ARTICLE

Sex matters in autism and other developmental disabilities

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Abstract We have paid little attention to gender differences in developmental disabilities aside from the purpose of establishing prevalence. Yet, studying sex differences in the incidence and presentation of developmental disability and mental health disorders may contribute to our understanding of the neural circuitry and neurochemistry of both the normal and the abnormal brain. Furthermore, investigation into gender difference may have practical implications, as we may need to design sex-specific interventions for persons with developmental disability. In this article, we first review sex differences in typically developing children as well as some of the literature on the biology proposed to explain those differences. We then explore differences in prevalence and presentation of several developmental and mental health disorders as they may relate to biological mechanisms – with special attention to autism. Finally, we look at research needs as they relate to sex in developmental disability.

Keywords autism; developmental disability; neurochemistry; sex

In 1929 James Thurber and E. B. White wrote *Is Sex Necessary?*, providing an amusing commentary on differences in the way women and men perceive their everyday relationships. In 2001, the United States Institute of Medicine reviewed the biological research literature on sex differences and asked a more serious question: *Does Sex Matter?* (Wizemann and Pardue, 2001). Mary-Lou Pardue concluded in her preface: 'Sex does matter. It matters in ways we did not expect. Undoubtedly, it also matters in ways we have not begun to imagine' (2001, p. x). We suspect that the same conclusion will be reached in the world of developmental disabilities, where sex hasn't yet mattered sufficiently in research or in practice.

Biological and biologically driven psychological characteristics evolved to assure our species' successful reproduction. These characteristics have a far-reaching impact in both typical and atypical brain development, and in other ways they determine what it means to be a woman or a man. Some of the same hormones and chemical signaling systems that make fertility possible also regulate the way a baby's brain develops and functions, which ultimately affects how we behave as adults. Differences in emotional expression and self-regulation, play, language, relationships, and cognitive abilities are well described, even if mechanisms are still poorly understood. The popularity of such books as *Men Are From Mars, Women Are From Venus*, and *You Just Don't Understand: Women and Men in Conversation* attest to the resonant chord struck by the issues of gender differences within Western popular culture. If we can learn to understand the biology – the sex differences in the brain that underlie the gender differences – we may begin to unravel some of the mysteries surrounding behavioral differences between the sexes.

By studying sex differences in the presentation and incidence of developmental disability and mental health disorders, we may gain insights into sex differences in the neural circuitry and neurochemistry of both the normal and the abnormal brain. In the past, many studies of developmental disability were conducted only on one sex and the findings were extrapolated across genders. However, disability may look different depending on sex. Because there are hormonal and brain developmental differences between typically developing children, adolescents, and adults, these differences might also occur among girls and boys with developmental disabilities. Disability may look different in girls than in boys because of a different background neural substrate. Does it look so different that it affects diagnosis and thus prevalence? Do sex differences in the brain mediate the development of the disability or do they simply moderate the presentation of the disability? These issues need to be systematically studied.

Sex matters

Differences in play

While there are clear cultural differences in expectations and social practice in treatment of boys and girls, there is evidence of powerful underlying biological differences as well (Vanderschuren et al., 1997). In typically developing children, there are gender differences in several behavioral domains, some of which vary with sexual maturity. Typically developing boys and girls show many differences in play. Boys generally prefer vehicles,

building toys, and rough types of physical play, whereas girls prefer dolls and social play (DiPietro, 1981; Sutton-Smith et al., 1963). There are also gender differences in the motif, color choice, figure composition, and use of motion in children's pictures (Iijima et al., 2001). Girls draw flowers, butterflies, the sun, and human motifs significantly more often than do boys, who more often draw mobile objects such as trains and cars. Girls use color more often and more diffusely; tend to arrange their figures in a row; and draw each figure equally. Boys tend to use blue and gray; draw three-dimensionally; and magnify or emphasize a central figure or theme more often than girls (Iijima et al., 2001). Although many studies on play do not control for social experiences that might contribute to gender-specific play behavior, there is evidence to suggest that these differences may be at least partially biological in nature. Play and other gender-specific behaviors are correlated with prenatal hormone exposure. Both laboratory animal and human females exposed to prenatal androgen demonstrate a preference for rough play and male preferred toys (Berenbaum and Hines, 1992; Goy et al., 1988). Females with congenital adrenal hyperplasia (CAH), a disorder in which there is an excess of adrenal androgen, demonstrate masculine forms of play (Berenbaum and Hines, 1992), better spatial abilities (Berenbaum, 2001), and a significant increase in masculine characteristics in their free drawing (Iijima et al., 2001), compared with typically developing girls.

Differences in problem solving

Sexes differ in intellectual functioning as well. Men and women show different patterns of intellectual abilities even though there are no disparities in IQ or general intellectual functioning on standardized tests of intelligence such as the WISC and the WAIS (Kimura, 1992). Males outperform females on tasks that assess visuospatial and mathematical problem solving skills (Benbow and Lubinski, 1993; Hyde et al., 1990; Levine et al., 1999). The male advantage in arithmetical reasoning (e.g. the ability to solve complex word problems) is mediated by men's strengths in spatial cognition and computational fluency, rather than by social factors such as expectations. The advantage in mathematical reasoning allows males to generate spatial representations or diagrams of related information conveyed in word problems (Geary et al., 2000). Although some researchers suggest that the magnitude of male advantage is small (Geary et al., 2000), Benbow and Stanley (1983) found large discrepancies in mathematical reasoning ability by age 13, especially at the high end of the distribution (score of 700 or more on the Scholastic Aptitude Test) where boys outnumbered girls 13 to 1. These differences can be seen as early as first grade and are maintained into adulthood (Geary et al., 2000).

On the other hand, women outperform men on tasks that assess verbal abilities and perceptual speed (Hyde and Linn, 1988; Schaie and Willis, 1993). Women have superior verbal episodic memory as measured by free recall and recognition of abstract words (Herlitz and Yonker, 2002). Women also excel at facial recognition even when they are not using verbal strategies to facilitate performance. Additionally, face recognition skills are associated with estimates of intelligence for men, but not women (Herlitz and Yonker, 2002). Canli et al. (2002) recently found that women are better than men at recalling emotional issues. They used magnetic resonance imaging to demonstrate that neural responses to emotional scenes were larger and more active in women than men.

Like gender-specific play behavior, differences in specific intellectual abilities between men and women may be related to biological differences between the sexes. Kimura (1992) suggests that gender-specific ability patterns may be related to the differential effects of sex hormones on the developing brain. Later, hormones exert an organizational influence and may produce gender-specific behavior by permanently altering brain functioning during critical periods such as puberty. This type of hormonal effect influences sexual and reproductive behavior (e.g. sexual preference) as well as other gender-related behaviors; however, the relationships between hormone levels early in life when abilities are organized and later in adulthood are not well understood (Kimura, 1992).

Biology of sex differences in typically developing individuals

There are sex differences in anatomy, hormonal influences, hormonal–neurotransmitter interactions, receptors, and function as determined by functional MRI and electrophysiologic studies.

There is considerable cerebral cortical dimorphism. Males have more neurons, but similar cortical thickness to women – implying that there may be more neuronal processes present in the female cortex (Rabinowicz et al., 1999). Neural pathways develop under the influence of sex steroids during the perinatal period. In animal models, sex steroids direct the development of a sexually dimorphic limbic–hypothalamic neuronal pathway, and postnatally testosterone appears to result in a sexually dimorphic pattern of connectivity (Ibanez et al., 2001). Gonadal steroids are also implicated in control of physiological behaviors and functions and the brain's response to physiological or harmful substances. Sex hormones appear to modify the number of synaptic inputs to neurons via estrogen and testosterone receptors on astroglia, which may induce sex differences in synaptic connectivity and synaptic plasticity (Chowen et al., 2000). In puberty, testosterone levels rapidly increase in boys and appear to influence the development of some cognitive functions. Lateralization of language

processing continues to be controversial (Frost et al., 1999; Harasty, 2000), but some investigators have found differences in the functional organization of the brain for language tasks using fMRI (Shaywitz et al., 1995). Sex steroid hormones appear to be important for influencing cortical asymmetry (Wisniewski, 1998).

Sex on my mind

Differences in psychopathology

There are pronounced differences in psychopathology rates between men and women. Women experience higher rates of internalizing psychopathology such as anxiety, eating disorders, and mood disorders, while men engage in more externalized behavior such as aggression. Although these differences are likely to be at least partially mediated by social factors such as gender-specific experiences, there is evidence to implicate biological factors as well. Many of these differences emerge after puberty; therefore, much research in this area has focused on the hormonal environment of the brain during the reproductive years as a possible explanation for such differences.

Gender disparity of mood disorders has received considerable attention. Rates of depression between boys and girls are equal until puberty, at which time the ratio of females to males with depression rises to 2:1 and remains higher throughout adult life (Kessler et al., 1993). This rise in depression rate is correlated with pubertal status, but not chronological age (Angold et al., 1998). Such findings suggest gender differences in depression bear some relation to hormonal influences, although social factors such as ethnicity, current or past victimization, social relationships, access to health care, birth cohort effects, and personality differences remain important (Hayward and Sanborn, 2002).

Anxiety disorders such as panic disorder, agoraphobia, social phobia, and simple phobia are also more common in women (Kessler et al., 1993). Additionally, 31 percent of women and 19 percent of men who are exposed to a traumatic event will develop post-traumatic stress disorder (Yonkers and Ellison, 1996). Seeman (1997) proposes that cyclical changes in estrogen levels and progesterone metabolites make women more vulnerable to environmental stressors because of their effects on the GABA-A/benzodiazepine receptor. Pubertal stage (rather than chronological age) seems to be a stronger predictor for anxiety disorders as well. Thus, like depression, anxiety disorders may result from a biological vulnerability that heightens sensitivity to environmental stressors.

The prevalence of Alzheimer's disease is higher in women and

hormonal modulation is implicated in this phenomenon. Estrogen modulates the neurotrophins that maintain neuronal connections, acts as an antioxidant protecting against beta-amyloid, and regulates acetylcholine in the hippocampus (Henderson et al., 1994). As estrogen levels decrease during menopause, women become more prone to neuronal deterioration. Men are protected by testosterone, which is partially converted to estradiol in the brain (Seeman, 1997).

Differences in developmental disability

There is evidence that both the incidence and the manifestations of some developmental disabilities differ by gender. Eme (1992) reviewed the literature investigating sex-based differences in childhood disorders and concluded that childhood disorders are generally more prevalent among males, but more severe among females. Autism, attention deficit hyperactivity disorder, learning disability, and Tourette's syndrome have all been thought to occur more commonly among boys. Studying these disorders as they present in girls versus boys provides opportunities to understand how sex affects the brain. Sex differences in dopamine neurons may, for example, explain some of the gender differences in ADHD. In laboratory animals, male striatal dopamine receptor density increases markedly at the onset of puberty, while periadolescent female offspring show little overproduction and pruning of dopamine receptors. The authors propose that the rise of male striatal dopamine receptors parallels the early developmental appearance of motor symptoms of ADHD and may explain why prevalence rates are two to four times higher in men than women. Subsequent pruning of the male striatal dopamine receptors may account for the significant remission rate in hyperactivity by adulthood (Andersen and Teicher, 2000). Estrogen neuroprotection has also been proposed to account for the male predominance in ADHD (Sawada and Shimohama, 2000).

Little attention has been paid to gender differences in developmental disabilities except for the purpose of examining prevalence. Most research on specific syndromes or disability groups has failed to analyze data separately for males versus females, and few studies have compared males and females controlling for mental age and intellectual disability. In a review of publications abstracted in PsychLit for 1990–2 dealing with autism, we found 392 empirical articles listed under the keyword 'autism'. Of the 392 publications, 119 (30 percent) provided information about the number of males versus females. Fifty-seven (15 percent) of the 119 articles were single subject studies with too few participants to analyze gender. Only 20 (5 percent) of the articles analyzed dependent variables separately for males and females, and only three of these 20 studies considered differences in intellectual disability in comparing males and females with autism.

Between 2000 and 2002, the number of articles listed under the keyword 'autism' increased substantially, yet gender issues were again not addressed. Of the 563 empirical articles listed, 134 (24 percent) provided information about the number of males versus females in the study samples, and more than half of these (76 or 13 percent) were small sample, single subject designs with too few subjects (mostly males) to analyze gender differences. Of the articles that included information about the number of males versus females in the sample, only 12 (2 percent) analyzed dependent variables separately for males and females. Thus, studies examining gender differences in autism decreased from 5 percent to 2 percent during this 10 year period. Additionally, for both periods, the purpose was to assess gender differences in incidence and prevalence. Few studies have examined gender differences in phenotypic expression of autism or treatment outcome. Because approximately 80 percent of all autism study samples have been male on average, and only a minority of studies have analyzed data separately for males and females, most of what we believe we know about autism is actually about males with autism. There may be a similar bias toward the study of males with other developmental disabilities as well.

Sex on the brain

Sex ratios in developmental disabilities

Many brain-based problems of children's development are equal opportunity conditions. Down's syndrome, for example, occurs equally in boys and girls. In other disabilities the reasons for sex discrepancy in incidence are obvious, e.g. Turner's syndrome (XO). Studying girls with Turner's syndrome has allowed us to look at the effect of the single X chromosome on cognitive function and compare cognitive function to normal girls, as has been done with PET scan (Murphy et al., 1997). Severity also affects ascertainment, which may affect sex ratios. Disorders like fragile X syndrome differ in severity depending on sex. Boys are more severely affected because they lack the FRM1 protein, while girls may have at least some of the FRM1 protein because they have a second normal X chromosome. The FRM1 protein plays a role in prenatal and postnatal brain development, and IQ depends on the amount of FMR1 protein made, which, in girls, depends on the activation ratio of the normal versus the abnormal X chromosome.

With the explosion of knowledge in genetics, there has been increased interest in the biology of the apparent vulnerability of males to developmental disability. Lockshin (2001) notes that sex discrepancy in disability and disease incidence and severity can potentially be explained at different

biological levels: molecular (e.g. imprinting, X-inactivation), cellular (sex-specific receptor activity), organ (endocrine influences), whole organism (size, age), and environmental-behavioral, including intrauterine influences. These same categories have been proposed to explain gender difference in the prevalence and severity of developmental disability.

Sex ratios in developmental disabilities: autism, sex, and gender

The reasons behind the 4:1 male to female ratio in autism (and the more than 10:1 male to female ratio in high-functioning autism and Asperger syndrome) are difficult to explain. Genome scans have not shown any predisposing loci on the X chromosome (Schutz et al., 2002), and no conventional mode of transmission explains the male vulnerability to autistic spectrum disorders. Szatmari and Jones (2002) propose that male gender is a risk factor based on standard epidemiologic designs and propose that any genotype that is established as contributing to autism next be studied in conjunction with sex.

The high male to female ratio in autism and social skill deficits in X monosomy (Turner syndrome) led Skuse and his colleagues (Skuse, 1999; Skuse et al., 1997) to propose that X-linked genetic imprinting could account for the sexual dimorphism in any phenotypic characteristic, independent of the influence of sex hormones on brain development. This group (Skuse et al., 1997) found girls with Turner syndrome (XO) who inherited their single X chromosome from their father had substantially better social communication skills than those girls whose single X was from their mother. Skuse (2000) also found typical boys had poorer social communication than typical girls, and that children with ADHD also had social communication impairment. He suggests an imprinted X-locus may increase male vulnerability to social and communication impairments in a number of developmental disabilities (Skuse, 2000). In this model, multiple autosomal loci would cause genetic vulnerability, which is then mediated in females by an imprinted protective locus on their paternally derived X chromosome.

The risk for autistic spectrum disorders may be greater in males because of epigenetic factors. Androgens are thought to organize the male brain (Collaer and Hines, 1995), and exposure to prenatal androgen (as occurs in females with congenital adrenal hyperplasia) may result in masculine behavior and ability patterns (e.g. stronger visuospatial skills) (Berenbaum, 2001). Simon Baron-Cohen has proposed that autism might be the 'extreme form of the male brain' (Baron-Cohen, 2002; Baron-Cohen and Hammer, 1997). He suggests that women in general spontaneously empathize to a greater degree than do males, while males tend to systematize better than empathize. He quotes Hans Asperger, who wrote: 'The

autistic personality is an extreme variant of male intelligence. Even within the normal variation, we find typical sex differences in intelligence . . . In the autistic individual, the male pattern is exaggerated to the extreme' (Baron-Cohen, 2002). Baron-Cohen points out that we know something about the neural circuitry of empathizing, but very little about the neural circuitry of systematizing. Systematizing cognitive skills are often strengths in persons with autism and understanding the neural circuitry involved could be an important step forward to understanding important aspects of cognition.

Understanding the mechanisms behind the sex ratio differences could lead to new concepts about differences in sex and the brain. The male/female ratio varies according to the absence or presence of intellectual disability (Fombonne, 1999) and abnormal phenotype (Miles and Hillman, 2000), with the ratio more closely approximating 1:1 in children with more impairment. At the milder end of the spectrum, the ratio of boys to girls is higher. If girls require a larger dose of predisposing factors to develop autism, is it primarily because of a genetic threshold effect as Skuse proposes – or is it possible the threshold may be higher because of non-genetic gender-specific brain differences? Perhaps the fact that girls have stronger language and communication skills to begin with affects the recognized phenotype of autism.

Lord et al. (1982) found unusual visual responses and inappropriate stereotypic play were more common in males than females after controlling for IQ. Gillberg and Coleman (2000) found girls in the higher-functioning portion of the autism spectrum were referred for services later than boys. Additionally, they had fewer special interests, better superficial social skills, better language, and less hyperactivity and aggression (Gillberg and Coleman, 2000). McLennan et al. (1993) found that parents report young girls with autism who have mild or no intellectual impairment to have less social and communication deficit than boys with autism even after controlling for age and IQ. Some investigators have found undiagnosed autistic spectrum disorder in girls diagnosed with anxiety disorders and selective mutism (Kopp and Gillberg, 1997) and with anorexia nervosa (Nilsson et al., 1999). It may be that girls with autism, like girls without, have more affective disorders around puberty and receive other diagnoses. In summary, these differences suggest that girls with autism may have a different phenotype than boys, and in milder cases, may not be recognized as having an autistic spectrum disorder.

Sex, the brain, and expressed spectrum variants

Developmental disabilities may appear different depending on gender, presumably due to sex differences in the brain. Recent studies indicate referral

bias raises the male to female ratio in ADHD (Arcia and Conners, 1998; Gaub and Carlson, 1997). Santangelo et al. (1994) found sex differences in Tourette's syndrome may be more a difference in the prevalence of the expressed spectrum variant than a difference in the prevalence of the disorder *per se*. Males also have higher rates of cerebral palsy (CP). This is true for both acquired and congenital CP, although the gender disparity for acquired CP is greater than for congenital CP (Murphy et al., 1993).

Developmental disabilities can look different over time. Although girls may exhibit more competent early social and communicative behaviors than boys, McLennan et al. (1993) found that as adolescents and adults, this same group of autistic females was described as having more severe social deficits than an age and IQ matched group of males with autism. Gillberg and Steffenburg (1987) also report that 10–30 percent of children with autism have cognitive and/or behavioral deterioration at puberty. In their patient sample, 12 percent of the males and 50 percent of the females demonstrated deterioration. These authors suggested that female sex is a risk factor for behavioral and or cognitive deterioration in adolescence (Gillberg and Steffenburg, 1987). Girls with autism, like girls without, may have more affective disorders around puberty that may adversely impact their autistic spectrum disorder.

Finally, sex hormones can influence epileptic activity (Morrell, 1999), suggesting that this disorder, which disproportionately affects individuals with developmental disabilities (Devinsky, 2002), may be expressed differently in males and females across the lifespan. Although there are no gender differences in the incidence or the age of onset of epilepsy (Strauss et al., 1997), sex hormones influence seizure threshold and propagation (Morrell, 1992). Cyclical changes in sex hormones may even contribute to variation in response to antiepileptic medications. Estrogen facilitates neuronal excitability (lowering seizure threshold) while progesterone reduces it (increasing seizure threshold) (Herzog, 1999; Morrell, 1992; 1997). In addition to immediate and short-lived effects on the neuronal membrane, estrogen and progesterone can also have delayed and long-lasting effects on neuronal excitability by altering RNA-mediated gene transcription, which affects protein synthesis (Morrell, 1999). Experimental results on the effect of testosterone and corticosteroids are mixed. Testosterone appears to have seizure-type, dose, and age-dependent effects on seizure activity (Wheless and Kim, 2002). While there are no epidemiological differences in epilepsy between genders, females are more likely to experience changes in seizure pattern, severity, and frequency during puberty, with cyclical changes in hormones related to the menstrual cycle, with pregnancy, and at menopause (Morrell, 1999).

In conclusion, longitudinal studies of gender differences in developmental and other disabilities are needed (McAuley and Anderson, 2002).

A framework for research

The Institute of Medicine Report *Does Sex Matter?* (Wizemann and Pardue, 2001) provides a framework for how sex should matter in research. Research into gender differences in developmental disability may lead to understanding of the neurobiology of the underlying sex differences in the brain. Earlier research has focused on the hormonal milieu to which males and females are exposed, but biochemical differences may be the result of genetic differences between the two sexes. Sex should be a variable in basic research designs both in animal models of disability and in human studies. Intrauterine environment should be explored as well as research at different stages of the lifespan. Wizemann and Pardue (2001) argue that hormonal events occurring at puberty may lay a framework for biological differences that persist through life and that contribute to disease variability. Sex differences in cognitive ability should be studied longitudinally and across the lifespan. Natural variations – for example cognitive differences between girls with and without Turner syndrome (XO) – provide the opportunity to better understand brain organization and function (Murphy et al., 1997; Wizemann and Pardue, 2001). Males and females without developmental disabilities have different patterns of illness and different lifespans. This is likely true of males and females with developmental disabilities as well and is in keeping with the call for a focus on health within an epidemiological framework (Kerr et al., 1996). Comorbidities need to be studied by gender.

Outcomes research is also critical. It appears that many women with developmental disabilities do not receive the health services that typically developing women do. Routine mammograms and routine gynecologic care are often lacking or insufficient (Davies and Duff, 2001; Messinger-Rapport and Rapport, 1997). Females with disability, like females without, appear to be more likely to manifest mental health and behavioral distress as anxiety or depression (Heiman, 2001; Reynolds and Miller, 1985; van Os et al., 1997) while males are more likely to display aggressive behaviors and other forms of acting out (Edelstein and Glenwick, 1997). The mental health needs of males with developmental disabilities are often seen as more pressing, since caregivers are more likely to have difficulty managing outwardly directed behavioral challenges. There may be sex differences in the responses to pharmacological agents and to educational interventions as well.

From research to practice

Girls and boys with and without disabilities are accorded the same or similar educational services in Western countries, though their strengths and weaknesses may differ (Halpern, 1997). If girls with autism process language and social information differently than do boys, educational strategies based largely on research with males may be inappropriate. This is also true in designing interventions for behavior problems such as aggression and self-injury. Behavior problems in females with developmental disabilities may be exacerbated by hormonal changes related to the menstrual cycle. Taylor et al. (1993) found that self-injury in women with developmental disabilities increased during the early and late follicular phases of the menstrual cycle. Additionally, Carr et al. (1996) found that women with developmental disabilities engaged in more self-injury to escape tasks when they were experiencing menstrual discomfort. They obtained significant decreases in problem behaviors by decreasing menstrual discomfort through exercise, medication, diet, massage, and hot water bottles, and by teaching communication and choice-making behaviors. Quality of life for individuals with developmental disabilities is enhanced by greater levels of adaptive skills and abilities, which result in lower levels of challenging behavior (Felce et al., 2000). The results obtained by Carr et al. (1996) and Taylor et al. (1993) suggest that investigation into gender differences can have practical implications and that differential intervention for males and females based on established sex differences may improve treatment outcome and quality of life.

Most people with mild to borderline intellectual disability are either unidentified or function in integrated settings with few limitations placed on their freedom to pursue their lives as they see fit. Understanding gender differences has practical and ethical implications. Women with developmental disabilities may be under-identified, causing delay in diagnosis and intervention. Furthermore, hormonal factors that affect the developmental processes in typically developing individuals may extend to individuals with developmental disabilities, but in different ways. The life course consequences of these differences need to be investigated.

Finally, sex matters to persons with developmental disability. Sexual intimacy is as important a part of life for many persons with disability as it is for those without. Parents and caregivers of individuals with more significant limitations are understandably concerned about the possibility of sexually transmitted diseases and unwanted pregnancies due to their charge's limited capacity to make sound judgments (Shepperdson, 1995). Sex education programs are often limited, although programs have been shown to be effective in teaching persons with intellectual disability about

puberty, intercourse, pregnancy, birth control, and venereal disease (Lindsay et al., 1992). The rights of women and men with developmental disabilities to marry and express sexual intimacy are ambiguous at best, and in many cases very limited. The rights of children born to mothers and fathers with intellectual disabilities and the right of those individuals to parent have been debated, generating a good deal of heat and very little light. These issues touch on deeply held moral and religious beliefs that are often manifested as provincial, state, and national legal doctrine.

Conclusions

The role of sex and gender differences in developmental disabilities has been largely unexplored. Sex ratio differences among some developmental disabilities raise important scientific questions regarding the etiology and mechanisms underlying developmental disabilities. There may be significant differences in the presentation of some developmental disabilities (both strengths and weaknesses) between females and males in cognitive, behavioral, mental health and pathophysiological domains. Cultural differences in the ways in which males and females are perceived and treated extend to individuals with developmental disabilities and may further influence the phenotypic expression of some developmental disabilities (Abu-Habib, 1997). Such differences may have an impact on diagnosis as well as interventions accorded females with developmental disabilities. While the scientific questions posed by these differences provide important research opportunities, these disparities also raise important questions regarding the adequacy of services for females with disabilities based largely on information garnered from male populations.

More poetry, music and literature have been written about romantic and sexual love than perhaps any other topic. To assume that people with developmental disabilities do not share similar longings and desires as the rest of us is untenable. Yet, our discomfort in discussing intimate relationships among people with developmental disabilities has prevented a more productive discussion of these issues due to deep-felt cultural, moral, and religious considerations. We seem especially apprehensive and protective when considering female sexuality. While uneasiness in exploring these important aspects of the human condition is understandable, it is time to challenge our discomfort on behalf of people with developmental disabilities.

There is currently sufficient empirical foundation regarding sex and gender differences to warrant commitment of meaningful research resources to investigating some of these under-examined issues, which

affect a substantial proportion of all people with developmental disabilities.

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