Development of a Stress Questionnaire: A Tool for Diagnosing Mental Stress

Shahina Begum, Mobyen Uddin Ahmed, Bo von Schéele, Erik Olsson and Peter Funk

Abstract. Stress and its relation with health, behavioral and environmental factors are known today. The stress questionnaire is a scientific screening instrument to understand individual's causes of stress in different parts of life e.g. in the work place and at home. The 38-item stress questionnaire (SQ) is developed to assess the appraisal of stress personally experienced in a patient's life. This questionnaire cannot diagnose any illness or psychological disorder. However it can be a helpful tool for developing the individual stress management plan by assessing data about the current demands of individual's life and work.

1. Introduction

Stress-related disorders can be diagnose using figure temperature (FT) mentioned in [6], [7] and a biofeedback treatment procedure using FT is also proposed by Ahmed et al in [5]. Moreover, a diagnosis and treatment system using FT, for the individual stress management is also present in [8]. However, there are many factors which can cause stress such as, deadlines, job insecurity, going through a breakup in relationships, physical illness etc. Everyone react to stress in his or her own way. So, complete diagnosis of stress depends on data from various data sources including stress questionnaire, psychophysiological tests and traditional anamneses etc. PSS [3] and SF-12[1] are the two widely used stress screening tools. SF-12 provides an estimation of patient's health and well being from the individual point of view. PSS assesses the subjective evaluation of the stressful environments/situations. "The psychological perspective on stress assumes that stress arises totally out of persons' perceptions (whether accurate or inaccurate) of their relationship to their environment"[3]. In paper [2], the authors describe their experiences of using the SF-12 as an instrument for assessing health status in heart and stroke patients. The effects of burn out and perceived stress on early morning free cortisol levels in [4] is investigated using PSS scale.

The purpose of the stress questionnaire (SQ) is to assess the appraisal of stress personally experienced in one's life. SQ consists of 38 questions where the first 10 focuses on assessing preserved stress (PSS), next the short form health survey (SF-12) [1] is referring to the health-related quality of life and the last 16 estimates work-load related stress. The first two parts are frequently used questionnaires and the last is used by von Schéele (developed by von Schéele and coworkers, not published yet) as a tool - together with psychophysiological testing - for problem identification in projects at work places and to motivate individuals for intervention activities.

2. Scoring process

The SQ scoring process follows different algorithms. The scoring results will help to analyze the individuals' current situation to manage stress.

2.1 Scoring process for PSS-4

PSS-4 is used to make a comparison of the subject's preservative stress. It doesn't provide us any diagnostic information so there is no cut-off in the scoring process. The higher score value could indicate a risk of greater perceived stress or clinical psychiatric disorder. The score i.e. 0 = never, 1 = almost never, 2 =sometimes, 3 = fairly often, 4 = very often is taken for each questions. For the scoring of the items 4, 5, 7, and 8 the reverse order i.e. 0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0 is considered and then summing across all scale items. The highest scoring value is 40 and the lowest value is 0. If for example, answer to the questions 1 to 10 is 2, 2, 2, 2, 3, 1, 3, 2, 2, 1 then the scoring value will be 2+ 2+ 2+ 2+ 1+ 1+ 1+ 2+ 2+ 1= 16 for this subject. All questions must be answered. If any answer is missing the questionnaire is not valid and cannot be used.

2.2 Scoring process for SF-12

The result of SF-12 is scored into two meta-scores: Physical Component Summary (PCS) and Mental Component Summary (MCS). The higher the score value better the physical functioning. The scoring process for SF-12 follows a complex algorithm. The details are explained below. Here Q01 – Q12 denotes questions1 to questions 12. The score for the answer to the questions are considered as:

For the question 1: 1= excellent, 2 = very good, 3 = good, 4= fair, 5= poor.
For the questions 2 and 3: 1= yes, limited a lot, 2= yes, limited a little, 3= no, not limited at all.
For the questions 4, 5, 6, 7: 1=yes and 2= no.
For the question 8: 1=not at all, 2= a little bit, 3=moderately, 4= quite a bit, 5= extremely.
For questions 9, 10, 11 and 12: 1= all of the time, 2= most of the time, 3= a good bit of the time, 4= some of the time, 5= a little of the time, 6= none of the time

1. For Q01, Q08, Q10, Q09
   Reverse the answers (i.e. 1=5, 2=4, 3=3, 4=2, 5=1)
   New variables: Q01_a, Q08_a, Q10_a, Q09_a

2. If Q02=1 then PF02_1=1 otherwise PF02_1=0
   If Q02=2 PF02_2=1 otherwise PF02_2=0

3. If Q03=1 then PF04_1=1 otherwise PF04_1=0
   If Q03=2 PF04_2=1 otherwise PF04_2=0

4. If Q04=1 then RP2_1=1 otherwise RP2_1=0
5. If Q05=1 then RP3_1=1 otherwise RP3_1=0
6. If Q08_a=1 then BP2_1=1 otherwise BP2_1=0
   If Q08_a=2 then BP2_2=1 otherwise BP2_2=0
   If Q08_a=3 then BP2_3=1 otherwise BP2_3=0
   If Q08_a=4 then BP2_4=1 otherwise BP2_4=0
7. If Q01_a=1 then GH1_1=1 otherwise GH1_1=0
   If Q01_a=2 then GH1_2=1 otherwise GH1_2=0
   If Q01_a=3 then GH1_3=1 otherwise GH1_3=0
   If Q01_a=4 then GH1_4=1 otherwise GH1_4=0
8. If Q10_a=1 then VT2_1=1 otherwise VT2_1=0
   If Q10_a=2 then VT2_2=1 otherwise VT2_2=0
   If Q10_a=3 then VT2_3=1 otherwise VT2_3=0
   If Q10_a=4 then VT2_4=1 otherwise VT2_4=0

9. If Q12_a=1 then SF2_1=1 otherwise SF2_1=0
   If Q12_a=2 then SF2_2=1 otherwise SF2_2=0
   If Q12_a=3 then SF2_3=1 otherwise SF2_3=0
   If Q12_a=4 then SF2_4=1 otherwise SF2_4=0
10. If Q06 = 1 then RF2_1=1 otherwise RF2_1=0
11. If Q07 = 1 then RF3_1=1 otherwise RF3_1=0
12. If Q09_a=1 then MH3_1=1 otherwise NH3_1=0
    If Q09_a=2 then MH3_2=1 otherwise NH3_2=0
    If Q09_a=3 then MH3_3=1 otherwise NH3_3=0
    If Q09_a=4 then MH3_4=1 otherwise NH3_4=0
    If Q09_a=5 then MH3_5=1 otherwise NH3_5=0
13. If Q11_a=1 then MH4_1=1 otherwise MH4_1=0
    If Q11_a=2 then MH4_2=1 otherwise MH4_2=0
    If Q11_a=3 then MH4_3=1 otherwise MH4_3=0
    If Q11_a=4 then MH4_4=1 otherwise MH4_4=0
    If Q11_a=5 then MH4_5=1 otherwise MH4_5 =0

14. RAWPCS12 =
    $(-7.23216*PF02\_1) + (-3.45555*PF02\_2) + (-6.24397*PF04\_1) + (-2.73557*PF04\_2)$
    $+ (-4.61617*RP2\_1) + (-5.51747*RP3\_1) + (-11.25544*BP2\_1) + (-8.38063*BP2\_2)$
    $+ (-6.50522*BP2\_3) + (-3.80130*BP2\_4) + (-8.37399*GH1\_1) + (-5.56461*GH1\_2)$
    $+ (-3.02396*GH1\_3) + (-1.31872*GH1\_4) + (-2.44706*VT2\_1) + (-2.02168*VT2\_2)$
    $+ (-1.6185*VT2\_3) + (-1.14387*VT2\_4) + (-0.42251*VT2\_5) + (-0.33682*SF2\_1) +$
    $(-0.94342*SF2\_2) + (-0.18043*SF2\_3) + (0.11038*SF2\_4) + (3.04365*RE2\_1) +$
    $(2.32091*RE3\_1) + (3.46638*MH3\_1) + (2.90426*MH3\_2) + (2.37241*MH3\_3) +$
    $(1.36689*MH3\_4) + (0.66514*MH3\_5) + (4.61446*MH4\_1) + (3.41593*MH4\_2) +$
    $(2.34247*MH4\_3) + (1.28044*MH4\_4) + (0.41188*MH4\_5)$

15. RAWMCS12 =
    $(3.93115*PF02\_1) + (1.8684*PF02\_2) + (2.68282*PF04\_1) + (1.43103*PF04\_2) +$
    $(1.4406*RP2\_1) + (1.66968*RP3\_1) + (1.48619*BP2\_1) + (1.76691*BP2\_2) +$
    $(1.49384*BP2\_3) + (0.90384*BP2\_4) + (-1.71175*GH1\_1) +$
    $(-0.16891*GH1\_2) + (0.03482*GH1\_3) + (-0.06064*GH1\_4) + (-6.02409*VT2\_1)$
    $+ (-4.88962*VT2\_2) + (-3.29805*VT2\_3) + (-1.65178*VT2\_4) + (-0.92057*VT2\_5)$
    $+ (-6.29724*SF2\_1) + (-8.26066*SF2\_2) + (-5.63286*SF2\_3) + (-3.13896*SF2\_4) +$
    $(-6.82672*RE2\_1) + (-5.69921*RE3\_1) + (-10.19085*MH3\_1) + (-7.92717*MH3\_2) + (-6.31121*MH3\_3) + (-4.09842*MH3\_4) + (-1.94949*MH3\_5) +$
    $(-16.15395*MH4\_1) + (-10.77911*MH4\_2) + (-8.09914*MH4\_3) + (-4.59055*MH4\_4) + (-1.95934*MH4\_5)$

16. Physical Component Summary (PCS) 12 = RAWPCS12 + 56.57706
    Mental Component Summary (MCS) 12 = RAWMCS12 + 60.7578

2.3 Scoring process for work-load related questions

Various workload-related outcomes such as, job stress, boss, job environment, soc. supp home, stress general, private associated with stress are calculated from these scores. The score i.e. 1= agree, 2= fairly agree, 3= do not fully agree, 4= do not agree at all is taken for the

questions 1-10. For the questions 11-16, 1= very often, 2= often, 3=do sometimes, 4= rarely, 5=never.

1. If Q01=1 then Q01=0
else if Q01=2 then Q01=1
else if Q01=3 then Q01=0
else if Q01=4 then Q01=1
else Q01=0

2. If Q02=1 then Q02=2
else if Q02=2 then Q02=1
else if Q02=3 then Q02=0
else if Q02=4 then Q02=0
else Q02=0

3. If Q03=1 then Q03=-1
else if Q03=2 then Q03=0
else if Q03=3 then Q03=1
else if Q03=4 then Q03=2
else Q03=0

4. If Q04=1 then Q04=-1
else if Q04=2 then Q04=0
else if Q04=3 then Q04=1
else if Q04=4 then Q04=2
else Q04=0

5. If Q05=1 then Q05=2
else if Q05=2 then Q05=1
else if Q05=3 then Q05=0
else if Q05=4 then Q05=-1
else Q05=0

6. If Q06=1 then Q06=2
else if Q06=2 then Q06=1
else if Q06=3 then Q06=0
else if Q06=4 then Q06=-1
else Q06=0

7. If Q07=1 then Q07=2
else if Q07=2 then Q07=1
else if Q07=3 then Q07=0
else if Q07=4 then Q07=-1
else Q07=0

8. If Q08=1 then Q08=2
else if Q08=2 then Q08=1
else if Q08=3 then Q08=0

else if Q08=4 then Q08=-1
else Q08=0

9. If Q09=1 then Q09=2
else if Q09=2 then Q09=1
else if Q09=3 then Q09=0
else if Q09=4 then Q09=-1
else Q09=0

10. If Q10=1 then Q10=2
else if Q10=2 then Q10=1
else if Q10=3 then Q10=0
else if Q10=4 then Q10=-1
else Q10=0

11. If Q11=1 then Q11=-2
else if Q11=2 then Q11=-1
else if Q11=3 then Q11=0
else if Q11=4 then Q11=1
else if Q11=5 then Q11=2
else Q11=0

12. If Q12=1 then Q12=-2
else if Q12=2 then Q12=-1
else if Q12=3 then Q12=0
else if Q12=4 then Q12=1
else if Q12=5 then Q12=2
else Q12=0

13. If Q13=1 then Q13=-2
else if Q13=2 then Q13=-1
else if Q13=3 then Q13=0
else if Q13=4 then Q13=1
else if Q13=5 then Q13=2
else Q13=0

14. If Q14=1 then Q14=-2
else if Q14=2 then Q14=-1
else if Q14=3 then Q14=0
else if Q14=4 then Q14=1
else if Q14=5 then Q14=2
else Q14=0

15. If Q15=1 then Q15=-2
else if Q15=2 then Q11=-1

else if Q15=3 then Q11=0
else if Q15=4 then Q11=1
else if Q15=5 then Q11=2
else Q15=0

16. If Q16=1 then Q16=-2

else if Q16=2 then Q16=-1
else if Q16=3 then Q16=0
else if Q16=4 then Q16=1
else if Q16=5 then Q16=2
else Q16=0

Job Stress = (Q01+Q02+Q03)/9;
Stress General= Q04/3;
Boss= Q05/3;
Job Environment=(Q06+Q07+Q08+Q09)/12;
Soc Supp=Q10/3;
Private (Q11+ Q12+Q13+Q14+Q15+Q16)/12;

3. Conclusions

Fifteen persons have taken part to complete the online SQ. One of the examples is shown in Figure 1.
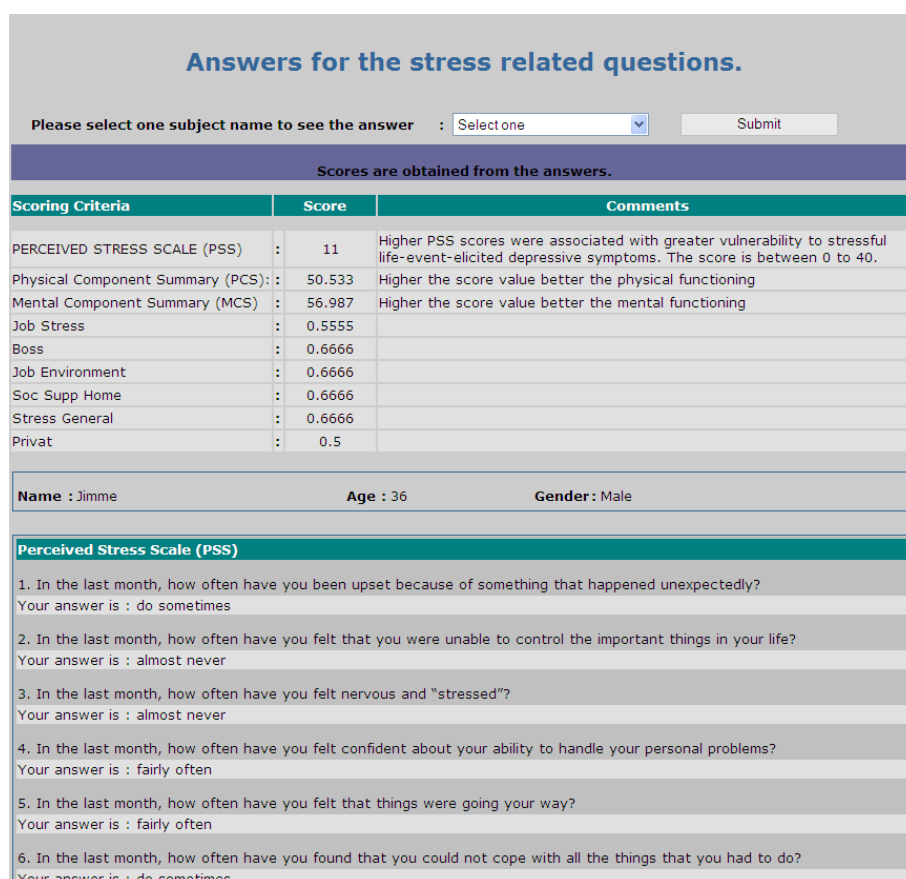

Figure 1. Screen shot of the Online SQ

The questionnaire helps to investigate relationship of stress and individuals' quality of life and environment. The 38-item questionnaire is presented in the appendix. SQ along with the other measurements of physiological parameters such as, finger temperature, heart rate, respiration rate etc. help to develop a computer-based stress management system in the

domain. Here, SQ will provide supplementary information and supports to verify the measurements against the user perception of stress.

References

1. Ware J Jr, Kosinski M, Keller SD: A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliabilityand validity. Med Care 1996, 34:220-233.

2. Lim L. L.Y. and Fisher J. D.: Use of the 12-item Short-Form (SF-12) Health Survey in an Australian heart and stroke Population. Quality of Life Research, 1999 Kluwer Academic Publishers, 8, pp. 1–8.

3. Cohen S, Kessler RC, Underwood-Gordon, L, eds. Measuring Stress: A Guide for Health and Social Scientists, Oxford University Press, 1997.

4. Jens C. Pruessner, Dirk H. Hellhammer, and Clemens Kirschbaum: Burnout, Perceived Stress, and Cortisol Responses to Awakening. Psychosomatic Medicine 61:197-204 (1999)

5. Ahmed M.U., Begum S., Funk P., Xiong N., and Schéele B. V., A Multi-Module Case Based Biofeedback System for Stress Treatment, In Artificial Intelligence in Medicine. In press, ELSEVIER, 2010.

6. Ahmed M.U., Begum S., Funk P., Xiong N., and Schéele B. V., Case-based Reasoning for Diagnosis of Stress using Enhanced Cosine and Fuzzy Similarity, Transactions on Case-Based Reasoning on Multimedia Data, vol. 1, nr 1, IBaI Publishing, 2008, ISSN: 1864-9734, pp. 3-19.

7. Begum S., Ahmed M.U., Funk P., Xiong N., and Schéele B. V., A case-based decision support system for individual stress diagnosis using fuzzy similarity matching, In Computational Intelligence (CI), vol. 25, Issue 3, Blackwell, 2009, pp. 180-195.

8. Ahmed M.U., Begum S., Funk P., Xiong N., Multi-modal and multi-purpose case-based reasoning in the health sciences, 8th International conference on Artificial Intelligence, Knowledge Engineering and Data Bases (AIKED 2009), Cambridge, UK, 2009, pp. 378-383.

Appendix

Stress Questions (SQ)

Name _____Date _____
Age _____ Gender (Circle): M F Other _____

Perceived Stress Scale (PSS)

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?................................. 0 1 2 3 4
2. In the last month, how often have you felt that you were unable to control the important things in your life? 0 1 2 3 4
3. In the last month, how often have you felt nervous and "stressed"? 0 1 2 3 4
4. In the last month, how often have you felt confident about your ability to handle your personal problems? 0 1 2 3 4
5. In the last month, how often have you felt that things were going your way?... 0 1 2 3 4
6. In the last month, how often have you found that you could not cope with all the things that you had to do? 0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?.. 0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things?.. 0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control?................................... 0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? 0 1 2 3 4

Short Form Health Survey (SF-12) Questionnaire

This information will help your doctors keep track of how you feel and how well you are able to do your usual activities. Answer every question by placing a check mark on the line in front of the appropriate answer. If you are unsure about how to answer a question, please give the best answer you can and make a written comment beside your answer.

1. In general, would you say your health is:

_____ Excellent (1)
_____ Very Good (2)
_____ Good (3)
_____ Fair (4)
_____ Poor (5)

The following two questions are about activities you might do during a typical day. Does YOUR HEALTH NOW LIMIT YOU in these activities? If so, how much?

2. MODERATE ACTIVITIES, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf:
_____ Yes, Limited A Lot (1)
_____ Yes, Limited A Little (2)
_____ No, Not Limited At All (3)

3. Climbing SEVERAL flights of stairs:
_____ Yes, Limited A Lot (1)
_____ Yes, Limited A Little (2)
_____ No, Not Limited At All (3)

During the PAST 4 WEEKS have you had any of the following problems with your work or other regular activities AS A RESULT OF YOUR PHYSICAL HEALTH?

4. ACCOMPLISHED LESS than you would like:
_____ Yes (1)
_____ No (2)
5. Were limited in the KIND of work or other activities:
_____ Yes (1)
_____ No (2)

During the PAST 4 WEEKS, were you limited in the kind of work you do or other regular activities AS A RESULT OF ANY EMOTIONAL PROBLEMS (such as feeling depressed or anxious)?

6. ACCOMPLISHED LESS than you would like:
_____ Yes (1)
_____ No (2)

7. Didn't do work or other activities as CAREFULLY as usual:
_____ Yes (1)
_____ No (2)

8. During the PAST 4 WEEKS, how much did PAIN interfere with your normal work (including both work outside the home and housework)?
_____ Not At All (1)
_____ A Little Bit (2)
_____ Moderately (3)
_____ Quite A Bit (4)
_____ Extremely (5)

The next three questions are about how you feel and how things have been DURING THE PAST 4 WEEKS. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the PAST 4 WEEKS –

9. Have you felt calm and peaceful?
_____ All of the Time (1)
_____ Most of the Time (2)
_____ A Good Bit of the Time (3)
_____ Some of the Time (4)
_____ A Little of the Time (5)
_____ None of the Time (6)

10. Did you have a lot of energy?
_____ All of the Time (1)
_____ Most of the Time (2)
_____ A Good Bit of the Time (3)
_____ Some of the Time (4)
_____ A Little of the Time (5)
_____ None of the Time (6)

11. Have you felt downhearted and blue?
_____ All of the Time (1)
_____ Most of the Time (2)
_____ A Good Bit of the Time (3)
_____ Some of the Time (4)
_____ A Little of the Time (5)
_____ None of the Time (6)

12. During the PAST 4 WEEKS, how much of the time has your PHYSICAL HEALTH OR EMOTIONAL PROBLEMS interfered with your social activities (like visiting with friends, relatives, etc.)?
_____ All of the Time (1)
_____ Most of the Time (2)
_____ A Good Bit of the Time (3)
_____ Some of the Time (4)
_____ A Little of the Time (5)
_____ None of the Time (6)

Work load related questions (Part-1a)

1. The workload seems moderate
   a) agree   b) fairly agree   c) do not fully agree   d) do not agree at all

2. There is a balance between work demands and what I have ability to perform?
   a) agree   b) fairly agree   c) do not fully agree   d) do not agree at all

3. I feel an overall high stress level at work
   a) agree   b) fairly agree   c) do not fully agree   d) do not agree at all

4. I feel an overall high stress level at work and free time
   a) agree   b) fairly agree   c) do not fully agree   d) do not agree at all

5. I have a responsible boss who gives me support and make sure about my needs and my skills

        a) agree b) fairly agree c) do not fully agree   d) do not agree at all

6. I feel involved in decisions concerning my work
    a) agree b) fairly agree c) do not fully agree   d) do not agree at all

7. There is a good atmosphere at my workplace
    a) agree b) fairly agree c) do not fully agree   d) do not agree at all

8. I get feedback and recognition for my work
    a) agree b) fairly agree c) do not fully agree   d) do not agree at all

9. I have the opportunity to influence how my work should be carried out
    a) agree b) fairly agree c) do not fully agree   d) do not agree at all

10. If necessary, I have social support from my family and friends
    a) agree b) fairly agree c) do not fully agree   d) do not agree at all

Part-1b

11. I'm having trouble with sleeping i.e. trouble falling asleep, frequently awakenings, wake up to early etc.
    a) very often   b) often   c. sometimes   d. rarely   e. never

12. I easily forget things I have to do
    a) very often   b. often   c. sometimes   d. rarely   e. never

13. It´s difficult for me to focus and/or to keep my attention
    a) Very often   b. Often   c. Sometimes   d. Rarely   e. Never

14. I feel worried / anxious
    a) Very often   b. Often   c. Sometimes   d. Rarely   e. Never

15. I feel tired and /or exhausted
    a) Very often   b. Often   c. Sometimes   d. Rarely   e. Never

16. I feel depressed
a) Very often   b. Often   c. Sometimes   d. Rarely   e. Never