Global Journal of Medical Research: K
Interdisciplinary
Volume 14 Issue 6 Version 1.0 Year 2014
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

The Smile Line in a Sample of a Sudanese Population

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Objectives: A cross sectional study to assess the smile line in a sample of Sudanese population and its correlation with age, gender, and incisor classification.

Material and methods: Clinical examination as well as a photograph was taken for 500 (230 males and 270 females) Sudanese adults with an age range of 15- >46 years in the Academy dental hospital to assess their smile line.

Results: Low smile line was the most frequently (41%) encountered smile line followed by average (29.4%), high (22%), and the least being the very high smile line (7.6%). A statistically significant difference was found between age, gender and incisor classification in relation to the smile line (p value ≤0.05).

Conclusion: Low smile line was the most frequent among Sudanese population and a strong correlation was found between the smile line and age, gender and incisor classification.

Keywords: *smile line, incisor classification, sudanese population.*

GJMR-K Classification: *NLMC Code : WU 113, WU 113.7*

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The Smile Line in a Sample of a Sudanese Population

The Smile Line

Dr. Sereen I. El Sarrag [α] & Dr. Amal H. Abuaffan [σ]

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I. Introduction

A smile is an important feature in determining an individual's attractiveness. It is a simple concept that is seldom thought about and adjusted rather involuntarily, yet it has the power to improve one's mood, lift spirits and generally make a person appear more beautiful. Conversely, an esthetically displeasing smile with the occlusion of teeth being far from ideal may have a negative impact on social life making a person feel insecure, timid and less confident.

Esthetic concerns regarding the smile are usually the patient's main reason for seeking orthodontic treatment.[1]Sabri stated that "the smile line depends on six factors; upper lip length, lip elevation, vertical maxillary height, crown height, vertical dental height, and incisor inclination". And defined the smile line (lip line) as the amount of vertical tooth exposure in smiling, the height of the upper lip relative to the maxillary central incisors.[2]

The lips are the main factors controlling tooth and gingival display, therefore they must be taken into consideration for an aesthetically pleasing smile. The smile composition is framed by the lips; in this way, the arrangement of the teeth and the visible gingiva is dictated by the outline of the lips and the height of the smile line. [3]

In orthodontic treatment, aesthetics has traditionally been associated with profile enhancement. Although a patient's top priority is to improve their smile; orthodontists' mainly focus on the skeletal structure rather than soft tissues and thus the smile gets relatively little attention. Creating a pleasing smile should therefore be a fundamental aim in orthodontics. [4, 5]

Smiles are either **posed** or **spontaneous**. A posed smile is the voluntary expression made when a person is for example being introduced to someone, or when taking a passport photograph or orthodontic records and according to studies it is repeatable. A spontaneous smile on the other hand is involuntary natural, and affected by emotions. With all the muscles of facial expression involved, a spontaneous smile always has more lip elevation than a posed smile.[2] Studies usually refer to the posed smile because it is reproducible and can therefore be used as a reference position. [1]

As a general guideline, the smile line is optimal when the upper lip reaches the gingival margin, displaying the total cervicoincisal length of the maxillary central incisors, along with the inter-proximal gingivae. The beginning point of a smile is the lip line at rest, with an average maxillary incisor display of 1.91mm in men and nearly twice that amount (3.40mm) in women.[2]With aging, there is a steady decrease in exposure of the maxillary incisors at rest and, to a much lesser degree, in smiling. This gradual decline in maxillary tooth exposure at rest is accompanied by an increase in mandibular incisor display. [5]

A number of studies worldwide have assessed the smile line using different evaluation methods among different ethnic groups. Photographs are the most popular methods for assessment. [1, 6-13, 15, 16, 18, 19] Very few researchers use visual and videographic methods for smile line evaluation. [14, 17]

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The smile of an individual affects their self-esteem, confidence, as well as their social and work life. Recently Sudanese people have become more conscious about their appearance and aesthetics and this has resulted in an increase in number of individuals seeking orthodontic treatment in order to have an aesthetically pleasing smile. However achievement of these aesthetic goals presents many challenges, including occasional differing opinions between patients and clinicians as to what constitutes an aesthetic smile. Therefore, the present study aimed to assess the smile line in a sample of Sudanese population, which may act as a baseline for future researches and aid orthodontists in treatment planning as there is no such study available in Sudan.

II. Materials and Methods

A descriptive, cross sectional study was carried out in the Academy Charity Teaching Hospital (ACTH), University of Medical Sciences and Technology, Faculty of Dentistry, Khartoum, Sudan. All students, staff members and patients (attending the hospital) satisfying the inclusion criteria from the period of November 2013 to March 2014 were included in the study.

Permission and approval was obtained from the University of Medical Sciences and Technology to conduct this study. The aim of the study was explained to each participant and it was ensured that the photographs taken will only be used for research purposes and the personal data will remain confidential throughout the study. Those that agreed to participate in the study signed a consent form and later were called for a clinical examination and photograph.

The data sheet was filled for each individual that fulfilled the inclusion criteria: Sudanese nationality, age group ≥15 years, no previous or current orthodontic treatment, presence of all anterior permanent teeth, no facial abnormalities and no syndromes.

The main researcher using a mask, gloves, and an examination set, carried out the clinical examination while the individual sat in the dental chair. The incisor classification was assessed according to the British classification as follows [20]:

Class I: The lower incisal edges occlude with or lie immediately below the cingulum of the upper incisors.

Class II division I: The lower incisal edge occludes behind the cingulum of the upper central incisors and the upper incisors are proclined.

Class II division II: The lower incisal edge occludes behind the cingulum of the upper central incisors, and the upper incisors are retroclined.

Class III: The lower incisal edge occludes in front of the cingulum of the upper incisors.

A photograph was then taken of each subject by the main investigator using a (Sony Cyber-shot DSC-WX100, Sony lens, 18.2 mega pixels, 10X optical zoom) camera with a wide mouth opener to yield a smile with the front teeth with the teeth in habitual contact. Later each photograph was assessed under four different categories with the following score definitions: [3]

a. Score 0= Low smile line: Estimated as less than 25% of the inter- proximal gingivae visible and no gingival margins visible.
b. Score 1= Average smile line: Estimated as 25-75% of the inter-proximal gingivae visible, gingival margins possibly visible at single teeth.
c. Score 2= High smile line: Estimated as more than 75% of the inter-proximal Gingivae visible, while gingival margins scarcely visible.
d. Score 3= Very high smile line: when a band of contiguous maxillary gingival of at least 2 mm is visible in all regions of interest.

After the data was collected, summarized, and coded it was entered into the Statistical Package for Social Sciences (SPSS) program (version 17) in the computer. The data was analyzed in the form of pie and bar charts. A chi square test was used to examine the correlation between smile line scores with age and gender, and incisor classification. For all statistical tests a P-value of less than 0.05 was considered as significant.

Method of the error

Fifteen participants were randomly selected for a repeated photograph and clinical examination. No difference was found between the 2 photographs as well as the incisor classification.

III. Results

The number of participants examined was 500 (230 males and 270 females) with an age range of 15->46. Most of the examined participants were in the age group of 15-25 years (figure 1).

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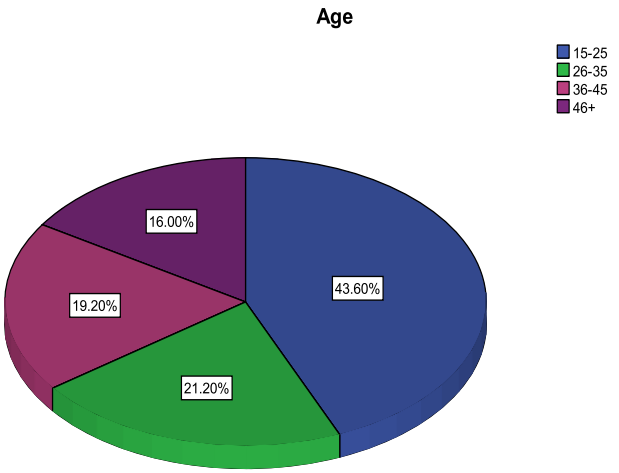

Figure 1 : Age distribution of the study sample

According to the incisor classification (figure 2), the most common class was Class I with (40.8%) followed by Class II (33.4%) and the least common was Class III (25.8%)

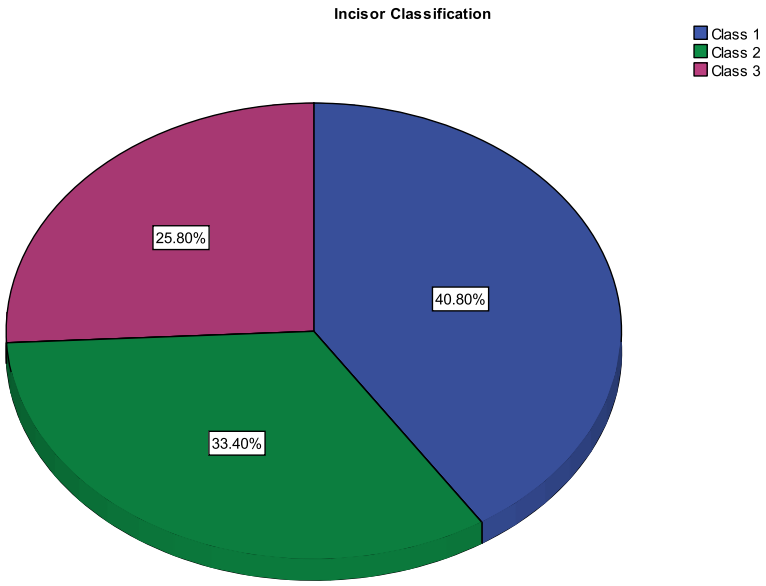

Figure 2 : Incisor classification of the study sample

The smile line score revealed that 41% of the sample had score of 0 while 29.4%, 22%, and 7.6% of the sample had a score of 1, 2, and 3 respectively (Figure 3,4,5,6).

Age * Smile * Gender Cross tabulation

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Figure 3 : Smile Line Score 0 Low smile line. less than 25% of the inter proximal gingivae visible and no gingival margins visible

Figure 4 : Smile Line Score 1. Average smile line 25-75% of the inter-proximal gingivae visible, gingival margins possibly visible at single teeth

Figure 5 : Smile Line Score 2. High smile line more than 75% of the inter-proximal Gingivae visible, while gingival margins scarcely visible

Figure 6 : Smile Line Score 3 Very high smile line: when a band of contiguous maxillary gingival of at least 2 mm is visible in all regions of interest

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It was noted that in table 1 the majority of the studied sample with incisor class I, II, and III had a smile line score of 0 (44.6%, 34.7% and 43.4% respectively) while very few had a score of 3. A strong association was found between gender smile line and incisor classification with a p value of ≤ 0.05.

Table 1 : Shows the correlation between gender, incisor classification, and smile line score (%)

Incisor Classification			Smile Line Score				Total	P Value
			Score 0	Score 1	Score 2	Score 3		
Class 1	Gender	Male	55 (27.0%)	34 (16.7%)	7 (3.4%)	3 (1.5%)	99 (48.5%)	.000*
		Female	36 (17.6%)	24 (11.8%)	36 (17.6%)	9 (4.4%)	105 (51.5%)	.000*
	Total		91 (44.6%)	58 (28.4%)	43 (21.1%)	12 (5.9%)	204 (100%)	
Class 2	Gender	Male	31 (18.6%)	23 (13.8%)	9 (5.4%)	1 (0.6%)	64 (38.3%)	.000*
		Female	27 (16.2%)	13 (7.8%)	45 (26.9%)	18 (10.8%)	103 (61.7%)	.000*
	Total		58 (34.7%)	36 (21.6%)	54 (32.3%)	19 (11.4%)	167 (100%)	
Class 3	Gender	Male	33 (25.6%)	30 (23.3%)	3 (2.3%)	1 (0.8%)	67 (51.9%)	.020*
		Female	23 (17.8%)	23 (17.8%)	10 (7.8%)	6 (4.7%)	62 (48.1%)	.020*
	Total		56 (43.4%)	53 (41.1%)	13 (10.1%)	7 (5.4%)	129 (100%)	

**P value <0.05 is significant*

In table 2, the majority of the studied sample fall within score 0 among all age groups, however very few numbers fall within score 3 smile line. All of the participants falling in the age group of >46 years had a 0 smile line score except 2 (1.1%).

Table 2 : Shows the correlation between age groups, incisor classification, and smile line score in the studied sample (%)

Incisor Classification			Smile Line Score				Total	P Value
			Score 0	Score 1	Score 2	Score 3		
Class 1	Age	15-25	38 18.6%	23 11.3%	28 13.7%	8 (3.9%)	97 (47.5%)	.000*
		26-35	8 3.9%	17 8.3%	4 2.0%	2 (1.0%)	31 (15.2%)	.000*
		36-45	11 5.4%	18 8.8%	10 4.9%	2 1.0%	41 (20.1%)	.000*
		46+	34 16.7%	0 0.0%	1 0.5%	0 0.0%	35 (17.2%)	.000*
	Total		91 44.6%	58 28.4%	43 21.1%	12 5.9%	204(100%)	
Class 2	Age	15-25	21 12.6%	12 7.2%	25 (15%)	6 (3.6%)	64 (38.3%)	.000*
		26-35	12 7.2%	13 7.8%	16 (9.6%)	9 (5.4%)	50 (29.6%)	.000*
		36-45	3 1.8%	11 6.6%	12 (7.2%)	4 (2.4%)	30 (18.0%)	.000*
		46+	22 13.2%	0 0.0%	1 (0.6%)	0 (0.0%)	23 (13.8%)	.000
	Total		58 34.7%	36 21.6%	54 (32.3%)	19 (11.4%)	167 (100%)	
Class 3	Age	15-25	24 18.6%	26 20.2%	4 (3.1%)	3 (2.3%)	57 (44.2%)	.000*
		26-35	4 3.1%	16 12.4%	3 (2.3%)	2 (1.6%)	25(19.4%)	.000*
		36-45	6 4.7%	11 8.5%	6 (4.7%)	2 (1.6%)	25 (19.4%)	.000*
		46+	22 17.1%	0 0.0%	0 (0.0%)	0 (0.0%)	22 (17.1%)	.000*
	Total		56 43.4%	53 41.1%	13 (10.1%)	7 (5.4%)	129 (100%)	

**P value ≤0.05 is significant*

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In table 3 it was noticed that females exhibited a higher smile line score 2 and 3 (33.7% and 12.2% respectively) than males among the different age groups, however more males were found to have a smile line score of 0 and 1(51.7% and 37.8% respectively). A strong association was also found between smile lines, age groups, among males and females (p value ≤0.05).

Table 3 : Correlation between smile lines, age groups among genders (%)

Gender			Smile Line Score								Total		P value
			Score 0		Score 1		Score 2		Score 3				
Male	Age	15-25	48	20.9%	37	16.1%	14	6.1%	4	1.7%	103	44.8%	.000*
		26-35	16	7.0%	27	11.7%	3	1.3%	0	0.0%	46	20.0%	.000*
		36-45	11	4.8%	23	10%	2	0.9%	1	0.4%	37	16.1%	.000*
		46+	44	19.1%	0	0.0%	0	0.0%	0	0.0%	44	19.1%	.000*
	Total		119	51.7%	87	37.8%	19	8.3%	5	2.2%	230	100%	
Female	Age	15-25	35	13.0%	24	8.9%	43	15.9%	13	4.8%	115	42.6%	.000*
		26-35	8	3.0%	19	7.0%	20	7.4%	13	4.8%	60	22.2%	.000*
		36-45	9	3.3%	17	6.3%	26	9.6%	7	2.6%	59	21.9%	.000*
		46+	34	12.6%	0	0.0%	2	0.7%	0	0.0%	36	13.3%	.000*
	Total		86	31.9%	60	22.2%	91	33.7%	33	12.2%	270	100%	

**P Value ≤ 0.05 is significant*

No association was found between age, gender, and incisor classification except with the age group of 36-45 years where the p value was 0.042 in males and 0.034 in females (<0.05) (table 4).

Table 4 : The correlation between age gender and incisor classification (%)

Age			Incisor Classification						Total		P Value Significance
			Class 1		Class 2		Class 3				
15-25	Gender	Male	42	19.3%	29	13.3%	32	14.7%	103	47.2%	.285
		Female	55	25.2%	35	16.1%	25	11.5%	115	52.8%	.285
	Total		97	44.5%	64	29.4%	57	26.1%	218	100%	
26-35	Gender	Male	16	15.1%	19	17.9%	11	10.4%	46	43.4%	.485
		Female	15	14.2%	31	29.2%	14	13.2%	60	55.6%	.485
	Total		31	29.2%	50	47.2%	25	23.6%	106	100%	
36-45	Gender	Male	19	19.8%	6	6.3%	12	12.5%	37	38.5%	.042
		Female	22	22.9%	24	25.0%	13	13.5%	59	61.5%	.034
	Total		41	42.7%	30	31.3%	25	26.0%	96	100%	
46+	Gender	Male	22	27.5%	10	12.5%	12	15%	44	55.0%	.348
		Female	13	16.3%	13	16.3%	10	12.5%	36	45.0%	.348
	Total		35	43.8%	23	28.8%	22	27.5%	80	100%	

**P Value ≤ 0.05 is significant*

IV. Discussion

This is a clinical based study aimed to evaluate the smile line among a sample of the Sudanese population with regards to age, gender, and incisor classification. A photograph of the participants' posed smiles was taken as the posed smile is reproducible.

The results showed (percentage of gender, age and incisors classification) that the majority of the studied sample had a low smile line. The majority of the studied sample fell in the age group of 15-25 since it was it was carried out in the university hospital and only a few of the patients fell in the older age group of >46.

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In the present study, 41% of the sample was found to have a low smile line which was similar to a study conducted by MN Hochman et al [10] who reported 78% of their population had a low gingival display whereas J Zhang et al [8] among Chinese population reported a lower percentage of a low smile line (16.25%) but exhibited a higher percentage of the average smile line (68.75%).

This difference in percentages can be attributed to the sample size, age groups, scoring method, environmental factors as well as ethnic background of the examined population.

When comparing genders, the present study showed that the smile line among the younger females age group exhibited more or less similar results as those obtained among other study populations in previous literature such as those reported by Jensen et al [1] among the Switzerland sample, H. Miron [7] in Israeli population as well as Tjian et al [19] among Californian Caucasian where younger females had a higher smile line than males.

This high smile line among young females may be partially attributed to their ethnic background as well as the cranial facial structure with bimaxillary protrusion displayed in the Sudanese population.

Regarding age groups the present study showed that the majority (97.5%) of the older age group (above 46 years) had low smile lines. Similar results were obtained by Jensen et al where 50-70% of the older age group (above 35 years) had a low smile line. [1]

This difference in results can be explained by the difference in the sample size together with the age range distribution and ethnic background of the studied samples. In contrast to the previous literature mentioned above, the present study evaluated the smile line in relation to the British incisor classification and it was evident that the results revealed a high statistical significance, in which approximately half of the class II individuals showed a higher smile line compared to class I and III in which only 25 % and 15 % respectively exhibited high smile line. This is in agreement with the results obtained by Sabri in which class II individuals exhibit a higher smile line. [2]

Nevertheless, some limitations should be discussed. The studied sample was only collected from the Academy Dental Hospital, as well as the fact that the majority of the sample consisted of university students and so only a few patients fell in the older age groups, thus the results may have not shown a clear association due to the limited diversity of the group.

In the future, it is recommended that a larger sample size is studied with a more diverse age range, a more equal distribution of gender, and a broadened range of the areas studied in Sudan in order to have an overview of the type of smile line in the general population of Sudanese adults. The results can then act as a guideline for orthodontists and orthodontic surgeons for treatment planning of an esthetically pleasing smile post treatment.

V. Conclusion

- The most common smile line in the Sudanese sample was the low smile line 41%. Females showed a higher percentage of high smile lines when compared to males. A low smile line was observed in all of the older age group over 46 years except two individuals.
- Incisors class I relation reported in 40.8%, of the sample while less individuals had class III (25.8%)
- Approximately half of the Incisor Class II individuals had a high smile line score.
- A difference exists in the smile line of the present studied sample with those of Caucasian, and Asians based on age and gender.

Reference Références Referencias

1. Jensen, Jorgen; Joss, Andreas; Lang, Nilkaus. smile line of different ethnic groups in relation to age and gender. Acta Med Dent Helv 1999; 4:38-46.
2. Sabri, Roy. The 8 components of a balanced smile. Journal of clinical oncology 2005; 39:155-167.
3. Van der geld, Pieter, Oosterveld, Paul. Smile line assessment comparing quantitative measurement and visual estimation. American journal of orthodontics 2009; 9:174-180.
4. Profit William, Fields Henry. Contemporary Orthodontics 2013; edition 5. P 181-2.
5. Philips E. Classification of smile patterns. Journal of the Canadian dental association 2003; 65:252-4.
6. Passia N., Blatz M, Strub JR. Is the Smile Line a Valid Parameter for Esthetic Evaluation? A Systematic Literature Review European journal of esthetic dentistry 2011; 6:314-327.
7. Miron H., Calderon S., Allon D. Upper lip changes and gingival exposure on smiling Vertical dimension analysis. American journal of orthodontics and dentofacial orthopedics 2012;141:87-93.
8. Zhang J., Chen Y., Zhou X. Characteristics of lip-mouth region in smiling position from 80 persons with acceptable faces and individual normal occlusions. Chinese medical scientific journal 2002; 3:189-192.
9. Van der Geld P., Oosterveld P., Van Heck G., Kuijpers-Jagtman AM. Smile attractiveness: self perception and influence on personality. The angle orthodontist 2007;77:759-765.
10. Hochman, MN; Chu, SJ; Tarnow, DP. A research on “maxillary anterior papilla display: a clinical study of the interdental smile line” The International journal of periodontics and restorative dentistry 2012; 32: 375-383.
11. Malhotr Smriti, Sidhu Maninder Singh, Prabhakar Mona, Kochhar Anuraj Singh. Characterization of a

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posed smile and evaluation of facial attractiveness by panel perception and its correlation with hard and soft tissue. The art and practice of Dentofacial enhancement 2012;3: 34-40.
12. Anwar Nabila, Fida Mubassar. Lip Line Preference for Variant Face Types. Journal of the College of Physicians and Surgeons Pakistan 2012;22: 375-380.
13. Schabel Brian, Franchi Lorenzo,Tiziano Baccetti, Mc Namara James. Subjective vs. objective evaluations of smile esthetics. American Journal of Orthodontics 2009;135: 72-9.
14. Al Johany Suleiman, Alqahtani Abdulaziz, Alqahtani Fahd, Alzahrani Adel. Evaluation of different esthetic smile criteria. International Journal of Prosthodontic 2011;24: 64-70.
15. Zhi Liang Ling, Hu. Wen-Jei, Zhang Yan-Ling, Chung Kwok-Hung. Analysis of dynamic smile and upper Lip curvature in young Chinese. International Journal of Oral Science 2013;5: 49-53.
16. Havens David, McNamara James, Sigler Lauren Baccetti Tiziano. The role of the Posed smile on overall facial esthetics. Angle Orthodontist 2010;80: 322-328.
17. Ritter Daltro, Gandini Luiz, Pinto Ary, Ravelli Dirceu Locks Arno. Analysis of the smile photograph. World Journal of Orthodontics 2006;7: 279-285.
18. Liébart Marie-Françoise, Fouque-Deruelle Caroline, Santini Alain, Dillier François-Laurent, Monnet-Corti Virginie, Glise Jean-Marc, Borghetti, Alain. Smile line and periodontium visibility. Journal of Periodontology 2004;1: 17-25.
19. Tjian Anthony, Miller Garry. Some esthetic factors in a smile. Journal of Prosthetic Dentistry 1984;51: 24–28.
20. Oxford Index. Incisor relationship. website April 1 2014. http://oxfordindex.oup.com/view/10.1093/oi/authority.201108031000005

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