

A comparative study of oral health attitudes and behaviour using the Hiroshima University - Dental Behavioural Inventory (HU-DBI) between dental students in Britain and China

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Abstract : The aim of this study was to compare oral health attitudes and behaviour between British and Chinese dental students. A cross-national survey using the Hiroshima University - Dental Behavioural Inventory (HU-DBI) was completed at the University of Leeds in Britain and West China University of Medical Sciences in China. In Britain and China, 192 of 266 and 180 of 303 dental students answered English and Chinese versions of the HU-DBI questionnaire, respectively. Data were statistically analyzed by logistic regression and the following results were obtained: 1) Self-reported gingival bleeding was more prevalent in Chinese students than in British students, although the number of students who had professional oral hygiene instruction was higher in China than in Britain; 2) 29% of Chinese students believed wearing dentures in old age was inevitable, whereas 7% of British students believed so; 3) Chinese students were substantially more concerned about the appearance of their teeth,

gums and halitosis; and 4) 54% of Chinese students seek dental care only when symptoms arise, as compared to 13% of British students. In conclusion, bilateral comparison of countries using HU-DBI revealed interesting differences in oral health attitudes and behaviour, while the logistic regression model made it possible to differentiate British from Chinese students with a probability of nearly 95%. (J. Oral Sci. 47, 1-7, 2005)

Keywords: oral health attitudes/behaviour; cross-national comparison; logistic analysis; dental students; dental education.

Introduction

There are major differences in the concepts of health between Britain and China, which are representative of western and eastern society. Lee et al. (1) proposed that understanding the cultural meaning of dental disease is fundamental to changing the beliefs and attitudes of people in order to improve the oral health of the community. Comparisons of oral health care in countries with similar social systems, language, and culture are relatively easy to perform because the criteria for function, diagnosis, and

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treatment are similar. However, comparisons of oral health care in countries having different bases for health care, particularly when coupled with the language barrier, are difficult and time-consuming.

The Hiroshima University - Dental Behavioural Inventory (HU-DBI), which consists of twenty dichotomous responses (agree-disagree), was developed by Kawamura to examine oral health attitudes and behaviour of patients in tooth brushing. The HU-DBI has good test-retest reliability, and thus it is not only useful for understanding patients but predicting clinical outcomes (2,3). The HU-DBI has also been translated from Japanese into English, Finnish, Chinese, and Korean for cross-cultural comparisons. Results for these translated versions, including methods and reliability, have been reported previously (4-8). For example, when compared with Australian students, upon entry into dental school, Japanese students had less positive attitudes and behaviour towards oral health (5). Similarly, Finnish dental students had a higher level of dental health awareness than that of their Japanese peers (6). The self-care level of Japanese students was substantially influenced by the course, while the influence of gender was not significant (5,6).

As the education of the dental student progresses, he or she is expected to be a role model for his or her patients, becoming a teacher of oral hygiene. In many countries, university students play a significant role in public life, eventually becoming future leaders. Patterns of oral health behaviour, beliefs and attitudes in dental students may therefore be particularly significant. However, little attention has been paid to the context in which dental students undergo motivational and behavioural changes with respect to their oral self-care regimens. The aim of the present study was, therefore, to investigate differences in the oral health attitudes and behaviours between British and Chinese undergraduate dental students.

Methods

Sample, procedure, and HU-DBI Questionnaire

All undergraduate dental students at the University of Leeds in Britain and West China University of Medical Sciences in China were invited to participate in this survey using English and Chinese versions of the HU-DBI questionnaire, respectively, at the beginning of the academic year. Students were asked by their faculties to remain in class at the end of a lecture to participate in this survey on a voluntary basis. No attempt was made to follow up with students who were absent on the day of the survey. The HU-DBI questionnaire, which consists of twenty dichotomous responses (agree-disagree) regarding oral health attitudes and behaviour of patients in tooth brushing, was distributed to all students. Students were asked to fill in the questionnaire and completed questionnaires were collected. All questionnaires completed in Britain and China were mailed to Hiroshima University in Japan for scoring. A total score was calculated based on the response to each statement. Details of the scoring system have been described previously (2,6). In all, 192 of 266 (72%) and 180 of 303 (59%) dental students in Britain and China answered translated HU-DBI questionnaires, respectively (response rates). The mean age (S.D.) of British and Chinese respondents was 20.2 (1.8) and 21.0 (1.7) years old, respectively. The percentage of female students was higher in both samples (60% and 53%, Britain and China, respectively) (Table 1).

Statistical analysis

All variables of the questionnaires were analysed by country and level of dental education (Years 1, 2, 3, 4, and 5). Differences were assessed by the Mantel-Haenszel chi-squared test. The hypothesized model was tested by logistic regression analysis in order to examine whether British dental students have similar oral health behaviours

Table 1 Distribution of respondents and mean age by level of dental education

| Level | Britain | | | | | China | | | | |
|--------------|-----------|------------|----------|------------------|----------------------------------|-----------|-----------|----------|------------------|----------------------------------|
| | Male | Female | Unknown | Total * | Mean age \pm SD | Male | Female | Unknown | Total * | Mean age \pm SD |
| Year 1 | 20 | 27 | 2 | 49 (54) | 18.4 \pm 0.9 | 19 | 20 | 0 | 39 (59) | 19.7 \pm 1.3 |
| Year 2 | 23 | 28 | 0 | 51 (55) | 19.4 \pm 0.6 | 23 | 27 | 0 | 50(60) | 20.2 \pm 1.0 |
| Year 3 | 12 | 20 | 1 | 33 (54) | 20.7 \pm 1.0 | 13 | 22 | 0 | 35 (62) | 20.9 \pm 1.0 |
| Year 4 | 10 | 21 | 1 | 32 (52) | 21.9 \pm 1.4 | 14 | 13 | 0 | 27 (56) | 22.2 \pm 0.9 |
| Year 5 | 10 | 16 | 1 | 27 (51) | 22.5 \pm 0.8 | 16 | 13 | 0 | 29 (66) | 23.5 \pm 1.0 |
| Total | 75 | 112 | 5 | 192 (266) | 20.2 \pm 1.8 | 85 | 95 | 0 | 180 (303) | 21.0 \pm 1.7 |

*; Parentheses indicate the number of enrollment.

No significant differences of mean age between British and Chinese dental students.

to their Chinese peers. Backward stepwise regression was carried out on the dependent variable (country). The Wald statistic was used to test the null hypothesis that the regression coefficients were zero. The Nagelkerke R^2 statistic was used to discriminate how well the model is able to distinguish between students from the two countries. Statistical significance was based on probability values of less than 0.05. Data were analysed using SPSS 10.0 (SPSS, Chicago, USA).

Results

Percentage of “agree” responses and odds ratios

Table 2 shows the percentage of “agree” responses in the dichotomous response (agree-disagree) HU-DBI questionnaire. The data are classified by country and level of dental education. Significant differences were found between Britain and China and are described in detail under in following sections: A) oral health attitudes; B) oral hygiene behaviour; and C) self-reported oral health and dental visits.

Table 2 Questionnaire items of the HU-DBI and percentage of ‘agree’ response by country and level of dental education

| No. | Item descriptions | Country | Year | | | | | Total | M-H χ^2 | |
|-----|--------------------------------------------------------------------------|---------|------|----|----|-----|----|-------|--------------|-----|
| | | | 1 | 2 | 3 | 4 | 5 | | Odds ratio | P |
| 1. | I don't worry much about visiting the dentist. | Britain | 76 | 75 | 69 | 62 | 59 | 70 | 0.62 | NS |
| | | China | 85 | 76 | 83 | 81 | 66 | 78 | | |
| 2. | My gums tend to bleed when I brush my teeth. (D) | Britain | 4 | 0 | 18 | 6 | 0 | 5 | 0.13 | *** |
| | | China | 44 | 36 | 23 | 26 | 21 | 31 | | |
| 3. | I worry about the colour of my teeth. | Britain | 49 | 35 | 59 | 41 | 26 | 42 | 0.06 | *** |
| | | China | 90 | 92 | 97 | 100 | 79 | 92 | | |
| 4. | I have noticed some white sticky deposits on my teeth. | Britain | 12 | 2 | 24 | 16 | 4 | 11 | 0.04 | *** |
| | | China | 85 | 71 | 71 | 85 | 62 | 75 | | |
| 5. | I use a child sized toothbrush. | Britain | 8 | 2 | 30 | 6 | 0 | 9 | 0.76 | NS |
| | | China | 10 | 8 | 0 | 19 | 28 | 12 | | |
| 6. | I think that I cannot help having false teeth when I am old. (D) | Britain | 6 | 10 | 9 | 6 | 4 | 7 | 0.19 | *** |
| | | China | 21 | 36 | 20 | 41 | 31 | 29 | | |
| 7. | I am bothered by the colour of my gums. | Britain | 12 | 25 | 22 | 9 | 19 | 18 | 0.07 | *** |
| | | China | 74 | 72 | 71 | 89 | 83 | 77 | | |
| 8. | I think my teeth are getting worse despite my daily brushing. (D) | Britain | 18 | 4 | 12 | 3 | 7 | 9 | 0.07 | *** |
| | | China | 62 | 62 | 57 | 59 | 45 | 58 | | |
| 9. | I brush each of my teeth carefully. (A) | Britain | 69 | 72 | 72 | 91 | 81 | 76 | 1.89 | ** |
| | | China | 49 | 54 | 54 | 85 | 90 | 63 | | |
| 10. | I have never been taught professionally how to brush. (D) | Britain | 53 | 49 | 9 | 16 | 0 | 31 | 4.52 | *** |
| | | China | 8 | 24 | 3 | 4 | 3 | 10 | | |
| 11. | I think I can clean my teeth well without using toothpaste. (A) | Britain | 0 | 6 | 3 | 12 | 15 | 6 | 0.64 | NS |
| | | China | 13 | 4 | 3 | 15 | 17 | 9 | | |
| 12. | I often check my teeth in a mirror after brushing. (A) | Britain | 76 | 71 | 79 | 75 | 56 | 72 | 5.37 | *** |
| | | China | 33 | 22 | 31 | 37 | 41 | 32 | | |
| 13. | I worry about having bad breath. | Britain | 57 | 49 | 67 | 41 | 26 | 49 | 0.44 | *** |
| | | China | 74 | 68 | 77 | 70 | 45 | 68 | | |
| 14. | It is impossible to prevent gum disease with toothbrushing alone. (D) | Britain | 35 | 25 | 47 | 28 | 15 | 30 | 0.09 | *** |
| | | China | 90 | 82 | 86 | 78 | 61 | 80 | | |
| 15. | I put off going to the dentist until I have a toothache. (D) | Britain | 18 | 6 | 18 | 9 | 11 | 13 | 0.12 | *** |
| | | China | 64 | 68 | 60 | 30 | 31 | 54 | | |
| 16. | I have used a dye to see how clean my teeth are. (A) | Britain | 33 | 49 | 70 | 66 | 78 | 55 | 1.34 | NS |
| | | China | 10 | 38 | 83 | 85 | 55 | 51 | | |
| 17. | I use a toothbrush which has hard bristles. | Britain | 33 | 29 | 15 | 0 | 4 | 19 | 0.70 | NS |
| | | China | 23 | 40 | 23 | 7 | 21 | 25 | | |
| 18. | I don't feel I've brushed well unless I brush with strong strokes. | Britain | 27 | 6 | 18 | 10 | 7 | 14 | 1.14 | NS |
| | | China | 21 | 12 | 17 | 4 | 3 | 12 | | |
| 19. | I feel I sometimes take too much time to brush my teeth. (A) | Britain | 18 | 29 | 27 | 12 | 7 | 20 | 1.41 | NS |
| | | China | 13 | 12 | 23 | 15 | 17 | 16 | | |
| 20. | I have had my dentist tell me that I brush very well. | Britain | 47 | 59 | 39 | 77 | 67 | 57 | 2.89 | *** |
| | | China | 26 | 20 | 17 | 56 | 62 | 33 | | |

Mantel Haenszel chi-square tests were done in each level of dental education.

Significant differences between British and Chinese students;

*: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$, NS: Not significant.

In the calculation of the HU-DBI;

(A) = One point is given for each of these agree responses.

(D) = One point is given for each of these disagree responses.

Oral health attitudes

Of the Chinese students, 29% believed that wearing dentures in old age was inevitable, whereas only 7% British students believed so. (HU-DBI item number (Item) 6, Odds Ratio (OR) = 0.19, $P < 0.001$). There were few differences between year groups in level of dental education. In addition, 80% of Chinese students believed that it was impossible to prevent gum disease with tooth brushing alone, whereas 30% of British students believed so (Item 14, OR = 0.09, $P < 0.001$). Chinese students were significantly worried about the appearance of their teeth, gums and halitosis (92%, 77% and 68%, respectively), when compared with British students (42%, 18% and 49%, respectively). (Items 3, 7, 13, OR = 0.06, 0.07, 0.44, $P < 0.001$)

Oral hygiene behaviour

A total of 10% of Chinese and 31% of British students reported that they had never received any professional oral hygiene instruction (Item 10, OR = 4.52; $P < 0.001$). Among first-year dental students, 8% of Chinese and 53% of British students reported that they had never received any professional oral hygiene instruction. Seventy-five percent of Chinese students noticed some 'white sticky deposits' on their teeth, a proportion that was significantly higher than that among British students (11%) (Item 4, OR = 0.04, $P < 0.001$). The majority of students, 76% in

Britain and 63% in China, believed that they brush teeth carefully (Item 9, OR = 1.89; $P < 0.01$). In addition, a higher proportion of British students (72%) regularly look at their teeth in a mirror after brushing when compared with Chinese students (32%) (Item 12, OR = 5.37; $P < 0.001$).

Self-reported oral health and dental visits

Five percent of British dental students agreed with the statement 'my gums tend to bleed when I brush my teeth', compared to 31% of Chinese dental students who agreed with this statement (Item 2, OR = 0.13, $P < 0.001$). Furthermore, 54% of Chinese students seek dental care only when symptoms arise, compared to 13% of British students. (Item 15, OR = 0.12; $P < 0.001$). The proportion of Chinese students who agreed with these items in HU-DBI decreased as the level of dental education progressed.

Mean HU-DBI scores

Figure 1 shows the mean HU-DBI scores classified by level of dental education (Years 1, 2, 3, 4, and 5) and gender (male/ female) in Britain and China. The HU-DBI scoring system has been reported previously. The maximum score in HU-DBI is 12, and higher scores signify better oral health behaviour. (2) The mean score of British students was 7.33, which was significantly higher than that of Chinese students (5.07; $P < 0.001$). As the level of dental education increased, mean scores increased.

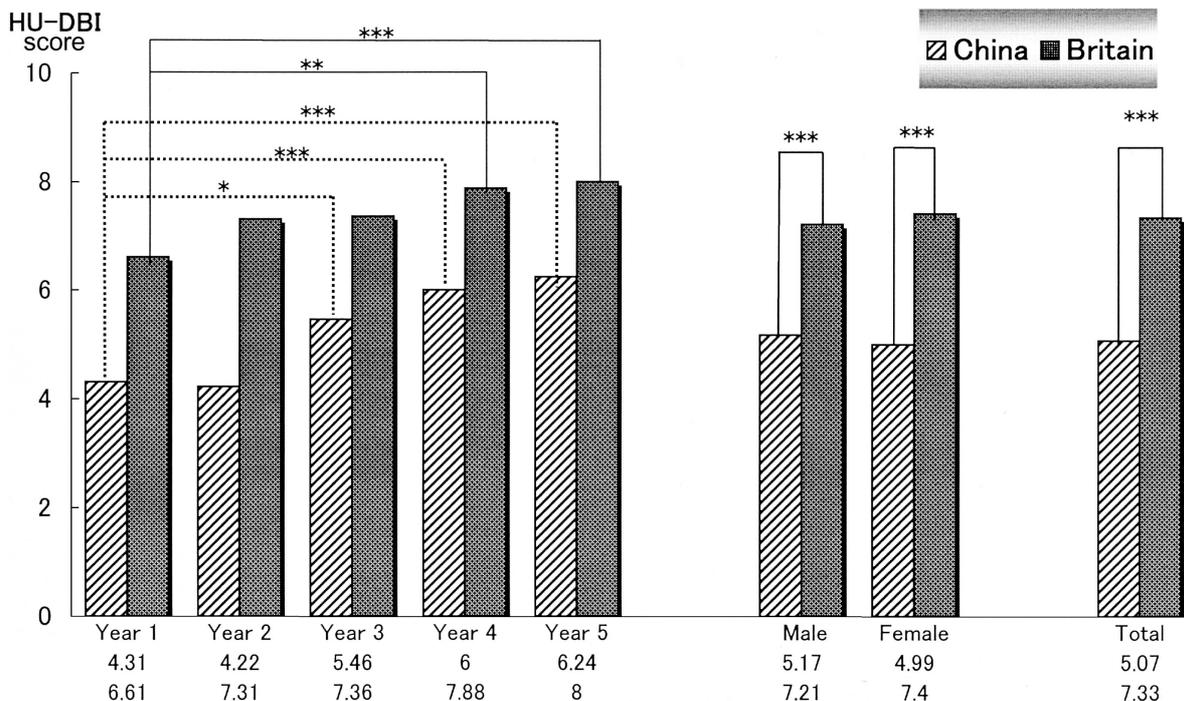


Fig. 1 Comparison of HU-DBI scores classified by level of dental education (Years 1, 2, 3, 4, and 5) and gender (male/ female) in Britain and China. *: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

Table 3 Results of the logistic regression analysis (n = 363)

| Item descriptions | B | S.E. | Wald Chi-Square | Freedom | P | Exp (B) | 95%C.I. |
|-----------------------------------------------------------------------|-------|------|-----------------|---------|-------|---------|------------|
| 7. I am bothered by the colour of my gums. | -3.36 | 0.64 | 27.82 | 1 | 0.000 | 0.03 | 0.01-0.12 |
| 4. I have noticed some white sticky deposits on my teeth. | -3.11 | 0.59 | 27.36 | 1 | 0.000 | 0.04 | 0.01-0.14 |
| 15. I put off going to the dentist until I have a toothache. | -2.61 | 0.62 | 17.54 | 1 | 0.000 | 0.07 | 0.02-0.25 |
| 8. I think my teeth are getting worse despite my daily brushing. | -2.59 | 0.67 | 14.84 | 1 | 0.000 | 0.07 | 0.02-0.28 |
| 3. I worry about the colour of my teeth. | -1.45 | 0.60 | 5.85 | 1 | 0.016 | 0.24 | 0.07-0.76 |
| 2. My gums tend to bleed when I brush my teeth. | -1.20 | 0.69 | 3.03 | 1 | 0.082 | 0.30 | 0.08-1.16 |
| 14. It is impossible to prevent gum disease with toothbrushing alone. | -1.08 | 0.54 | 3.99 | 1 | 0.046 | 0.34 | 0.12-0.98 |
| 13. I worry about having bad breath. | 1.15 | 0.56 | 4.22 | 1 | 0.040 | 3.15 | 1.05-9.41 |
| 12. I often check my teeth in a mirror after brushing. | 2.32 | 0.55 | 17.61 | 1 | 0.000 | 10.15 | 3.44-29.98 |
| 10. I have never been taught professionally how to brush. | 2.39 | 0.74 | 10.46 | 1 | 0.001 | 10.90 | 2.56-46.36 |
| Constant | 14.99 | 2.66 | 31.75 | 1 | 0.000 | | |

Nine subjects were omitted because they did not respond to any one of the selected items.

95%C.I.: 95% confidence interval for Exp (B).

Logistic regression

Table 3 lists the estimated coefficient and related statistics from the logistic regression model that predicts group membership. Interpretations of this statistical analysis are as follows: British students were more likely to check their teeth after tooth brushing than Chinese students; Chinese students were more likely than British students to have professional oral hygiene instruction, gingival bleeding, and concerns about the appearance of their teeth, gums and halitosis; Chinese students seek dental care only when symptoms arise.

Table 4, which shows the observed and predicted group membership, demonstrates that 176 of 192 British dental students (94.6%) were correctly predicted by the model. Similarly, 167 of 180 Chinese dental students (94.4%) were correctly predicted. The Nagelkerke R² statistic was 0.88, meaning that 88% of the variance was explained by the logistic regression model.

Discussion

The percentage of dental students who participated in this study was 72% and 59% in Britain and China, respectively, as shown in Table 1. These percentages were high overall, but there were discrepancies in participation between students in Year 1/2 and those in Year 3/4/5. Students in Year 1/2 had a higher participation rate than those in Year 3/4/5. The environment of one school in this study is not representative of other schools in either country. Caution should be exercised in making generalisations based on the results of this study. However, the variation in the favourable attitudes and behaviour toward oral health appeared to reflect the clinical training of dental students in Britain and China. Nonetheless, the HU-DBI questionnaire successfully identified differences. In the

Table 4 The observed and predicted group membership

| Country | Year | Predicted country | | Percentage Correct |
|---------|--------------|-------------------|------------|--------------------|
| | | Britain | China | |
| Britain | 1 | 47 | 2 | 95.9 |
| | 2 | 48 | 1 | 98.0 |
| | 3 | 26 | 4 | 86.7 |
| | 4 | 29 | 2 | 93.5 |
| | 5 | 26 | 1 | 96.3 |
| | Total | | 176 | 10 |
| China | 1 | 1 | 37 | 97.4 |
| | 2 | 2 | 47 | 95.9 |
| | 3 | 2 | 33 | 94.3 |
| | 4 | 1 | 26 | 96.3 |
| | 5 | 4 | 24 | 85.7 |
| | Total | | 10 | 167 |

Nagelkerke R² = 0.878

complex interplay of factors that shape attitudes and health behaviours, two major influences have been indicated: one is learned experience and the other is culturally determined attitudes/beliefs/behaviours (social norms) (9,10). The differences between the two countries in this study may be influenced by such factors. For example, the majority of Chinese students seek dental care only when symptoms arise. This agrees with findings of other studies in China (11) and remains unchanged following migration (12). The Chinese generally accepted losing teeth in old age and dental diseases were not considered preventable (13).

Studying dental health behaviour, which is affected by cultural influences, is difficult, because there are overlaps between cultural influences and other factors, such as dental health knowledge, socioeconomic status, and

personal experience. For instance, Kwan and Williams (12) used a validated structured questionnaire and revealed that older Chinese people in Britain placed less trust in dentists and would prefer one of Chinese origin. Strauss (14) found that culture has significant impact upon professional practice and patient health behaviours, particularly in multicultural societies.

Previous reports using the HU-DBI in cross-cultural dental health behaviour studies in university settings gave us objective data and implications for dental education and strategies of preventive dentistry. In a cross-national study using the HU-DBI, Kawamura et al. (5) reported that Japanese dental students appeared to have more negative oral health attitudes and behaviours than Australian students on entry, but the HU-DBI score of Year 6 Japanese students was considerably higher than that of Australian final-year students. In the Japanese study (2), 82 of 99 adults with good periodontal health had an HU-DBI score of more than 8, whereas only 5 of 97 adults who assessed their periodontal status as very poor had a score of more than 8. Recently, Kim et al. (8) have reported that the Korean version of the HU-DBI scale was significantly associated with gingival health status in a sample of Korean dental hygiene students.

The present study identified an increased HU-DBI score as British and Chinese students progress in their dental programs. This may reflect exposure of students to concepts of prevention, such as professional tooth brushing, which appear to have an influence on their personal oral health attitudes and behaviours. For example, early contact with patients has not been introduced until quite recently at West China University. Lecture courses in Preventive Dentistry commence in Year 4, but clinical training does not start until the end of Year 5. There are about 30,000 dentists in China, which gives a ratio of 1 dentist to 40,000 people. Considering this shortage of dentists and facilities, China needs to emphasise community dental health care, with prevention and health promotion as priorities.

Concepts regarding health and disease are different between Asia and Europe. In Asia, most health beliefs and practices are learned and practiced in the home; and professional help is only sought when home remedies fail (15). However, the strong reliance on self-care may undermine the effectiveness of organized oral health care by delaying dental visits or considering them unnecessary.

Conclusion

Bilateral comparison of countries using the HU-DBI revealed interesting facts regarding differences in oral health attitudes and behaviours between undergraduate dental students and a logistic regression model made it

possible to differentiate British from Chinese students with a probability of nearly 95%. Dental students, as future health professionals, should have a comprehensive program including self-care regimes. Preventive dental science curricula need to be changed to incorporate oral self-care regimens, not only in clinical practices but also in academic and public policy.

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