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The Impact of Immunity on Developing Literacy Culture at Primary School: Investigating Students' Extroverted and Introverted Personalities

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Abstract: The development of literary culture in schools needs a literate ecosystem and full support from literacy activists in schools. This study aims to describe and explore the profile of literacy activists in madrasahs in terms of their level of immunity and personality traits. This study investigates the effect of student immunity as literacy activists in madrasahs with extroverted and introverted personality types on the ability to develop a literary culture. The parameters used to investigate the immunity levels in extroverted and introverted students were by examining the number of leukocytes, types of leukocytes, and the results of the IL-6 examination using the ELISA method. The results show that extroverted students have higher immunity than introverted students. The average leukocyte level of extroverted students is 24,350 cells/mm3 and introverted students is 50 cells/mm3. Meanwhile, the results of the IL-6 examination show the highest is 163,863 and the lowest is 43,984. Extroverted students can design various literacy programs that are challenging for students and are better able to build networks in developing literacy programs compared to introverted students. So, it can be concluded that extroverted students have a higher level of immunity, and also have the ability to explore and develop literacy programs better than introverted students.

Keywords: immunity, personality type, literacy activist, reading culture

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INTRODUCTION

Various studies have shown that there is a strong correlation between high reading habits and the achievement level of students' critical thinking competence. Sulaiman and Harpiansi (2018) find that students' reading habits have a significant impact on students' reading comprehension competence. The achievement of this competency encourages students' reasoning and problem-solving skills (Sulaiman & Harpiansi, 2018; Balan et al., 2019; Indianasari et al., 2021; Küçükaslan et al., 2022). Furthermore, another study describes that students' reading habits are built through the facilitation of an appropriate reading culture. To encourage a reading culture in schools, the availability of libraries and various reading culture programs play an important role in encouraging an increase in students' interest in reading so that their reading habits grow. This study shows that the presence of libraries in 6 schools where the research was conducted helps students improve their reading skills (Moses et al., 2015). With various book collections and various supporting references for reading and learning activities, the library encourages the growth of reading activities and interests. The International Federation of Library Associations and Institutions (IFLA) states that libraries with various sources and services based on the needs of students have been able to encourage the growth of a culture of literacy, reading for pleasure, and lifelong learning (Loh et al., 2017).

In Indonesia, the development of students' literacy competencies has been carried out through various efforts, such as the development of a reading culture program. However, the results of the literacy competency assessment of Indonesian students still show a poor category. INAP (Indonesian National Assessment Programme) and Indonesian Student Competency Assessment (AKSI) have conducted evaluations of students' abilities in reading, mathematics, and science. This action program was applied to 4th-grade elementary school students with the results showing that 77.13% of students were in the poor category in mathematics, 46.83% in reading, and 25.38% in science. Meanwhile, students in the good category in mathematics were 2.29%, 6.06% in reading, and 1.01% in science (Laksono et al., 2018).

Therefore, to develop a literacy culture in schools, systematic efforts are needed to encourage the growth of students' interest in reading as well as the involvement of all school members and related stakeholders. At the basic education level, one of the efforts to develop a reading culture is carried out by college students through Community Service activities. In its implementation, college students cooperate with schools through library revitalization activities and implementing reading culture programs. In line with the role of college students as literacy activists in driving the success of these programs, it is necessary to identify the skills needed and the resilience of college students involved in these activities. Therefore, this study aims to

describe the profile of literacy activist college students in terms of their immunity and personality traits in encouraging a reading culture in schools. The immune system is the body's defense mechanism as a protection against hazards from various substances in the environment that are considered foreign to the body, namely viruses, bacteria, parasites, fungi, and protozoa. When the immune system is weak, these foreign materials easily pass through the body's defenses, causing disease. In addition, the weakness of the body's defense system can also affect the body's psychological response (Brosschot et al., 2006).

To determine the body's immune response to stress management, an immunity test is needed. Immunity testing is a measurement method to determine the number of cells, proteins, or functions of the immune system (Andreasson et al., 2013). The most basic parameter is a simple count of the number of cells of different subtypes in the blood, the type determination of neutrophils, monocytes, lymphocytes, eosinophils, basophils, and macrophages, which is usually obtained from peripheral blood tests. This is important to know the number of immune cells of different types in the right proportion. However, the normal range for these enumerative parameters is large enough, that "correct" numbers and proportions can cover a wide range, and small changes are unlikely to have clinical significance in healthy humans (Cohen et al., 1999).

In people with extroverted and introverted personalities, the immunity level may be different. Some studies suggest that there is a significant relationship between extroverted and introverted personality types (Chien et al., 2022; Tao et al., 2020; Tychmanowicz et al., 2021). Personality is a dynamic organization that is always changing all the time. Personality is inherent in each individual and determines the unique pattern of adjustment of each individual to their environment. Creativity can be honed through stimuli that encourage children to think creatively. Creativity will develop well through habituation. Creativity is an individual mental process that produces new ideas, processes, or effective new products that are imaginative and flexible that are useful in various fields to solve a problem (Aschauer et al., 2022; Guaman-Quintanilla et al., 2023; Weng, 2022).

The purpose of this study is to investigate the impact of immunity on the inventiveness of students' literacy in administering a reading culture program. Many studies on immunity have been conducted, but the majority of them have only led to the health sector (Loyal et al., 2021; Macdonald et al., 2022; Ravi et al., 2018; Sadik et al., 2020). Several other immunological studies that lead to components of schooling, including creativity, have not been discovered. This study also looks at other factors that affect immunity, such as introversion and extroversion. Thus, the results of this study are expected to be able to describe the profile of literacy activists in encouraging the growth of a reading culture in schools and encouraging the belief of all stakeholders in optimizing a reading culture.

METHODS

Personality Typology Mapping: Extrovert and Introvert

To obtain data related to the typical personality of literacy activist college students, tests were carried out using DISC-Dominant, Influence, Steadiness, and Compliant. The DISC model was invented by William Moulton Marston (1928) to measure a person's personality style regarding work behavior (Fuqua & Bryan, 2017). The tests carried out included psychological tests, personality, workability, pedagogical knowledge, and literacy skills. The results of this test were then analyzed using a psychological scale (burnout scale). Blood sampling was carried out before and after treatment. The blood sample used for leukocyte analysis was venous blood. The blood sample taken was put into a bottle, added with EDTA anticoagulant, and put in an ice box.

Leukocytes Count

Analysis of the leukocyte count was carried out by the hemocytometer method using Turk diluent. Turk's solution consisted of glacial acetic acid, 1% gentian violet, and distilled water. This solution made erythrocyte cells undergo hemolysis and the blood becomes thinner so that the leukocyte cells are easier to count. The blood sample was taken up with a leukocyte pipette to a limit of 0.5. The pipette tip was cleaned with a tissue and then Turk's solution was added up to the mark of 11 (diluent 1: 20). The two ends of the leukocyte pipette were closed using the thumb and forefinger of the hand in a horizontal position. The blood that has been diluted in the leukocyte pipette was then homogenized by inverting the pipette to form the number 8 for 3 minutes. The blood sample was then dropped into the Improved Neubauer counting chamber. Before filling the blood sample in the counting chamber, the first four drops of blood were discarded and the pipette tip was placed in the counting chamber at the limit of the cover glass. Blood was dripped in the counting chamber on the fifth drop. The number of leukocytes was counted in four square planes under a light microscope with 100 times magnification. The calculation started from the upper left corner, then to the right, going down and from right to left, then going down again and starting again from left to right. This method was carried out in all four fields.

The types of leukocytes Count

Analysis of the type of leukocyte count was carried out by counting the number of each type of leukocyte on a blood smear preparation. The blood sample was dripped at ± 2 – 3 mm from the tip of the object glass. A quick smear of the blood was made on the surface of the object glass with the help of another glass object by placing the object glass on the short side/edge in front of the blood drop and then pulling it back a little until it touched the circle of blood until capillaries appear which caused the blood to spread evenly to the left and right on the edge of the first object glass. The angle between the two glass objects should be ± 45º. A second slide was pushed forward with equal force and speed to obtain a thin, even blood film. After obtaining a thin blood film, then the results of the smear were evaluated under a microscope, especially at the end of the smear. The smear was good if no cells are found stacked on top of each other with an even distribution. Then the blood smear preparations were fixed with methanol by immersing the results of the smear in a staining jar for 5 minutes, then removed and air dried. After drying, the preparations were put into Giemsa dye for 30 minutes. Then washed with running water for 5 minutes and dried. The leukocyte count was observed under a light microscope with 1000x magnification. Counting started at the top edge of the preparation, then the bottom edge, then to the right, then the top edge again, and so on. The counting was continued until 100 leukocytes were obtained. Leukocyte cells were counted according to their type. The number of each cell type was expressed in percent. The absolute number of each type of leukocyte was obtained by multiplying the percentage of the number of each type of leukocyte with the total leukocyte.

Analysis of blood serum IL-6 levels

The blood of introverted and extroverted college students was taken at about 10cc, all blood was taken using a peripheral venous catheter (BD Nexiva IV catheter, Becton-Dickinson, Franklin Lakes, NJ) and collected at Vacutainers (Becton – Dickinson, Franklin) Lakes, NJ) containing EDTA as an anticoagulant. The blood sample was centrifuged immediately and the plasma was aliquoted and stored at 80°C. IL-6 concentrations were determined using a commercial high-sensitivity ELISA (R&D Systems, Oxford, UK). The limit of detection for IL-6 was 0.09 pg/ml with inter- and intra-assay CVs of 9.2% and 5.3%, respectively.

RESULT AND DISCUSSION

Number of Leukocytes and Types of Leukocytes

The number of leukocytes in preliminary examination showed that among college students of community service programs with the number of leukocytes above normal are A and B with values of 24,350 cells/mm^3 and 11,500 cells/mm^3, respectively. While the number of leukocytes below normal was B and C with values of 550 cells/mm3 and 50 cells/mm^3 respectively. College students of the community service program who had normal leukocyte counts are D, E, and F with values of 6,500 cells/mm^3, 6,500 cells/mm^3, and 6,400 cells/mm^3, respectively. This is following Nurrachmat (2005) who states that the normal number of leukocytes is in the range of 4,500-11,000 cells/mm^3. However, the number of leukocytes in the final examination is not in line with Nurrachmat (2005). The results show that all college students in the community service program have a number of leukocytes that were less than normal. B had 800 cells/mm^3, C had 1,500 cells/mm^3, A had 1,100 cells/mm^3, D had 700 cells/mm^3, B had 1,000 cells/mm^3, E had 850 cells/mm^3, and F had 1,150 cells/mm^3.

At the initial examination of the type of leukocytes, D and E's neutrophils decreased (less than the normal limit, namely 36-73%) which can be referred to as neutropenia. Neutropenia may result from colonization by intracellular neutrophilic parasites. Regarding this, the function of neutrophils will be disrupted, where their function is as an initial defense of non-specific immunity against bacterial infections (Baratawidjaja, 1996). A and F eosinophils increased (exceeding the normal limit, namely 0-6%). An increase in eosinophils indicates the number of parasites. This is following the result of Bhalla et al.'s (2008) research that the number of eosinophils increases during allergies caused by parasites.

A, B, and E's basophils increase (exceeding the normal limit, namely 0-2%). This can be caused by an inflammatory reaction. The function of basophils is to give allergic reactions and antigens by releasing the chemical histamine which causes inflammation. All students show the normal number of monocytes, namely 0-11%. Monocytes act as phagocytosis of macrophage cells, and they have a role in conveying antigens to lymphocytes to work in the immune system (Subowo, 2009). The number of C and D lymphocytes exceeds normal limits. Meanwhile, B is less than normal. According to Bhalla et al. (2008), an increased number of lymphocytes (lymphocytosis) occurs in chronic infections. The role of the lymphocytes is as an immunological system (Subowo, 2009). At the final examination, it is found that the types of neutrophil leukocytes, monocytes, and lymphocytes in students are classified as normal. This is following the theory of the Pharmaceutical and Medical Devices Development Program (2011) that the percentage of leukocyte types in neutrophils is 36-73%, lymphocytes 15-45%, monocytes 0-11%, eosinophils 0-6%, and basophils 0-2%. But the result is in contrast to the type of basophil leukocytes in all students which exceed normal limits. This can be caused by an

inflammatory reaction. The function of basophils is to give allergic reactions and antigens by releasing the chemical histamine which causes inflammation (Subowo, 2009).

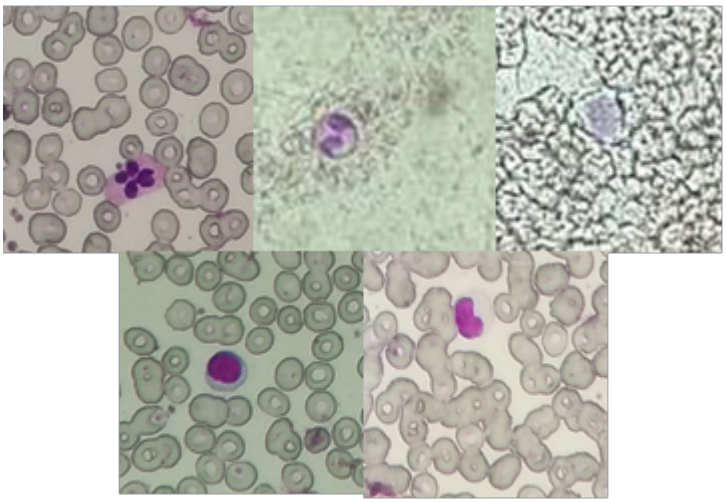

Figure 1. Types of Leukocytes

The Relationship between Immunity and Personality

The previous exploration shows that some college students in the community service program have abnormal leukocyte counts, some experience an increase while others experience a decrease. Increased leukocyte levels are affected by several conditions such as acute infection, tissue necrosis, leukemia, collagen disease, stress, excessive physical activity, menstruation, and drug consumption. Meanwhile, the decrease in leukocyte levels is influenced by several conditions such as stress, hematopoietic diseases, viral infections, malaria, agranulocytes, alcoholism, systemic lupus erythematosus and rheumatoid arthritis (Fikriya, 2016). One of the causes of abnormal leukocytes is stress. Stress is defined as a strong external stimulus both physiological and psychological which causes a physiological response in one's body. Therefore, stress can be described as a process with both physiological and psychological components. The psychological definition of stress is seen from the way a person responds to stress on several factors, including the ability to deal with stress (coping), genetic predisposition, stressors, level of social support, and other lifestyle factors. A stressor is a stimulus, situation, or circumstance with the potential to cause a stress reaction.

Many studies have shown that psychological stress led to immunological changes. Elevated levels of cortisol and epinephrine can disrupt homeostasis and increase susceptibility to disease through various mechanisms. Cortisol exerts potent anti-inflammatory and immunosuppressive effects. This is evidenced by the administration of cortisol in large quantities reducing the inflammatory response to infection. The biological mechanism of stress reduces the function of the immune system, and the occurrence of chronic inflammation is mediated by the production of the hormone cortisol which reduces immune capabilities by inhibiting IgA and IgG, and neutrophil function, resulting in increased biofilm colonization and reduced ability to prevent bacterial invasion of connective tissue. Another factor that can also influence the appearance of stress is personality. Personality is defined as the overall pattern of thoughts, feelings, and behaviors that are often used in an ongoing effort to adapt to one's life. Several factors influence the development of personality, namely biological, social, and cultural factors. There are two personality types: introvert and extrovert. People with introverted personalities tend to live in their own world. Unlike the extrovert personality type, his interaction with the outside world is very good. A study on the relationship between extrovert and introvert personality types on stress in college students finds a significance where higher levels of stress were found in subjects with introverted personalities (Subowo, 2009). If stress affects a person's immune system and this stress is also influenced by a person's own personality type, then the immune system can also be affected by the personality type itself. That is, extroverts or introverts have an impact on stress, and stress itself has an impact on immunity; Therefore a person's immune power can also be predicted to be determined by a person's personality type. As an example, B-one of the college students in the community service program with an introverted personality whose immune system is not good and one of the causes is stress. Another condition of the other students with the extrovert show that there is no relationship between immunity and personality type because of the unusual of their body condition.

Result IL-6

Based on the results of the analysis of IL-6 levels in college students in the community service program, the average value is higher than the normal value for IL-6 levels in human serum, namely 5-15 pg/ml, while IL-

6 levels in literacy with a reading culture program conducted for one month show a significant increase from each student, with IL-6 concentration in D's blood serum which is 163.8 pg/ml and the lowest concentration of IL-6 is in C's blood serum which was 43.9 pg/ml. This can be due to various factors that affect the physiology of each student, including the literacy program process carried out between the busy lecture schedules, lecture assignments, and the midterm exams that the student is currently taking. These factors greatly impact the physiological and psychological conditions of the study sample students, which is clearly seen from the high IL-6 level values in the blood serum of each student.

IL-6 is an indicator of an immune reaction, inflammation, pathological conditions, as well as stress and depression being experienced. This is following research conducted by Bob et al. (2010) who argues that there has been a lot of evidence showing that various types of interactions between the nervous and immune systems are important in the pathogenesis of depression. These findings suggest that an important role in the development of depression plays the role of proinflammatory cytokines that can mediate the psychological and neurobiological manifestations of depression. One of the most important cytokine molecules is interleukin-6 (IL-6). There is growing evidence that this depression-associated inflammatory process may be influenced by psychological distress and organic inflammatory conditions. These findings suggest that specific effects related to traumatic stress and dissociation can be found in close association with increased levels of the cytokine IL-6.

Immune Power, Personality Typical, and Development of a Reading Culture Program

A person's immunity can be influenced by many factors from within and outside the body, one of which is typical personality. Based on the results of research conducted on college students in the community service program, it is shown that the ability to develop a reading culture program is related to typical personality and the immune system. The development of a reading culture program is an effort to instill reading habits and increase students' interest in reading through the conditioning of a conducive literate environment and various reading activities (Ogwu, 2010). There are students with typical introverted personalities who have low and some very high leukocyte counts, this is related to the temporal and situational stability of the brain which may have a long-term impact on health (Eysenck, 1991; Friedman, 2008). Several epidemiological studies have found a relationship between personality characteristics and measures of disease or longevity (Weiss & Costa, 2005; Nakaya et al., 2010; Chapman et al., 2011), but the biological mechanisms of this relationship are still poorly understood. However, based on observations on the success of making a reading culture program and the targets that have been achieved, it shows that there are differences between students with introverted and extroverted personalities. Students with introverted personalities tend to have difficulty socializing, conveying ideas, and completing reading culture programs, while students with extroverted personalities are better able to organize, disseminate, and complete reading culture programs well.

The personality of almost extrovert students is interactive work motivation and has good immunity. The level of students with good immunity impacts students' ability to produce more literacy programs compared to extrovert students with low immunity levels. This is in line with theoretical analyzes showing that individual differences in the strength of the biological immune response can be associated with individual differences in personality traits that function as behavioral immune responses (Schaller & Murray, 2008; Thornhill et al., 2010; Schaller, 2011; Mengelkoch et al., 2022; Namaziandost et al., 2023). According to this theoretical approach, individuals who have relatively weak biological immune responses are hypothesized to exhibit stronger behavioral immune responses such as avoidance of strangers, reduced exploratory behaviors, and greater exploratory behaviors. Recent genetic association studies support this hypothesis in documenting increased rates of introversion in people carrying immune response gene polymorphisms that increase susceptibility to infectious diseases (MacMurray et al., 2013; Napolioni et al., 2014; Asaad & Taleban, 2022; Liu et al., 2023). In contrast, allostatic physiology suggests that biological immune defenses can be regulated by individuals who experience prolonged exposure to threats or stress and may experience an increased risk of injury or infection, or in highly sociable individuals who face increased exposure to infectious diseases (Sterling, 2004; Cole et al., 2011; Cole, 2013; Slavich & Cole, 2013; Bobrovitz et al., 2023; McLean, 2023). Despite many theoretical explanations regarding the relationship between personality and health, the biological mechanisms mediating this relationship remain poorly defined.

CONCLUSION

The management of the reading program carried out by college students in the community service program affects the decrease in leukocytes and the increase in IL-6 in student blood serum. This shows a decrease in immunity caused by psychological stress in the form of stress and depression. Furthermore, there are disparities between introverted and extroverted students. Students with introverted personalities have difficulty socializing and communicating ideas, combined with a weakened immune system, which makes it difficult for them to complete the reading culture program. Students with extroverted personalities, on the other

hand, are better able to develop, disseminate, and complete the reading culture program and have strong immune systems. For future research, it is suggested to focus on how to deal with students with introverted personalities so that they can have strong immunity, socialize effectively, and conduct educational programs smoothly in general.

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