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ORIGINAL PAPER

Shaping Effective Masturbation in Persons with Developmental Disabilities: A Review of the Literature

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Abstract
Individuals with developmental disabilities often encounter problems when engaging in sexual behavior through masturbation. Although sometimes taking the form of inappropriate behavior, such as public masturbation, ineffective masturbation, such as the inability to achieve orgasm through masturbation, is also encountered. The current study investigated the peer-reviewed literature as it pertains to empirically supported treatments for inappropriate and ineffective masturbation. Out of an original 1066 articles from 1940 to 2017, only 38 articles met criteria as treatment articles with masturbation as the target of study. Articles were analyzed by years of publication, desired direction of target, orientation of treatment, participant characteristics and behavioral treatments employed. Treatments were then discussed in detail with the purpose of establishing a body of empirically supported treatments for the shaping of effective masturbation in individuals with developmental disabilities. Unfortunately, results highlighted the need for significantly more clinical research before clinicians are able to rely on the literature for treatment ideas.

Keywords Masturbation · Sexual behavior · Developmental disabilities · Autism · Behavior analysis · Inappropriate sexual behavior · Literature review · United States

Introduction

Self-stimulation of the genitals, "masturbation," is a common behavior noted in children [1]. Although modal frequencies are noted at around 4 years of age and in adolescence [1], accounts of self-stimulatory genital touching have been noted to occur in infancy and even in utero [2, 3]. Because epidemiological investigations have not been done on the rates of childhood masturbation in typically developing children, rates are unknown, however, it is a frequently reported referral to outpatient clinics [4]. Prevalence rates in typically developing adults indicate that 90–94% of males and 50–60% of females report having engaged in masturbation at some point in their lives [5].

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With regard to the development of masturbation skills, overt and direct teaching is often not required for typically developing children. Jackson, as cited in Davis et al. [6], indicated that the expression of sexuality often begins in early childhood in the form of exploring the self and associated bodily sensations. The preschool and early elementary years are often a time when children learn the social boundaries of sexual behavior including self-stimulation, genital touching and clothing removal. Based on caregiver response (which is often not explicitly stated), children of this age typically begin to restrict their masturbation behavior and other sexual expressions to private spaces [6]. Masturbation, even in young children, is therefore seen as a typical behavior.

As with typically developing individuals, individuals with a diagnosed developmental disability also engage in masturbation as normal expression of sexuality. Kaeser and O'Neill [7] reported estimates of masturbation in individuals with mild to moderate levels of cognitive impairments to be as high as 97% and with more impaired individuals as high as 80%. The issue becomes the detrimental effects of delays in development when it comes to social skills and learning ability. When it comes to appropriate engagement in masturbation, individuals with developmental disabilities often require more explicit instruction than typically developing peers [6]. In a study looking at referrals to Queensland's Family Planning program for intensive education, Walsh [8] reported that over one half of the total referrals were related to sexual behavior and out of those, 70% were for some topography of inappropriate masturbation.

One of the most common issues reported is public display of masturbatory behavior, which would be appropriate in private but highly inappropriate or even illegal in public [9]. Ruble and Dalrymple [10] surveyed parents of children with autism ages nine and older and found that 65% of parents reported instances of genital touching in public and 23% reported actual masturbation in public. An elevated level of public masturbation was also found in a survey of parents of children with high functioning autism published by Stokes and Kaur [11]. Public masturbation is more common in preschool children as compared to elementary age children and more commonly reported in boys than girls [12].

When it comes to individuals with developmental disabilities, another issue can be the practice of ineffective masturbation methods. Ineffective methods can lead to individuals engaging in masturbation for excessive durations without orgasm. Adopted methods can also be dangerous in form [7]. Hellemans et al. [13] investigated masturbation across two groups: one with cognitive impairments comorbid with ASD and one with cognitive impairments without ASD. Although some amount of public masturbation was found in both groups, the interesting finding was that the participants in the ASD group reported more need for direct teaching of masturbation as compared to the non-ASD group in order to learn effective technique. Van Bourgondien et al. [14] surveyed 89 individuals with ASD and found that 68% reported engagement in masturbation, however only 47% of those individuals reported reaching orgasm "most of the time." In fact, 36% reported rarely or never have achieved orgasm through masturbation. These numbers were similar to those reported by Haracopos and Pedersen [15] in their survey of 81 individuals with ASD. In their study, it was found that 68% of individuals reported engagement in masturbation, however only 60% of the 68% reported reaching orgasm. There was no correlation found between the ability to reach orgasm and functioning level. These data seem to indicate issues with regard to technique, interfering medications or perhaps other sexual health issues.

Hingsburger [16] brings up the important point that genital touching as a topography might not always be self pleasuring (sexual) in function. Issues such as physical discomfort, medications, history of sexual abuse, improper hygiene, allergies, the desire for attention from others and the avoidance of task demands may all be possible causes of genital

touching. Masturbation as a term, however, includes a pleasure seeking function as a necessary part of the definition [16, 17]. Therefore, genital touching serving a social function or resulting from a medical condition is not considered masturbation. Given this line of reasoning, Kul et al. [4] recommend that a differential diagnosis be made prior to implementing any treatment for inappropriate genital touching. Even in individuals with ASD or other developmental disabilities, issues such as irritation due to a urinary infection, bladder stones, other neurological conditions and even comorbid obsessive compulsive disorder can result in behavior topographically similar to masturbation but without a pleasure seeking function. Individual analysis of motivation is also recommended by Walsh [8] who adds additional variables such as lack of knowledge of limits and boundaries, boredom, depression, pain, lack of privacy and feelings of guilt.

Hingsburger [16] outlines four conditions that should prompt intervention. The first is when masturbation occurs in an inappropriate place or at an incorrect time. Second is when masturbation is conducted with a level of force that injures the genitals. Third is when masturbation interferes with regular activities due to its frequency and fourth is when masturbation is engaged in almost constantly. Intervention may also be warranted if the form of the behavior is causing distress in the individual or distress in others [8]. Assessment and intervention may also be needed when an individual cannot masturbate to orgasm. Individuals with developmental disabilities and cognitive impairments report this issue more frequently than typically developing adults [18]. After a well-done medical evaluation rules out a physiological or biogenic cause, behavioral deficits must be investigated. Masturbation, being an operantly maintained behavior, falls into the realm of learned responding. Masturbation must be actively learned by an individual in order to be done correctly. The negative impact of a developmental disability or cognitive impairment on learning is a factor that must be taken into consideration when assessing ineffective masturbation [18]. Tarnai [9] conducted a literature review of treatment practices for inappropriate masturbation in individuals with cognitive impairments. Seventeen articles were reviewed that dealt with public and/or excessive masturbation. Authors attributed inappropriate masturbation to many factors, the top four being; (1) limited access to sexual knowledge due to overprotection or sheltering by the caregivers, (2) limitations in cognitive abilities, (3) limitations in social abilities including a lack of peer modeling, and (4) limited opportunities to engage in sexual behavior appropriately.

Given that the majority of referrals for treatment regarding sexual behavior in individuals with developmental disabilities, is for the reduction of problematic displays of masturbation (i.e. public and/or excessive masturbation) [8, 9, 16] it is not surprising that the majority of treatment literature targets the reduction of behavioral excesses. As cited in Ferguson and Rekers [19], the first account of treatment for excessive masturbation was conducted by Gilbert in 1916. The participant in this case was a 10-year old boy who engaged in masturbation up to 12 times per night starting at around 2 years of age. According to Gilbert, the behavior escalated to raping females and having sex with male peers. Treatment consisted of castration to reduce the sex drive, a strategy that would be deemed extreme and unethical by today's standards. Gilbert wasn't the only account of a highly intrusive and contemporaneously unethical treatment for inappropriate masturbation. Rudolph [20], who held the belief that masturbation, both appropriate and inappropriate, was an undesirable behavior for individuals with cognitive impairments, attempted to eliminate all masturbation in six participants by reducing sex drive through pharmacological treatment with Stilboestrol. Not only would Rudolph's philosophical stance be considered inappropriate by contemporary clinicians in the field, the intervention was only effective in two of six participants.

Although intrusive interventions are still being employed and the focus of intervention is still heavily directed at reduction plans for behavioral excesses rather than skill acquisition plans for behavioral deficits, the philosophical stance of contemporary clinicians and researchers towards masturbation in individuals with developmental disabilities is changing for the better. Hingsburger [16] states that masturbation should be considered a normal behavior that is sometimes expressed inappropriately. He believes that masturbation is a healthy sexual expression for both sexes and for people with and without developmental disabilities. Masturbation is just one of many possible forms of sexual expression. He also asserts that professionals working with people with developmental disabilities should see masturbation as positive behavior in clients. Similarly, Walsh [8] outlines three fundamental philosophical principles that should be upheld when providing treatment for inappropriate forms of masturbation. First, that masturbation is normal and healthy. Second, that all human behavior, masturbation included, should be considered a form of communication and third, that treatment should consist of the least restrictive alternatives possible. The belief that masturbation is a normal behavior and that the aim of sexual education should not be to eliminate all masturbation but to teach appropriate masturbation was discussed by Gordon (1971) as cited in Tarnai [9]. If masturbation of an appropriate topography is a normal behavior that is learned through operant principles and is a behavior not always acquired by individuals with developmental disabilities, the question arises as to what teaching methods are empirically supported to teach the response. The current literature review was designed with that question in mind.

Method

Primary Search Procedure

A search was conducted via EBSCOhost using the exact term "masturbation" located either in the title or abstract of the citation. A full search was conducted, without limitation as to years of publication, of the following databases: PsychINFO, Complementary Index, Academic Search Complete, MEDLINE, Science Direct, Supplemental Index, CINAHL, JSTOR Journals, Directory of Open Access Journals, Historical Abstracts, Health and Wellness Resource Center, Psych ARTICLES, ERIC, American History and Life, MLA International Bibliography, Project MUSE, Business Science Elite, Literature Resource Center, SPORT Discus, Political Science Complete, ART full text, ATLA Religion Database, Film and Television Literature Index, Communication and Mass Media Complete and Opposing Viewpoints in Context. Search results were then refined by limiting to peer reviewed entries from academic journals, published in the English language and having humans as the subject of study. The search resulted in 1118 citations spanning from 1911 through October of 2017. The initial list of citations was then extracted to Zotero in order to easily create a Microsoft Excel database. In the process, some duplicate entries were automatically removed resulting in a final 1066 citations.

Exclusion Criteria

All entries were then reviewed in order to confirm that the term "masturbation" was indeed found in the title or the abstract. Results were then manually limited by excluding articles where the focus was not on some form of treatment. This resulted, for

example, in the removal of articles related to the philosophy of masturbation, history of masturbation, masturbation as related to religion and epidemiological studies without a treatment component. This resulted in a list of 98 citations. Although these 98 treatment articles included the term "masturbation" in the title or abstract, it was noted that some had a focus on sexual behavior in a more general sense. The list was therefore further refined by excluding articles where masturbation was not the primary target behavior of interest. This resulted in a list of 33 citations. Five additional relevant articles were obtained through a review of references of the retrieved articles. These articles were not found through the original search because alternate terms were used for masturbation (e.g. "self-stimulation of the genitals"). As displayed in Fig. 1, the final result consisted of only 38 articles.

The total list of 38 treatment articles was analyzed by years of publication, desired direction of target, orientation of treatment, participant characteristics, and behavioral treatment components. A more detailed discussion of treatment procedures used specifically for the teaching of effective masturbation then follows.

Results

Analysis by Publication Year

Figure 2 graphically displays articles by decade of publication. Stirt [21], the earliest article included in this analysis, outlined the results of a case study where public masturbation was treated in a group of adolescent boys through a psychodynamic approach to assessment and treatment. Public masturbation was viewed as a symptom of past conflict with authority figures, which was then decreased through the therapist forming a working bond with the boys and uncovering the latent conflict. Although low in overall frequency (between one and eight articles per decade), it is encouraging to see publication on an increasing trend.

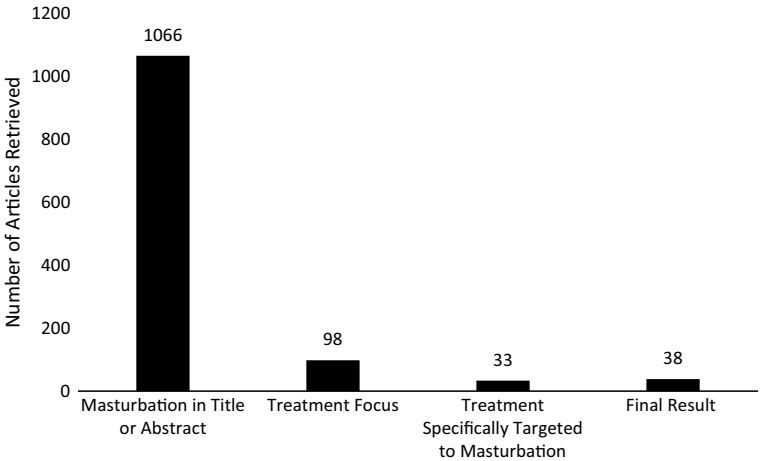


Fig. 1 Displays the number of relevant articles retrieved in the current search (final result includes additional articles found through article reference review)

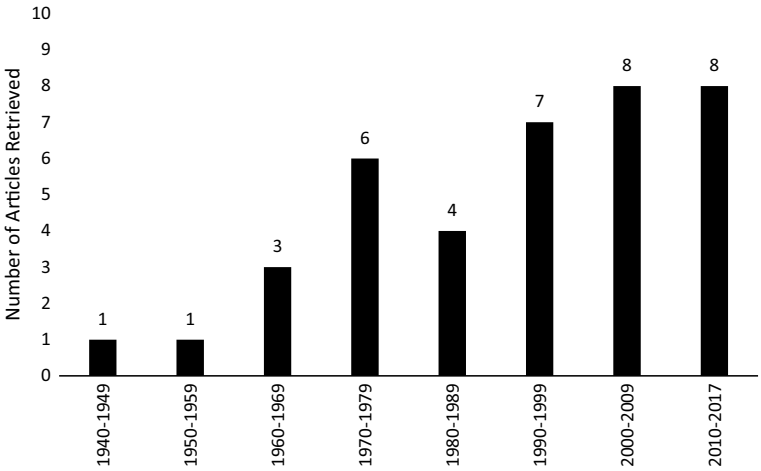


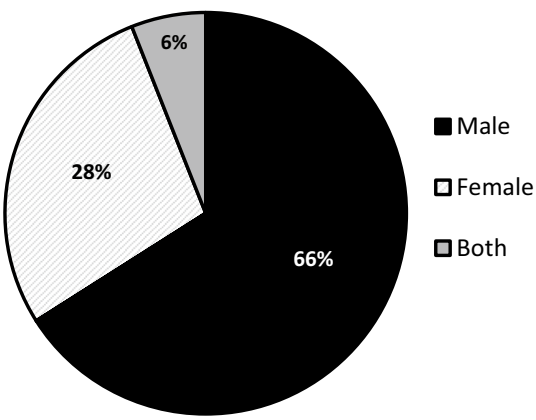
Fig. 2 Displays the breakdown of articles by publication year

Analysis by Participants

Figure 3 graphically displays the sex of the participants in those studies that were case descriptions or data-based designs. Studies consisting only of a theoretical description of treatment were not included in these numbers. Interestingly, studies did not only consist of male participants. In fact, 28% of studies focused on treatment of masturbation in females and 6% contained participants of both sexes. Sixty-six percent of studies focused exclusively on males.

Age of participants is graphically displayed in Fig. 4. Although the majority of studies focused on an adult population (14 studies), it is surprising to note that studies focusing on elementary age participants were a close second (12 studies) and were more frequent than studies focusing on an adolescent population (6 studies). Outliers included, Rosenthal et al. [22] who studied the treatment of public and dangerous masturbation resulting from dementia in an elderly participant, and Franić and Ujevic Franić [5] who studied the treatment of chronic infantile masturbation in an infant female.

Fig. 3 Displays the participant breakdown by sex



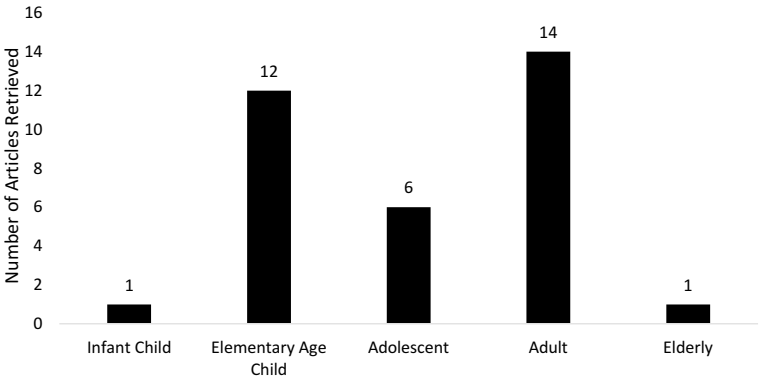


Fig. 4 Displays the participant breakdown by age

In Fig. 5, you will see the developmental and mental health status of the participants. Although the majority (46% of studies) focused on treatment of individuals with various forms of developmental disabilities and delays, including autism spectrum disorder and/or cognitive impairments, it is surprising to note that 43% of studies focused on the treatment of inappropriate masturbation in typically developing participants. Nine percent of studies (3) focused on treatments for individuals with mental health diagnoses without developmental issues.

Analysis by Trends in Treatment

The 38 treatment articles, included in this review, consisted of treatments designed to decrease problem masturbation (reduction of a behavioral excess) as well as those designed to teach appropriate masturbation (skill acquisition of a behavioral deficit). As you can see in Fig. 6, an overwhelming majority of articles (87%) (33 out of 38 articles) targeted only a behavioral excess. Only 8% of articles focused exclusively on the skill acquisition of a behavioral deficit and 5% targeted masturbation in both directions. A majority of the behavior reduction studies focused on the treatment of public masturbation (26 out of 33 articles). Other behavioral excess targets included reduction of excessive masturbation,

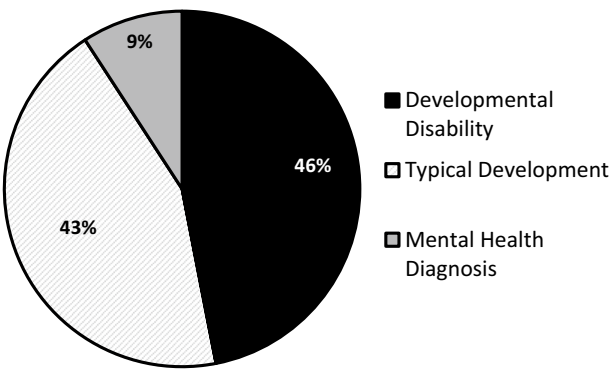


Fig. 5 Displays the participant breakdown by developmental/mental health status

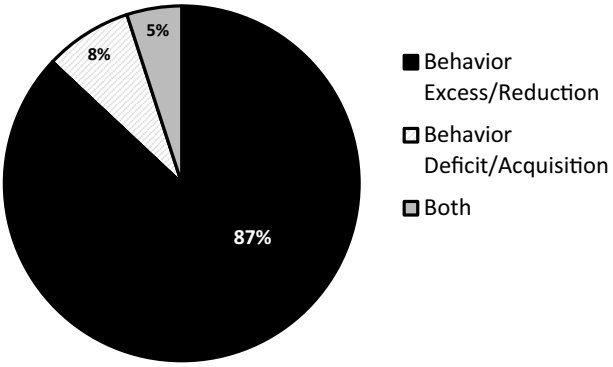


Fig. 6 Displays whether the researchers were looking to decrease inappropriate masturbation or increase appropriate masturbation as their main target

dangerous masturbation and inappropriate fantasies associated with masturbation. One study, Rudolf [20], set out to eliminate all forms of masturbation in participants with developmental disabilities.

Treatment orientation is graphically displayed in Fig. 7. Due to some treatment packages containing components of different orientations, the overall total is greater than the 38 treatment articles included in the review. As you can see, a behavioral approach was utilized in the majority of studies with 25 of the 38 articles describing some form of behavioral treatment. Ten out of 38 articles used a biomedical approach. Six out of 38 articles described an educational treatment not aligned with any particular treatment orientation. Only three studies described the use of a psychoanalytic treatment. Figure 8 displays the specific behavioral treatments that were described across the articles that included a behavioral treatment component. A few of the articles were not included in the graph due to specific treatment procedures being difficult to determine and/or to separate from other treatment strategies. Although seven treatments relied exclusively on a positive reinforcement

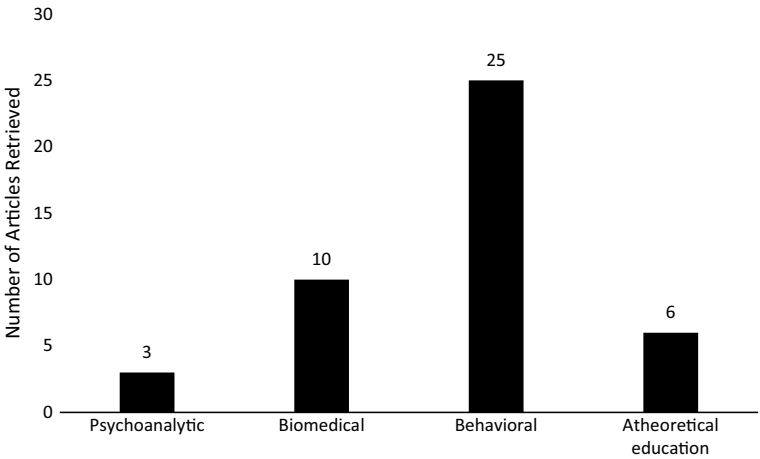


Fig. 7 Displays the breakdown of theoretical orientation of treatment across articles

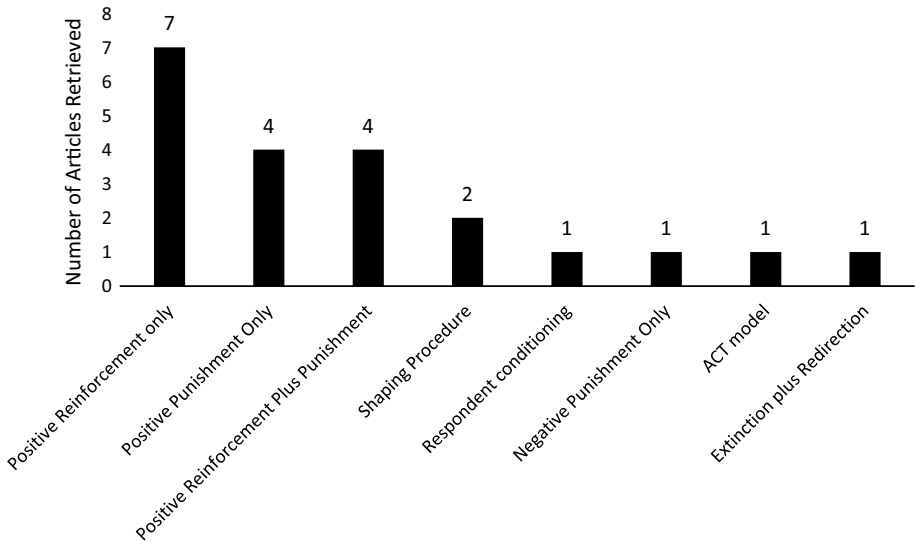


Fig. 8 Displays the behavioral procedures that were employed across treatment case studies

paradigm, it is noted that nine treatments contained some aspect of a punishment component. In fact, five studies described a treatment that relies solely on punishment to modify behavior. The ethics of such punishment-only interventions is questionable by today's standards in behavior analysis. A more detailed description of treatments is provided in the next section.

Treatment of Public and/or Excessive Masturbation

Since the focus of the present work is a review of literature pertaining to the teaching of effective masturbation, an exhaustive and detailed review of literature pertaining to the reduction of problematic masturbation will not be provided. The readers are referred to reviews done by Tarnai [9], Beddows and Brooks [23] and Davis et al. [6] for more information, however, due to 87% of articles having their focus in this area, a brief review of treatments will be provided here.

As reported by Tarnai [9] the majority of treatments used some form of punishment contingency to produce a reduction in problem masturbation. For participants with mild to moderate levels of cognitive impairment, punishment procedures tended to be paired with more educational treatments, often stressing self-control cognitive techniques. For participants with greater levels of cognitive impairment, aversive stimuli were often used as punishment in the absence of supportive education. The current search resulted in five studies that relied exclusively on punishment contingencies to produce the desired change in behavior. Olson and Kelley [24] employed an aversive contingency, through the use of contingent electric shock to the fingers of a typically developing 23 year old man who displayed chronic masturbation. An 80% reduction in masturbation was obtained upon a 4-month follow up. Although not directly targeting masturbation as an isolated response, Marshall [25] used a combination of experimenter initiated contingent aversive shock, self-administered contingent aversive smell and orgasmic reconditioning techniques in the reduction of unwanted fetish fantasy and behaviors associated with masturbation in an adult

male college student. Treatments were implemented in an additive fashion showing that the introduction of orgasmic reconditioning was a necessary addition to the aversive contingency. Cook and Shaw [26] described the treatment of public masturbation in a 7 year old boy with developmental disabilities and cognitive impairment. Treatment consisted of aversive lemon juice to the mouth contingent upon the boy's hands being placed in his pants. The target behavior was quickly eliminated. Although relying on an exclusively aversive contingency, the authors mention that the treatment is at least less intrusive than contingent electric shock [26]. This statement is potentially accurate, however contemporary ethics in behavior analysis calls for the inclusion of a reinforcement contingency in addition to any punishment contingency [27]. Although not always the case, negative punishment contingencies, such as response cost, are often less intrusive than positive punishment contingencies. Armstrong and Drabman [12] used a response cost procedure in the treatment of public masturbation in a nine-year-old girl. Preferred, self-made drawings were used as response cost stimuli and were lost upon engagement in masturbation in school. Barmann and Murray [28] used contingent facial screening to reduce public masturbation in a non-ambulatory, adolescent male participant with severe cognitive impairment. Although the problem behavior was successfully treated with the aversive contingency alone, the authors asserted that the goal of the study was to eliminate public masturbation, not all forms of masturbation. In their discussion section, the authors mentioned that, post treatment, the participant was provided access to a sex education program targeted to individuals with developmental disabilities. The education program was designed to be implemented by residential staff and parents [28].

Topographies of masturbation were treated through biomedical interventions in nine treatment studies. At the extreme, Rudolf [20] administered Stilboestrol, a synthetic nonsteroidal estrogen, to six males with cognitive impairments in an effort to eradicate all forms of masturbation. Participants ranged in age from 10 years old to 25 years old. Rudolf believed that engagement in masturbation resulted in even greater decline in mental abilities in people already affected with cognitive impairment. Although medication was administered daily at varying dosages, it was only effective in reducing masturbation in two participants. Other biomedical treatments included the reduction of compulsive masturbation with Haloperidol and Fluoxetine [29], public masturbation with medroxyprogesterone acetate [30], public masturbation with Mirtazapine [31], public and dangerous forms of masturbation with Haloperidol in an elderly man with dementia [22], public and excessive masturbation with Citalopram [32], excessive masturbation through discontinuation of the dopamine agonist, Pramipexole [33], and excessive childhood masturbation with Aripiprazole [4]. This body of research has two major limitations. Although many of these studies were successful in reducing problem behavior related to masturbation through pharmacological intervention, it is important to note that the majority of the studies only postulate potential reasons behind the positive effects. The exact biological reasoning behind the behavior change was sometimes indirect and rarely confirmed. In addition, not one of the studies addressed the encouragement or teaching of appropriate masturbation.

Not all studies relied on punishment contingencies to modify problem masturbation. In their review of treatments for inappropriate sexual behavior in individuals with developmental disabilities, Davis et al. [6] discussed many behavioral strategies, both proactive and reactive, outlined in the literature. An important point made by the authors is that sexual behaviors, including but not limited to masturbation, are learned operants that will respond to applied behavioral intervention, as would any topography of operant behavior. As with any behavioral treatment, the first step to intervention would be to conduct a functional behavior assessment of the target behavior of interest. Treatment

would then be tailored to function. A wide range of behavioral strategies are found in the literature in the treatment of problem sexual behavior. These include instructional revisions, manipulation of motivating operations, noncontingent reinforcement schedules (NCR), differential reinforcement of alternative behavior (DRA), differential reinforcement of other behavior (DRO), extinction paradigms and punishment contingencies [6].

As early as 1968, Wagner [34] showed that public masturbation could be treated through operant conditioning procedures consisting only of a positive reinforcement schedule. The participant was an eleven-year-old, typically developing girl who would engage in frequent masturbation in her classroom. Although the author refers to the treatment as differential reinforcement of an incompatible response, positive reinforcement in the form of teacher praise and pats on the head were delivered contingent on the "response" of "non-masturbation." In this way, the contingency is more similar to a DRO than a DRI. Regardless of terminology, public masturbation ceased within 74 days of treatment. DRO procedures were also successfully used to treat public masturbation in an adult male with developmental disabilities [35], compulsive masturbation in an eight-year-old girl [36], and public masturbation in an adolescent boy with severe cognitive impairments [37]. Although all of these studies used positive reinforcement to reduce the presence of problem masturbation, not one of them mentioned the teaching or encouragement of appropriate masturbation. In this way, the ethical benefits of these reinforcement-based treatments over the punishment-only treatments is questioned. A combined DRA/DRO procedure was successfully employed by Ferguson and Rekers [19] in their treatment of public masturbation in a 4 year old girl. Unlike the previously mentioned works, Ferguson and Rekers mentioned their decision making process when it came to not teaching appropriate masturbation as a replacement response. The operational definition they used for masturbation was strictly objective, based on observable topography of response. They did not include any assumption or requirement of self or sexual stimulation in the definition of the response. They indicate that if the behavior were being maintained by sexual stimulation, it would have been appropriate to teach effective masturbation towards orgasm as a replacement behavior. However, in their case, there was no evidence that the participant was engaging in the behavior for sexual pleasure. Teaching of effective masturbation for sexual pleasure in a four-year-old girl could then have been deemed inappropriate [19].

Then there are the studies that relied on a combination of reinforcement and punishment contingencies to decrease problem masturbation. Luiselli et al. [38] initially employed a DRA for the treatment of public masturbation in an eight-year-old boy with cognitive impairments. The DRA contingency consisted of positive reinforcement for staying on task in school. Results indicated that the DRA was not effective until an overcorrection routine was added contingent on masturbation. The authors made no mention of whether or not masturbation occurred in appropriate private places. Similar results were obtained by Polvinale and Lutzker [39], in their investigation of treatments for public masturbation and other problem sexual behaviors in a 13-year-old boy with Down's Syndrome. An original DRO contingency was not effective in decreasing the behavior; however, the problem behaviors were successfully treated when a social punishment contingency (apologizing for the behavior) was added into the DRO procedure. The authors made a mention of sex education being provided subsequent to treatment; however, no details were provided except for a citation to a conference workshop. A combination treatment package for public masturbation, consisting of DRO, response blocking and guided compliance, was also shown to be effective by Dufrene et al. [2]. Once again, no mention was made of the presence of appropriate masturbation.

Teaching Effective Masturbation

Because masturbation is seen as a form of healthy and normal behavior [8, 16], and a response that is shaped through the principles of operant conditioning [18], it is surprising that the current search yielded only five articles with a focus on the teaching of appropriate masturbation technique. Only two of those articles were case studies. Kaeser [18] postulated eight reasons why literature on masturbation training may not be found. First, the public holding negative attitudes towards masturbation in general. Second, the potentially controversial nature of the subject matter. Third, a broad level of discomfort with sexual issues especially in people with developmental disabilities. Fourth, fear of potential legal issues. Fifth, the incorrect belief that teaching appropriate sexual behavior to individuals with disabilities will lead to an increase in sexual acting out. Sixth, the incorrect belief that people with developmental issues do not have an interest in sex. Seventh, the unfortunate lack of experts in the field, and eighth, an emphasis in the literature on decreasing problem masturbation as opposed to increasing appropriate behavior [18]. In the present author's opinion, it is highly probable that these are still likely reasons resulting in a lack of published literature on teaching appropriate masturbation despite the public having a need for the information at this time.

Kaeser and O'Neill [7] was the first peer reviewed account of the shaping of an appropriate masturbation response. The authors used behavioral techniques to shape an appropriate form of masturbation in an adult man with profound cognitive impairment who, up until treatment, was engaging in a topography of masturbation that was rarely successful in leading to orgasm with ejaculation. In baseline, the participant's preferred form of masturbation was to lie prone on his bed, fully dressed, rubbing his pelvis against the bed. Although he would have erections during masturbation and would engage in the behavior for long periods of time, he would only ejaculate on rare occasions. The majority of masturbation episodes ended unsuccessfully through interruption from residential staff, resulting in frustration and agitation. Using a hierarchy of prompt level, ranging from minimal assistance via verbal prompts to maximum physical assistance via hand-over-hand prompting, the experimenters were successful in shaping a new masturbation topography. Unfortunately, the new topography did not result in a significant increase in ejaculation episodes. The authors cite a lack of experience with orgasm and potential negative sexual side effects of Mellaril as having been potential obstacles [7].

Robison et al. [40] developed a procedure to shape a new topography of masturbation in an elderly male with cerebral palsy who was engaging in a dangerous topography of masturbation. After doing an informal assessment of the participant's form of preferred stimulation, the authors chose a topography of masturbation that would hopefully, be satisfying and safe. Treatment consisted of a sex education program including components targeting safety and privacy, hygiene, appropriate motions for penile stimulation, introduction of adaptive equipment to make penile manipulation easier, appropriate methods for anal manipulation (a preferred area for stimulation), discussion of safety and danger when it comes to object use, how to clean adaptive devices and general training in human sexuality topics. In addition to didactic instruction, the participant was allowed free time and privacy in order to encourage appropriate masturbation. The authors point out that previous attempts to reduce dangerous masturbation, including generic reinforcement systems and punishment-based interventions, were unsuccessful due to the lack of a teaching method for an alternate form of sexual behavior. Again, masturbation as a response was not inappropriate; it was the dangerous method chosen by the participant due to a lack

of knowledge, experience and adaptive equipment that was inappropriate [40]. Consistent with trends in behavioral treatment literature in general, Robison et al. [40] placed an emphasis on self-management of behavior instead of on behavior change through reliance on direct reinforcement provided by others. This has the benefit of producing behavior change that can maintain in the absence of caregivers [41].

In a more recent study, Patterson and Scott [1] used a sex education treatment in combination with a behavior modification plan to replace inappropriate public masturbation with appropriate private masturbation in an eight-year-old girl without developmental issues. Although the focus of the article was on the reduction of problem masturbation, it is included here because of the use of sex education to shape a more socially appropriate expression of masturbation. Educational goals consisted of labeling and naming of body parts, discussion of body parts used for masturbation, normalizing the concept of masturbation, realizing the positive aspects of masturbation and understanding the difference between private and public spaces with regard to masturbation. Education was also provided for the participant's mother to provide support on how to discuss socio-sexual issues with her daughter. Behavioral strategies in both the school and home consisted of reinforcement of appropriate behavior, redirection of public masturbation, reminders of where masturbation is appropriate (i.e. private spaces) and brief time out. Results indicated that the educational components of the plan were quickly effective, therefore, the behavioral components were only required on a few occasions [1]. Unfortunately, the authors did not describe the teaching methods that were used in the educational component. It is assumed that the lessons consisted primarily of verbal, didactic instruction and informal discussion. These techniques however would likely not be successful with individuals with moderate to severe levels of developmental disabilities.

Although not a case study, Hingsburger [16] provides treatment suggestions and discussion points for promoting appropriate masturbation behavior in individuals with developmental disabilities. The article mentions some treatment suggestions for teaching masturbation topography; however, a majority of the article discusses treatment strategies for public masturbation. Hingsburger's focus on functional assessment of behavior prior to considering it sexual and on the discrimination training of public and private environments are proactive strategies in line with current best practice in behavior analysis. Hingsburger clearly outlines that when a response looks like masturbation it may actually be maintained by physical issues, attention from others or escape from demands. Treatment strategies would therefore need to be tailored to the function of the problem behavior [16]. For example, treatment for medical conditions would be deferred to a medical professional and treated accordingly. For operant behavior maintained by escape or attention, you would consider function-based behavioral strategies such as noncontingent access to attention/escape, functional communication training for attention/escape, proactive modifications such as making tasks easier, providing more 1:1 attention, differential reinforcement for appropriate behavior and function-based extinction. With regards to appropriate masturbation topography, Hingsburger places an emphasis on shaping appropriate force in order to reduce the risk of injury to the genitals. He suggests techniques such as relaxation training, hand over hand guidance on model genitals and the use of sexual aids to replace hand movements where needed [16]. Consistent with current best practice in sexual education, Hingsburger does not advocate for any hand over hand prompting on a learner's genitals. In Hingsburger's summary, he states that this initial work is only the start of a more in depth analysis of masturbation training for individuals with developmental disabilities [16]. Unfortunately, however, as the current literature review indicates, not much more has been published to date.

In a similar work, Kaeser [18] discusses methods of masturbation training for individuals with developmental disabilities who cannot achieve orgasm. Masturbation training refers to exercises designed to teach a person how to achieve orgasm through self-stimulation and reduce any associated fears or anxiety. Consistent with the current review, Kaeser only found a handful of related articles in the literature with the majority of them focusing on the reduction of inappropriate public masturbation instead of the teaching of appropriate masturbation. According to Kaeser, it may not make sense to treat public masturbation in the absence of teaching appropriate private masturbation because the inability to masturbate to orgasm in private may actually be the cause of the public masturbation. Similar to the current author, Kaeser holds the belief that masturbation to orgasm is a learned response that may need to be directly taught to individuals with significant developmental delays. Inconsistent with current best practice in sex education, however, Kaeser advocates for the use of hand over hand prompting by a trained professional in the teaching of the mechanics of masturbation. He explains how it is often necessary for an instructor to physically guide a learner to manipulate his or her genitals in a way that would achieve orgasm. The masturbation act is first broken down into a task analysis and physical guidance is faded as needed. Through this prompting and fading, the person begins to learn his or her body and how to regulate sexual responses to orgasm [18]. Kaeser offers some basic guidelines when teaching masturbation through physical prompting, including conducting training sessions in the learners bedroom, training at conducive times, reducing the level of prompting as soon as possible, refraining from over prompting, considering gender of the trainer and learner and ensuring opportunities for learner choice. For learners who do not require full prompting, Kaeser suggests less intrusive techniques such as video modeling or practice with genital models [18].

In another theoretical article, Walsh [8] outlines a framework for encouraging appropriate masturbation in individuals with developmental disabilities for which he uses the acronyms, IMPROVE and CARE. IMPROVE stands for Investigate, Meet the need, Planned education, Redirection, Optimism, Versatility, and Evaluation. Consistent with contemporary best practice in applied behavior analysis, the model is based on the theories that a behavior must first be assessed before it can be treated and that treatment must be structured and individualized. CARE is the acronym Walsh uses for redirection of inappropriate masturbation. CARE stands for Consistency, Accuracy, Respect and Empowerment [8]. Once again, the theories are consistent with best practice. Although outlining a philosophical framework to use when treating the target of masturbation, Walsh does not provide details of recommended training procedures, nor empirical support for specific techniques. The article, however, is beneficial for treatment professionals to read because of its client-centered philosophical stance and ideas for treatment goals.

The sensitive nature of shaping masturbation as a behavior in individuals with developmental disabilities cannot be argued. Several authors discussed valid cautions that a professional should keep in mind when working in this area. In their work with an 11-year-old boy with learning disabilities, Withers and Gaskell [41] encountered a few issues that required mention. Inappropriate masturbation was the target of interest and treatment consisted of a combination of cognitive-behavioral techniques and education conducted in 1:1 treatment sessions with a therapist. Over the course of treatment, the participant expressed to the therapist that he wanted information of a sexual nature kept secret from his parents. The therapist was concerned about the potentially harmful result of having the participant learn that it is acceptable to have secret sexual conversations with an adult who is not his parent. Even when his parents gave permission, the therapist was concerned about the perception of an adult having private conversations of a sexual nature with such a young child.

The authors note that the power imbalance between a young child with learning disabilities and an adult professional can leave the child vulnerable to abuse. Equally as problematic is the vulnerability of the therapist to false allegations in the absence of a witness. These issues can have a negative effect on the success of intervention. Reviewing his direct work with the participant, Withers reported that he was so focused on these concerns that his ability to do effective therapy was negatively impacted [41]. Therapists working on similar cases most likely have encountered equally problematic issues.

There is also the potential for therapists to encounter legal issues when working in this area [9]. When behavioral teaching techniques rely on the use of physical prompting, such as those described by Kaeser and O'Neill [7], therapists could be putting themselves in harm's way if not executed with extreme caution. Tarnai [9] suggests that professionals develop policies that can guide treatment situations and that they should be prepared for different sensitive scenarios. Tarnai also suggested that therapy sessions be conducted in the presence of a witness.

In order for any intervention to be effective, individuals within the natural environment need to be in agreement with the nature of the treatment and with the expected outcome. In their attempt to shape a dangerous topography of masturbation into a safe, yet equally pleasurable topography of masturbation, Robison et al. [40] found that the attitudes of the professional staff on the treatment team were having a negative impact on treatment. The authors felt that the treatment team was highly uncomfortable with the topography of masturbation that the participant found pleasurable (which included anal as well as penile stimulation). They were also uncomfortable with endorsing adaptive equipment to aide masturbation. If treatment is to be successful, individuals in the natural environment need to view masturbation as a healthy form of sexual expression in both males and females and maintain a positive attitude towards sexual behavior in people with developmental disabilities [16].

Summary

Despite it being over 30 years since Kaeser and O'Neill [7], no other peer reviewed study has been published investigating the effects of an applied behavior analytic treatment on the shaping of masturbation behavior in individuals with developmental disabilities. Data show that 50% of adolescent students with a diagnosis of autism spectrum disorder still do not receive formal sex education and, in addition, are often sheltered from informal methods of gaining sexual knowledge [23]. Survey data continue to show that children with developmental disabilities often require direct teaching to learn appropriate and effective masturbation techniques, since masturbation is an operant behavior that requires learning through exposure and practice [42].

Although sufficient research does not currently exist outlining empirically supported interventions for teaching masturbation, the theories and techniques of applied behavior analysis seem to be a good fit for shaping an appropriate masturbation response instead of repressing sexual desire in individuals with developmental disabilities [23]. The focus on functional assessment prior to treatment is a highly beneficial aspect of applied behavior analysis and one that is often ignored when it comes to treating responses that topographically appear to be masturbation. If it is determined that ineffective masturbation is the result of a skill deficit, the principles of applied behavior analysis, including differential

reinforcement, shaping, chaining, prompting, extinction and redirection are likely to be beneficial.

Although not specifically targeting masturbation, the use of applied behavior analytic techniques such as social stories, video modeling, visual cues, script fading and task analyses has been suggested in the teaching of socio-sexual behavior to children with autism [43, 44]. It is possible that the controversial and sensitive nature of masturbation as a topography of behavior prevents therapists from directly teaching the skill through behavioral techniques that we know have a high likelihood of success. Despite the groundbreaking work by Kaeser and O'Neill [7], it is a major issue that it remains the only empirical treatment study in the field of applied behavior analysis with shaping appropriate masturbation as the target. Although effective, the authors used a full physical prompt technique to guide the participant through masturbation, a strategy that is no longer seen as an appropriate option for such a sensitive and controversial target. Alternate behavioral teaching strategies have been empirically supported for the acquisition of other targets, however the literature on teaching methods for masturbation is absent. Unfortunately, research articles describing plans for the reduction of problem masturbation continue to be published with greater frequency than those describing skill acquisition plans for behavior shaping, despite significant need for the latter. In fact, with more focus on teaching the skills necessary for effective masturbation to individuals with developmental disabilities, there will be less need to target problem behavior after the fact.

Compliance with Ethical Standards

Conflict of interest Author declare that he has no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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