ANALYSIS AND RESULTS: CONFIRMATORY FACTOR ANALYSIS THE MALAY VERSION OF DREEM INVENTORY WITH MEDICAL STUDENTS OF UNISZA, KUALA TERENGGANU, MALAYSIA

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Received: 10 August 2017, Revised and Accepted: 15 September 2017

INTRODUCTION

The World Federation for Medical Education emphasized the teaching-learning environment as one of the principal objectives for the assessment of medical education programs, in 1998 [1]. It is widely established among medical educators and teachers that the effects of the educational environment, both academic and clinical, are important elements of medical students’ attitudes, knowledge, skills, progression, and behaviors [2-5]. Dr. Sue Roff, a faculty member of the Centre for Medical Education of University of Dundee, Scotland, UK, was the principal scientist of a team and who developed the 50-item DREEM instrument utilizing a "Delphi panel of nearly 100 health professions educators from around the world and validation by over 1000 students in countries as diverse as Scotland, Argentina, Bangladesh and Ethiopia to measure and "diagnose" undergraduate educational climates in the health professions [6]." The DREEM is a 50-item inventory measure of students’ perceptions of their learning environment resulting in scores on five scales. These are labeled, the perception of atmosphere (SpOA), and social self-perception [6]. Medical educators and researchers of different parts of the world have tried to quantify the medical education environment and the most extensively utilizing the DREEM inventory [6,7-15]. Thereafter, the DREEM inventory has demonstrated itself globally valuable in a diverse health-care setting such as medical, dental, nursing, and chiropractic the teaching-learning environments [16-20]. The far majority these studies revealed that “variety of descriptive statistics for the scale items, subscales, and the total DREEM score; internal consistency (Cronbach’s alpha); and correlational statistics, investigating relationships between the DREEM total and subscale scores with characteristics such as age, gender, and program year level” [21].

Structural equation modeling (SEM) is statistical procedures that one can use to decrease "the number of observed variables into a smaller number of latent variables by examining the covariation among the observed variables" [22]. SEM includes two components, i.e., confirmatory factor analysis (CFA) and structural model [23]. CFA is a confirmatory procedure—it is theory focused. Therefore, the preparation of the analysis is driven by the theoretical associations among the observed and unobserved variables. The researcher planned to measure a hypothesized model a population covariance matrix that is compared with the observed covariance matrix-CFA is conducted. Precisely, when any research intended to reduce the difference between the estimated and observed matrices [22]. Thereafter, CFA depicts the pattern of observed variables for those latent constructs hypothesized model [23]. CFA plays the role of validating and finding the reliability of any measurement in most social science studies [24]. Afterward, several study inventories have been CFA to measure the validity and reliability [25-30].

The Faculty of Medicine, UnisZA, is scheduled to conduct a major revision in the next few years of the undergraduate medical curriculum [31,32]. The Ministry of Higher Education of the Government of Malaysia to approved the University’s medical program in Kuala Terengganu, Terengganu, Malaysia. The first group of 30 MBBS students, admitted in 2009, graduated in August 2014. Malaysian medical education is...
usually of a 5-year program and 2-year housemanship in hospitals owned by the Ministry of Health, Government of Malaysia [14,33-35]. This study aimed to evaluate the psychometric properties of Malay translated DREEM (DREEM-M) in a sample of Malaysian medical students. This study was designed to answer four questions: (i) Is DREEM-M a valid tool to measure the educational climate in a sample of Malaysia medical students? (ii) Is DREEM-M a reliable tool to measure the educational climate in a sample of Malaysia medical students? (iii) What is the best fit model of DREEM-M to measure the educational climate in the studied population? (iv) Does the internal consistency of DREEM-M vary across years of study? The authors hypothesized DREEM-M would demonstrate a high level of internal consistency; however, its construct validity will differ from the original construct proposed by the DREEM developers.

METHODS

A cross-sectional study was carried, and universal sampling method was applied. Based on the best practice of sample size calculation for a validation study, 5-10 samples per item were considered adequate to obtain a significant result [36], therefore a minimum number of study subject was 250. Researchers selected 1.5-year medical students in a public medical school (UniSZA) as study subjects. All medical students of UniSZA from 1.5-year of the MBBS program of session 2015-2016 were the target population. The total number of medical students at UniSZA was 300 (60=5=300). The universal sampling technique was used as the total sample size was small and obtains a significant result [36]. A pilot study was conducted among 10 undergraduate medical students (2.5=10, 2 students from each year) for Malay version of DREEM inventory and it was found that the survey instructions and items were easily comprehensible and suitable for the study. The students who participated in the pilot study were excluded from the final study. Researchers collected data through a guided self-administered questionnaire during a face-to-face session. This study obtained ethical approval from UniSZA Research Ethics Committee, recorded as Memo Number UniSZA. C1/1/URBEC/628-1 (44), Dated: 3 November 2015. Informed consent was obtained from the respondents before the questionnaire administration. Completion of DREEM-M was voluntary, and participants were informed that not returning it would not affect their progress in the medical study. DREEM-M was immediately returned after completion. Data were analyzed by Statistical Package for the Social Sciences version 22 (SPSS 22) and Analysis of Moment Structure software version 22 (AMOS 22).

The DREEM inventory was developed as a tool to measure educational climate at educational institution [6,37] and was claimed as a "cultural-free" instrument [38]. There are 50 items measuring five aspects of the educational environment based on students’ perception, which include students’ perception of learning (SPL), students’ perception of teaching (SPt), students’ academic self-perception (SASP), students’ perception of atmosphere (SPA) and students’ social self-perception (SSP). Each item is rated based on five-Likert scales range between 0 and 4 (0 = strongly disagree, 1 = disagree, 2 = unsure, 3 = agree, and 4 = strongly agree). There are 9 negative items that must be scored in reverse manner before analysis and interpretation; item 4, 8, 9, 17, 25, 35, 39, 48, and 50 [6]. It has been translated into various languages, and the reported overall Cronbach's alpha coefficient ranges from 0.89 to 0.93 [5,39-44]. The Malay translated DREEM was used in this study [45].

A descriptive analysis of the demographic data was performed by SPSS 22. CFA was performed to test measurement model of each latent construct. CFA was performed by AMOS 22. The latent constructs and the proposed model were considered fit if all the goodness-of-fit indices achieve minimal requirement (Table 1) [46]. Standardized factor loading (SFL), modification indices (MI), and standardized residual covariance’s (SRC) were used as indicators for selecting items fit to be remain in the model [47]. The SFL signify contribution of items to their respective construct [47]. MI suggest correlations between variables, therefore, reduction of Chi-square values signify its contribution to the model [47], and SRC estimate a standard normal distribution if the model is correct, thus if the model is correct, most of the items should have an SRC value of less than ±2 [47,48]. Although the reduction in Chi-square values would improve model fit, following the suggestions in MI, SRC, and SFL should be based on a literature review or theoretical basis [49,50]. A correlation between constructs of <0.85 was considered as good discriminant validity thus supporting construct validity [47].

Reliability analysis was applied to determine the internal consistency of DREEM-M inventory. Internal consistency of items was evaluated by the Cronbach’s alpha, corrected item-total correlation (CITC), and Cronbach’s alpha if item deleted (CAID) values. The items were considered to represent an acceptable level of internal consistency if the Cronbach’s alpha value within 0.5-0.7 and a good level if the Cronbach’s alpha value more than 0.7 [57,58]. An item is considered to highly contribute to the measured construct if CITC value more than 0.3 and CAID value decreased [59].

RESULTS

A total of 277 medical students completely responded to the 50 statements of DREEM-M. Demographic profiles of participants were summarized in Table 2. CFA showed that the one factor model of DREEM-M (Model A), consisting 50 items were not fit, indicating it was a multidimensional instrument (Table 3). On further CFA, it appeared that the proposed five-factor structure was not fit (Model B) as all the goodness-of-fit indices did not signify a model fit. Item reduction was performed based on MI, SRC, and SFL values to select which DREEM-M items should remain in the model [47]. As shown in Table 3, the five-factor model of DREEM-M with 19 items (Model G) was found to be model fit as all the goodness-of-fit indices signifies model fit. SFL for the proposed five-factor structure of the 50-item DREEM-M (Model A) ranged between 0.05 and 0.79, suggesting that certain items did not represent the construct being measured. Whereas, for the best fit model (i.e., Model G), the SFL ranged between 0.49 and 0.81 (Fig. 1), indicating that all items contributed highly to the constructs being measured. The majority of standardized correlation coefficients (r) between the five domains were more than 0.85, except the correlation between SSPS-SASP (r=0.75) and DSSP-SASP (r=0.83) (Fig. 1), suggesting that they might be assessing similar constructs [47].

Reliability analysis shows that the overall Cronbach’s alpha values for the 50 item and 19-item DREEM-M were more than 0.9, respectively.

| Name of category | Name of index | Level of acceptance |
|------------------|--------------|---------------------|
| Absolute fit | RMSEA | <0.08 [51] |
| Incremental fit | CFI | More than 0.9 [52] |
| Parsimonious fit | Chiq/df | <5 [56] |

1Absolute fit: Measures overall goodness-of-fit for both the structural and measurement models collectively. This type of measure does not make any comparison to a specified null model (incremental fit measure) or adjust for the number of parameters in the estimated model (parsimonious fit measure).
2Incremental fit: Measures goodness-of-fit that compares the current model to a specified "null" (independence) model to determine the degree of improvement over the null model. 3Parsimonious fit: Measures goodness-of-fit representing the degree of model fit per estimated coefficient. This measure attempts to correct for any "overfitting" of the model and evaluates the parsimony of the model compared to the goodness-of-fit. RMSEA: Root mean square of error approximation, GFI: Goodness-of-fit index, CFI: Comparative fit index, TLI: Tucker-Lewis index, NFI: Normed fit index, Chiq/df: Chi-square/degree of freedom

Table 1: Goodness-of-fit indices that were used to signify model fit

This study evaluated the psychometric properties of Malay translated DREEM (DREEM-M) in a sample of Malaysian medical students. This study was designed to answer four questions: (i) Is DREEM-M a valid tool to measure the educational climate in a sample of Malaysia medical students? (ii) Is DREEM-M a reliable tool to measure the educational climate in a sample of Malaysia medical students? (iii) What is the best fit model of DREEM-M to measure the educational climate in the studied population? (iv) Does the internal consistency of DREEM-M vary across years of study? The authors hypothesized DREEM-M would demonstrate a high level of internal consistency; however, its construct validity will differ from the original construct proposed by the DREEM developers.
Both versions showed a high level of internal consistency in measuring students’ perception of educational climate. The Cronbach’s alpha values for the five subscales of the 50-item DREEM-M ranged between 0.78 and 0.85 while for the 19-item DREEM-M ranged between 0.69 and 0.79 (Table 4). The subscales for both versions showed acceptable to a high level of internal consistency [57,58] in measuring the five aspects of students’ perception of educational climate. Reliability analysis showed that the internal consistency of DREEM-M for both versions varied across phases of study. The Cronbach’s alpha values across phases of study for subscales of the 50-item DREEM-M ranged between 0.78 and 0.88 while for the 19-item DREEM ranged between 0.64 and 0.83 (Table 4). Reliability analysis shows that the original 50-items DREEM had CITC values ranged between 0.117 and 0.730. This result reflected that certain items contribute poorly to the constructs being measured as the CITC values <0.30 [59]; item 17, 25, 48, and 50 (Table 5). In contrast, the CITC values for the 19-item DREEM highly contributed to the constructs being measured as the CITC values more than 0.3 (Table 6) [59].

**DISCUSSION**

The educational environment is exceedingly multifaceted and defining also a very difficult assignment. Educational environment has considered as “a set of factors that gives each situation a personality,

| Domain | Cronbach’s alpha | The 50-item DREEM-M | The 19-item DREEM-M |
|---|---|---|---|
| Preclinical | Clinical | Overall | Preclinical | Clinical | Overall |
| DREEM-M | 0.951 | 0.937 | 0.943 | 0.894 | 0.859 | 0.874 |
| SPL | 0.845 | 0.832 | 0.836 | 0.833 | 0.764 | 0.796 |
| SPT | 0.826 | 0.831 | 0.826 | 0.791 | 0.725 | 0.754 |
| SASP | 0.842 | 0.797 | 0.818 | 0.757 | 0.640 | 0.694 |
| SPA | 0.882 | 0.845 | 0.859 | 0.771 | 0.803 | 0.784 |
| SSP | 0.784 | 0.781 | 0.787 | 0.729 | 0.719 | 0.730 |

Best fitting model in bold. Model D (item 9, 12, 22, 23, 27, 31, 38, 39, 42, and 44 were removed from Model B); Model E (item 6, 8, 10, 11, 20, 21, 24, 28, 36, and 47 were removed from Model D); Model F (item 5, 17, 25, 46, 48, and 50 were removed from Model E); Model G (item 3, 29, 33, 34, and 37 were removed from Model F)
Table 5: Reliability analysis of the 50 items of DREEM according to the five domains

| Number | Statement                                                                                     | CITC  | CAID   |
|--------|-----------------------------------------------------------------------------------------------|-------|--------|
| 1      | I am encouraged to participate/Saya ter dorong untuk mengambil bil bagaimana                  | 0.553 | 0.819  |
| 7      | The teaching is often stimulating/Setup pengajaran selalu menangkarkan                        | 0.730 | 0.805  |
| 13     | The teaching is student-centered/Pengajaran menekankan pendekatan berpusat pada pelajar        | 0.551 | 0.820  |
| 16     | The teaching is helpful to develop my skills/competency/Kaedah pengajaran membantu untuk meningkatkan kemahiran/kecekapan saya | 0.728 | 0.807  |
| 20     | The teaching is well focused/Kaedah pengajaran memberikan focus yang menyeluruh               | 0.649 | 0.812  |
| 22     | The teaching is sufficiently to develop my confidence/Kaedah pengajaran cukup untuk meningkatkan keyakinan saya | 0.675 | 0.810  |
| 24     | The teaching time is put to good use/Masa pengajaran digunakan dengan baik sekali             | 0.682 | 0.810  |
| 25     | The teaching over emphasizes factual learning*/Pengajaran terlalu menitikberatkan pembelajaran berasaskan fakta | -0.117 | 0.869  |
| 38     | I am clear about the learning objectives of the course/Saya jelas tentang objektif pembelajaran dalam kursus ini | 0.614 | 0.816  |
| 44     | The teaching encourage me to be an active learner/Kaedah pengajaran memberikan semangat kepada saya untuk menjadi pelajar yang aktif | 0.639 | 0.812  |
| 47     | Long term learning is emphasized over short-term/Pembelajaran jangka panjang lebih ditekankan berbanding jangka pendek | 0.535 | 0.821  |
| 48     | The teaching is too teacher-centered*/Kaedah pengajaran terlalu menekankan pendekatan berpusat pada pengajar | -0.089 | 0.867  |
| 2      | The teachers are knowledgeable/Pensyarah berpengetahuan luas                                 | 0.687 | 0.792  |
| 6      | The teachers are emphasizes on patient-centered during their interaction with patients/Pensyarah menekankan pendekatan berpusat kepada pesakit semasa berinteraksi bersama pesakit | 0.478 | 0.813  |
| 8      | The teachers are rigid/the student*/Pensyarah menyindir para pelajar                          | 0.563 | 0.805  |
| 9      | The teachers are authoritarian*/Pensyarah terlalu memerintah                                  | 0.674 | 0.795  |
| 18     | The teachers have good communication skills with the patients/Pensyarah mempunyai kemahiran komunikasi yang baik dengan para pesakit | 0.481 | 0.813  |
| 29     | The teachers are good at providing feedback to students/Pensyarah bagus dalam menyediakan maklum balas kepada pelajar | 0.675 | 0.794  |
| 32     | The teachers provide constructive criticism here/Pensyarah menambahkan kritikan yang membina di in | 0.520 | 0.810  |
| 37     | The teachers give clear examples/Pensyarah memberikan contoh-contoh yang jelas               | 0.647 | 0.801  |
| 39     | The teachers get angry is class*/Pensyarah adakah marah dalam kelas                           | 0.272 | 0.832  |
| 40     | The teachers are well prepared for their classes/Pensyarah bersedia dengan baik untuk kelas-kelas yang akan diajar | 0.637 | 0.800  |
| 50     | The students irritate the teachers*/Para pelajar ada menyebabkan kemarah kepada pensyarah      | 0.002 | 0.859  |
| 5      | Learning strategies which work for me before continue to work for me now/Strategi pembelajaran yang digunakan oleh saya sebelum ini masih berkesan untuk saya sekarang | 0.494 | 0.805  |
| 10     | I am confident about my passing this year/Saya yakin dengan keputusan pekerjaan saya untuk lulus pada tahun ini | 0.634 | 0.782  |
| 21     | I am feel I am well prepared for my profession/Saya menasakan saya telah bersedia sebelumnya untuk kerja saya | 0.546 | 0.795  |
| 25     | Last year work has been a good preparation for this year's work/Uaha pada tahun lepas telah menjadikan persediaan yang baik kepada usaha tahun ini | 0.594 | 0.788  |
| 27     | I am able to memorize all I need/Saya berkebolehan untuk mengingati semua yang perlu saya ingati | 0.539 | 0.797  |
| 31     | I have learn a lot about empathy in my profession/Saya telah belajar banyak tentang rasa empati dalam kerja saya | 0.429 | 0.810  |
| 41     | My problem skills are well developed here/Kemahiran peengersalisisial saya ditingkatkan dengan baik di in | 0.586 | 0.792  |
| 45     | Much of what I have to learn seem relevant to career in health care/Kebanyakan perkara yang saya perlu belajar dilitah berkaitan dengan kerja saya di bidang kesihatan | 0.487 | 0.804  |
| 25     | The atmosphere was relax during teaching/Suasana sangat menenangkan semasa pengajaran dalam wad | 0.405 | 0.857  |
| 12     | The school is well timetabled/Universiti ini mempunyai jadwal yang bagus                      | 0.563 | 0.846  |
| 17     | Cheating is a problem in this school/Meniran adalah satu masalah di dalam universiti ini      | 0.199 | 0.881  |
| 23     | The atmosphere is relaxed during lectures/Suasana tenang semasa mendenger kuliah             | 0.629 | 0.842  |
| 30     | There are opportunities for me to develop interpersonal skills/Disini terdapat banyak peluang untuk saya meningkatkan kemahiran interpersonal | 0.727 | 0.836  |
| 33     | I feel comfortable in class socially/Saya bersa selesa di dalam kelas ketika bersosial        | 0.674 | 0.842  |
| 34     | The atmosphere is relaxed during seminars/tutorial/Suasana tenang semasa seminar/tutorial  | 0.608 | 0.844  |
| 35     | I found the experience disappointing/Saya merasakan pengalaman disini adalah mengecewakan     | 0.616 | 0.843  |
| 36     | I am able to concentrate well/Saya mampu menumpukan perhatian dengan baik                    | 0.593 | 0.846  |
| 42     | The enjoyment outweighs the stress of studying medicine/Keseronokkan telah mengatasi tekanan belajar ilmu perubatan | 0.500 | 0.851  |
| 43     | The atmosphere motivates me as a learner/Suasana memotivaskan saya sebagai pelajar           | 0.629 | 0.842  |
| 49     | I feel able to ask the questions I want/Saya boleh bertanya soalan yang saya mahu            | 0.563 | 0.847  |

*Negative Item; CITC = Corrected Item-Total Correlation; CAID = Cronbach’s Alpha if Item Deleted; Green Color is Malay Language. Notes: Items in italics are the negative statements. SPoL: Students’ perceptions of learning; SPoT: Students’ perceptions of teaching; SASSP: Students’ social self-perception; SPoA: Students’ perception of atmosphere; SSSP: Students’ social self-perception.
The teachers are well prepared for their classes.

The teaching is often stimulating.

The teaching is helpful to develop my skills/competency/Kaeding pengajaran membantu untuk meningkatkan kemahiran/kecekapan saya.

The teachers are knowledgeable/Pensyarah berpengetahuan luas.

The teachers have good communication skills with the patients/Pensyarah memberikan kritikan yang membina disini.

The teachers are well prepared for their classes/Pensyaria bersedia dengan baik untuk kelas-kelas yang akan diajar.

Last year work has been a good preparation for this year's work/Usaha pada tahun lepas telah menjadikan persediaan yang baik kepada usaha tahun ini.

My problem skills are well developed here/Kemahiran saya ditingkatkan dengan baik di sini.

Much of what I have to learn seem relevant to career in health care/Kebanyakan perkara yang saya pelajari dilihat berkaitan dengan kerjaya saya dalam bidang kesihatan.

There are opportunities for me to develop interpersonal skills/Di sini terdapat banyak peluang untuk saya meningkatkan kemahiran interpersonal

I found the experience disappointing/Saya merasakan pengalaman disini adalah mengecewakan.

The atmosphere motivates me as a learner/Suasana motivasi saya sebagai pelajar.

I feel able to ask the questions I want/Saya boleh bertanya soalan yang saya mahu.

I am too tired to enjoy this course/Saya terlalu lelah untuk menikmati kursus ini

I rarely bored on this course/Saya jarang beraosan di dalam kursus ini.

I have good friends in this school/Saya mempunyai ramiawan-kawan yang baik di dalam universiti ini.

My social life is good/Kehidupan sosial saya adalah baik.

Cronbach’s alpha values for the five subscales of the 50-item DREEM-M

Table 6: Reliability analysis on individual item of the best fit DREEM model

| Domain | No. | Statement                                                                 | CITC   | CAID   |
|--------|-----|---------------------------------------------------------------------------|--------|--------|
| SPoL   | Q1  | I am encouraged to participate/Saya terdorong untuk mengambil bahagian    | 0.518  | 0.795  |
|        | Q7  | The teaching is often stimulating/Setiap pengajaran selalu merangsangkan | 0.723  | 0.687  |
|        | Q13 | The teaching is student-centered/Pengajaran menekankan pendekatan berpusat pada pelajar | 0.532  | 0.782  |
|        | Q16 | The teaching is helpful to develop my skills/competency/Kaeding pengajaran membantu untuk meningkatkan kemahiran/kecekapan saya. | 0.680  | 0.714  |
| SPoT   | Q2  | The teachers are knowledgeable/Pensyarah berpengetahuan luas              | 0.554  | 0.695  |
|        | Q18 | The teachers have good communication skills with the patients/Pensyarah memberikan kritikan yang membina disini. | 0.483  | 0.736  |
|        | Q32 | The teachers provide constructive criticism here/Pensyarah memberikan kritikan yang membina disini. | 0.585  | 0.679  |
|        | Q40 | The teachers are well prepared for their classes/Pensyaria bersedia dengan baik untuk kelas-kelas yang akan diajar. | 0.593  | 0.677  |
| SAST   | Q26 | Last year work has been a good preparation for this year's work/Usaha pada tahun lepas telah menjadikan persediaan yang baik kepada usaha tahun ini. | 0.410  | 0.743  |
|        | Q41 | My problem skills are well developed here/Kemahiran saya ditingkatkan dengan baik di sini. | 0.600  | 0.494  |
|        | Q45 | Much of what I have to learn seem relevant to career in health care/Kebanyakan perkara yang saya pelajari dilihat berkaitan dengan kerjaya saya dalam bidang kesihatan. | 0.538  | 0.567  |
| SSSP   | Q30 | There are opportunities for me to develop interpersonal skills/Di sini terdapat banyak peluang untuk saya meningkatkan kemahiran interpersonal. | 0.676  | 0.690  |
|        | Q35 | The atmosphere motivates me as a learner/Suasana motivasi saya sebagai pelajar. | 0.558  | 0.754  |
|        | Q49 | I feel able to ask the questions I want/Saya boleh bertanya soalan yang saya mahu. | 0.590  | 0.732  |
|        | Q54 | Much of what I have to learn seem relevant to career in health care/Kebanyakan perkara yang saya pelajari dilihat berkaitan dengan kerjaya saya dalam bidang kesihatan. | 0.434  | 0.721  |
|        | Q14 | I rarely bored on this course/Saya jarang beraosan di dalam kursus ini. | 0.528  | 0.666  |
|        | Q15 | I have good friends in this school/Saya mempunyai ramiawan-kawan yang baik di dalam universiti ini. | 0.566  | 0.642  |
|        | Q19 | My social life is good/Kehidupan sosial saya adalah baik. | 0.562  | 0.647  |

CONCLUSION

The current study findings regarding the Bahasa Melayu version of DREEM inventory 50-item inventory failed to achieve a model fit, but it demonstrated a high of internal consistency. The proposed 19-item DREEM-M revealed good model fit as its goodness-of-fit indices achieved an acceptable level, and confirmed a high level of internal inconsistency.

ACKNOWLEDGMENT

The authors are much grateful to those medical students who participated in this study. Furthermore, authors also humbly express their gratitude toward UniSZA authority for their kind cooperation.

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