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Birth Order and Ratio of Brothers to Sisters in Spanish Transsexuals

Esther Gómez-Gil · Isabel Esteva · Rocío Carrasco · M. Cruz Almaraz · Eduardo Pasaro · Manel Salamero · Antonio Guillamon

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Abstract Three Western studies have shown that male-to-female (MF) homosexual transsexuals tend to be born later than their siblings and to come from sibships with more brothers than sisters. The objective of this study was to determine whether these variables would be replicated in 530 MF and female-to-male (FM) Spanish transsexuals according to sexual orientation. The results showed that MF homosexual transsexuals had significantly more older brothers than the non-homosexual MF group. Compared with the expected rates in the general population, birth order was significantly higher in both MF (Slater's Index = 0.59; Fraternal Index = 0.61; Sororal Index = 0.58) and FM homosexual transsexuals (Slater's Index = 0.65; Fraternal Index = 0.68; Sororal Index = 0.67), and sibling sex ratio was significantly higher than expected in homosexual MF (sex ratio = 0.55) but not in homosexual FM transsexuals. No significant differences were found in the non-homosexual subgroups. The replication of the later birth order and sibling sex-ratio effect in MF homosexual transsexuals corroborates previous findings in a variety of groups from different cultures and may suggest a common mechanism underlying the etiology of transsexualism.

Keywords Birth order · Sibling sex ratio · Gender identity disorder · Transsexualism · Sexual orientation

E. Gómez-Gil · M. Salamero
Unidad de Identidad de Género, Instituto Clínic de Neurociencias, Servicio de Psiquiatría, Hospital Clínic, Universidad de Barcelona, Barcelona, Spain

I. Esteva · M. C. Almaraz
Unidad de Trastornos de Identidad de Género, Servicio de Endocrinología, Hospital Carlos Haya, Málaga, Spain

R. Carrasco
Unidad de Trastornos de Identidad de Género, Servicio de Ginecología, Hospital Carlos Haya, Málaga, Spain

E. Pasaro
Departamento de Psicobiología, Universidad de A Coruña, A Coruña, Spain

A. Guillamon
Departamento de Psicobiología, UNED, Madrid, Spain

E. Gómez-Gil (✉)
Department of Psychiatry, Institute Clinic of Neurosciences, Hospital Clínic, University of Barcelona, Villarroel 170, 08036 Barcelona, Spain
e-mail: esgomez@clinic.ub.es

Introduction

The phenomenon of transsexualism, or gender identity disorder (GID), is present in all cultures (Gómez-Gil & Esteva de Antonio, 2006). The etiology is unknown, but it has been suggested that biological and environmental factors may contribute to gender identity variations (for a review, see Cohen-Kettenis & Gooren, 1999). The replication of biological variables in cross-cultural research may reflect common underlying causal mechanisms.

Two biodemographic variables, birth order and sibling sex ratio, have been studied in homosexual men (for a review, see Blanchard, 1997; Bogaert, 2005; Slater, 1962; Zucker & Blanchard, 1994), and also in male-to-female (MF) and female-to-male (FM) patients with GID.

In male samples, Western studies from Canada (Blanchard & Sheridan, 1992), The Netherlands (Blanchard, Zucker, Cohen-Kettenis, Gooren, & Bailey, 1996), and England (Green, 2000), and non-Western studies from Singapore (Tsoi, Kok, & Long, 1977), Polynesia (Poasa, Blanchard, & Zucker, 2004; VanderLaan & Vasey, 2009; Vasey & VanderLaan, 2007), and South Korea (Zucker, Blanchard, Kim, Pae, &

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Lee, 2007) have consistently found that MF transsexuals, gender dysphoric or transgendered patients who are sexually attracted to members of the same biological sex (homosexuals according to Blanchard, 1989) are born later and come from sibships with more brothers than sisters. Similar results have also been found in children and adolescent boys with GID (Blanchard, Zucker, Bradley, & Hume, 1995; Blanchard et al., 1996; Zucker et al., 1997). Moreover, the later birth order in these boys appears to be accounted for predominantly by the number of older brothers, but not older sisters, and has thus been named the fraternal birth order effect (Zucker et al., 1997).

In samples of FM adult transsexuals or gender dysphoric women, there is no evidence of an earlier birth order or an excess number of brothers to sisters compared with the theoretical mean (Blanchard & Sheridan, 1992; Green, 2000). One study found that girls with GID, in contrast to boys who tend to be later-born, were more likely to be earlier-born than controls (Zucker, Lightbody, Pecore, Bradley, & Blanchard, 1998).

Since the study of these two demographic variables in transsexuals has been reported in only three Western adult samples, mainly MF transsexuals, it would be interesting to see if the findings are replicated in other countries and in more FM transsexual samples. Evidence that transsexuals from different cultural backgrounds share associated features such as these biodemographic variables would give support to the possibility of a common underlying causal mechanism.

The objective of this study was to explore two biodemographic variables, birth order and ratio of brothers to sisters, in a Spanish sample of MF and FM transsexuals. Based on previous Western studies, our hypothesis was that MF, but not FM transsexuals, would be later-born and have more brothers than sisters.

Method

Participants

The study sample comprised 530 transsexual probands (355 MF and 175 FM) recruited consecutively at the first two gender identity disorder units in the Spanish public heath system. One is in Andalusia (Unidad de Trastornos de Identidad de Género (UTIG), Hospital Carlos Haya, Malaga) and the other in Catalonia (Unidad de Identidad de Género (UIG), Hospital Clínic, Barcelona) (Gómez-Gil & Esteva de Antonio, 2006). Both units provide specialized and comprehensive psychiatric-psychological and endocrine therapy for transsexual patients. The UTIG has provided surgical treatment since 1999 and the UIG since January 2009. Both gender identity teams have adopted the Standards of Care guidelines of the World Professional Association for Transgender Health (Meyer et al., 2001). GID in adulthood or adolescence is diagnosed according to the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994) and transsexualism according to the tenth revision of the *ICD Classification of Mental and Behavioural Disorders* (*ICD-10*; World Health Organization, 1993). The diagnosis is made after several sessions with two mental health professionals (a psychiatrist and a psychologist) using semi-structured, sociodemographic, clinical, and psychiatric interviews (Esteva et al., 2001; Gómez-Gil, Trilla, Salamero, Godás, & Valdés, 2009). The study was approved by the Ethics Committee of both hospitals and was conducted in accordance with the Declaration of Helsinki.

Measures and Procedure

The numbers of older brothers, younger brothers, older sisters, and younger sisters for all probands were extracted from the clinical structured interview protocol records. From these data, we computed measures of birth order and sibling sex ratio. The birth order measure used was Slater's Index (S.I. = Number of older siblings/total number of siblings) (Slater, 1962), the Fraternal Index (number of older brothers/total number of brothers), and the Sororal Index (number of older sisters/total number of sisters) (Jones & Blanchard, 1998). The Slater Index can be calculated only for probands who have one or more siblings, the Fraternal Index only for probands who have one or more brothers, and the Sororal Index for probands who have one or more sisters. The probands, not the siblings, are treated as the cases. A score was computed that expressed birth order as a value between 0 (first-born) and 1 (last-born), and controls for family size. Sibling sex ratio was calculated using the formula number of brothers divided by number of sisters, or the proportion of siblings. In this case, the siblings, not the number of probands, are treated as the cases.

All probands were classified with respect to sexual orientation as: (1) sexually attracted towards the same biological sex (homosexuals) or (2) sexually attracted to the opposite sex, to both sexes, or to neither sex (non-homosexuals) (Blanchard, 1989). Sexual orientation was established by asking what partner (a man, a woman, both or neither) the patient would prefer or feel attraction to if they were completely free to choose and the body did not interfere.

Data Analysis

Data were analyzed using the SPSS V.16.0 statistical software package for Windows. Differences between homosexual and non-homosexual MF transsexuals in the mean number of older brothers, older sisters, younger brothers, and younger sisters were assessed using a two-tailed independent *t*-test. The mean Slater, Fraternal, and Sororal Index values for each group were compared against a value of 0.5, the theoretical value in the general population, by two-tailed one-sample *t*-tests**.** Moreover, comparisons between homosexual and non-homosexual MF and FM transsexuals were assessed by a two-tailed independent

t-test. The observed proportion of male siblings (sex ratio) was compared with the known theoretical proportion of male live births in the general population: 0.515 (51.5%, that is, 106 males to 100 females at birth), by using the *z* approximation to the binomial test. Moreover, comparisons between homosexual and non-homosexual subgroups were assessed by the comparison test between proportions. A significance level of $p < .05$ was considered statistically significant.

Results

All probands were white Caucasian. The mean age at first assessment was 30 years ($SD = 8.78$) for MF probands, and 27 years ($SD = 7.77$) for FM probands. The 30 MF and 15 FM transsexuals who were singletons or adopted were excluded.

The mean numbers of older and younger brothers and sisters, categorized according to sexual orientation, are shown in Table 1. The homosexual MF transsexuals had significantly more older brothers than the non-homosexual MF transsexuals ($t = 2.81$, $df = 323$, $p = .005$). The two groups did not differ with regard to older sisters, younger brothers, or younger sisters. Since the non-homosexual FM transsexual group in this study was so small, statistical comparative analyses according to sexual orientation were not performed in FM transsexuals.

The birth order (Slater, Fraternal, and Sororal Indices) results by sexual orientation subgroup are shown in Table 2. Compared with the expected rates in the general population, birth order was significantly higher in both MF (Slater's Index = 0.59; Fraternal Index = 0.61; Sororal Index = 0.58) and FM homosexual transsexuals (Slater's Index = 0.65; Fraternal Index = 0.68; Sororal Index = 0.67). Homosexual MF transsexuals differed significantly from the non-homosexuals MF group in the Fraternal Index ($t = 2.07$, $df = 241$, $p = .04$); the homosexual group had more older than younger brothers (Fraternal Index = 0.61), but in the non-homosexual group the reverse was true (Fraternal Index = 0.42).

As shown in Table 3, compared with the ratio expected in the general population, sibling sex ratio was significantly higher in homosexual MF transsexuals (sex ratio = 0.55, $z = 2.17$, $p = .03$) but not in homosexual FM transsexuals and in the non-homosexual subgroups.

Discussion

This study investigated whether demographic variables previously reported in Western samples of transsexual or gender dysphoric patients are replicated in two Spanish samples of MF and FM transsexual probands.

We found that the incidence of late birth order in both MF and FM Spanish transsexuals who are sexually attracted towards the same biological sex (homosexual group) was higher than in the general population or in the non-homosexual group. The later birth order found in the MF transsexual sample was in accordance with previous reports in Western (Blanchard & Sheridan, 1992; Blanchard et al., 1995, 1996; Green, 2000; Zucker et al., 1997) and non-Western samples (Poasa et al., 2004; Tsoi et al., 1977) of homosexual adolescents and adults with GID. Nevertheless, our results did not replicate the data from Zucker et al. (1997) in children, suggesting that the probands were born later relative to their brothers than they were relative to their sisters.

The later birth order found in our FM homosexual transsexual sample was not found in previous studies in adult (Blanchard & Sheridan, 1992; Green, 2000) or adolescent (Zucker et al., 1998) homosexual girls with GID. Moreover, the data from Zucker et al. (1998) found that the girls probands were born early compared with their sisters but not with their brothers.

Table 1 Mean number and *SD* of older, younger, and total number of brothers and sisters of Spanish male to female and female to male transsexuals by subgroup according to sexual orientation

Transsexual type	Homosexual		Non-homosexual		Comparison test	
	Number of siblings	*M* (*SD*)	Number of siblings	*M* (*SD*)	*t*	*p*[a]
Male to female transsexuals		$n = 287$		$n = 38$		
Older brothers	291	1.01 (1.27)	16	0.42 (0.72)	2.81	.005
Older sisters	243	0.85 (1.13)	24	0.63 (0.85)	1.13	ns
Younger brothers	177	0.62 (0.98)	26	0.68 (1.04)	−0.40	ns
Younger sisters	136	0.47 (0.69)	22	0.58 (0.83)	−0.86	ns
Female to male transsexuals		$n = 154$		$n = 6$		
Older brothers	127	0.82 (1.02)	9	1.50 (1.98)		
Older sisters	122	0.79 (1.14)	9	1.50 (2.07)		
Younger brothers	63	0.41 (0.78)	0	0		
Younger sisters	63	0.41 (0.76)	2	0.33 (1.84)		

[a] Two-tailed

Table 2 Birth order (Slater, Fraternal and Sororal Indices) and sibling sex ratio in Spanish male to female transsexuals by subgroup according to sexual orientation

Transsexual type	Homosexuals		Comparison test[a]		Non-homosexuals		Comparison test[a]		Comparison test[b]	
	Probands	*M* (*SD*)	*t*	*p*	Probands	*M* (*SD*)	*t*	*p*	*t*	*p*
Male to female										
Slater's Index	$n = 287$	0.59 (0.42)	3.48	.001	$n = 38$	0.47 (0.45)	−0.37	ns	1.56	ns
Fraternal Index	$n = 219$	0.61 (0.43)	3.74	.001	$n = 24$	0.42 (0.48)	−0.88	ns	2.07	.04
Sororal Index	$n = 208$	0.58 (0.46)	2.55	.01	$n = 29$	0.52 (0.47)	0.26	ns	0.64	ns
Female to male										
Slater's Index	$n = 154$	0.65 (0.43)	4.42	.001	$n = 6$	0.67 (0.52)				
Fraternal Index	$n = 112$	0.68 (0.44)	4.35	.001	$n = 3$	1.00 (0.00)				
Sororal Index	$n = 107$	0.67 (0.44)	3.96	.001	$n = 5$	0.60 (0.55)				

[a] Two-tailed one-sample *t*-tests. The Slater, Fraternal, and Sororal Indices in transsexuals were compared with the indices expected in the general population (0.50)

[b] Two-tailed

Table 3 Sibling sex ratio in Spanish male to female transsexuals by subgroup according sexual orientation

Transsexual type	Homosexuals	Comparison test[a]		Non-homosexuals	Comparison test[a]		Comparison test[b]	
	Sibling sex ratio	*z*	*p*	Sibling sex ratio	*z*	*p*	*z*	*p*
Male to female	$n = 287$			$n = 38$				
Brothers/all siblings	0.55	2.17	.03	0.48	−0.71	ns	0.64	ns
Female to male	$n = 154$			$n = 6$				
Brothers/all siblings	0.51	−0.37	ns	0.45	−0.58	ns	−0.13	ns

[a] The *z* approximation to the binomial test. The sibling sex ratio in transsexuals was compared with the indices expected in the general population (0.515) for the expected ratio of brothers to sisters

[b] Comparison of two proportions. Comparison tests between homosexual and non-homosexual transsexuals

With regard to sibling sex ratio, the findings that MF homosexual transsexuals have a higher than expected proportion of male siblings replicate the elevated ratios observed in three adult MF Western samples (Blanchard & Sheridan, 1992; Blanchard et al., 1996; Green, 2000), in boys with GID (Blanchard et al., 1995; Zucker et al., 1997), and in transgendered males from Polynesia (Poasa et al., 2004). The sibling sex ratio in FM homosexual transsexuals, which did not differ from the expected value, was in accordance with the ratios observed in two studies in FM transsexuals (Blanchard & Sheridan, 1992; Green, 2000).

Taken together, the present findings reinforce the earlier studies. As Zucker et al. (1997) pointed out, birth order and sibling sex ratio appear to be at least partially independent phenomena. The later birth order in MF transsexuals sexually attracted towards the same biological sex appears to be the biodemographic variable most consistently replicated across different cultural groups. However, the birth order and sex ratio phenomenon is a purely empirical observation, and is therefore open to a wide variety of biological and psychosocial theoretical interpretations.

Biological theories share the assumption that a decrease in androgen levels in the brain during development might result in incomplete masculinization of the brain in MF transsexuals, resulting in a more feminized brain and a female gender identity (Cohen-Kettenis & Gooren, 1999). The maternal immune hypothesis proposes that the fraternal birth order effect may be triggered when fetal cells or cell fragments (large molecules like proteins or peptides) enter the maternal circulation, an event especially common during childbirth. The mother' immune system recognises the male-specific molecules as foreign and produces maternal anti-male antibodies. These antibodies may cross the placental barrier, enter the brain of a male fetus, and divert their sexual differentiation from the typical male pathway. The probability of maternal immunization increases with each male fetus. Therefore, the probability of homosexuality increases with each older brother (Blanchard, 2008). Since the maternal immune reaction during the pregnancy with a male fetus may result in behavioural feminization, this hypothesis may help explain not only homosexuality but also transsexualism (Green, 2000; MacCulloch & Waddington, 1981).

Another theory has proposed that male homosexuality is caused by an androgen insufficiency during sexual differentiation of the fetal brain, as a result of stress experienced by a homosexual's mother during pregnancy (Bailey, Willerman, & Parks, 1991; Dörner, Schenk, Schmiedel, & Ahrens, 1983;

Ellis and Cole-Harding, 2001). Since previous findings suggest that stressed mothers produce a predominance of male offspring mediated by maternal gonadotropin levels, the hypothesis predicts that the mothers of homosexual sons should be characterologically more stressed than the mothers of comparable heterosexual men (for a review, see Blanchard & Sheridan, 1992; Ellis & Cole-Harding, 2001). Nevertheless, there is no evidence in support of this hypothesis.

Moreover, it could be hypothesized that pregnancies may induce changes in the expression of gene variants involved in sex steroidogenesis and may therefore cause undermasculinization and/or feminization. A significant association between MF transsexualism and longer androgen receptor repeat length polymorphisms has been found (Hare et al., 2008). Successive pregnancies may increase the percentage of long polymorphism in the androgen receptor resulting in less effective testosterone signalling, similarly to the way in which polyglutamine diseases (such as Huntington's chorea and Kennedy's disease) increase length polymorphism in some genes (gene expansion) in each generation. Nevertheless, there is no evidence of this hypothesis. In summary, no consistent biological explanation has been established, and there is a lack of empirical evidence for these theories that would be only relevant for older brothers and for MF homosexual transsexuals.

Psychological or psychosocial theories have also been proposed. One theory holds that parents with many or only boys prefer their next child to be a girl. Therefore, this prenatal gender preference might influence the parents' gender role socialization in a later-born boy. However, data reported by Zucker et al. (1994) showed that a prenatal wish for a daughter was not disproportionately higher among mothers of boys with GID than among mothers of control boys. Other psychological theories that have been reviewed in greater detail elsewhere (Blanchard & Sheridan, 1992; Blanchard et al., 1995, 1996; Bogaert, 2005; Green, 2000) are based on psychological clichés about homosexuality from the 1940s and 1950s, and enjoy no greater degree of empirical support than biological hypotheses. In general, the explanation for the late birth order of transsexuals is still debated, and the value of these theories is unclear.

The present research has some limitations. First, we had no control group to estimate the expected birth order indices for the general Spanish population. We chose expected theoretical data in general populations since in Spain there are no stopping rules governing parental reproductive behavior, such as the male preference rule in South Korea (Zucker et al., 2007), which might distort the expected data. Second, the non-homosexual transsexual group in this study was small, and statistical analysis could not be performed for the FM non-homosexual transsexuals. Previous research in a Spanish population found a high proportion of MF (89.9%) and FM (94.4%) transsexuals who reported same-sex sexual orientation (Cano et al., 2004; Esteva et al., 2006; Gómez-Gil et al., 2009) compared with previous European studies (for a review, see Gómez-Gil et al., 2009).

In summary, the present findings corroborate those of previous studies that found a later birth order and a higher sibling sex ratio (more brothers than sisters) among siblings of homosexual MF transsexuals. The replication of these biodemographic variables across different cultural groups suggests that a common mechanism might underlie the etiology of transsexualism. Nevertheless, these mechanisms remain enigmatic. As Blanchard and Sheridan (1992) pointed out, we think that it is important to replicate these parameters in other samples that would give us a sufficiently large number of cross-cultural studies to propose verifiable hypotheses regarding the possible causes of GID.

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References

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Bailey, J. M., Willerman, L., & Parks, C. (1991). A test of the maternal stress theory of human male homosexuality. *Archives of Sexual Behavior, 20*, 277–293.

Blanchard, R. (1989). The classification and labelling of nonhomosexual gender dysphorics. *Archives of Sexual Behavior, 18*, 315–334.

Blanchard, R. (1997). Birth order and sibling sex ratio in homosexual versus heterosexual males and females. *Annual Review of Sex Research, 8*, 27–67.

Blanchard, R. (2008). Review and theory of handedness, birth order, and homosexuality in men. *Laterality, 13*, 51–70.

Blanchard, R., & Sheridan, P. M. (1992). Sibship size, sibling sex ratio, birth order, and parental age in homosexual and nonhomosexual gender dysphorics. *Journal of Nervous and Mental Disease, 180*, 40–47.

Blanchard, R., Zucker, K. J., Bradley, S. J., & Hume, C. S. (1995). Birth order and sibling sex ratio in homosexual male adolescents and probably prehomosexual feminine boys. *Developmental Psychology, 31*, 22–30.

Blanchard, R., Zucker, K. J., Cohen-Kettenis, P. T., Gooren, L. J. G., & Bailey, J. M. (1996). Birth order and sibling sex ratio in two samples of Dutch gender-dysphoric homosexual males. *Archives of Sexual Behavior, 25*, 495–514.

Bogaert, A. F. (2005). Gender role/identity and sibling sex ratio in homosexual men. *Journal of Sex and Marital Therapy, 31*, 217–227.

Cano, G., Bergero, T., Esteva, I., Giraldo, F., Gómez, M., & Gorneman, I. (2004). La construcción de la identidad de género en pacientes transexuales [Gender identity construction in transsexual patients]. *Revista de la Asociación Española de Neuropsiquiatría, 90*, 2840–2848.

Cohen-Kettenis, P. T., & Gooren, L. J. G. (1999). Transsexualism: A review of etiology, diagnosis and treatment. *Journal of Psychosomatic Research, 46*, 315–333.

Dörner, G., Schenk, B., Schmiedel, B., & Ahrens, L. (1983). Stressful events in prenatal life of bi-and homosexual men. *Experimental and Clinical Endocrinology, 81*, 83–87.

Ellis, L., & Cole-Harding, S. (2001). The effects of prenatal stress, and of prenatal alcohol and nicotine exposure, on human sexual orientation. *Physiology & Behavior, 74*, 213–226.

Esteva, I., Giraldo, F., Bergero, T., Cano, G., Crespillo, C., Ruíz, S., et al. (2001). Unidad de Trastornos de Identidad de Género de Andalucía: Evaluación diagnóstica, tratamiento hormonal y quirúrgico

de los pacientes con Transexualidad [Gender Identity Disorder Unit in Andalusia: Diagnostic evaluation, hormonal, and surgical treatment in transsexual patients]. *Cirugía Plástica Iberolatinamericana, 27*, 259–324.

Esteva, I., Gonzalo, M., Yahyaoui, R., Domínguez, M., Bergero, T., Giraldo, F., et al. (2006). Epidemiología de la transexualidad en Andalucía, atención especial al grupo de adolescents [Epidemiology of transsexualism in Andalusia: Special attention to the adolescent group]. *Cuadernos de Medicina Psicosomática y Psiquiatría de Enlace, 78*, 65–70.

Gómez-Gil, E., & Esteva de Antonio, I. (2006). *Ser transexual* [Being transexual]. Barcelona: Editorial Glosa.

Gómez-Gil, E., Trilla, A., Salamero, M., Godás, T., & Valdés, M. (2009). Sociodemographic, clinical, and psychiatric characteristics of transsexuals from Spain. *Archives of Sexual Behavior, 38*, 378–392.

Green, R. (2000). Birth order and ratio of brothers to sisters in transsexuals. *Psychological Medicine, 30*, 789–795.

Hare, L., Bernard, P., Sánchez, F. J., Baird, P. N., Vilain, E., Kennedy, T., et al. (2008). Androgen receptor repeat length polymorphism associated with male-to-female transsexualism. *Biological Psychiatry, 65*, 93–96.

Jones, M. B., & Blanchard, R. (1998). Birth order and male homosexuality: Extension of Slater's index. *Human Biology, 70*, 775–787.

MacCulloch, M. J., & Waddington, J. L. (1981). Neuroendocrine mechanisms and the aetiology of male and female homosexuality. *British Journal of Psychiatry, 139*, 341–345.

Meyer, W., Bockting, W., Cohen-Kettenis, P., Coleman, E., DiCeglie, D., Devor, H., et al. (2001). The Harry Benjamin Gender Dysphoria Association's standards of care for gender identity disorders, sixth version. *Journal of Psychology and Human Sexuality, 13*, 1–30.

Poasa, K. H., Blanchard, R., & Zucker, K. J. (2004). Birth order in transgendered males from Polynesia: A quantitative study of Samoan fa'affine. *Journal of Sex and Marital Therapy, 30*, 13–23.

Slater, E. (1962). Birth order and maternal age of homosexuals. *Lancet, i*, 69–71.

Tsoi, W. F., Kok, L. P., & Long, F. Y. (1977). Male transsexualism in Singapore: A description of 56 cases. *British Journal of Psychiatry, 131*, 405–409.

VanderLaan, D. P., & Vasey, P. L. (2009). Male sexual orientation in independent Samoa: Evidence for fraternal order and maternal fecundity effects. *Archives of Sexual Behavior*. doi:10.1007/s10508-009-9576-5.

Vasey, P. L., & VanderLaan, D. P. (2007). Birth order and male androphilia in Samoan fa'afafine. *Proceedings of the Royal Society of London Series B: Biological Sciences, 247*, 1437–1442.

World Health Organization. (1993). *International classification of diseases: Diagnostic criteria for research* (10th ed.). Geneva: Author.

Zucker, K. J., & Blanchard, R. (1994). Re-analysis of Bieber et al.'s 1962 data on sibling sex ratio and birth order in male homosexuals. *Journal of Nervous and Mental Disease, 182*, 528–530.

Zucker, K. J., Blanchard, R., Kim, T. S., Pae, C. U., & Lee, C. (2007). Birth order and sibling sex ratio in homosexual transsexual South Korean men: Effects of the male-preference stopping rule. *Psychiatry and Clinical Neurosciences, 61*, 529–533.

Zucker, K. J., Green, R., Coates, S., Zuger, B., Cohen-Kettenis, P. T., Zecca, G. M., et al. (1997). Sibling sex ratio of boys with gender identity disorder. *Journal of Child Psychology and Psychiatry, 38*, 543–551.

Zucker, K. J., Green, R., Garofano, C., Bradley, S. J., Willians, K., Rebach, H. M., et al. (1994). Prenatal gender preference of mothers of feminine and masculine boys: Relation to sibling sex composition and birth order. *Journal of Abnormal Child Psychology, 22*, 1–13.

Zucker, K. J., Lightbody, S., Pecore, K., Bradley, S. J., & Blanchard, R. (1998). Birth order in girls with gender identity disorder. *European Child and Adolescent Psychiatry, 7*, 30–35.