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Association among Sleep Pattern, Sleep Disturbance and Problem Behavior in Persons with Developmental Disabilities: A Systematic Review Study

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Abstract

The present study is based on a systematic research review. The review of literature is an important component of the research process and should be carried out in an orderly manner. It is also known as the back bone of research study. It involves a systematic identification, location and analysis of documents containing information related to the research problem. The purpose of reviewing literature is to determine what has already done by the scientific community related to the research problem. The reviews used in the present study were identified through psychological literature and Medline searches using the following keywords: Sleep patterns, sleep problems, sleep disorders and sleep disturbances, Sleep disruptions and sleeplessness, Bedtime problems, resistance, struggles, refusal, tantrums dys-somnias, insomnia Limit setting sleep disorder, settling problems night-waking, nighttime awakenings, sleep onset association disorder and variables associated with sleep problems. The major objective of the current study is to conduct a systematic review on association among sleep pattern, sleep disturbance and problem behavior in persons with developmental disabilities. To go ahead with this goal, it was very important to collect the literature on:

(A) Sleep pattern, Sleep disturbance, Sleep disorders in persons with developmental disabilities.

(B)Electroencephalography (EEG) recorded studies on persons with developmental disabilities.

(C) Sleep related problem behaviors in persons with developmental disabilities.

(D) Variables associated with sleep disorders in persons with developmental disabilities.

(E)Indian studies on sleep and sleep disorders of persons with disabilities [1-6].

Keywords: Sleep pattern, Sleep disturbance, Problem behaviors, Autism, Mental retardation & developmental disability.

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Introduction

According to Developmental Disabilities Act of 2000, "Developmental Disabilities means a severe, chronic disability of an individual that is attributable to a mental or physical impairment or combination of mental and physical impairments that are manifested before the individual attains 22 years of age and are likely to continue indefinitely. Developmental disabilities result in substantial limitations in three or more of the fallowing functional areas: self-care, receptive, expressive language, learning, mobility, self-direction, capacity for independent living and economic self-sufficiency". Developmental disability is a disability that is attributable to mental retardation, cerebral palsy, epilepsy, autism, or any other neurologically handicapping condition closely related to mental retardation and that requires treatment similar to that required by persons with mental retardation (State of Montana 2002). Sleep is a reversible state of behavioral quietness and lack of responsiveness to normal

stimuli. It is opposite to the state of the wakefulness where there is an awareness of the environment and normal responsiveness to stimuli is present. Sleep is a necessary process for the survival of the human. Sleep is a mental and physical resting state in which a person becomes unaware of the environment and is seemingly inactive. Essentially, sleep is a detachment from the world, wherein most external stimuli are blocked from the senses. Despite the apparent inactivity there are vital functions that are performed during a normal sleep pattern. Sleep is a natural periodic suspension of consciousness needed to revive the body (The Gale Encyclopedia of Childhood and Adolescence-3rd edition 1996). Sleep is a state of brain characterized by partial or total suspension of consciousness, muscular relaxation and inactivity, reduced metabolism and relative insensitivity to stimulation. Other mental and physical characteristics that distinguish sleep from wakefulness include amnesia for events occurring during the loss of consciousness and unique sleep related electroencephalogram and brain imaging patterns. These characteristics also help distinguish normal sleep from a loss of consciousness due to injury, disease or drugs (APA Dictionary of Psychology 2007). Sleep is important for the consolidation of memory and learning, enhancement of metabolic and inflammatory responses, and improvement in growth and development. The implications for vulnerable children with atypical development are even more rational as they tend to spend more time without sleep than typically developing children. Sleep is a vital part of child and adolescent development. Poor or inadequate sleep can have a dramatically negative impact on a child's daily functioning, particularly school performance. Side effects may include off-task behavior, drowsiness, irritability and an inability to focus. Sleep is a fundamental part of life. It is not just a function of the body, it is an active process. Sleep is so vital to the body's daily functioning that a prolonged loss of sleep impairs metabolism, immune function, temperature control and can ultimately lead to death (Rechtshaffen & Bergmann, 2002). There is no one acceptable pattern of sleep for all children. As a child develops from infancy through childhood and adolescence, sleep pattern change. In addition, there are also differences between the sleep needs of children at the same stage of development, some children naturally sleep for a shorter period of time while others need a greater than average amount of sleep. The vast majority of children get enough sleep to meet their needs. As long as a child's sleep pattern is consistent and he/she does not exhibit signs of excessive sleepiness or fatigue during the daytime, the quality and quantity of his/her sleep are probably adequate (The Gale Encyclopedia of Childhood and Adolescence-3rd edition 1996).Sleep pattern is a habitual, individual pattern of sleep (APA Dictionary of Psychology 2007), sleep patterns refer to a profile of the amount, timing, and quality of sleep that is typical for any given individual over a period of time. Comprehensive analyses of sleep patterns should incorporate poly-somnographic recordings (e.g., actigraphy, EEG) during sleep. However, only a few studies have evaluated sleep patterns of individuals with developmental disabilities [7]. The human body runs on an internal clock. The entire cycle--transitioning from wakefulness to sleep and back to wakefulness is known as the circadian rhythm and lasts approximately 24 hrs. During this cycle, people experience daily hormonal and body temperature fluctuations. The circadian rhythm helps most people achieve regular sleep patterns. Individuals who experience regular sleep patterns generally feel energetic during the day. Disrupted sleep cycle stages cause people to operate slower and reducing their work performance or academic productivity. Regular sleep patterns encourage healthy immune responses, helping the body stave off disease and infection. Adequate sleep is also essential for children's mental and physical growth. Children who experience sleep disorders may not have regular sleep patterns. Regular sleep patterns can be disrupted by many factors, including mental health, physical health, lifestyle and age.

Systematic Review of Sleep Pattern & Disorders

Sleep patterns of persons with developmental disabilities are significant with problem behaviors like temper tantrums & misbehavior with others ,furthermore persons with developmental disabilities also showed severe problems in sleep patterns which lead to severe problems in behaviors, such as self-injurious behavior, repetitive behavior, odd behavior, hyperactivity & rebellious behavior (Ganaie S 2014). The significant difference was found in sleep pattern of persons with developmental disabilities between the groups having normal EEG record and abnormal EEG record. Similar findings were also observed with respect to problem behavior. Stores G & Stores R, (2013) conducted a study on sleep disorders and their clinical significance in children with Down syndrome. Sleep disturbance is particularly common in children with developmental disorders including Down syndrome. Although there are just three basic sleep problems (sleeplessness or insomnia, excessive daytime sleepiness, and para-somnias) there are many possible underlying causes (sleep disorders), the nature of which dictates the particular treatment required. In children with Down syndrome, in addition to the same influences in other children, various co-morbid physical and psychiatric conditions are capable of disturbing sleep. Possible adverse medication effects also need to be considered. Screening for sleep disorders and their causes should be routine, positive findings with detailed assessment will help in diagnosis. Management should acknowledge the likely multi-factorial etiology of the sleep disorders in Down syndrome. Successful treatment can be expected to alleviate significantly the difficulties of both child and family [11] conducted a study on sleep and sleep ecology during the first 3 years of infants in 18 countries it was found that most infants (more than 80%) from predominantly Asian countries shared a room with their parents throughout the first three years whereas in predominantly Caucasian countries about 50% of the infants shared a room with their parents during the first few months and these figures dropped sharply during the first year to around 10% at the beginning of the second year of life. While the practice of co-sleeping was probably very adaptive in times when basic sleep conditions (e.g., appropriate temperature, safety from predators) could not be taken for granted and infant mortality rates were extremely high, there is very little empirical evidence to support co-sleeping as the only "correct" approach to sleep in infants in modern society. Moreover, some evidence suggests that it may be harmful. Although sharing a room with the child was the tradition and norm in the predominantly Asian countries in the

study quoted above, the parents in these countries reported later bedtimes, shorter night time sleep and more night-waking, and were more likely to consider their child's sleep as a problem in comparison to parents in predominantly Caucasian countries. These findings are similar with other studies indicating that co-sleeping is usually associated with more fragmented sleep and less deep sleep for both infant and parents. Furthermore, some evidence suggested that co-sleeping is more stressful and associated with more intense responses to stress in infants than solitary sleep. Tikotzky L, Sadeh A & Glickman GT (2011) studied the involvement of fathers and mothers in overall and nighttime infant care giving. Findings suggest that paternal involvement in infant care giving is associated with both infant sleep consolidation and shorter sleep duration after controlling for breastfeeding. These findings in this study emphasize the importance of including fathers in developmental and clinical sleep research [8] have conducted descriptive cross sectional study on Sleep Patterns in 1 to 36 month-old children. The back ground of the study was on understanding about the sleep patterns in Indonesian children that can contribute to basic knowledge for educating parents and health providers about good sleep hygiene. The conclusions of the study are that prevalence of sleep problem is 33.3%, with awakening at night was being the most occurring problem, prone sleeping position is associated with sleep problems [9] described the establishment of a "mature sleep-wake rhythm" as a "developmental phenomenon". In other words, children learn how to sleep and wake in a routine as their brain develops and matures. Typically developing infants move from a pattern of sleeping and waking that is "poly phasic" when they are newborn to a more settled pattern of a longer night time sleep with 2 short naps at about 3 months and then on to one nap per day by 12 months of age. By 4 years of age most children give up their daytime sleep. Children's sleep-wake rhythm is usually influenced by the light-dark cycle and the child's daily routines such as eating and social activities. Sleep problems in typically developing children may include difficulty in settling down to sleep, waking during the night, night terrors or nightmares and occur in about 30% of pre-school aged children. Sleep improves during middle childhood and continuing problems such as night waking or difficulty in settling are usually treated behaviorally or with progressive rescheduling of the sleep-wake cycle [10] have done a study to examine the associations between sleep hygiene and sleep patterns in children ages from newborn to 10 years. A national poll of 1473 parents/caregivers of children age's newborn to 10 years was conducted in 2004. The poll included questions on sleep hygiene (poor sleep hygiene operationally defined as not having a consistent bedtime routine, bedtime after 9:00 PM, having a parent present when falling asleep at bedtime, having a television in the bedroom, and consuming caffeinated beverages daily), and sleep patterns (sleep onset latency, frequency of night waking, and total sleep time). Overall, this study found that good sleep hygiene practices are associated with better sleep across several age ranges. These findings support the importance of common US based recommendations that children of all ages should fall asleep independently, go to bed before 9:00 PM, have an established bedtime routine, include reading as part of their bedtime routine, refrain from caffeine, and sleep in bedrooms without television [11] conducted a study on 39 toddlers and primary care givers, sleep data were collected via mother's sleep diary and actigraphy for 7 consecutive nights. The study suggests that greater number of completed steps in the bedtime routine was associated with better sleep efficiency. The study also concludes that children have fewer elements in the bedtime routine at 36 months compared to 30 months [12] evaluated the links between sleep ecology and sleep in their study titled 'Sleep and sleep ecology in the first three years: A web-based study'. In this study, five thousand six parents completed a web-based online questionnaire about their children, aged from birth to 36 months. The questionnaire included items pertaining to sleep patterns, sleep environment, sleep-related parental interventions, sleep position, and demographic information. The results reflected clear sleep-related developmental changes including a decrease in daytime sleep and total sleep time, as well as consolidation of sleep during the night, which was manifested in a decrease in night waking and nocturnal wakefulness. Sleep ecology and parental behaviors significantly explained a portion of the variance in the child's sleep patterns. Parental interventions that encourage independence and self-soothing were associated with extended and more consolidated sleep, especially in comparison to more active interactions that were associated with shorter and more fragmented sleep. These findings provide parents and professionals reference data for assessing sleep in young children. Furthermore, the results provide information on specific ecological factors that are associated with increased risk for sleep problems [13] conducted a retrospective study on Melatonin in treatment of chronic sleep disorders in adults with autism. This study presents the use of melatonin to treat severe circadian sleep-wake disturbances in 6 adults with autism. Melatonin was initiated at a daily dose of 3 mg at nocturnal bedtime. If this proved ineffective, the melatonin dose was titrated over the following 4 weeks at increments of 3 mg/2 weeks up to a maximum of 9mg, unless it was tolerated. Assessments included Clinical Global Impression-Severity (CGI-S) and CGI-Improvement (CGI-I). Melatonin administered in the evening dramatically improved the sleep-wake pattern in all patients. Melatonin appears to be effective in reducing sleep onset latency and is probably effective in improving nocturnal awakenings and total sleep time in adults with autism. Its effectiveness remained stable for the 6-month period of administration. Melatonin was well tolerated in all patients and no side effects were noted during the therapy. Melatonin appears to be promising as an efficient and seemingly safe alternative for treatment of severe circadian sleep disturbances in adults with autism. There may be heterogeneity of response depending on the nature of the sleep problem and cause of the intellectual disability or associated disabilities. Richadale (2009) & [14] reported that Children with intellectual disability (ID), particularly those with severe ID, are reported to experience higher rates of sleeping problems than typically developing children, (about 34-80%). They reported that children with intellectual disabilities have problems with greater frequency and severity. They also reported that sleep onset and sleep maintenance problems in children with ID found that sleep problems are usually associated with other behavioral problems and communication difficulties that affect the development of and maintenance of sleep-wake routines [15]. Children with ID

have difficulty in developing "the calming and necessary rhythms of rest and activity that allow synchrony with parents and carers" [14,16] studied on sleep hygiene in school children aged 2 to 12 years. One hundred and sixty one children were evaluated. Eighty four children (51.9%) had good sleep hygiene compared to Seventy eight children (48.1%) with poor sleep hygiene. Children with poor sleep hygiene had lower mean scores on the cognitive, bedtime and sleep stability subscales compared to those with good sleep hygiene. The prevalence of poor sleep hygiene in this pioneering study is high. The potential for negative impact on these children is enormous particularly as it affects their cognitive development [17] in their study on Sleep hygiene for children with neuro-developmental disabilities suggested that emphasis should be given equally to the sleep hygiene as was giving to other strategies like the behavioral and pharmacological. They also opined that despite the importance of sleep hygiene principles, clinicians often lack appropriate knowledge and skills to implement them. In addition, sleep hygiene practices may need to be modified and adapted for this population of children and are often more challenging to implement them compared to their healthy counter parts [18] has studied a total of 19,299 elementary-school children, with a mean age of 9.00 years. A parent-administered questionnaire and the Chinese version of the Children's Sleep Habits Questionnaire were completed to quantify media use and to characterize sleep patterns and sleep disturbances. Results show that a television was present in the bedroom of 18.5% of Chinese school-aged children. Media presences in the bedroom and media use were positively correlated with later bedtimes, later awakening times, and a shorter duration of sleep during weekdays and weekends. Conclusion of the study was that the presence of media in a child's bedroom and media use had a negative effect on children's sleep/wake patterns, duration of sleep, and sleep disorders [19] made a study to examine the effects of various forms of TV exposure on the quality of children's sleep. In this randomized population-based survey questionnaires concerning TV viewing, sleep disturbances, and psychiatric symptoms were administered to 321 parents of children aged 5-6 years. Sleep disturbance scores were the main outcome measures. Active TV viewing and passive TV exposures was related to sleeping difficulties, especially sleep-wake transition disorders and overall sleep disturbances. Particularly, passive TV exposure and viewing adult-targeted TV programs were strongly related to sleep disturbances. The association remained significant when socioeconomic status, family income, family conflicts, the father's work schedule, and the child's psychiatric symptoms were controlled statistically. The results suggest that health-care professionals should be aware of the association between TV exposures and sleep disturbances [20-23]. "Conducted a study on Actigraphic and parent reports of sleep patterns and sleep disorders in children with subtypes of attention-deficit hyperactivity disorder". Results of the study highlighted the prominence of parent-reported sleep disturbance in children with ADHD and the need for clinicians to routinely screen for the presence of sleep disorders and assess detailed sleep physiology where indicated [11] conducted clinical research which has shown that behavioral interventions based on encouraging infants to fall asleep and resume sleep in their crib with minimal parental involvement are very effective in resolving night-waking problems in infancy [22] conducted a study on Sleep patterns and sleep disorders in children with autistic spectrum disorders: insights using parent report and actigraphy. The study describes the profile of sleep disturbance reported in children with autistic spectrum disorders (ASDs) and to document sleep disorders underlying reports of sleeplessness. Sixty-nine children aged 5 to 16 years (mean 9 years 4 months, SD 2 years 7 months, 14 females) with an ASD were assessed by detailed sleep histories taken from parents, the Simonds & Parraga Sleep Questionnaire, a 2-week sleep diary, and actigraphs worn by the child for five nights. Parent-reported sleeplessness featured prominently (64%). Sleep disorders underlying the sleeplessness were most commonly behavioral (i.e., to do with inappropriate sleep-related behaviors), although sleep-wake cycle disorders and anxiety-related problems were also seen. In addition, the sleeplessness patterns of a large minority of children could not be classified by conventional diagnostic criteria. Sleep patterns measured objectively did not differ between those children with or without reported sleeplessness, but the sleep quality of all children seemed to be compromised compared with normal values [24] conducted a study in which they involved four toddlers who had developmental disabilities and sleeping difficulties. The researchers wanted to minimize sleeping problems by implementing positive bedtime routines and restrictions on sleep. Positive bedtime routines varied, but still had specific guidelines: Each child's parents constructed a routine following those guidelines. Parents also restricted sleep time by setting bedtimes and wake-times for the children based on their normal sleep duration. This approach reduced the number of times the children awoke during the night. Beyond these findings, researchers were successful in eliminating bedtime disturbances as long as the routine continued for the duration of the study. Research suggests that children's sleep quality can be positively affected by routines such as taking a bath, reading a story and changing into night dress etc., [25] reported that sleep disturbances refers to a variety of conditions in which people with ID experience disruptions in sleep, such as sleep apnea, restless legs syndrome, insomnia, and night awakenings. Some types of sleep problems (e.g., sleep apnea and restless legs syndrome) primarily reduce REM sleep, while difficulty falling asleep and night awakenings have a greater impact on Slow-Wave Sleep (SWS). Stores G (2001) conducted a study on Sleep-wake functions in children with neuro-developmental and psychiatric disorders. Sleep disturbance was commonly described in children with developmental problems of a primarily physical or psychiatric nature. Its persistence is likely to adversely affect cognition, mood, behavior, and family functioning. Therefore, accurate diagnosis of the underlying sleep disorder with prompt and effective treatment can be considered essential for overall care. Reports of sleep disturbance in various neuro-developmental and psychiatric disorders of childhood are outlined. The origins of the disturbance in each condition may lie in the disorder itself, the child's circumstances or reflect co-morbidity. Each contributory factor has implications for treatment strategies and outcome. Much remains to be discovered about childhood sleep disorders. However sufficient information was already known to significantly improve their recognition and management if professional education in such matters improves [26] examined scores on

several indices of sleep disorders on 52 children with mild to profound mental retardation and compared these scores to those from a control group of typically developing children, Overall [26] found sleep disorders in 58.6% of the children, and between-group analyses revealed that both past (66.7%) and present (57.7%) sleep disorders were more common in children with developmental disabilities than in typically developing children [26] conducted a research study in which they utilized direct observation method only. Observers conducted hourly checks from 9 p.m. to 7 a.m. for 471 individuals with severe to profound mental retardation. Observers recorded the total number of hours each person spent in bed, as well as the total number of hours of sleep, total amount of interruption (by toileting or position changes), and the total number of nights with insomnia. The main dependent variable was the sleep efficiency index (SEI), which refers to the total number of hours of sleep minus the amount of time spent awake, divided by the number of nights. The higher SEI, the more efficient the sleep cycle (i.e., lesser fragmentation and shorter sleep latency).They found an average SEI of 7.17 hrs (standard deviations were not given) for their sample, a pattern that was almost one hour less than is recommended for adults [5] concluded that individuals with nocturnal incontinence were likely to show more night waking, para-somnias, snoring, and excessive daytime sleepiness than individuals without incontinence [27] conducted a study on sleep disorders and their relationship to psychological disturbance in children with epilepsy. By means of parental questionnaires, sleep disturbances were assessed in 79 schoolchildren with epilepsy (mean age 10.12, range 5-16 years) for comparisons with 73 healthy control children matched for gender and to within a maximum of 6 months of age. The daytime behavior of the children with epilepsy also got assessed with the help of questionnaire. The children with epilepsy were considered representative of such children under general pediatric care. Sleep disturbance was classified into five basic types (poor quality sleep, anxieties about sleep, disturbances during sleep, symptoms of disordered breathing during sleep and short duration sleep) and the behavior questionnaire provided scores on five factors (conduct problems, hyperactivity, attention problems, anxiety and physical complaints).Compared with normal controls children with epilepsy showed much higher rates of sleep disorders, particularly poor quality sleep and anxieties about sleep. In children aged 5-11 years associations were found between disturbed daytime behavior and sleep problems, particularly poor quality sleep. There was also a significant association between seizure frequency and anxieties about sleeping. This study highlights the potentially serious psychological and other developmental implications of persistent sleep disturbance to children with epilepsy, and the need for further research on specific types of epilepsy with careful identification of the nature of both sleep disturbance and related psychological dysfunction [28] assessed sleep problems in 44 children with developmental disabilities in Australia, compared with a group of 15 children without developmental disabilities. In this study children with developmental disabilities had a greater frequency of sleep problems than control children. Children with Down syndrome had higher incidence of sleep apnea than did others, and children with autism had the most severe sleep problems in the study group [20,22] conducted a survey research study on sleep of 209 children ages 5-16 years with severe learning disabilities. Forty-four percent of this sample had a current severe sleep problem most nights or every night, with an average duration of over seven years. Of the 25 children with autism in the group, 17 (68.0%) had reported sleep problems, as did seven of the twelve with cerebral palsy. After careful assessment for general daytime behavior problems, these authors concluded that the children with current sleep disturbance had significantly more daytime behavior problems than did other children [29] conducted research studies on sleep pattern of children and adults with developmental disabilities. Results from one of study suggested that the sleep patterns of children and adults with developmental disabilities may differ from those of age-matched peers. Over an approximate 3-week period, 51 individuals from 3 to 21 years of age, who had been admitted to an inpatient unit for the treatment of daytime problem behavior, were observed briefly at half-hour intervals to determine whether the person was asleep or awake. Individuals with developmental disabilities had less total sleep and more nighttime disruptive behaviors than did their non-handicapped peers. Average duration of night waking was 48.3 minute and, on average, these individuals required 69 minutes to fall asleep. However, the total number of hours of sleep per day decreased with age, which was similar to peers [30], studied sleep patterns in a group of 103 institutionalized persons with profound mental retardation, almost all adults, and found that 38.8% had persistent patterns of short-sleep over a period of many months [5] Surveyed 205 persons, ages 18 years or over, living in community housing, with a response rate of 85.7%. Results showed problems falling asleep in 26.8%, night waking in 55.6%, para-somnias in 14%, and sleep-related breathing problems in 15%. Para-somnias reported included sleep-talking, tooth grinding, waking screaming, head banging, nightmares, and sleepwalking [31] Completed a 3-year longitudinal survey of 200 children with severe mental retardation who ranged from 1 to 18 years of age. Sleep disorders were assessed initially, and the assessment was repeated 3 years later. At the initial assessment, 51% of the parents reported settling difficulties in the child, while 67% reported frequent night waking. Fifty percent to 75% of the children who exhibited sleep disorders when first assessed still showed these problems 3 years later [32] studied Chrono-biologically four congenitally blind children with severe or moderate mental retardation. Three of these children showed a free-running rhythm of sleep-wake, and the fourth showed an irregular sleep-wake rhythm. They felt that the free-running rhythms in the three children were their own internal rhythms, revealed through some disorder in the brain mechanism supposed to synchronize to the normal 24-hour day. They postulated that the irregular sleep-wake rhythm in the fourth child may have been the result of immaturity or of failure of the pacemaker of the circadian (24-hour) rhythm. They also noted that, because of the severe degree of their mental retardation, all of the children were lacking in social time cues. Studies by [25] would appear to confirm the importance of blindness on sleep patterns, since 15 of the 19 persons with blindness in their sample, 78.9%, exhibited chronic short sleep patterns, compared to 38.8% of their total sample [33] assessed a variety of markers, including presence or absence of sleep disturbances, in 247

consecutive persons with Tourette syndrome, 17 persons with attention-deficit disorder, 15 persons with attention-deficit disorder associated with Tourette syndrome, and 47 random controls. Sleep problems were pervasive in the individuals with Tourette syndrome, with a significantly increased frequency of sleepwalking, night terrors, trouble falling asleep, early awakening, and inability to take afternoon naps as a young child. They noted that in all diagnostic categories, including persons with mild Tourette syndrome, a total sleep-problem score was significantly higher than that of controls. They feel this is consistent with the theory that Tourette syndrome is a disorder of dis-inhibition of the limbic system of the brain [34] reported that very little attention has been paid to characteristics other than obvious behavioral or cognitive factors. One neglected area is that of patterns of sleep, even though atypical patterns would be expected to present far more problems in a small-group setting than they do in a large congregate facility. Certainly individuals with developmental disabilities would be expected to exhibit all of the types of sleep abnormalities seen in the general population. Because of the apparent impact of atypical sleep patterns on the physical and mental health of persons with developmental disabilities, the area of assessment and management of these conditions appears to be a fruitful area for research for persons with mental retardation and behavioral/psychiatric conditions. While sleep laboratories and research centers are able to use complex electronic equipment to analyze sleep disorders, this usually is a time-consuming and expensive process. Most sleep disorders can be satisfactorily assessed with thorough, careful history and basic medical evaluation [34] conducted an exploratory study of a group of handicapped children which showed some degree of sleep difficulty in over a third of the group [36,37] studied development of nighttime sleep of 79 children and adolescents with mental retardation, whose ages ranged from six months to 20 years. Polygraphic recordings were carried out while the subjects were in bed, and routine sleep parameters were measured. Total sleep time and percentage of rapid-eye movement sleep decreased and awake time tended to increase with age, similar to the pattern seen for age-matched subjects. This group felt that their results indicated that the basic function of the sleep-waking system of children with mental retardation developed normally with age [4] studied 214 children with severe mental retardation. All of the children lived at home. Eighty-six percent of children were under 6-23 years of age had a reported sleep disorder. Slightly lower but still fairly high percentage of children from 6 to 11 years old (81%) and from 12 to 16 years (77%) were said to have some type of sleep disorder. The specific types of sleep disorders that were reported by parents included waking at night (56%), problems in settling to sleep (56%), and difficulty in getting the child to go to bed (53%) [38] reported in a survey of 218 children between two and 15 years of age, seen for pediatric or child psychiatric consultation, which assessed the frequency of sleep disorders. They found an incidence of 6.5% for night terrors, 6.5% for sleep-rocking, 9.5% for bruxism (tooth grinding), 17% for enuresis (bed-wetting), 23% for trouble falling asleep, 28% for night-waking, 31% for nightmares, and 32% for sleep walking [39].

Systematic Review of EEG related Research on PwDDs

Conducted a comparative hospital study based on electroencephalographic and radiological profiles of the subjects. He found that it is likely that dominant side and frontal lobe involvement in symptomatic epilepsies is associated with higher number of seizures during sleep and that techniques like sleep EEG, sleep deprived EEG and video-EEG telemetry are supposed to improve outcome in the diagnosis of patients with sleep seizures [40] "Conducted a cross sectional study and found that sleep spindle activity is correlated with reading abilities in developmental dyslexia". This study analyzes sleep architecture of children with dyslexia, by means of conventional parameters and EEG spectral analysis and to correlate sleep parameters and EEG spectra with neuropsychological measures. Sixteen subjects with developmental dyslexia (mean age 10.8 years) and 11 normally reading children (mean age 10.1 years). All the subjects underwent overnight polysomnographic recording, EEG power spectra were computed from the CZ derivation and spindle density was calculated during sleep stages N2. Dyslexic children showed an increase in power of frequency bands between 0.5–3 Hz and 11–12 Hz in stage N2 and between 0.5–1 Hz in stage N3, they also showed significantly increased spindle density during N2. The power of the sigma band in N2 was positively correlated with the Word reading and MT reading tests, similarly, spindle density was significantly correlated with the Word reading test. The increased spindle activity and EEG sigma power in dyslexic subjects were found to be correlated with the degree of dyslexic impairment. The correlation found between sleep spindle activity and reading abilities in developmental dyslexia supports the hypothesis of a role for NREM sleep and spindles in sleep-related neuro-cognitive processing [41] investigated the sleep patterns of 28 adults with severe to profound mental retardation and seizure disorder. Twelve individuals lived in a family home, three in a community home, and thirteen in a residential facility. Data were collected for seven nights by caregivers who completed sleep diaries. In addition, EEG recordings were obtained on one night. Overall, these adults spent approximately 42% of each 24-hr period in bed, but the quality of their sleep was questionable. Only 12 individuals (43%) evidenced any REM-sleep, and total REM-sleep was only about 30 minute on average. Non REM-sleep was markedly impoverished. While organic factors (e.g., brain damage) could be related to reduce REM-sleep, an alternative explanation is that the frequent use of antiepileptic medications and other drugs (e.g., benzodiazepines) in this population might suppress the duration of REM-sleep. Laboratory electro-physiologic testing and/or self-reporting are often not considered appropriate for the long-term study of individuals with marked degrees of mental retardation, who may exhibit severe behavior problems and often lack verbal skills necessary for self-reporting. The potential utility of behavioral study of sleep patterns was noted by [42], who demonstrated that behaviorally defined sleep/wakefulness could be reliably determined in a nursing home setting. They also noted that the diffuse slowing seen in the EEG in many institutionalized persons may interfere with defining sleep electro-physiologically. Inter rater reliability for the study

on institutionalized persons with profound mental retardation by [25] was 0.91 for five subjects residing in one living area housing 16 persons. (Because of their large study group and long data set, they made no effort to check inter rater reliability for each person studied) [36] Conducted a research study and reported that sleep patterns in 23 children with cerebral palsy and mental retardation, as compared with 39 children with mental retardation without cerebral palsy. In this latter study, 11 of the children with cerebral palsy and 30 of the children with mental retardation without cerebral palsy had normal sleep patterns. Twelve other persons in the cerebral palsy group and nine of the controls had some abnormal sleep EEG patterns. After extensive analysis they concluded that brain lesion abnormalities seemed to be greater in the children with abnormal sleep patterns than in others.

Systematic Review of Literature on Problem Behavior

Evidence supported that sleep related problems behaviors are more common in persons with developmental disabilities. According to western researchers the relationship between sleep pattern and problem behavior has been found in persons with developmental disabilities [43] Conducted a research study on "sleep problems and symptom severity in children with autism". They tried to understand the relationships between the specific sleep problems and specific behavioral problems of children with autism. Mothers' reports of sleep habits and autism symptoms were collected for 109 children with autism. Unlike previous research in this area, only children diagnosed with autism without any commonly co-morbid diagnoses (e.g., intellectual disability, epilepsy) were included in the analysis. Consistent with prior work, a positive correlation between the severity of sleep problems and the severity of autism symptoms was obtained. Sleep onset delay and sleep duration were positively correlated with autism symptoms and autism severity. Sleep onset delay was the strongest predictor of communication deficit, stereotyped behavior, and autism severity. These results provide support for specific sleep problem and symptom relationships that are unique to autism and suggest the importance of including the treatment of sleep problems as part of a comprehensive behavioral intervention for children with autism, [29] reported that symptoms of a health problem are initially treated with health interventions once they are identified. However, ignoring the reinforcement contingencies could result in problem behavior being socially reinforced in the absence of the health problem [44,45] reported that anywhere from 35% to 90% of people with ID experience sleep disturbances. Fisher, Piazza, & Roane, (2002) reported that temporal onset of the health problem may be cyclical over shorter time periods (e.g., sleep disturbances), which may correspond to the onset or exacerbation of problem behavior in the presence of aversive environmental events [46] reported that sleep hygiene routines and psychopharmacology or a combination of the two will be the best intervention. This may suffice for instances in which sleep disturbances evoke problem behaviors that do not otherwise occur. However, in many instances, problem behaviors occur even when sleep disturbances are not present. In these instances, behavior intervention plans that actively focus on increasing appropriate behaviors and decreasing inappropriate behaviors should be in place [47] reported that negative effects of sleep deprivation include reduced attention, impaired memory, increased stress response, and altered immune system functioning. Because sleep disturbances may be associated with other health conditions, such as depression or hyperthyroidism, it is important for health professionals to identify the etiology of the sleep disturbance before treatment [48] observed 30 adults with profound mental retardation with and without SIB. Repeated nighttime observations were used to determine whether an individual was asleep or awake. Adults with a history of SIB slept less than adults in the matched-control group. They also found a higher variability in the number of intervals asleep across nights in adults with SIB than in controls. The authors hypothesized that there may be a reciprocal relation between the endogenous opioids system and REM-sleep disturbance, which leads to a cycle of SIB, opioids release, and sleep deprivation [48] also examined the relation between sleep deprivation and changes in problem behavior for a child with ID. Not only did the child exhibit problem behavior during her daily scheduled routines, but more so when the child missed her afternoon naps. In this study, sleep disturbances functioned to exacerbate negatively reinforced responding and decreased the discrimination between contexts and reinforcement contingencies [4] explored the association between sleep disorders and daytime problem behaviors in a sample of 205 adults with moderate to profound mental handicap who lived in community based group homes. Results showed that individuals with sleep disorders scored significantly higher on three of the five subscales of the Aberrant Behavior Checklist (ABC) [2] (i.e., Irritability, Stereotypy, and Hyperactivity). Specific topographies of problem behavior, such as self-injury, aggression, and screaming were more severe in the sleep-disordered group [26] hypothesized the relationship between sleep disturbance and SIB is consistent with the fact that individuals who exhibited self-injurious behaviors had lower SEI scores when compared to individuals with mainly destructive and aggressive behaviors. Durand, (1998) reported that intervention for sleep disturbances influencing problem behavior involves the remediation of sleep disturbance through sleep hygiene routines [49] reported that the first step in assessment of a sleep disorder is careful definition of the chief sleep symptom, such as insomnia, excessive daytime sleepiness, or disturbed behavior during sleep [19] also found that children with sleep disorders had higher scores on all factors of the ABC, except Inappropriate Speech [51] reported that a good sleep history has a number of important aspects. Factors associated with the onset of the sleep problem, particularly medical or psychiatric conditions should be discussed. Information about the usual sleep-wake schedule should include bedtime, awakening time, regularity of sleep schedule, and time usually required to go to sleep after the individual goes to bed. The sleep environment and bedtime routine should be explored, looking for factors which may lead to a state of over-arousal and nighttime disturbances [52] analyzed the aggression of a man with frequent night awakenings. O'Reilly tracked the sleep patterns of the individual while conducting functional analyses. On days when the man slept five or more hours, aggression was infrequent when demands were placed on him. When the man slept less

than five hours, aggression occurred more frequently to escape demands placed on him. Similar relations between sleep deprivation on the daytime occurrence of self-injury and aggression have been found [49,53] found that para-somnias and dys-somnias, numerous associated problems may also emerge when sleep is disturbed. The individual may become excessively tired and irritable during the day. Behavioral manifestations of sleep disorders can include increased aggression and other behavior problems and disruptive behaviors related to going to sleep, such as crying, bedtime tantrums, calling out, screaming, co-sleeping, and leaving the bed [31] found that sleep disorders were associated with frequent nighttime problem behaviors [54] reported that the duration of symptoms is probably the most important guide to evaluation and treatment of insomnia [55] reported that appropriate treatment of temporary insomnia, with good sleep hygiene measures and possibly very brief drug treatment, may prevent development of longer-term sleep problems. Most effective treatment programs for sleep disorders do not involve drug treatment, except for possibly very brief periods [56] reported that studies indicated two most important aspects of subjectively perceived sleep are the process of going to sleep and the quality of sleep. Carr and McDowell (1980) reported the case of a child with ID who began scratching himself in response to a skin allergy; the scratching was likely maintained by automatic reinforcement. After remission of the allergic reaction, scratching continued because the behavior acquired a social reinforcement function (i.e., positive reinforcement in the form of access to attention). In other words, although health problems can influence rates of problem behavior, problem behavior may persist in the absence of the original health problems. Allyon (1959), Bijou & Peterson, (1961) reported that behavioral interventions were developed from early research in experimental and applied behavior analysis.

Systematic Review of Literature on Associated Variables

Sleep apnea appears to be relatively common in children with developmental disabilities and may be related to seizure disorders [57] found that treatment of sleep apnea led to improved seizure control in five of nine children with neuro-developmental disorders. Another study found that age was not significantly related to measures of sleep quantity and sleep quality in developmentally disabled children with and without autism [58,59] examined sleep disturbance in 73 children and young adults with Angelman syndrome who were severely mentally handicapped. Forty-two percent of the sample was reported to experience disordered sleep [48]. Observed 30 adults with profound mental retardation with and without SIB. Repeated nighttime observations were used to determine whether an individual was asleep or awake. Adults with a history of SIB slept less than adults in the matched-control group. They also found a higher variability in the number of intervals asleep across nights in adults with SIB than in controls. The authors hypothesized that there may be a reciprocal relation between the endogenous opioids system and REM-sleep disturbance, which leads to a cycle of SIB, opioids release, and sleep deprivation. This hypothesized relation between sleep disturbance and SIB is consistent with the fact that individuals who exhibited self-injurious behaviors had lower SEI scores when compared to individuals with mainly destructive and aggressive behaviors [26,22] found a significant positive correlation between age and the duration of childhood sleep problems. Among a sample of adults who lived in a community home, a difference in mean age was found between those with and without sleep disorders [6]. Those with sleep disorders had a mean age of 49.6 years (*SD*=15.7), whereas those without a sleep disorder had a mean age of 45.2 years (*SD*=14.6). [15] found no relationships between sleep disorders, snoring and apnea in 52 children with mental handicap. Further complicating the picture are the results of [26] who found no age-related differences in the mean SEI of their sample. The sleep-wake pattern of children with autism may be different from the pattern of typically developing children and developmentally disabled children without autism was suggested in a study by [60] Twenty-two children with autism, aged 3 to 12 years participated. Sleep questionnaires and actigraphy were used to investigate sleep patterns. Scores on several parameters of sleep (e.g., sleep onset time, sleep duration) were compared with a control group of typically developing children. There were no differences between the groups, except for sleep offset time (early waking). Children with autism woke one hour earlier than the controls. In general, however, sleep patterns of autistic children were similar to those of the typically developing children [6] explored the association between sleep disorders and daytime problem behaviors in a sample of 205 adults with moderate to profound mental handicap who lived in community based group homes. Results showed that individuals with sleep disorders scored significantly higher on three of the five subscales of the Aberrant Behavior Checklist (ABC) (Aman, Singh, Steward, & Field) (i.e., Irritability, Stereotypy, and Hyperactivity). Specific topographies of problem behavior, such as self-injury, aggression, and screaming were more severe in the sleep-disordered group. Patzold, Richdale & Tonge (1998), sleep disorders were assessed in 38 children with pervasive developmental disorder (i.e., autism and Asperger's syndrome), most of whom had a mental handicap. It was found that 63.2% and 76.3% had current and past sleep problems, respectively. Frequent night waking, restless sleep, and bedtime problems were reported in 23.3%, 72.2%, and 32.8% of the cases, respectively. Means of sleep latency and duration in min of night waking were 32 min (*SD*=24.4) and 30.2 min (*SD*=35), respectively [61] investigated sleep and nighttime behaviors among 39 individuals with Smith-Magenis syndrome who ranged from 1.5 to 32years of age (mean=10, 5 years). The most commonly reported forms of disruptive nighttime behaviors were settling problems, delayed sleep onset, bedtime refusal, bedwetting, snoring, teeth grinding, and apnea attacks. The level of parental concern about these behaviors seemed significant because 59% of the individuals were given medication to facilitate sleep. The most frequently reported medical conditions associated with sleep disorders were recurrent ear infections (87%), constipation (53%), allergies/eczema (45%), and other types of infection (45%) (Smith et al) [5] Also found an association between epilepsy and sleep problems. Children and adults with sleep disorders were more likely to suffer from epilepsy than children with no sleep disorders. Intake of at least four mugs of tea or coffee after 6 pm was associated with sleep delays of more than 1 hr and shorter

sleep duration than those who drank less [5], De Moor (1998) showed that withholding parental attention following nighttime disruption resulted in relatively quick and lasting reductions in sleep disorder symptoms of children with developmental disabilities who lived at home. The type of consequence that maintains nighttime disruptive behaviors may vary across individuals and could include access to parental attention and preferred activities such as being allowed to stay up and watch television. In other cases, negative reinforcement may play a role in maintaining disruptive nighttime behaviors if such behaviors result in escape from non-preferred stimuli, such as a dark bedroom, or avoidance of being placed into bed. The variables that maintain disruptive night time behaviors may not necessarily be responsible for its emergence. Sleep disorders that occur naturally during infant development or that are related to medical problems such as an ear infection may come under operant control. In addition, fear-related sleep disorders may be classically conditioned, such as in cases where the individual experiences a traumatic event that is associated with bedtime or sleeping. For example, in one of our own studies [61] a traumatic experience during the day (i.e., being stuck in an elevator) appeared to influence the emergence of settling problems in a 7-year-old boy with mild mental handicap. In this case, desensitization or gradual distancing (see Treatment section) was effective in the normalization of the sleep-wake cycle within three weeks [5] concluded that individuals with nocturnal incontinence were likely to show more night waking, para-somnias, snoring, and excessive daytime sleepiness than individuals without incontinence [7,41] suggested that lowered sleep efficiency may be associated with institutionalized routines that do not coincide with individual sleep needs and preferences [27] found a significant correlation between the amount of appropriate sleep and both IQ and expressive language scores [20,22] also found that children with sleep disorders had higher scores on all factors of the ABC, except Inappropriate Speech. In some cases, sleep disorders appear to influence self-injurious behavior (SIB). [30] however, found that epilepsy was not associated with short-sleep patterns [30] found that institutionalized adults who were blind or deaf/blind were less likely to be short-sleepers than adults without such impairments. This is surprising when one considers the fact that light is a powerful external cue for the sleep-wake cycle, and sleep disturbance is common in blind people [63] In a study by [30] cerebral palsy was inversely related to short-sleep patterns in that individuals with cerebral palsy were found to be less likely to be short-sleepers [64] recorded the sleep-wake continuum of 13 individuals with PWS (mean age in years: 31) during 48 hrs. Polygraphic measures were compared to those recorded in19 nondisabled individuals. Significant differences between groups were found for measures of sleep-onset REM which was five times more common in the PWS group than in the control group. These results suggest a higher prevalence of narcolepsy in individuals with PWS [53] indicated that incontinence was not related to the severity of the sleep disorder [31] found that children with sleep disorders were more likely to have a diagnosis of cerebral palsy than children without sleep problems [31] found that adults with severe/profound mental handicap spent twice as much time awake at night than did adults with mild/moderate mental handicap [31] found that a significantly higher proportion of children under age 5 exhibited night waking problems [64] found evidence for obstructive sleep apnea and other breathing related sleep disorders in a group of 53 children with Down syndrome [31] showed that sleep disorders were associated with frequent nighttime incontinence and adaptive skill deficits in a number of areas (i.e., communication, academic, and self-help skills) [32] investigated sleep disorders in 120 adults with mild to profound mental handicap. In this sample, 57% lived in the community and 43% lived in a large residential facility. Mean sleep efficiency scores of these two groups were 88%, and 90%, respectively. While the mean sleep efficiency index did not differ significantly between groups, many individual scores for those living in the large facility indicated inefficient sleep (i.e., >85%). Cassidy, McKillop & Morgan (1990) conducted a study among 25 individuals with PWS who were between 20 months and 42 years of age (mean age=13 years). Daytime somnolence was reported in 52% of the sample. Richdale et al. frequently reported problems included daytime napping after age 5 years (89%), snoring (44%), and restless movements during sleep (40%). Another study showed a higher prevalence of sleep disorder among individuals with PWS than among non-handicapped peers [4] found similar high rates of sleep disturbance across a range of age groups.

Systematic Review of Indian Studies on Sleep Disorders

Savant, N.S **et al. (2005)** reported the case of a patient with isolated sleep paralysis who progressed from mild to severe sleep paralysis over eight years. He also restarted drinking alcohol to be able to fall asleep and allay his anxiety symptoms. The patient was taught relaxation techniques and he showed complete remission of the symptoms of SP on follow-up after eight months. Suri J.C, **et al**. was performed to determine the prevalence of sleep related disorders in Indian school-going children residing in Delhi. It was of great concern that the findings suggested that no effort was made on the part of parents to seek medical help in significantly large number of children in whom sleep disorders were present, indicating a total lack of awareness amongst the general population about the larger implications of sleep disorders in children [66] designed a study to assess the psychometric properties of a parent-rated measure of sleep habits i.e. Children Sleep Habits Questionnaire (CSHQ) in Indian school going children, concluding that CSHQ is a reliable and internally consistent scale, and it is useful optional tool for assessing sleep problems in Indian school children. Bhatia M, **et al** aimed to translate the Epworth Sleepiness Scale into Hindi and validate it for use in the Hindi speaking population in India. With the help of a study conducted by them the Hindi version was found to be valid and reliable for use in the evaluation of sleepiness in Hindi speaking population of our country [67-82].

Conclusion

Research into sleep pattern, sleep disturbance and problem behavior in persons with developmental disabilities is still in its infancy. The present systematic review tries to explore the association among sleep pattern, sleep disturbance and problem behavior in persons with developmental disabilities.

Research Implication

Researchers need to be developed standardized diagnostic criteria for children with developmental disabilities and their sleep disorders. Interventions should be developed keeping in view the type of developmental disability and its level of severity. Socio-cultural aspects should be considered during the development of an assessment tool and design intervention oriented methodologies. The behavioral procedures should be selected based on the evidences of their effectiveness in the field of developmental disorders and its associated problems like sleep disorders, behavioral problems etc.

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