International Journal on Advanced Science Engineering Information Technology

Vol.10 (2020) No. 2
ISSN: 2088-5334

Game-Based Rehabilitation Program for Community-Based Centers in Malaysia

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***Abstract*— Rehabilitation and intervention therapy is a program medically structured for disabled patients due to unfortunate events or born with disabilities. Rehabilitation and intervention therapy require prolonged, continuous, and intensive recovery activities that can be time-consuming, difficult, costly, and tedious. Based on studies conducted, rehabilitation and intervention programs are not well-received by many patients due to some reasons. Hence, innovative home-based and community-based rehabilitation and intervention programs are to be advocated and endorsed to engage these disabled patients continuing their required treatments for better success in rehab. Focus groups consist of three community-based rehabilitation centers in Putrajaya, Malaysia, were studied; the goal is to investigate the objectivity of current rehabilitation and intervention programs held. Rehabilitation and intervention programs conducted are designed and implemented based on the disability types of each patient (trainees), executed by teachers, and also professional therapists. Among the many programs held, it had been identified that for revamp; it can be done within one of the programs, which will boost the current rehabilitation and intervention program; the focus should be at the Prepare for School program. The program focuses on younger trainees (aged 5 – 9 years old), preparing them to enter school. The program uses multimedia courseware as one medium of delivery. Respondents highly recommended that there is a need to infuse and improve the current game elements within the courseware. The change is imperative and necessitated for community-based rehabilitation and intervention program.**

***Keywords*— rehabilitation; intervention; disability; game-based; community-based.**

I. INTRODUCTION

The rehabilitation program is an intervention program, crucial in assisting disabled individuals, patients, injured workers (after undergone bad experiences, such as stroke, accidents, and others) to be back on their feet, preparing them for adjusting to normal life and preparing for Return-To-Work (RTW). Even though rehabilitation programs are designed to assist and support disabled individuals for their future, but engagement to stay on the programs may not be as expected, especially in a hospitalized environment. Among the many reasons for that is lack of patient compliance, lack of family/friends support, difficulty, and costly traveling and poor one-self motivation [1], [2]. Community-based rehabilitation programs are another method of intervention for the disabled as the programs are closer to home and within the community. This study looks at community-based rehabilitation centers in Putrajaya, Malaysia, and its goal is to understand how the current programs work and what else could be improved.

A. Rehabilitation and Therapy

Rehabilitation programs are important for intervention and assisting patients (injured, disabled) for preparing them for full re-integration into the community and workplace. These may include communication therapy, physical therapy, social skill development, and behavior modification programs.

In Malaysia, rehabilitation centers, such as Hospital Rehabilitasi Cheras, Kuala Lumpur perform a consistent, comprehensive, and coordinated manner of therapy and exercises designed for the patients' needs for them to recover, and are typically delivered by a trained specialist at the rehabilitation centers. There is a high dropout rate in utilizing rehabilitative services among Malaysian parents of the disabled [3]. This may due to reasons such as services for disabled are fragmented, hospital-based, inadequate, and do not appear to be a priority. Many of the services are developed to meet the needs of the professional, therapists, or organization, not mainly for the disabled person or family. Rehabilitation services for the disabled have little integration that causes discontinuity from one department and another, which causes confusion and a sense of hopelessness, not addressing the emotional burden of the family. Other than that, the rehab facilities are not well-distributed throughout the country, and there are only limited numbers of certified rehab physicians around Malaysia [4]. Besides, stroke patients were not keen to commit to the program due to these

reasons [5]. Patients are not interested in the program planned for them (monotonous and repetitive nature of the rehabilitation exercises designed), incurred costing for transportation of the scheduled program, and timing for each session that might not be suitable for patients nor family members for traveling back and forth [5].

It is recommended that professionals and therapists train disabled and parents to focus on their rehabilitation sessions by themselves at their own space and time [3]. As stated by [5], rehabilitation is a vital component in stroke care; thus, innovative home-based therapies as an alternative to standard physiotherapy should be considered.

However, there was a low percentage (one-third) of stroke patients continuing therapy at home after being discharged [6]. This lack of rehabilitation may lead to further physical deterioration, affect mental capabilities, or lead to additional strokes or hospitalization. Besides the repetitive structure of conventional rehabilitation exercises, lack of supervision and feedbacks during the activities caused the low number of stroke patients following the therapists' regimen instructed at home (31%) [7].

Comparing the occupational rehabilitation programs in Malaysia and Singapore, it was found that there are serious gaps in the continuous process from clinical care of injured workers to rehabilitation (in preparation for return-to-work) [8]. It is recommended that comprehensive development and coordination of rehabilitation for RTW programs that incorporate both clinical and community-based facilities. Community-based Rehabilitation centers (CBR) are centers that handle rehabilitation programs, managed by the community for the community, providing rehabilitation activities such as physical training, leisure activities and speech and other therapy. Authors in [9] recommended that upon discharge from the hospital, patients with mild or moderate impairment should continue rehabilitation within a community setting, with a multidisciplinary team of experts. It was identified that CBR has been contributing to improving patients' physical functions and health status, especially beneficial for enhancing patients' lower limb strength[10].

B. CBRs (or Pusat Pemulihan dalam Komuniti) in Malaysia

CBR in Malaysia or widely known as *Pusat Pemulihan* PDK (PDK) has been spearheaded by the World Health Organization (WHO). The Malaysian Department of Social Welfare has been directly involved in evaluating and modifying the implementation of such program.

The followings are the objectives of introducing PDK in Malaysia (as stated at The Malaysia Department of Social Welfare official website.

- Promote self-awareness, self-reliance, and a sense of responsibility of local communities in the rehabilitation of persons with disabilities (or Orang Kurang Upaya).
- Bring together local resources for the restoration of local resources for the rehabilitation of *Orang Kurang Upaya* (OKU).
- Promote the use of simple and accepted techniques that are affordable and effective, which under local situations.
- Using the infrastructure of the existing local organizations to provide services.
- Take into account the country's economic resources and enable it to extend comprehensive services according to the needs of OKU. PDK programs are operationalized within the community and become a one-stop center that provides services to the disabled.

Details of the activities within PDK can be found in [11]. Among the activities that are conducted within PDK are;

- Gross motor skills.
- Fine motor skills.
- Social development.
- Language development.
- Self - Management
- Pre-write, read, think, and paint.
- Creativity - games, recreation, and others.
- Vocational Training (cooking, sewing, cleaning, batik canting and painting as well as handcraft)
- Music therapy.
- Sports and recreation (swimming and outdoor activities).

PDK activities are run and handled by dedicated staffs and activities are administered by the local health professionals. This study investigates the current scenario of rehabilitation and intervention programs organized in PDK to identify which programs can be re-designed and re-introduced for the betterment of disabled individuals.

II. MATERIALS AND METHOD

Once approval from the Ministry of Women, Family and Community Development, Malaysia, was achieved, this project started its first stage of the data collection process for two months (April until May 2018). The total number of PDKs involved is only three, as a selection of PDKs was based on the geographical proximity to Putrajaya. A qualitative method has been used to collect data and information in this study.

The main goal of this data collection was to gather understanding about the current scenario of PDKs, collecting facts on how current programs are run and highlighting the area of focus for implementing game-based rehabilitation program. A set of interview questions about the programs in PDK was prepared, and the interview sessions were conducted with each of the three PDKs involved. These include three supervisors from each PDKs, six teachers and three parents were conducted at separate sessions. Besides interviewing, observations of each PDKs were also conducted. A set of observation notes (i.e., focusing on how teachers conduct programs, reactions from the trainees, and environment within the PDKs) was prepared earlier and used. While interviews were done, an observer would take note of the matters within the observation notes. All data of interview sessions and observation notes were analyzed using ATLAS.ti.

III. RESULTS AND DISCUSSION

A. Rehabilitation and Therapy

This section shows the demographics of the data collection conducted. Table 1 illustrates the total number of trainees registered at each PDKs. However, during the data

collection, not all trainees were involved. It depended on the PDK's supervisor about which programs involved for observation. There was no specific number of trainees involved. The main concern was opinions from the supervisors, teachers, and parents or guardians about the program held. Nine representatives from all PDKs and three parents or guardians acted as respondents.

TABLE I
DEMOGRAPHICS DATA

Category	**PDK1**	**PDK2**	**PDK3**
Adults involved in data collection	1 supervisor & 2 teachers	1 supervisor and 2 teachers	1 supervisor, 2 teachers & 3 parents
Total trainees registered in PDK	39	25	22
Age Range of trainees accepted in PDK	4 - 30-year-old	4 - 36-year-old	3 months - 30-year-old
Disability Type accepted at PDK	• 1.Down-syndrome • Celebralpalsy • Autism • Learning disability (GDD)	• Down-syndrome • Celebralpalsy • Autism • Learning disability (GDD)	• Down-syndrome • Celebralpalsy • Autism • Learning disability (GDD)

B. Rehabilitation and Therapy

From the data collection, we found out that the rehabilitation and therapy programs held at PDKs are varied, designed depending on the disabilities type of the trainees. Generally, each PDK might have a different type of rehabilitation and therapy program needs as these therapy activities depend on the trainees attending for the day. We found out the similar rehabilitation programs held (refer to Table 2); focusing on patients' preparation for schooling, patients' ability to self-manage, patients' ability for work along with specialized therapy programs. These programs are practiced at each PDKs, conducted by each supervisor and teachers (after given proper training from the specific professional, i.e., doctors and occupational therapists). Guidance and guidelines were set by the Department of Social Welfare, under Malaysia's Ministry of Women, Family and Community Development. Each PDKs will run programs based on the guidelines provided.

TABLE II
AVAILABLE REHABILITATION AND THERAPY PROGRAMS HELD

Programs	**PDK1**	**PDK2**	**PDK3**
Prepare for school (Pendidikan Khas Integrasi - PKI)	✓	✓	✓
Prepare for work	✓	✓	
Physiotherapy	✓	✓	✓
Learning Therapy		✓	✓
Speech Therapy			✓

From our data collected, all of the activities strategized by the Malaysian Department of Social Welfare were introduced directly or indirectly are orchestrated and executed by each PDKs within the programs identified in Table 2. Programs are scheduled due to the needs of the current's patients within each PDKs. Trainees are grouped according to the assessment conducted earlier during registration. Thus, each group is given activities associated with the program. Two teachers are assigned to each application, training, and executing all activities.

It has been recorded that, in all PDKs, the organization of programs executed was similar. Within the first or two hours after trainees reached PDKs, they were gathered as a whole. During this gathering, musical activities were conducted. Teachers from two PDKs called it musical therapy sessions, which the motive is to ensure appropriate transition among the trainees as they had just arrived from home. Comments given were the musical therapy allows trainees to adjust themselves mentally for rehabilitation and therapy. It was observed that related musical activities were not standard (not a formal therapy material coming). The supervisors use materials based on their own preferences. Two PDKs played a list of popular children's songs (a different set of songs) through the use of television. Meanwhile, another PDK uses a laptop and projector showing a different set of children's songs. Once trainees had adjusted to the environment and are ready for each specified program, separation of groups was done for about two to three hours. Then, trainees conjoin for lunch and refreshment activities.

To conclude, trainees again will merge and mingle in another gathering for one more musical related activity before ending their sessions of the day (as shown in Fig. 1). According to one of the supervisors, the second gathering is done for trainees to be alert that they had completed their sessions and be ready to go home. These gatherings (early in the morning and at the end of the day) were vital for the trainees, for them to be mentally and physically adjusted for activities.

Fig. 1 Recorded merging activities after separate group sessions (gathering for musical therapy)

C. Identified Scenario in PDKs

There were some scenarios we conducted during the interview and observations *PDKs.* The details are presented as follows:

1) Physiotherapy: Physiotherapy was done by the either by professionals and specialists at each the PDK or by the

teachers themselves. These teachers had been given training by the specialist to do necessary physiotherapy. Currently, physiotherapy is conducted at all PDKs (either by specialists or trained teachers in PDKs), depending on the time slot and availability of physiotherapists as these sessions are not compulsory. Each of the trainees will be received physiotherapy treatment at least once per week (either done by teachers or professional physiotherapists). However, speech therapy, as a vital rehabilitation session, could not be accomplished as regular as physiotherapy sessions as teachers couldn't be trained to conduct such therapy sessions. Speech therapists can only perform speech therapy. Based on our data collection, only one PDK (PDK 1) provides a speech therapy program as this requires professionals for the delivery, and this is done once per fortnight as there are not enough professionals to cater to services at PDKs.

2) Prepare for work: This is a program that caters who preparing trainees for work. The teachers in PDKs also handle it. This program, however, has no standardized structure, and it is implemented depending on the creativity of the staff in each PDKs as been informed by the supervisors. For example, at PDK 2, trainees are trained on how to make and produce curry puffs. They are taught how to measure, how to mix ingredients, and how to mold the curry puffs with standard measurement. These products are then sold to nearby shops, and the balance (after deduction of cost) is given to the trainees as a reward. For the other PDKs, no activities related to preparing for work carried out.

3) Prepare for school: This is another program which caters for preparing trainees to enter school. These trainees are trained to be able to adapt to a normal school environment, especially under the Pendidikan Khas Integrasi (PKI) program. This particular program has a structured syllabus and planning, and are handled by the teachers in PDKs. It has been observed that for all PDKs, this program has been the main focus among all rehabilitation and therapy programs conducted. The majority of the trainees who enter this program are from the age range of five until nine years old. One of the main objectives of the program is to train trainees to be able to self-manage themselves at school; trainees should be able to go to the toilet themselves, are pampers-free, can mingle with others, and ready to follow instructions. Other than that, similar activities were conducted at all PDKs such as writing exercises, coloring, and familiarizing with numbers and alphabets; however, teachers mentioned that improvement could be made for the program by introducing interactive computer-based elements within. Each of the PDKs involves their computer settings, but only PDK 3 was able to utilize such a facility fully. Others had issues such as hardware faulty and electrical problems, which haven't been resolved due to financial constraints during the data collection. In the case of PDK 3, trainees were lucky to have a dedicated room as a computer room, which is currently used to familiarize the trainees to computer functionality and use (refer to Fig.2). Teachers shared that only those within the age range of 5 – 12 are allowed to use the facilities again, focusing on the Prepare to School program.

The PDKNet is used. It is multimedia courseware distributed to all PDKs. Within the courseware, it introduces eight main modules; Computers, Introduction to Human Body, Exercise & Aerobics, Daily Health, and Safety Activities, Safety at Home, How to Prepare Food, Road Safety, Activities among Family & Friends. In each module, sub-topics related are explained interactively with the use of graphics, text, audio, and sometimes video. After the explanation of sub-topics, trainees have the option to perform interactive activities such as games (refer to Fig. 3).

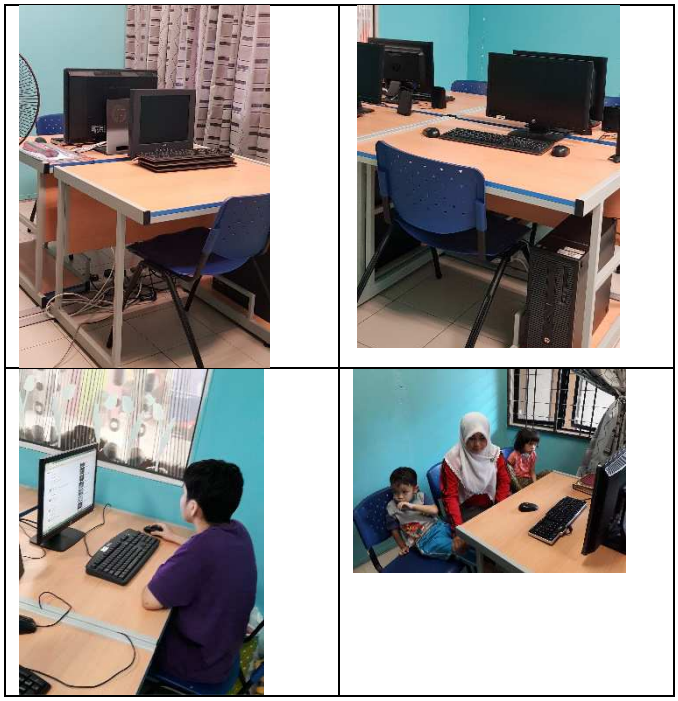

Fig. 2 Dedicated room for computer facilities at one of the PDKs.

In each module, the game element is included as an activity. Teachers from PDK3 recommended for the activities to be improved for better use among the trainees as the current games are not engaging for many. Besides the 'boring' delivery of the modules, the activities created are not suitable for the trainees. Some of the activities have difficulty level, which is ideal for the trainees' ability (as shown in Fig. 4).

Among the request of these teachers interviewed about the PDKNet courseware are;

- A different set of activities – for different modules. Should not be repeating. And should be incremental of difficulties. Variety of how the activities should be done, not only drag and drop.
- Delivery of knowledge/learning should be animated as realistic as possible. The current 2D characters and items applied do not represent the real environment, which is important.
- Instructions given should be simple and straight to the point. Not as current – using storytelling intonation as instruction.
- Activities should be done together with the assistance or guidance of teachers.

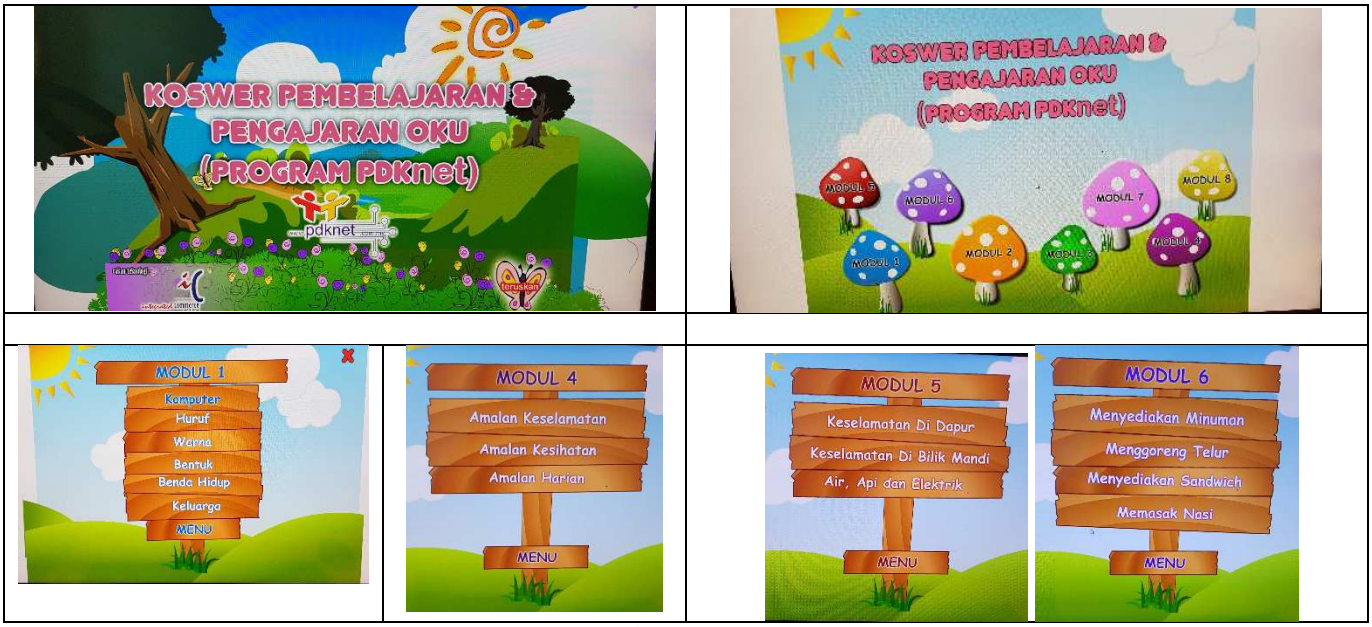

Fig. 3 Snapshots of PDKNet courseware used at PDK

Fig. 4 Snapshots of different game activities within PDKNet courseware

As stated earlier in II Materials and Method, this study investigates the current scenario of rehabilitation and intervention programs organized in PDKs to identify which programs can be re-designed and re-introduced for the betterment of disabled individuals. From the observation made and interview data analyzed, it has been identified that the most significant program out of the three mentioned earlier, the Prepare for School Program, is the most crucial. This particular program has been executed and emphasized by all PDKs. Consequently, it should be the main focus. Since within the program, PDKNet courseware is being used; therefore, the aim is to improve and the current courseware, especially in the game activities for a betterment design.

IV. Conclusion

Improvement could be made on one of the programs implemented in PDKs, which is Prepare for School Program. As mentioned by the teachers, games activities within the courseware should be the focus of the change. This idea is interchangeable to other researches who advocate games for rehabilitation programs [6], [7], [12]–[17]. It is highlighted that three benefits of using games for therapy, i.e., building excitement, increase voluntary participation, and offer convenience as well as affordable treatment options which were missing from the current courseware [6]. Another study provided a survey with Taiwanese patients and Occupational Therapies comparing specific designed-rehabilitation games with commercial games. It had identified that the crucial features which should be a vital aspect of design are fun and diverse activities (not limited) [7]. The comments made by teachers were the current PDKNet courseware has limited activities, which caused short-term engagement for use among the trainees.

Any therapy game should have customizability, which allows the patient to play according to the preferred time length and choose different levels of intensity [18]. This is to meet the patient's ability and challenge them to improve their health and fitness. Another study also supports this recommended that the key element of the rehabilitation exercise game model is appropriate to challenge the OKUs [14]. This was an issue brought up by teachers that the current game activities do not consider the trainees' ability. Authors in [19] come up with a game design that includes game levels with different levels of game difficulties as the game progresses. Other than that, proper instructions, corrections, and incentives of activities done and should include real-time social interaction with therapists [7]. The importance of designing a rehabilitation gaming system, especially for those with cognitive deficiencies with customizable difficulties are therapists control [20]. The points mentioned are additional elements that should be added within the courseware as teachers mentioned the need for incremental difficulties as well as the essence of having interaction within the teachers while completing the activities.

By combining the opinions of PDK stakeholders, i.e., teachers, and other researchers, in general, for improving the program, it is recommended that the current PDKNet courseware could be upgraded by the delivery of games activities while maintaining the same modules. In the future, the PDKnet courseware should have at least these three general features are as follows: options of games activities must be plenty and not limited, allow customization that is having different options of difficulty, and real-time social interaction between the trainee and their therapists/teachers while completing the games activities.

It is hoped that with these three general key features identified, the PDKnet courseware could be enhanced. The authors of this study plan to build a set of improved game elements and then to test out the enhanced game element injected to the current Prepare for School Program. Even though the data collection was conducted at a small number of PDKs (three to be exact), but it did provide sufficient information in understanding the current scenario of rehabilitation and intervention programs held at PDKs in Malaysia. Hopefully, with the injection of the new design, it will provide better user experience during rehabilitation and intervention therapy session, especially at PDKs in Malaysia.

Acknowledgment

The authors would like to express their appreciation to all supervisors, teachers, and parents of Program Pemulihan dalam Komuniti (PDKs) involved in this study as well as to thank Department of Social Welfare, Ministry of Women, Family and Community Development of Malaysia and Universiti Tenaga Malaysia for their support. This work is supported by the UNITEN research grant [J510050746].

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