

A concept analysis: Physical activity level

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Abstract

Background: A concept of physical activity level has been used widely as a key variable in research. A clearly defined concept could help provide advance knowledge of the term and allow for analysis and clarification to ensure consistency in meaning and understanding

Purpose: this concept analyses was examined the concept of physical activity levels that can be applied in clinical situation.

Methods: Walker and Avant evolutionary method of concept analysis was used to collect and analyse the data. The CINAHL, MEDLINE, Ovid, and PubMed databases were searched for publications from 1990–2020. Search terms included physical activity, physical activity level, moderate-intensity of physical activity, and concept analysis. Data were analysed with particular focus on the attributes, antecedents and consequences of the concept.

Results: Defining attributes of physical activity level were identified as personal to express number of daily physical activity (include intensity, frequency and duration) and to estimate a total of energy expenditure. Antecedents for physical activity to occur there should be living, conscious being to experience it, can movement or activity, and healthy. Consequences of physical activity levels viewed on a continuum from negative and positive.

Conclusion: This concept analysis provided an in-depth analysis and clarification of physical activity levels. Studies needed to explore physical activity level for specific risk group likes high-risk of diabetes; behavior and psychological aspects influences physical activity level; trend and issues of physical activity level related with transcultural aspects; and government support to promote physical activity program.

Keywords: Physical activity; Physical analysis levels; Exercise; Concept analysis

INTRODUCTION

The evidences have been given the choice of demonstrating the importance of a physically active lifestyle in the prevention and management of developing many chronic diseases (Colberg et al., 2010; Lagerros & Ligiou, 2007; Valanou, Bamia, & Trichopoulou, 2006; Woodcock, Franco, Orsini, & Roberts, 2011). Determinants and antecedents of physical activity (PA) are diverse, thus increasing physical activity is a societal, not just an individual problem. Reasons for not adhering to guidelines of PA include lack of self-motivation, lack of time, no self-monitoring or feedback, lack of the necessary resources, environmental barriers (Korkiakangas, Alahuhta, & Laitinen, 2009), and socioeconomic limitations (Ekong, & Kavookjian, 2016). The ability to engage in physical activity also depends on policies, environments, and cultural norms. Although these factors have been widely studied in

many developed countries (Ekong, & Kavookjian, 2016; Korkiakangas, Alahuhta, & Laitinen, 2009).

Many organizations have been concern to help people become more physically active. The concept of physical activity has been widely discussed in the literature by multi-disciplines such as: nursing, medicine, physical therapy, and public health. Basically people who provides some programs or interventions to prevent chronic disease considers about physical activity when determining the goals. Physical activity is a familiar concept that has been known most of healthcare discipline. The common term used by health care professional are “physical activity,” “exercise,” “physical fitness” (Caspersen, Powell, & Christenson, 1985). When defining the quality of physical activity or exercise, the most important is level of physical activity.

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A clearly defined concept of physical activity level can help provide a mental image of the term and allow for analysis and clarification to ensure consistency in meaning and understanding (Cronin, Ryan, & Coughlan, 2010). Concepts used within a scientific discipline require a more specific or narrow definition, so the concept can be used the same way with the same meaning every time (Hupcey, & Penrod, 2005). Numerous resources give recommendation level of physical activity that makes health care professional confuse which one is the best level to apply in clinical or in community. Defining level of physical activity with the hope that each level will provide a framework in which studies might be interpreted and compared.

Ideally, standardized terminology level of physical activity will increase understanding of the concept and how current theory may good be operationalized to further understanding and knowledge. It is very important for health care providers to use consistent terms in assessing levels of physical activity and encouraging the appropriate in patients. Challenges arise when health care provider are not knowing physical activity level for different patients' conditions or diseases. Therefore, this study seeks to clarify the concept of physical activity levels that can be applied in clinical situation.

RESEARCH METHODS

A study literature search was conducted using the CINAHL, MEDLINE, Ovid, and PubMed databases. The key words used were "physical activity," "physical activity level," "intensity of physical activity," "moderate-intensity of physical activity," and "vigorous-intensity of physical activity," and "concept analyses." To be included in this concept analyses, the literatures should be peer-reviewed articles, including research articles, systematic reviews and theoretical articles; writing in English or Indonesia language, physical activity levels as concepts; and patients with different conditions. The exclusion criteria were conference abstract, dissertation, editorials, articles involving healthy people and other health behaviors not relevant with concept being analyzed.

A Concept Analysis

Concept analysis is a strategy to examine the basic element or attributes the concept (Walker and Avant, 2005). The basic purpose of concept analysis is how we can differentiate between attribute of concept and irrelevant attribute. The concept analysis can be useful for understanding the concept (Walker, & Avant, 2005). Walker and Avant's (2005) framework was chosen as the methodology in this analysis that is several reasons using this framework. First, this framework constructs the mind about thing and action. This concept analysis will provide information for nurses to apply in clinical or community. Thus, this reason will support the aim of the concept analysis. Second, the Walker and Avant's method is logical and easy to apply. Third, this framework has been used in several studies and successful for concept analysis in multidiscipline (for example: (Hagerty, Lynch-Sauer, Patusk, Bouwsema, & Collier, 1992; Ream & Richardson, 1996; Siatkowski, 2007)). The framework requires eight steps process are (1) selecting a concept, (2) determining the aims or purposes of analysis, (3) identification all of uses of the concept, (4) determination the defining attribute, (5) construction of a model case, (6) construction of borderline, related, contrary, and invented cases, (7) identify of antecedents and consequences, and (8) define empirical referents (Walker and Avant, 2005, p. 65). Steps one and two were presented in the introduction. Step three to eight following:

1. Identify the Concept and Associated Terms

To understand the meaning of "physical activity levels" that need to know the definition itself and related term of it. There are various recommendations relating to physical activity levels, which is making difficult to choice the best and the most appropriate with clinical setting. To assist the health care professional in differentiating among these recommendation and concepts, we tried to look the root word of physical activity first, than the concept and associated term.

Physical

Physical comes from medieval Latin as "physicalis," and from Latin "physica" that means things relating to nature. Physical is coming from a

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16th century Middle English word that uses as both a noun and adjective. The noun physical refers to a medical examination to determine a person's bodily fitness (Oxford dictionaries, 2014). The adjective physical are relating to the body as opposed to the mind, the things perceived through the senses as opposed to the mind that are tangible and concrete, and physics or the operation of natural forces generally (Oxford dictionaries, 2014).

Activity

Active as a noun comes from late Middle English word *activite* or Late Latin word *activitas* (Oxford dictionary, 2014). Today, it is defined as the quality or stage of being active, vigorous, or energetic action, natural or normal function. In medical definition, activity means a process (as digestion) that an organism carries on or participates in by virtue of being alive (Merriam-Webster's Collegiate Dictionary, 2014).

Level

Level as a noun, adjective and verb come from the Middle English (denoting an instrument to determine whether a surface is horizontal). Level comes from old French *level*, based on Latin *libella*, diminutive of *libra* 'scale, balance' (Oxford dictionary, 2014). In medical definition, level means as a characteristic and fairly uniform concentration of a constituent of the blood or other body fluid or a degree of ability of aptitude or measure of performance (Merriam-Webster's Collegiate Dictionary, 2014).

Physical activity

The term of "physical activity" should not mistake with term of "exercise". Exercise is a part of physical activity, which it has planned, structured, repetitive, and the purpose to improve or maintains one or more component of physical fitness (WHO, 2010). Physical activity is as all body movement resulting from coordination and contraction of muscles and skeletal that needs energy expenditure (Caspersen et al., 1985; Lindsay et al., 2014; U. S. Department of Health and human Services, 1996; WHO, 2010).

Another definition of physical activity is any kind of body movement producing by muscle and needs more energy than resting (example: walking,

running, dancing, swimming, gardening, and yoga) (National heart, lung, and blood institute, 2014). European food International Council (2006) state that physical activity is all type of body movement that results of energy expenditure. Physical activity includes daily activities like's household jobs, shopping, and working. From several definitions above, we can conclude that physical activity means as all of bodily movement producing by muscles and skeletal that needs energy expenditure.

Physical Activity Levels

The physical activity level is a technique to express number of daily physical activity and to estimate a total of energy expenditure each person (Food and Agriculture Organization of the United Nations. (2004). There are some criteria of physical activity level as following:

The U.S. Department of Health and Human Services (2008) provides four categories of amount of aerobic physical activity for adults per week, as follow: 1) Inactive is no physical activity of daily life likes standing, walking slowly, and lifting lightweight objects; 2) Low activity is doing daily life but fewer than 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity per week; 3) Medium activity is doing physical activity 150 minutes to 300 minutes of moderate-intensity or 75 to 150 minutes of vigorous-intensity. This category will equivalent to 500 to 1,000 metabolic equivalent (MET) minutes per week; 4) High activity is doing physical activity more than 300 minutes of moderate-intensity or equivalent per week.

There are three level of physical activity base on International physical activity questionnaire group (2005): 1) Low (performing physical activity less than 30 minutes of moderate-intensity on most days); 2) Moderate (doing physical activity at least 30 minutes of moderate-intensity on most days); 3) High (doing physical activity at least one hour or more of moderate-intensity per day or equivalent with 5000 steps per day). High active category is considered perform at least 12,500 steps/day or at least one hour and above of moderate-intensity activity or 30 minutes and above of vigorous-intensity activity.

According to United Nations University (1994), there are three categorize of intensity levels of

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exercise. The levels are low, moderate and vigorous-intensity that are measured by metabolic equivalent (METs). The American College of Sports Medicine and the Centers for Disease Control and Prevention divided physical activity level in three categories that are light-intensity, moderate-intensity and vigorous-intensity (Haskell et al., 2007), following: 1) The light-intensity is all activities that performed during daily life (e.g., self care, washing dishes) or activities of very short duration (e.g., taking, walking at store, home or office); 2) Moderate-intensity is as an aerobic activity that equivalent with brisk walk at least 30 minutes or more and noticeably accelerates the heart rate; 3) Vigorous-intensity is doing activities that cause rapid breathing and increase heart rate likes jogging.

There are numerous recommendations of physical activity levels by the U.S. Department of Health and Human Services, (2008) are following: 1) For children and adolescents should do physical activity at least 60 minutes (1 hour) or more every day; 2) For adults should do physical activity at least 150 minutes of moderate-intensity per week or 75 minutes of vigorous-intensity aerobic activity per week, or equivalent combination between moderate-intensity and vigorous-intensity of aerobic physical activity. An aerobic activity should do at least 10 minutes per week and preferably. For additional purpose or more significant benefit for health, adults should be performed aerobic physical activity at least 300 minutes (5 hours) of moderate-intensity per week, or 150 minutes of vigorous-intensity per week, or equivalent combination between moderate and vigorous-intensity of aerobic physical activity. 3) For older, the level of physical activity is same guideline with adult (at least 150 minutes of moderate-intensity per week) as their conditions or ability. In additional, if older adults at risk of falling should do physical activity to maintain or increase their balance, determine level of effort for physical activity, aware and understand their conditions to do physical activity regularly and safety.

The other recommendation of physical activity level for health by WHO (2010): 1) For children and young people (age 5-17 years old) should do physical activity in moderate to vigorous-intensity at least 60 minutes per day. In additional health

benefit should perform more than 60 minutes per day. The physical activity's type is aerobic activity. For strengthen muscle and bone should do aerobic physical activity in vigorous-intensity at least 3 times per week. 2) For adults aged 18-64 years old should perform aerobic physical activity at least 150 minutes of moderate-intensity, or 75 minutes of vigorous-intensity per week, or equivalent combination between moderate and vigorous-intensity of aerobic physical activity. The duration of aerobic activity should do at least 10 minutes. For additional health benefits should improve aerobic physical activity at least 300 minutes of moderate-intensity, or 150 minutes of vigorous-intensity per week, or equivalent combination activity in moderate and vigorous-intensity. For muscle strengthens activities should be performed including major muscles groups on 2 or more day per week. 3) For adults aged 65 years old and above have same recommendation of physical activity level with adult's people. For additional, when this group with limitation of mobility should do physical activity on 3 or more days per week to improve balance and to prevent fall. For muscle-strengthening activities should perform including major muscle groups at least 2 or more days per week. If this age groups cannot reach level of physical activity because health conditions, they should do physical activities as their abilities and condition.

Pate et al. (1995) recommended to US adults should do physical activity 30 minutes or more of moderate-intensity days per week. The physical activities such as walking up the stairs instead of taking the elevator or driving short distance, gardening, housework, and playing with children if the intensity related to brisk walking. Blair, LaMonte, & Nichaman (2004) recommended that adults should do physical activity for 30 minutes of moderate-intensity per day. People who perform at least 30 minutes or more of moderate-intensity exercise a day will reach additional health benefits.

The American College of Sports Medicine and the Centers for Disease Control and Prevention published national guidelines on Physical Activity and Public Health to promote and maintain healthy, as follow (Haskell et al., 2007): Adults' aged 18-65 years should do and maintain physical activity at least 30 minutes of moderate-intensity on five days

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one week or at least 20 minutes of vigorous-intensity on three days a week. The combinations between moderate-intensity and vigorous intensity should meet with this recommendation. For example, if people are brisk walking for 30 minutes twice a week and jogging for 20 minute on two other days.

2. Defining Attributes

Determining of defining attributes is as a heart of concept analysis. Defining attributes is effort to find the attributes that are the most related with the concept and allow differentiate the broadness insight into the concept (Walker and Avant, 2005). To discuss about physical activity, there are two attributes involved such as intensity, and duration of physical activity.

Intensity of Physical Activity

The quality or state of being intense (especially degree of strength, energy of force) or the magnitude of quality (as force or energy) per unit are used to describe intensity (Merriam-Webster's Collegiate Dictionary, 2014). Intensity may refer to how much work is being done or level of activity or

exercise recommended (Center for Disease Control and Prevention, 2011). All physical activity can identified an intensity level used the rate of energy expenditure as metabolic equivalent (METs). Intensity of activities can calculated as multiples of 1 MET or as the ratio of related metabolic rate for the specific activity divided standard resting metabolic rate of 1.0 (4.184 kJ) kg⁵ –h-5. The compendium makes list for multiples of the resting MET level and range from 0.9 (sleeping) to 18 METs (running at 10.9 mph) (Ainsworth et al., 2000; Norton, Norton, & Sadgrove, 2010).

The intensity of physical activity is as expenditure relative to body mass or resting metabolism, or as a value of peak performance that are related with energy expenditure (kJ/min), oxygen consumption (liters/min or ml/min per kg), or metabolic activity relative to resting condition (METs) (Shephard, 2003). According to United Nations University (1994), intensity of physical activity is measured by metabolic equivalent (METs). The intensity of physical activity are described in table below:

Table 1. Total Metabolic Equivalent (METs)

Physical Activity	MET
Light Intensity Activities	< 3
Sleeping	0.9
Watching television	1.0
Writing, desk work, typing	1.8
Walking, 1.7 mph (2.7 km/h), level ground, strolling, very slow	2.3
Walking, 2.5 mph (4 km/h)	2.9
Moderate Intensity Activities	3 to 6
Bicycling, stationary, 50 watts, very light effort	3.0
Walking 3.0 mph (4.8 km/h)	3.3
Calisthenics, home exercise, light or moderate effort, general	3.5
Walking 3.4 mph (5.5 km/h)	3.6
Bicycling, <10 mph (16 km/h), leisure, to work or for pleasure	4.0
Bicycling, stationary, 100 watts, light effort	5.5
Vigorous Intensity Activities	> 6
Jogging, general	7.0
Calisthenics (e.g. pushups, situps, pullups, jumping jacks), heavy, vigorous effort	8.0
Running jogging, in place	8.0
Rope jumping	10.0

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Type of Physical Activity

Term of type comes from French as in the sense 'symbol, emblem' or Latin as *typus* in late 15th century (Oxford dictionary, 2014). U.S. Department of Health and Human Services (2008) divides type of physical activity into two categories, as follows: 1) Baseline activity refers to light-intensity of physical activity such as standing, walking slow, lifting lightweight objects, and climbing a few stairs; 2) Health-enhancing physical activity refers to health benefits such as brisk walking, jumping rope, dancing, lifting weights, climbing on playground equipment at recess and yoga.

According to WHO (2010) divides type of physical activity based on age, such as: 1) ages 5-17 years old, type of physical activity includes play, games, sports, transportation, recreation, physical education, and activities in home, school and community; 2) age 18-64 years old, type of physical activity likes recreational or leisure-time of physical activity, transportation such as walking and cycling, occupational such as work, household chores, play, games, sports exercise, and daily activity in home and community; 3) age 65 years old and above, type of physical activity is similar with adult's type of physical activity.

Canadian Diabetes Association divides type of exercise for people living with diabetes into three categories such as: 1) aerobic exercise includes biking, brisk walking, swimming, dancing, hockey, baseball, bicycling or jogging; 2) resistance exercise involves brief exercise with weights, weight machine, resistance bands like pushups to rise muscle strength; 3) flexibility exercise like yoga (Canadian Diabetes Association Clinical Practice Guidelines Expert et al., 2013).

Frequency of Physical Activity

Term of frequency comes from middle 16th century as a term *frequency*, or in Latin as a word *frequentia* (Oxford dictionary, 2014). Frequency of physical activity is as total number of doing physical activity times per week (Shephard, 2003). The American College of Sports Medicine and the Centers for Disease Control and Prevention gives recommendation for adult to perform physical activity on three days per week (Haskell et al.,

2007). Another studies give recommendation for adult to perform physical activity every day (Pate et al., 1995; Blair, LaMonte, & Nichaman, 2004)

Duration of Physical Activity

Duration of physical activity is accumulating the total number of activity in minutes (Shephard, 2003). According to Center for Disease Control and Prevention (CDC) (2011) definition of duration as length of time in which activity or exercise is performed. In general, duration is measured in minutes. In order to get benefit for cardiorespiratory health, all activity should do at least 10 minutes duration without stop (WHO, 2014).

Currently, public health recommendation the duration of physical activity at least 30 minutes of moderate-intensity of exercises a day (Blair et al., 2004). This definition of duration in physical activity was presented almost similar recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine (CDC/ACSM) that adult should do physical activity accumulate 30 minutes or more of moderate-intensity (Pate et al., 1995).

In contrast, the Institute of Medicine recommended the duration of physical activity should perform 60 minutes of daily moderate-intensity physical activity (for example walking or jogging at 4 to 5 mph) (Institute of medicine of the national academic, 2005). Whereas duration of physical activity based on sedentary lifestyle is doing activity less than 25 minutes per day for clinical practice (León et al., 2007).

3. Antecedents and consequences

Antecedents are a condition that must occur before the concept occurs, and consequences are those conditions or events as the results of the concept having happened (Walker and Avant, 2005).

Antecedents

For physical activity to occur there should be living, conscious being to experience it, can movement or activity, and healthy.

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Consequences

The consequences of physical activity levels may be viewed on a continuum from negative and positive. As a direct result of regular and adequate physical activity levels get beneficial such as: 1) increase strengthens of muscular and cardiorespiratory; 2) increase quality of bone and functional health; 3) increase of energy and weigh control; 4) decrease the high risk of hypertension, coronary disease, stroke, diabetes mellitus, breast and colon cancer, and depression; and 5) decrease high risk of fall or vertebral fractures (WHO, 2014).

The benefit of physical activity levels was presented similar with Center for Disease Control and Prevention (2011) state that regular physical activity has significant correlated with your health, such as: control body weigh, decrease risk of chronic disease (e.g. type 2 diabetes or metabolic syndrome, and cardiovascular disease) and some cancers, improve strengthens of bones and muscles, improve mental health and mood, improve ability to perform daily activities and prevent fall for older, and increase quality of live (Gulliford, Charlton, Bhattarai, Charlton, & Rudisill, 2014; CDC, 2011).

According to American Heart Association (2014), the benefits of physical activity are controlling blood pressure, managing body weight, strengthening heart, and managing stress level. The other beneficial of physical activity levels are managing the behavioral body weight, decreasing energy expenditure, and improving adherence to prescribed caloric restriction (DeLany, Kelley, Hames, Jakicic, & Goodpaster, 2014).

4. Constructed Cases

A model case is creating examples for explain attributes of the concept and can be constructed from real life experience (Walker and Avant, 2005). Basically, the model case should instance of concept. This stage is often difficult to make sure the defining attributes that the best represent of the concept (Walker and Avant, 2005). In additional, the model case will overlap with related concept. The cases are as following:

Model Cases

Mr. A. is a 56-year-old man who was diagnosed diabetes and overweight since 10 years ago. However, he has performed regularly moderate physical activity-intensity in several times in the past. His first attempt was when he was 32 years old. Each time he was successful perform regular physical activity only within three months. He decided to try again, but this time he knew things were different. He felt more confident from what he had learned in the past. He was successful and happy in his life and was retired that allowed him to take time for health-promoting activities especially promote physical activity in moderate intensity level. He is dating with his friends who are physically inactive and also determined to promote in recommendation levels of physical activity.

He also has more knowledge about the health benefits of physical activity in recommendation level. He is seeing a nurse practitioner who has developed a multidisciplinary plan to promote physical activity level for his that includes frequent follow-up visits to monitor his health's condition include weight loss. He has set realistic goals that include doing physical activity at least 30 minutes per day on five day a week or walking 5.5 km/h. He tried to perform walking 5.5-km/h on five days or doing jogging at least 30 minutes five days per week and keeps a log of his progress. His wife participates in the same plan and whenever possible they walk 5.5 km/h or jogging together.

After 6 months, he has decreased body weight until 20 kg, decreased blood pressure, and stabilized level of blood glucose. He continues to watch his fat and calorie intake. He also continues to physical activity in moderate intensity level daily. Three years later, he has continued to maintain his physical activity in moderate intensity and stabilize blood glucose with less effort. His wife also maintains his physical activity in recommendation. Despite family histories of diabetes and cardiac disease, they have decrease blood pressure, stabilize blood sugar, and normal cholesterol, and report a marked improvement in their quality of life.

This example of physical activity level shows that he planned and tried do his behavior by going to practice 5 days a week. It was a structured physical activity on moderate level by nurse practitioner program that progressed his physical

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activity level made the workouts build up to improve the duration and frequency.

Contrary Cases

Mr. A. is a 35-year-old woman who tried to promote physical activity levels once before but was unsuccessful. He is an employee and stroke patient with paralysis of left hand. He was a cheerful and optimistic person before sick. During sick, he looked sad and depression. He said, "I just cannot deal with my conditions that I cannot do any thing likes before." Physician gives advice to him that he can do any thing but still aware with his conditions likes doing daily activity and exercise to maintain health. His family gives support to him that he can do daily activity likes eating, bathing and exercise in wheelchair. He told his physician and family not to worry about him and did not want treatment. His fiancé told him that she likes man "have high motivation to do more better for his life and family" and she does little to encourage his. He only seeks medical care once a year for his physical exam or if he has an occasional respiratory infection. At these visits, a physical activity and paralyze training plan are never discussed. He decided if he tries moving the fingers of his left hand only he could move his left hand. He also decided to walk around his house on a 2-week.

He avoids making log plan for perform physical activity every day because he is afraid of being disappointed. He lives in the city and rarely physical activity outside because he does not feel safe to do physical activity in his neighborhood and he is not able to afford the cost of a health club membership. After 6 months, he performed physical activity in moderate intensity level and moved his left hand. He feels great; however, his fiancé keeps telling he is too skinny and weak. He is tired of additional eating one meal a day; perform physical activity in light intensity, and increased sitting time more than 8 hours. Three months later, he increased body weight 25 kg, weaker and physically inactive. He feels very discouraged and reports having a poor quality of life. At his annual physical exam appointment, he is found to have an elevated blood pressure, blood sugar, and cholesterol. He is not surprised about these findings because his whole family developed these

health problems at an early age. He started treatment with a blood pressure medicine, an oral glyceic agent, and a cholesterol-lowering agent. His medical visits have increased to every 3 months for blood pressure checks and blood glucose and cholesterol monitoring. After 4 years he remains physical inactive, paralyze on his left hand and foot, and obese. His blood pressure, diabetes, and hyperlipidemia are in fair control after multiple changes in his medication regimens. He is thankful that his job has good health insurance with a prescription plan. He states that he is not going out to recreation with his fiancé because his medical visits take up all of his free time.

This analysis of physical activity levels shows that the recommendation of physical activity should be more restricted and focused than common usage. Understanding the difference recommendation of physical activity for people with diseases or disabilities are critical because research needs to be precise and nurses need to communicate with their patients. The suggestion from this analysis is that the recommendation of physical activity levels in clinical should not be used interchangeably in research, and that nurses make a clear distinction of their expectation of physical activity level when discussing health promotion with patients.

5. Empirical referents

When the concept analysis is nearing complete all process, and than the questions will come up, "if the concept is existing in the real world, how do we do so?" Defining the empirical referents is the last steps of concept analysis. Empirical referents are categories of actual phenomena, which are demonstrating existence the occurrence of the concept itself (Walker and Avant, 2005). The following empirical referents for physical activity level are proposed intensity and duration of physical activity.

The intensity and duration of physical activity are measured by some tool or questionnaire. The structure of questionnaire is important and recalls of physical activity must be broken down and time bound. There are 41 physical activity questionnaires. The lists of questionnaire title are following: 1) Ainsworth New Physical Activity Questionnaire and Physical Activity Log; 2)

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Auckland Heart Study (AHS) Physical Activity Questionnaire; 3) Baecke Physical Activity Questionnaire; 4) Cardia Seven-day Physical Activity Recall Questionnaire; 5) Central Sweden Physical Activity Questionnaire; 6) EPIC Physical Activity Questions; 7) Godin Leisure-time Exercise Questionnaire; 8) International Physical Activity Questionnaire (Long and short version); 9) Kaiser Physical Activity Survey; 10) KIHD Seven-day Physical Activity Questionnaire, 12-Month Leisure-time Physical Activity History, and 24-hour Total Physical Activity Record; 11) Lifetime Physical Activity Questionnaire; 12) The Lipid Research Clinics Physical Activity Questionnaire; 13) Longitudinal Aging Study Amsterdam (LASA) Physical Activity Questionnaire (LAPAQ); 14) Minnesota Leisure-time Physical Activity Questionnaire; 15) NHANES Physical Activity and Physical Fitness PAQ-SP 12-15 Version 12/9/98; 16) Paffenbarger Physical Activity Questionnaire; 17) Physical Activity Rating (PA-R) Questions; 18) Physical Activity Scale for the Elderly (PASE); 19) Physical Activity Recall – Suzuki; 20) Stanford Usual Physical Activity Questionnaire; 21) Yale Physical Activity Survey for Older Adults; 22) Zutphen Physical Activity Questionnaire; 23) Active Australia Survey: Physical Activity Survey; 24) The Brunel Lifestyle Physical Activity Questionnaire; 25) Fels Physical Activity Questionnaire for Children; 26) Global Physical Activity Questionnaire (GPAQ); 27) The Leisure Time Physical Activity Instrument (LTPAI); 28) New Zealand Physical Activity Questionnaire - Short and Long Form (NZPAQ-LF); 29) NHANES 2005 Physical Activity and Physical Fitness – PAQ; 30) Occupational Physical Activity Questionnaire (OPAQ); 31) Past Year Total Physical Activity Questionnaire (PYTPAQ); 32) The Physical Activity at Home and Work Instrument – PAHWI; 33) The Physical Activity Questionnaire for Elderly Japanese (PAQ-EJ); 34) Physical Activity Recall Instrument; 35) Rapid Assessment of Physical Activity; 36) Seven Day Physical Activity Recall (PAR); 37) School Health Action, Planning and Evaluation System (SHAPES) Physical Activity Questionnaire; 38) Telephone Assessment of Physical Activity (TAPA) Questionnaire for Older Adults; 39) Active Australia Physical Activity Survey (AAS); 40) Adult Physical Activity

Questions 2010 NHIS Sample Adult Cancer Supplement (18 years and over); 41) Occupational Sitting and Physical Activity Questionnaire (OSPAQ).

Physical activity (PA) for general population can be categorized into different intensities—light, moderate, vigorous, or in their various combinations, such as light to moderate PA (LMPA) and moderate to vigorous PA (MVPA). These activities are characterized by the amount of METs required to perform a specific PA. METs denote the energy cost of certain PAs, with higher MET values denoting more intense PA. For instance, one MET is the energy equivalent of a person seated at rest, whereas walking for transportation at 2.8-3.2 miles per hour (4.5-5.1 kilometer/hour) has a MET of 3.5. Light PA is defined as activity requiring less than 3 METs (Chastin et al., 2018), moderate PA is defined as activity requiring 3-6 METs (WHO, 2014), and vigorous PA is defined as activity requiring more than 6 METs (WHO, 2014). LMPA encapsulates lighter PA, such as walking for leisure or commute, whereas MVPA includes more intensive PA, such as cycling or running.

Physical activity has been shown to be an effective treatment for each of three diseases (cancer, cardiovascular disease, and diabetes) and current evidence suggests exercise has a positive effect on patient quality of life, physical functioning, and fatigue compared to usual care (Bullard, Ji, An, Trinh, Mackenzie & Mullen, 2019). For example, Gerritsen and Vincent (2015) examined the evidence from randomized controlled trials involving cancer patients in a systematic review and meta-analysis and determined that exercise significantly improved self-esteem, physical performance and functioning, fatigue, and social functioning. Prior studies found patients with cancer; those who participated in regular physical activity (9+ MET (metabolic equivalent task)-hours per week) saw reductions in cancer mortality (Johnsson et al., 2019; Spei et al., 2019; Lee 2019).

The physical activity-based cardiac rehabilitation programs and, relative to usual care, physical activity improved quality of life, reduced hospital admissions post-treatment, and reduced cardiovascular mortality (Anderson et al., 2016;

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Long et al., 2019; Petersen, Oestergaard, van Tulder, & Laustsen, 2020; Long et al., 2019). Likewise, previous studies provided substantial evidence that structured physical activity recommendation level training is associated with reduced levels of hemoglobin A1C (HbA1C), as well as reduced risks for diabetes-related complications in patients with type 2 diabetes (Okechukwu, 2020; Moghetti, Bacchi, & Donà, 2019; Rahimi, 2019; Subramaniam et al., 2019; Jeremiah et al., 2020). Other evidence in longitudinal studies patients with type II diabetes reported a reduction in mortality risk across low, moderate, and high physical activity levels (Hu et al., 2005; Chiang et al., 2019; Yerramalla et al., 2019). The American Heart Association (AHA) recommends 20–60 minutes medium to high intensity exercise (expressed as 40–70% of either peak oxygen uptake or heart rate reserve) in 3–7 days per week for stroke survivors (MacKay-Lyons et al., 2019; Gunnes et al., 2019; Gunnes et al., 2019; Kramer et al., 2019). Therefore, it is important to understand whether stroke survivors meet AHA recommendations for physical activity after stroke and the factors associated with the amount and intensity of physical activity patterns.

Conclusion

Physical activity level is an important concept for health care provider and scientists involved in research focused on physical activity level in clinical setting. This concept analysis provided an in-depth analysis and clarification of physical activity levels. Studies needed to explore physical activity level for specific risk group likes high-risk of diabetes, stroke, cancer; behavior and psychological aspects influences physical activity level; trend and issues of physical activity level related with transcultural aspects; and government support to promote physical activity program.

IMPLICATIONS FOR NURSING PRACTICE AND RESEARCH

Nursing practice

Situations likes weak, paralyzed, or pain because of disease such as stroke, fracture or cardiovascular disease, may contribute to

decrease physical activity level or physical inactive. Thus, nurses should assess patients conditions if its situation presence. The attributes set out in this concept analysis serve as a useful tool for such an assessment tool. If patients have decreased physical activity level lead to decease, nursing intervention is needed. Intervention should address the antecedents of the physical activity level to each patient. Nurses can help patients to identify their conditions, support, and give information or education to promote physical activity. At times it may be necessary to involve other professional such as physical therapy or social support likes family or friends to increase patients' ability.

Research recommendation

Some studies could be conduct to support physical activity level concept and make it clearly. Studies are needed to explore more about physical activity level for specific risk group likes high risk of diabetes; physical activity behavior and psychological aspects influences physical activity level; trend and issue of physical activity level related with transcultural aspects; and government support to promote physical activity program.

Implication for development

Based on the recommendation above, that government should make some programs and policy to promote physical activity in community.

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