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THE QUESTERVIEW METHOD AS A MEASURING TOOL IN INTEGRATED QUALITATIVE QUANTITATIVE CLINICAL STRESS EVALUATION STUDY

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ABSTRACT

Background: A mixed approach of including self completion of questionnaires by pencil and paper (PAPI) method and one to one, face to face interview method to gather information on the qualitative measurement of psychological and physical stress intensity and duration in human subjects. The study examines reproducibility of these questionnaires in qualitative research to measure when subject's behavior, attitude and perception towards their day to day stress conditions. **Objective:** The Depression Anxiety Stress Scale 21 (DASS-21) and International Physical Activity Questionnaire short form 7 (IPAQ-SF7) were used for this study. A total of 128 subjects were enrolled in the study and their identity was recorded as an alphanumerical value in computer system. They were shown the different signs and symptoms of psychological and physical stress by using an information leaflet. The Informed Consent Form (ICF) was obtained by the researcher. The method of face to face interview was conducted by an interviewer who was professionally a social worker in order to avoid the possible interviewer administration bias. The participant's responses to the self administrated, open- fixed answered questionnaires were recorded via PAPI. **Methodology:** The participants were called on to a separate room individually and given the questionnaire. A social worker who was not the part of the study has asked each questions to the subject to avoid administer bias. Each completed questionnaire was put into an envelope were sent to the research team for data processing. Incomplete questionnaires

were excluded and those subjects were not asked on second time to attend the study. This was to avid bias in total data processing and interpretation of results. **Results:** The Readability tests were calculated manually, of which Flesch Reading Ease Score were fairly easy 74.7 for DASS-21(60-70 is largely acceptable) and 70.2 for IPAQ-SF7. The Gunning's FOG score was 8 for DASS-21 and 7.2 for IPAQ-SF7; remarked as ideal for reading. The internal consistency Cronbach's alpha (α) obtained for the questionnaires DASS-21 and IPAQ-SF7 were 0.72 and 0.84 respectively, revealed excellent reproducibility of the language versions. The test retest analysis results data showed not a significant difference. **Conclusion:** The role of 'Questerview' (self explanatory, open, closed to fixed answer questionnaires with face to face, one to one asking interview) method in the field of integrated qualitative quantitative clinical studies was one again proved by this study. This will be useful as a non invasive tool to measure participant's responses to their stress stimuli, where an invasive technique or tool cannot be applied.

KEYWORDS: Questerview, Gunning's FOG Score, Flesch Reading Ease Score, DASS-21, IPAQ-SF7, Cronbach's Alpha.

INTRODUCTION

Modern scientists adopt three approaches of stress assessment: firstly; the environmental approach referring to the occurrence of demanding events (stressors), secondly; the psychological approach meaning the perceived by the individual stressfulness of each stressor and thirdly, the biological approach that focuses on the biological elements of the stress response (Cohen and Kessler, 1997). Questionnaires and interviews are the main measurement tools of the first two approaches and biomarkers of the biological one. Questionnaire is a set of common questions laid out in a standard and logical form to record individual respondent's attitudes and behavior. Instructions show the interviewer or the respondent how to move through the questions and complete the schedule. It could be printed on paper or on a computer screen. Face-to-face interviews can be time-consuming and expensive. However, a researcher can establish rapport with an interviewee and may have the opportunity to clarify responses. The face-to-face interview, also called an in-person interview, is probably the most popular and oldest form of survey data collection. It has continued to be the best form of data collection when one wants to minimize non response and maximize the quality of the data collected. Face-to-face interviews have a very high response rate. Types of questions are open questions, closed questions and fixed-choice

questions. An open question asks the participant to formulate his own answer, whereas a closed question constrains the participant to a greater extent. A fixed-choice question requires the respondent to pick an answer from a given number of options (Constantinos N. Phellas, 2011). The 'questerview' method used here allowing participants to relate their stress experience to the questions used to assess the frequency and intensity of stress. Exploring participant's experiences also enables to make better interventions when using self administered questionnaires (Rachael Gooberman-Hill, 2007).

The Depression Anxiety Stress Scales (DASS) was developed to measure the constructs of depression and anxiety and to address the failure of earlier emotional measures in discriminating between anxiety and depression. The original DASS has 42 items measuring three dimensions of negative emotional states, namely depression (DASS-D), anxiety (DASS-A) and stress/tension (DASS-S). Later, a shorter version of the DASS, the DASS-21, was developed by Lovibond and Lovibond (1995) to reduce administration time and has been used widely in clinical samples to screen for symptoms at different levels of depression, anxiety and stress (Lovibond & Lovibond, 1995). DASS-21 has been translated into various languages such as Malay, Arabic, Chinese, Dutch, German, Spanish, Japanese, Persian and Vietnamese and validated in a number of populations such as Hispanic adults, American and British. Crawford et al., 2009 and Norton, 2007 suggest that the DASS-21 is psychometrically sound with good reliability and validity and is a well established instrument for measuring depression, anxiety and stress.

The Depression Anxiety Stress Scales (DASS) was originally developed for people aged 17 or older but may be appropriate for younger age (McDowell, 2006) to evaluate the severity of core symptoms of depression, anxiety and stress (or tension) over the previous week (S H Lovibond & P F Lovibond, 1995; McDowell, 2006). The depression subscale assesses symptoms of dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest or involvement, anhedonia and inertia. The anxiety subscale assesses symptoms of autonomic arousal, skeletal musculature effects, situational anxiety and subjective experience of anxious affect. The stress subscale assesses symptoms of difficulty in relaxing, nervous arousal, easily upset or agitated, irritable or over-reactive and impatient. Together, the scales provide a broad range of psychological distress symptoms. Its main application is to identify emotional disturbance as part of a broader clinical assessment in general and clinical research set up. Apart from that, it is suitable for tracking change in severity over time and the three

dimensions of psychological distress are inter-correlated because they share common causes (McDowell, 2006). The Depression Anxiety and Stress Scale 21 (DASS-21) comprises three sub-scales: (1) the Depression sub-scale which measures hopelessness, low self-esteem, and low positive affect; (2) the Anxiety scale which assesses autonomic arousal, musculo-skeletal symptoms, situational anxiety and subjective experience of anxious arousal; and (3) the Stress scale which assesses tension, agitation, and negative effect (Tran et al. 2013)

The International Physical Activity Questionnaire (IPAQ) was developed as an instrument for cross-national assessment of physical activity and for standardizing measures of health-related physical activity behaviors of population in many countries and in different socio cultural contexts (IPAQ, 2011). The short form of IPAQ (IPAQ-SF) has been recommended for population prevalence studies, where time is limited, because it is easier and more feasible to complete than the long form (Craig et al. 2003). IPAQ measures vigorous-intensity activity, moderate-intensity activity, walking activity, and sitting in the last seven consecutive day period.

Studies of test-retest reliability for health related quality of life (QOL) instruments have used varying intervals between test administrations. There is no evidence available to aid in the selection of the time interval between questionnaire administrations for a study of test-retest reliability for health status instruments. Reliability is a critical measurement property for health related quality of life instruments. Reliability refers to the consistency of scores obtained by the same persons when re-examined with the same test on different occasions or with different sets of equivalent sets of items (Anastasi A 1988). There are many techniques available to measure reliability, including internal consistency and test-retest reliability. An instrument that has adequate test-retest reliability gives the same result if an individual is re-tested while remaining in a clinical steady state.

Readability tests are indicators that measure how easy a document is to read and understand. For evaluators, readability statistics can be solid predictors of the language difficulty level of particular documents. The essential information in an evaluation document should be easily understandable (Julien 2010). Test-retest reliability is more relevant in the setting of clinical medicine because the constructs we attempt to measure are heterogeneous (Robert G 2003). The interval has ranged from 10 minutes to 1 month (Martin DP, Badia, Ferris, Pollard, Whalen, Fholsen, Loken, Andersen, Gerace). Most investigators have chosen an interval ranging from 2 days to 2 weeks. This time frame is generally believed to be a reasonable

compromise between recollection bias and unwanted (on the part of the investigator) clinical change.

The purpose of the present study was to check the readability and test retest validity-reproducibility of Depression Anxiety Stress Scale 21 (DASS-21) questionnaire administered by 'Questerview' method. The results of this study will be helpful in using DASS-21 in Indian population for measuring their various intensities and frequencies of response to stressful events.

METHODOLOGY

The prospective observational study was conducted over a period of 6 months from October 2013 to March 2014, in a total of 128 participants were recruited from different locations of Ooty, The Nilgiris district of Tamil Nadu. The study protocol was reviewed and approved by Institutional Review Board (IRB). The participants were who have working at various levels of occupation such as Government employees, factory workers, workers on daily wages, load transporters, people working at construction site, housekeeping staff, sales men, security persons etc were participated in the study. Voluntary participation was ensured throughout the study and written informed consent was collected from each participant.

The participants were called on to a separate room individually and given the questionnaire. A social worker who was not the part of the study has asked each questions to the subject to avoid administer bias. Each completed questionnaire was put into an envelope were sent to the research team for data processing. Incomplete questionnaires were excluded and those subjects were not asked on second time to attend the study. This was to avid bias in total data processing and interpretation of results.

The method 'Questerview' self explanatory, open, closed to fixed answer questionnaires with face to face, one to one asking interview method was used including self completion of questionnaires by pencil and paper (PAPI) method. This enables transparency in conveying the true meaning of each question in the questionnaire. Also it encourages the participant to ask doubts and clarifications related to questions and in the other way this method of interview assures more productivity of outcome.

Reliability refers to the consistency of scores obtained by the same persons when re-examined with the same test on different occasions or with different sets of equivalent sets of

items (Anastasi A. 1998). There are many techniques available to measure reliability, including internal consistency (Cronbach's Alpha) and test-retest reliability.

Readability Analysis

1. Flesch Reading Ease Score

The Flesch Reading Ease Score considered as one of the oldest and most accurate readability formulas and a simple approach to assess the grade level of the reader developed by Rudolph Flesch writing consultant in 1948. It's also one of the few accurate measures can rely on without too much scrutiny but primarily it use to assess the difficulty of a reading passage written in English. The formula will output a number from 0 to 100; a higher score indicates easier reading. An ideal document has a Flesch Reading Ease score from 6 to 70. As a rule of thumb, scores of 90 to 100 can be understood by an average 5th grader. 8th and 9th grade students can understand documents with a score of 60-70; and college graduates can understand documents with a score of 0 to 30.

The formula is; RE= 206.835-(1.015 x ASL) – (84.6 x ASW)

RE- Readability Ease; ASL- Average Sentence Length (i.e., the number of words divided by number of sentences); ASW- Average number of Syllables per word (i.e., number of syllables divided by number of words).

Readability Ease (RE) scores ranges from 0 to 100. The higher the number, the easier the text is to read. Scores 90 to 100 are considered easily understandable by an average 5^{th} grader. Scores 60 to 70 are considered easily understood by 8^{th} and 8^{th} grader. Scores 0 to 30 are considered easily understood by college graduates.

Flesch Reading Ease Scores	Remarks
90- 100	Very easy
80- 89	Easy
70- 79	Fairly easy
60- 69	Standard
50- 59	Fairly difficult
30- 49	Difficult
0- 29	Very confusing

2. The Fog Scale (Gunning FOG Formula)

The Gunning-Fog index is a measure of text readability based upon sentence length and difficult words in a passage. The underlying message is that short sentences written in plain English achieve a better score than long sentences written in complicated language. The ideal

score for readability with the Gunning-Fog index is 7 or 8. Anything above 12 is too hard for most people to read. The Gunning Fog Index gives the number of years of education that the reader hypothetically needs to understand the paragraph or a given text. A Fog score of 5 is readable, 10 is hard, 15 is difficult, and 20 is very difficult. Based on its name 'Foggy' words are words that contain 3 or more syllables.

The formula is; 0.4 (ASL + PHW)
ASL- Average sentence length (i.e., number of words divided by number of sentences);
PHW- Percentage of hard words.

Reliability of the Questionnaires (Cronbach's Alpha)

Cronbach's Alpha was developed by Lee Cronbach in 1951 (Cronbach L. 1951) to provide a measure of the internal consistency of a test or scale; it is expressed as a number between 0 and 1. Internal consistency describes the extent to which all the items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test. Internal consistency should be determined before a test can be employed for research or examination purposes to ensure validity. There are two versions of alpha; normal and standardized. The normal alpha is useful when items on a scale are assumed to produce a single score for that scale and standardized alpha is appropriate when items on a scale are standardized before being summed. Alpha values ranges from 0 to 1. The value 0.7 to 0.8 is normal and up to 0.9 is strongly accepted for alpha when the purpose is related to research and >0.9 is accepted for clinical use of questionnaire items. Values substantially lower 0.7 indicate an unreliable scale. Calculating alpha has become common practice in medical education research when multiple item measures of a concept or construct are employed. This is because it is easier to use in comparison to other estimates (Cohen R, Swerdlik. 2010). There are different reports about the acceptable values of alpha, ranging from 0.70 to 0.95. (Nunnally 1994, Bland 1997, DeVilis. 2003). A low value of alpha could be due to a low number of questions, poor interrelatedness between items or heterogeneous constructs and if a low alpha is due to poor correlation between items then some should be revised or discarded. If alpha is too high it may suggest that some items are redundant as they are testing the same question but in a different guise. A maximum alpha value of 0.90 has been recommended (Streiner. 2003).

Test-Retest Validity Assessment

The assessment of test reliability is important in studies where questionnaires are used as a tool of measurement and this interval should not be too brief in order to prevent participants remembering what they previously answered, and should not be too long either, as participants' scores may have actually changed. A period of 1 to 2 weeks is often recommended, however, there may be reasons for Shortening or lengthening this time (Khaing Nang, et al. 2009). The questionnaire's reproducibility was obtained by means of a second application on the 20 persons (>10% of the total participants) of the 128 subjects who have participated in the study from each language zone, same subjects within 14 days interval using the same procedures used in the first application. The objective was to measure whether the same questionnaire answered at the times of second administration have any significant difference from the first time administration or not. A few participants who did not show up at the day for the questionnaire's reply filling were excluded.

RESULTS

Of the total 128 subjects participated in the study, 92 were men and 36 were women. Table-1 shows the mean age of the both gender of participants in which women subjects were found a mean age of 37.25±11.75 comparatively higher than men subjects, 35.73±11.87.

Table-1: Descriptive characteristics.

Gender	No. of subjects (n)	Mean age ± SD
Men	92	35.73±11.87
Women	36	37.25±11.75

Readability scales Flesch Reading ease and Gunning FOG score have been done in both DASS-21 and IPAQ-SF7. The analysis was done manually by using the formula 206.835-(1.015 x ASL) – (84.6 x ASW) for Flesch Reading ease score and 0.4 (ASL+PHW) for Gunning FOG score as described under the section methods. Table-2 shows the results where, Flesch Reading ease scores for DASS-21 was found 74.7 and for IPAQ-SF7 was found 70.2 those were acceptable level of score for fairly ease reading. The Gunning FOG scores for DASS-21 and IPAQ-SF7 were 08 and 7.2 respectively. Score levels 7 to 8 are considered as ideal for reading.

Table-2: Readability analysis of the questionnaires.

Questionnaire	Automated analysis scales	
	Flesch Reading Ease Score*	Gunning FOG score*
Depression Anxiety Stress Scale 21 (DASS-21) n-128	74.7	08
International Physical Activity Questionnaire 7 short form (IPAQ-SF7) n-128	70.2	7.2

* Flesch Reading Ease Score: >60 are acceptable for fairly ease reading

*Gunning FOG score: 7 to 8 is ideal for reading.

Reliability analysis was carried out by calculating the Cronbach's Alpha values using SPSS-20 version. The standardized alpha values were selected for representing the reliability of the questionnaires. The Cronbach's Alpha values obtained included in Table-3 reveal the questionnaires have excellent reliability.

Table-3: Reliability of the questionnaires (Cronbach's Alpha).

Questionnaires	Cronbach's Alpha (α)*
Depression Anxiety Stress Scale 21 (DASS-21) n-128	0.72
International Physical Activity Questionnaire 7 short form (IPAQ-SF7) n-128	0.84

**Cronbach's Alpha (α): 0.7 to 0.9 is acceptable for research purpose*

The test–retest validity of DASS-21 and IPAQ-SF7 has been done. Of the total 128 subjects participated in the study, 20 persons were called for the second time questionnaire administration. Researchers suggest different time period for the test-retest analysis, among those we have selected a 14 days (two weeks) interval for the second administration to be done (Robert G. Marx, 2003). The subjects were given the questionnaires and asking the questions by the medico social worker. Thereby, the 'Quest-review' method with pencil and paper (PAPI) was again carried out here. All subjects were completed the all questions and there were no incomplete questions. Table-4 shows test-retest values obtained for DASS-21. There were 12 men and 8 women subjects were participated with mean age of 37.5±10.7. The scores which are given by the individual subjects for each 7 questions for depression (D), Anxiety (A) and Stress (S) subscales have obtained (Table-4) and the average scores of depression (D), anxiety (A) and stress (S) subscales are also described in the Table-5. The

test and retest values have obtained for each individual questions for Depression (D), Anxiety (A) and Stress (S) subscales and the average values shows no significant variations

Table-4: Test-retest validity of each individual question in DASS-21 questionnaire

Gender	Age	Test value	Retest value*
23	F	12	12
24	M	12	12
26	M	13	11
26	F	8	8
27	M	3	3
24	F	12	10
21	M	8	8
48	F	8	8
21	M	7	8
20	M	10	10
35	F	15	12
57	M	10	10
20	F	16	15
24	F	7	7
21	F	7	6
48	M	5	5
21	F	5	5
20	M	12	12
35	M	16	14
57	M	15	13

*Retest time: 14 days

Table-5 Test-retest validity of DASS-21 questionnaire.

Descriptive characteristics	**Men**	**Women**
n-20	12	08
Mean age ± SD	37.5±10.7	
Scale Parameters	**Test value**	**Retest value***
Subscale Depression D	9.71±3.87	9.14±3.25
Subscale Anxiety A	10.42±3.97	10.91±3.71
Subscale Stress S	9.57±3.12	8.85±2.94

*Retest time: 14 days

Table-6: Test-retest validity of each individual question in IPAQ-SF7 questionnaire.

Gender	Age	Vigorous Physical Activity		Moderate Physical Activity		Walking		Total Physical Activity	
		Test	Retest	Test	Retest	Test	Retest	Test	Retest
23	F	0	0	240	180	594	540	834	720
24	M	960	960	960	960	594	524	2514	2444
26	M	0	0	348	348	594	594	942	942
26	F	0	0	960	960	198	210	1158	1170
27	M	0	0	720	720	198	210	918	930
24	F	96	96	720	720	396	396	1212	1212
21	M	480	480	480	480	1188	1260	2148	2220
48	F	192	180	960	960	1188	1188	2340	2328
21	M	216	200	2160	2000	950.4	900	3326.4	3100
20	M	480	500	0	0	0	0	480	500
35	F	32	32	0	0	396	360	428	392
57	M	480	480	0	0	792	820	1272	1300
20	F	56	60	0	0	792	792	848	852
24	F	144	150	0	0	792	792	936	942
21	F	0	0	1440	1530	396	360	1836	1890
48	M	480	480	0	0	594	540	1074	1020
21	F	960	920	0	0	594	594	1554	1514
20	M	480	500	0	90	200	200	680	790
35	M	960	980	0	0	1100	1000	2060	1980
57	M	960	980	0	120	1188	1188	2148	2288

Table-7: Test-retest validity of IPAQ-SF7 questionnaire.

Descriptive characteristics	**Men**	**Women**
n-20	12	08
Mean age	37.5±10.7	
Scale Parameters	**Test value**	**Retest value***
Avg. Vigorous Physical Activity (METs min/week)	348.8±364.38	335.16±365.63
Avg. Moderate Physical Activity (METs min/week)	449.4±603.39	453.4±582.07
Avg. Walking (METs min/week)	637.2±359.90	623.4±361.45
Avg.Total Physical Activity (METs min/week)	1435.42 ±774.12	1426.7±751.18

*Retest time: 14 days

DISCUSSION

The primary purpose of a questionnaire is to help extract data from respondents. It serves as a standard guide for the interviewers to ask the questions in exactly the same way. The DASS-21 and IPAQ-SF7 were already studied worldwide for research purposes and for clinical outcomes and there both had been proved excellence in reliability. The large quantitative

studies need structured questions to be administered by self completion through face to face interview.

Medical educators attempt to create reliable and valid tests and questionnaires in order to enhance the accuracy of their assessment and evaluations. Validity is concerned with the extent to which an instrument measures what it is intended to measure. Reliability is concerned with the ability of an instrument to measure consistently (Nunnally 1994) It should be noted that the reliability of an instrument is closely associated with its validity. An instrument cannot be valid unless it is reliable. However, the reliability of an instrument does not depend on its validity. It is possible to objectively measure the reliability of an instrument and in this paper we explain the meaning of Cronbach's alpha, the most widely used objective measure of reliability (Cohen Swerdlik 2010). The suggested minimum permitted test-retest interval was 3 days, and the maximum was 1 month. The mean interval was 11 days. The median interval was 7 days (60% of the interviews were conducted between 6 and 8 days after the first interview; 86% were conducted within 14 days of the first interview (Helen Link Egger. 2006).

The questionnaires are subjected for readability and reliability analysis to explore its productivity and reproducibility. In test retest analysis, the length of time between the two test administrations also affects the test-retest reliability. A very short time interval makes the carryover effects due to memory, practice, or mood more likely, whereas a longer interval increases the chances that a change in status could occur (Allen MJ, 1979). Testing the reliability by the test-retest method is that there is a potential for learning, carry-over, or recall effects; may be the first testing may influence the second). Test-retest reliability was subjected to intra class Pearson correlation coefficient to evaluate the reliability and to assess the consistency of the questionnaires over time. The Pearson correlation coefficient value for DASS-21was 0.99 (95% confidence interval (CI) of 0.74- 0.95) and for IPAQ-SF7 was 0.91 (95% confidence interval (CI) of 0.67 to 0.90). The time frame in which the questionnaires were administered, expected that the measures of these constructs would either not change or change minimally. The standard deviation (SD) values of the scores of Depression (D), Anxiety (A) and Stress (S) subscales were not deviated significantly. Two weeks (14 days) test-retest validity scores of the subjects were good.

CONCLUSION

The practical implication of this study was the 'Quest-review' method was found successful in collecting data related to psychological stress such as Depression, Anxiety and Stress in healthy subjects as well as their physical activity. The Tamil translated versions of DASS-21 and IPAQ-SF7 was found more ease in administration via 'Quest-review' method. These self-reported measures like questionnaires always can be used to document individual level perceptions towards their neighborhood environment, occupational factors and to measure their physical activity over a week or over specific period of time. The presence of interviewer could make the participant subjects more involved in asking and clarifying the possible doubts regarding individual questions. Conversation related to stressful life events from which the answers of each particular type of questions in the questionnaires were done through the interviewer. The readability of the questionnaires was excellent in terms of the level tested by Flesch Reading Ease and Gunning FOG formulas. The random sampling has done for measuring the Cronbach's Alpha in different 50 subjects was excellent. The test-retest validity in 20 subjects showed the time frame of 14 days was suitable for reproducibility at second time. Our results found that questionnaires are again proved to be better measuring tool in behavioral and epidemiological studies. DASS-21 could measure psychological stresses like depression and anxiety more easily than any other questionnaires in the present study population. Similarly, IPAQ-SF7 is aiming on vigorous, moderate physical activity and walking with avoiding leisure/ free time activity over past 7 days. The clinical studies where parameters to be measured are non quantifiable these questionnaires stand important in act a bridging towards making of integrated qualitative quantitative interpretations. The method will be useful in studies where an invasive measuring tool like sampling of blood, imaging techniques like X-ray, scan etc cannot be done.

In conclusion, the study proves 'Quest-review' has immense role in clinical data collection by ease of understanding for participants, better communication between interviewer and participant subjects progress to the quantification of stress symptoms in human. To date, no study has done in an objective to self-reported estimates of several physical, environmental and psychological stress measures. The evidence for test-retest reliability of the questionnaire is especially important, as work in this field is expanding rapidly toward stress-pharmacokinetic interaction and therapy failure. Future research studies can utilize these questionnaires to further explore the stress mediated optimization of therapeutic agents in clinical practice. Therefore, further works in this area will help to the development of

pharmacokinetic models for stress induced pharmacokinetic alteration leads to regularization of pharmacotherapy for better treatment outcomes.

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