an ABA approach fail to work collaboratively with service users. There was evidence that adopting an ABA approach lacks contextual validity and predates more recent advancement in the field in which person centered care and least restrictive practices are promoted. For example, Hobbs & Holt (1976) and McDougale et al. (2018) target the behaviour of adolescents when they were lining up, which was chosen to maximise convenience for the staff, rather than because these behaviours might contribute to the participants' successful community reintegration. Likewise, although a token economy programme evaluated by Fox et al. (1980) found aggressive behaviour of one male reduced, authors imposed periods of at least 24 hours of social isolation to encourage behavioural change. The objectives of the intervention are therefore in contrast to the aims of a more person-centered approach.

More recently, the adoption the use of PBS within forensic services and has received attention from researchers and practitioners as it corresponds with current approaches in services including the increase in “service user involvement” and the “recovery” movement (Karger et al., 2018). Findings suggest PBS training can lead to increases in staff confidence in managing challenging behaviour, particularly for qualified staff (Davies et al., 2016). Furthermore, research suggests PBS interventions that inform staff about the antecedents and causes of challenging behaviour are likely to have a positive impact on the care and treatment of individuals within forensic settings. Although barriers to implementing PBS in a forensic setting have been reported (e.g., reinforcers as contraband), Dodds et al. (2015) found that the PBS model worked well within existing risk assessment structures within a low secure adolescent inpatient unit. However, research conducted to date has not evaluated the effectiveness of PBS training on individual outcomes for service-users themselves, in terms of an actual reduction in challenging behaviour, the use of restrictive practices within services, quality of life, or length of stay. Furthermore, limited follow-up of individuals within a PBS framework has been conducted. Therefore the long-term impacts of PBS interventions has not been explored.

Studies failed to reliably measure whether ABA/PBS interventions or staff training significantly reduced challenging behaviour or improved the quality of life of participants, with only a few focused on measuring these variables (e.g., Dodds et al., 2015; Davies et al., 2019; Langdon et al, 2017). In addition, few researchers conducted a sufficient follow-up of participants to determine the long term effects of ABA/PBS on length of stay or post discharge (Davies et al., 2016a).

When reviewing the evidence on assessment tools used to measure the effectiveness of ABA and PBS interventions, findings suggest few empirically validated tools have been developed. Furthermore, the impact of PBS will be impacted by the quality of individual PBS

plans and intervention. Consequently, more robust measures to assess the quality of PBS plans are required (Davies et al., 2019). Research to date has focused on measuring the effects of staff training on staff confidence, internal and external attributes of behaviour, or knowledge of behaviour modification techniques. However, no research to date has sought to understand or measure the impact of PBS on risk or recidivism. Furthermore, staff outcomes in terms of job satisfaction and psychological wellbeing have not yet been investigated.

Limitations

Limitations of the current review include the low quality of research included. The majority of research has been conducted in the US, limiting the generalisability of findings to other countries. Furthermore, 11 of the 29 studies included in the review were conducted in the 1970-80's. Since this time, the aims and objectives of providers have evolved from being focused on control and punishment to rehabilitation and deinstitutionalisation (e.g., Ministry of Justice, 2016; NHS Long Term Plan, 2019). Consequently, more recent research has focused on the implementation of the PBS framework. Nevertheless, the research conducted is impacted by potential bias with several studies evaluating the effectiveness of PBS training and implementation in one medium secure psychiatric inpatient service for males, in which the first author was also the PBS lead for the clinic and instrumental in developing PBS plans for participants (Davies et al., 2015; 2016a; 2016b; 2019). Although, some measures to reduce bias were implemented (e.g., the first author did not conduct interviews with participants when exploring service-users' experiences of PBS; Davies et al., 2016b). Despitelimitations, this review offers a comprehensive synthesis of the research evidence pertaining to the effectiveness of ABA/PBS interventions in forensic settings and highlights several areas where practice and research can be developed.

Implications for policy and practice

Implications of the current review suggest the PBS framework is being adopted within forensic settings across the US, UK and Australia. Furthermore, findings suggest services are making adaptations to how PBS is implemented in order to accommodate working within a secure environment. Research highlights several barriers to the implementations of PBS in forensic setting which will need to be addressed for PBS to be implemented consistently and with success across services. Service user involvement has been a key policy objective for the last two decades (e.g., National Institute for Health and Care Excellence, 2013). Staff should therefore seek to work collaboratively with service users, who should be involved in the development and implementation of their own PBS plan and in doing so seek to improve the experiences of service-users (Davies et al., 2016b). Findings also highlight the importance and benefits of staff training, supervision and opportunities for reflective practice (Davies et al., 2016b). Furthermore, when implementing PBS, services need to ensure there is a system in place whereby plans are reviewed regularly and staff are well informed about PBS. It is important for services to monitor outcomes related to challenging behaviour and quality of life for patients before and after a PBS approach is applied, as efficacy data for PBS applied in forensic settings is lacking.

Future Research

Future research should therefore focus on exploring the reduction in number of challenging behaviour incidents, reduction in number of incidents of restraint and seclusion, the quality of behaviour support plans, quality of life outcomes, recidivism, and length of stay for service-users whose care and treatment has been informed by the PBS framework. Furthermore, the background factors for each individual may have a significant impact on the effectiveness of PBS, but this has not yet been investigated (Dodds et al., 2015). In addition

to exploring the impacts of PBS on service-users, future research should also seek to explore staff outcomes (e.g., well-being, job satisfaction) that have not yet been investigated. The views of the multi-disciplinary team and service-users themselves may have also provided further insight into the effectiveness of PBS and the barriers to its successful implementation. For the quality of research in the field to improve, research utilising empirically validated assessment measures is required, as well as a more robust measure of the quality of PBS plans (Davies et al., 2019). Finally, research into the impact of PBS on specific types of challenging behaviours may inform future assessment and treatment of those in forensic setting.

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