Prototype Application of Online Mental - Health Screening Design Among Junior and High School Through Strength and Difficulties Measure

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Abstract. Mental disorders are a major cause of disability and death throughout the world every year. Indonesia has low mental health and is mostly experienced by adolescents. Indeed, recognizing the signs and symptoms of stress in adolescents early is a preventive measure before the condition worsens and causes many losses. Mental health service programs have so far been limited, both in schools and in health care centres. Facing such conditions, this study proposes a mobile application model that can be an early detection tool for adolescent mental health and information sharing between adolescents and teachers or health workers. The screening results will be followed up by the health service if a problem is found. This research builds a prototype of the mobile application to the modelling stage. The model is produced from the system requirements analysis, the model presented here is in the form of; Context Diagram, Entity Relational Diagram (ERD), Relational Diagram Table (TRD), Flow Chart and User Interface Design. Early mental health detection uses the Strength and Difficulties Questionnaire (SDQ). Data collection is done by interview, observation and study of literature. This information system can be used by primary health care and implemented in schools, making it easier for adolescent mental health screening.

Keywords: Mental Health, Screening, Mobile Application, Junior and High School, Strength and Difficulties Questionnaire (SDQ)

1. Introduction
People with mental health are those who are mentally healthy. They are able to accept themselves as a whole, have stable emotions, good social community, and able to take responsibility for themselves and their environment, and have expectations that are in line with their potential. While people who are not mentally healthy are those who experience mental health disorders. They are anxiety, depression, dissociative disorders, somatoform, suicide thought, and personality problem [1].

Adolescence is a unique period. Characterized by emotional behaviour and related neural circuitry. Cortolimbic circuitry will develop dynamic changes, which play a role in both healthy and disruptive cognitive control of emotion [2]. During development, adolescent brains have the most elastic or plastic than childhood or adulthood and are able to adapt extraordinary to social, physical, sexual, and intellectual challenges [3].

Mothers of anxious children, regardless of their own anxiety status, were found to lack autonomy and less warm of act. Both the behaviour of parents and adolescents influence each other, so the style parenting for children with anxiety can be the impact of adolescent behaviour, not just causative factors [4].

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Schools is a place where teenagers spend a lot of time every day. Almost all teenagers go to school and faced with cognitive and social demands. School is an important place for adolescent mental health, for it is place to gain knowledge and inspiration for some people, while for others it may be a place of despair and failure [5].

The World Health Organization reported that 10-20% of children and adolescents around the world have mental health problems [6]. It is estimated that 50% of all mental disorders are experienced at the age of 14 years and 75% at the age of 18 years [7]. Most common disorders in children and adolescents is a generalized anxiety disorder and depression [8];[9].

According to the Royal Society for Public Health and Young Health Movement, the prevalence of anxiety and depression has increased by 70% in the last 25 years in young people [10]. Mental disorders are a major cause of disability [11] and contribute around 8 million deaths worldwide each year. This is a major problem in public health [12]. People with mental disorders can die 10-25 years younger than the general population [13]. Only a few people receive care with mental disorders [14] and often the quality of care is below service standards [15]. Public health workers must be able to develop, implement and disseminate programs and policies to prevent mental disorders, increase access and ensure quality care and improve quality of life in people with mental disorders [16].

The prevalence of stress in adolescents tends to increase [17]. About 30% of adolescents have reported problems with feeling sad or depressed to disrupt their daily activities [18].

Based on the study of Rofingatul Mubasyiroh, et al, in 2015 showed that there were 60.17% of junior-high school students in Indonesia experiencing symptoms of mental-emotional disorders. With details of symptoms; feeling lonely by 44.54%, feeling anxious by 40.75% and ever wanting to commit suicide by 7.33%. The highest mental social symptoms based on gender are 64.8%. Female students with the highest age category being 13-15 years old at 62.3% [21].

The increase in mental health problems is proportional to the increase in mental health services. The reach of mental health services must reach rural communities, not just in big cities. This is included in the distribution of health services. The number of mental health workers is still very limited, the people themselves are less concerned with their mental health conditions so that they cannot be detected and not handled properly [22].

Adolescent health care is more challenging than children and adult, for their physical, intellectual, and emotional development is developing rapidly [23]. The presence of primary care providers an important opportunity to screen teenagers with mental health problems and refer them to those who need care. About 70% of teenagers have contacted doctors in the last 12 months [24];[25].

According to WHO, a mental health information system is a "system for collecting, processing, analysing, disseminating and using information about mental health services and other people's mental health needs [26]. This can help develop a system of care that is fair and appropriate in certain contexts, can help improve physician communication, adherence to best practice norms and reduce errors in clinical care. In addition, mental health service providers can identify patterns in presenting complaints and treatment needs, which in turn informs the delivery of services and practices.

The priority program at primary health care is physical health. Mental health is one of the efforts to develop health in community health centres. There are no operational standards that are applied to adolescent mental health screening. Mental health monitoring activities for adolescents only during school visits that are in line with school activity units. Therefore, adolescent mental health conditions cannot be monitored.

The use of mobile phones has become a major need at this time, especially among teenagers to communicate with parents and friends. The internet is also a major need in all circles. Seeing this
condition and potential, this research forms an application model that can detect adolescent mental health quickly and precisely in large populations. This application is used to share information with teenagers, teachers and health workers. Therefore, people with mental health problems can be found immediately to be given care or treatment to prevent mental health. Students with problematic data will be integrated into the web of health workers. So, good collaboration between teachers and health workers in realizing good student mental health.

2. Method
To answer the research objectives above, the method to be used is prototyping. However, the stages used in this research are in the form of literature studies which are then continued with modeling as the basis for prototyping web- and android-based teen mental health applications. This research produces modeling that focuses on the early stage System Requirement Analysis, Context Diagram (CD), Entity Relational Diagram (ERD), Relational Diagram Table (TRD), Flow Diagram and Interface Design [27]. The application that will be built contains screening of adolescent mental health in schools using a standardized questionnaire from Strength and Difficulties Questionnaire (SDQ) [28]. This modeling presents a general description of the application to be built.

3. Results and Discussion
The application model is designed to make it easier for users to understand the information system to be built. Base on the application, users can get information quickly, cheaply and precisely. This condition is obtained from qualitative study results from qualitative study by interview, observation and study literature. The following is a system requirements analysis for mental-health.

3.1. System Requirements Analysis

| Table 1. System Requirements Analysis |
|--------------------------------------|
| **Current Conditions**              | **Needs** |
| **Input**                           | There is no valid standard operational of public health services to screen adolescent mental health at school. In general, physical health examine are the main program, while mental health is rarely conducted particularly in schools. |
|                                      | The mental health screening application design can be used personally to find out early adolescent mental health in preventing mental disorders and disabilities. Data obtained from students answers through the system and managed by the teacher |
| **Process**                         | Adolescents have emotional levels that are unstable and hard to express it. Because its emotional, relation among peers, teachers and community become unproductive. Significant changes are marked by low achievement of academic and lack of interest. |
|                                      | Development of an early mental health detection application is complemented by communication between students, teachers, health services and parents through the feature or content provided, like video, post share and article. |
| **Output**                          | There are no accurate reports or records regarding the mental health conditions of adolescents. School activities by the health unit are not monitored. Lack of health workers who are experts in mental health may cause inappropriate management |
|                                      | Application development will be equipped with a report format for mental health status. There is intervention by health worker to solve the student’s problem with mental health by reported of teachers. And, rise the relation among students-teachers-parents and health workers. |
3.2. Context Diagram
The Context diagram pays attention to system boundaries, interactions between external entities and the system. Can be seen in Figure 1.

3.3. Entity Relational Diagram
The ERD describes the relationships between entities in the system. Each entity has attributes and primary keys as database in the application. Can be seen in Figure 2.

3.4. Table Relational Diagram (TRD)
The TRD describes the relationship between entities. The relation between school and students is one-to-one, the relation between respondents/user and questionnaire is one-to-many, the relation between the teacher and the questionnaire is one-to-many, the relation between the nurses/midwives and the teacher is one-to-many, the relation between nurses/midwives with reports is one-to-many. Can be seen in Figure 3.

3.5. Flow Chart
The Flow chart is a description of the processes that exist in the system. Can be seen in Figure 4.

3.6. Design Interface
There are two design interface will be built, by mobile application and web base. Mobile application is used by students and teachers, while web base is used by health workers. The screening process will be followed up by health workers who are responsible for the school as a work environment.
3.7. Mobile Application

![Figure 5. Main Page](image1)
![Figure 6. Login Page](image2)
![Figure 7. Student Data Page](image3)

![Figure 8. Questionnaire](image4)
![Figure 9. Page Students Scores](image5)
![Figure 10. Recapitulation of student data](image6)

3.8. Web (Health Worker)

Design interface for health workers (midwives and nurses) using the web managed by health workers themselves. The following interface design drawings below.

![Figure 11. Display of Mental Health Information Systems web based](image7)

Teen mental health screening plan made in the form of android and the web. Online mental health screening activities are carried out to get information quickly and accurately with a large population and a short time. Each primary health care has a working area in the school in the school activity unit for junior and senior high schools in obtaining health services, both physical and mental health.
Health workers and teachers will work together in conducting mental health screening to students who are the responsibility of the teacher. Students will be directed to login the application and answer all questions according to what is considered correct. The results of the questions will be automatically recapitulated in the teacher's account if the student is already submitting in theirs account. The teacher can see student results without the students concerned being known. The system will interpret the results. If the student scores are normal then the submit button does not appear in the application, if the score is borderline and abnormal, a submit button will appear which will be integrated directly into the web at the health centre managed by nurses or midwife.

Health workers will counsel students with problems, by first communicating with teachers and parents of students. The last thing health workers can do for abnormal students is to refer to the psychiatric hospital for appropriate treatment.

Knowing the mental state of students, making teachers understand the condition of students in dealing with it as well as parents.

This application will be provided with interesting and positive content in the form of videos that can be opened at any time and up to date, youth articles and post shares that can be used to share stories and conditions experienced.

4. Conclusion
Adolescent mental health information systems produced in this study are at the modelling stage, for web-based and android applications. This research needs to be followed by an assessment to ascertain what the needs of potential users.

This application is planned to be used in primary health services, schools, for adolescent mental health screening. This application will have content that is interesting for teens, such as teen mental health videos, teen articles and sharing posts, then features for intensive communication between teachers, students, health workers, peers and parents.

References
[1] Kusumawati Farida. Buku Ajar Keperawatan Jiwa. Jakarta: Salemba Medika; 2010.
[2] Gee DG, Caballero C. Predicting Mental Health in Adolescence: Frontoinsular Circuitry, Emotion in Daily Life, and Risk for Depression. Biol Psychiatry Cogn Neurosci Neuroimaging [Internet]. 2019;4(8):684–5. Available from: https://doi.org/10.1016/j.bpsc.2019.06.004
[3] Paus T, Keshavan M, Giedd J, Paus T, Keshavan M, Giedd JN. Why do many psychiatric disorders emerge during adolescence? Nat Rev Neurosci 9: 947–957. Nat Rev Neurosci. 2009 Jan 1;9:947–57.
[4] Moore PS, Whaley SE, Sigman M. Interactions between mothers and children: Impacts of maternal and child anxiety. J Abnorm Psychol [Internet]. 2004 Aug [cited 2020 Feb 26];113(3):471–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15311992
[5] Ogden T, Hagen KA. Adolescent Mental Health: Prevention and Intervention. Second. London and New York: Taylor & Francis Ltd.; 2005.
[6] World Health Organization. Maternal, newborn, child and adolescent health. WHO. 2017;
[7] Kessler RC, Amminger GP, Aguilar-Gaxiola S, Alonso J, Lee S, Ustün TB. Age of onset of mental disorders: a review of recent literature. Curr Opin Psychiatry [Internet]. 2007 Jul;20(4):359–64. Available from: https://pubmed.ncbi.nlm.nih.gov/17551351
[8] Morgan C, Webb RT, Carr MJ, Kontopantelis E, Green J, Chew-Graham CA, et al. Incidence, clinical management, and mortality risk following self harm among children and adolescents: Cohort study in primary care. BMJ. 2017;359.
[9] Mental Health Foundation. Children and young people [Internet]. 2018 [cited 2020 Feb 26]. Available from: https://www.mentalhealth.org.uk/a-to-z/c/children-and-young-people
[10] Royal Society for Public Health. Status of Mind: Social media and young people’s mental health and wellbeing. R Soc Public Heal. 2017;(May):1–32.
[11] Whiteford HA, Degenhardt L, Rehm J, Baxter AJ, Ferrari AJ, Erskine HE, et al. Global burden
of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. Lancet [Internet]. 2013 Nov 9 [cited 2019 Nov 3];382(9904):1575–86. Available from: https://www.sciencedirect.com/science/article/pii/S0140673613616116

[12] Walker ER, McGee RE, Druss BG. Mortality in mental disorders and global burden implications: a systematic review and meta-analysis. JAMA psychiatry [Internet]. 2015 Apr 1;72(4):334–41. Available from: https://www.ncbi.nlm.nih.gov/pubmed/25671328

[13] Colton CW, Manderscheid RW. Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. Prev Chronic Dis. 2006;3(2):1–14.

[14] Kohn R, Saxena S, Levav I, Saraceno B. The treatment gap in mental health care. 2004;005736(03).

[15] Wang PS, Lane M, Olsson M, Pincus HA, Wells KB, Kessler RC. Twelve-month use of mental health services in the United States: Results from the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005;62(6):629–40.

[16] Reisinger Walker E, Jennie Kwon M, Delia Lang BL, Richard Levinson MM, Benjamin Druss MG. Mental Health Training in Schools of Public Health: Histor,Current Status, and Future Opportunities [Internet]. Available from: http://ceph.

[17] Anniko M, Boersma K, Tillfors M. Adolescent Stress : Prevalence , Sources of Stress & the Role of Cognitive Processes. 2017;(September).

[18] Li Q, Xue Y, Zhao L, Jia J, Feng L. Analyzing and Identifying Teens’ Stressful Periods and Stresor Events from a Microblog. IEEE J Biomed Heal Informatics. 2017;21(5):1434–48.

[19] Kementerian Kesehatan Republik Indonesia. HASIL UTAMA RISKESDAS 2018. 2018;

[20] Badan Pusat Statistik (BPS). Proyeksi Penduduk Indonesia 2010-2035. Jakarta; 2013.

[21] Mubasyiroh R, Suryaputri IY, Tjandrarini DH. Determinan Gejala Mental Emosional Pelajar SMP-SMA di Indonesia Tahun 2015. Bul Penelit Kesehat. 2017;45(2):103–12.

[22] Afifah KA. Literasi Kesehatan Mental Pada Tenaga Kesehatan. Univ Muhammadiyah Surakarta. 2016;

[23] Stang J, Story M. Adolescent Growth and Development A [Internet]. 2005 [cited 2020 Feb 26]. Available from: http://www.epi.umn.edu/let/pubs/adol_book.shtm

[24] Das JK, Salam RA, Lassi ZS, Khan MN, Mahmood W, Patel V, et al. Interventions for Adolescent Mental Health: An Overview of Systematic Reviews. J Adolesc Heal [Internet]. 2016 Oct 1 [cited 2020 Feb 26];59(4):S49–60. Available from: https://www.sciencedirect.com/science/article/pii/S1054139X16301665

[25] Salam RA, Arshad A, Das JK, Khan MN, Mahmood W, Freedman SB, et al. Interventions to Prevent Unintentional Injuries Among Adolescents: A Systematic Review and Meta-Analysis. J Adolesc Heal [Internet]. 2016 Oct 1 [cited 2020 Feb 26];59(4):S76–87. Available from: https://www.sciencedirect.com/science/article/pii/S1054139X16302397

[26] WHO. Mental Health Information System: Mental Health Policy and Service Guidance Package. 2005.

[27] P.Deck F, A.M.McHugh J, M.Eljabiri O. Strategic Software Engineering: An Interdisciplinary Approach. New York: Aurbach Publications; 2005.

[28] Ortuño-Sierra J, Aritio-Solana R, Fonseca-Pedrero E. Mental health difficulties in children and adolescents: The study of the SDQ in the Spanish National Health Survey 2011–2012. Psychiatry Res. 2018;259(May 2017):236–42.