Introduction

Down syndrome, a common chromosome disorder due to an extra chromosome number 21 (trisomy 21), causes mental retardation, a characteristic face, and multiple malformations. The chromosome abnormality affects both the physical and psychological development of the individual, such as cognitive ability, gross and fine motor, language, etc [1]-[6]. An earlier investigation in a Maternity Hospital, Kuala Lumpur, indicated that the incidence of Down syndrome was 1:959 live births. The incidence for the three major ethnics was one in 987 Malay, one in 940 Chinese, one in 860 Indians respectively [7].

The intellectual disabilities are the major representation of cognitive impairment of Down syndrome. The average Intelligence Quotient (IQ) of Down syndrome is 50, ranging from 30 to 70 [8], [9]. The development of cognitive profile such as processing speed, memory system has been well studied, some of the result are not consistent due to the different instrument, method applied [4], [10]-[12]. Despite the cognitive impairment on Down syndrome population in the early childhood, the relative strengths were evident, such as socioemotional ability, self-care ability [13], [14]. The impression and expectation of Down syndrome in current social environment becomes positive. A total of 79% community people and 85% teachers reported that children with Down syndrome are more affectionate than others. Around 80% of them believed that they are friendlier while 70% reported they are happier [15]. Chapman and Hesketh (2000) also pointed that the maladaptive behavior of Down syndrome children was lower than other children with cognitive disability and did not significantly change as they grow up [16]. A parent report in real-life situations showed that children with Down syndrome performed better in socialization while worse in communication and motor skill, which consistent with laboratory based developmental measure- strengths in visual processing, receptive language and weaknesses in gross motor and expressive language [17].

The strength and weakness of Down syndrome studies mentioned above were all conducted in other countries and areas. The empirical knowledge of...
developmental profile in current children with Down syndrome in Malaysia context is limited. As quality improvement on special education and school facility in Malaysia, it is necessary to examine the developmental profile of Malaysian children with Down syndrome, which may assist the local education system to provide more appropriate intervention and classes for this population. This study will compare the developmental profile between children with Down syndrome and typically developing children with cognitive ability matched to learn their strength and weakness.

2 Literature Review

Cognitive Compared with typically developing children, the unusual performances of cognitive aspects were found by numerous previous researches, such as worse verbal short-term memory [1], [11], [18], [19], auditory short-term memory [20], phonological short-term memory [4], reduced storage capacity of phonological information [21], unusual pattern of errors on Raven’s matrices [6]. Despite the deficits on cognitive ability, other aspects of developmental profile and difficulties such as gross and fine motor skill, language, self-help ability, are also concerned by the researchers and parents.

Motor skill A study to identify the motor growth curves on children with Down syndrome under six years old pointed that motor impairment do have negative effect on the rate of motor improvement but not the upper limit of motor function [22]. Buckley and Bird (2002) reviewed the prior researches and also pointed that the gross and fine motor skills of children with Down syndrome is usually delayed, but can improve by practice [23]. Down syndrome children performed the same motor developmental sequence as their typically developing peers and cost more time to master the skills [2], especially when the complexity of motor skill increases [22], some of them even can master considerable skills in sports, dance and gymnastics [23].

Differently, a study compared the motor skill among children with Down syndrome, developmental disabilities and typically developing children with mental age matched did not find significant difference between Down syndrome and typically developing group, but children with developmental disabilities did perform significantly better than Down syndrome on both gross motor and fine motor skill. There were profound difficulties of prehension, reaching and grasping on children with Down syndrome which may affect their self-help skill [5].

Language Speech and language skills are usually the greatest difficult area for most children with Down syndrome. A meta-analytic review showed that children with Down syndrome have deficits on expressive vocabulary, grammar, but their receptive vocabulary skills are better developed [1]. Laws and Bishop (2003) also found similar levels of vocabulary on children with Down syndrome compared with typically developing children with non-verbal mental age matched [24].

But Ferreira and Lamônica (2011) compared Down syndrome children and typically developing children with mental age matched, found that the lexical, receptive and expressive performance on Down syndrome is lower than the typically developing ones [3]. Chapman and Hesketh (2001) pointed that speech and language skills in children with Down syndrome are more delayed than other abilities, the difficulties are mainly on expressive syntax [20].

A study to examine the gesture-language system on Down syndrome found that no significant difference on use of gesture between Down syndrome and typically developing children, but smaller gestural repertoires, no two-word combinations and different information contained in the gesture-word combinations were observed among children with Down syndrome. The findings implied that Down syndrome may specifically delay in making the transition from one- to tow-word speech [25]. The whole word complexity and correctness are reduced in Down’s syndrome children compared with typically developing children with language age matched [26].

Sociemotion Buckley and Bird (2002) pointed that the social interactive skills of children with Down syndrome are good; they usually show good empathy and understanding of the emotional states and behave with appropriate sensitivity [23]. Compared to other developmental aspects, the social development of children with Down syndrome is a relative strength; they have strong orientation to their social environment and participate the social interactions [13].

But a study review indicated that children with Down syndrome exhibit array of difficulties on social emotional development from infancy and throughout the life span such as interpreting social and emotional
cues, communicating about social and emotional experiences, understanding mental states in self and others, acting on cognitions and emotions in an adaptive way [27]. Previous researches did find the specific deficits in processing facial expression [28], poorer emotion-recognition ability especially the fearful expression [29], [30].

The peer interaction is another important facet to study the socioemotional ability on children with Down syndrome. Guralnick (2002) did not find differences on frequency of contacts and the characteristics of children’s peer social networks between children with and without Down syndrome [14].

Except for the lower level of peer conversation, there is no significant difference on the peer interactions of children with Down syndrome and typically developing children. The difficulties on peer interaction can be conquered by the support from partner-child or adult-capitalizing. The difficulties emerge when less structured and more complex contexts were provided [31]. Contradict to the research mentioned above, a numerous dimensions examination on the peer social net work on Down syndrome showed unusual difficulties and less well-developed on peer interaction especially involvement in play, linkages to other settings, control of play [32].

Self-help Carr (1995) reported that none of the children with Down syndrome ate without help at the age of 4, more than half of them dressed with considerable amount of assistance, and 60% of children were enuretic [33]. The timing of skill acquisition varied a lot in individual and was not well predicted by IQ at the younger ages. A cross-sectional study from Norway found delayed self-care activities of children with Down syndrome (5 years old) on toileting tasks and management of bladder and bowel. Girls were significantly ahead of boys in the development of bladder and bowel control [34].

Examined the self help skill on school-aged children with Down syndrome found that over half of them (59.7%) needed no help with self-care tasks, the self –care skill improved with increased age, girls performed somewhat better than boys in dressing from the waist down [35].

This research is aimed to identify the difference on the developmental profile between children with Down syndrome and typically developing children with cognitive ability matched, to present the developing profile and find out the strength and weakness on early childhood developing of children with Down syndrome.

4 Method
4.1 Subjects
The sample of Down syndrome was get from a special education center for Down syndrome in Johor Bahru. A total of 31 children with Down syndrome aged 20-60 months were selected from the data base of Down syndrome research center. There were 22 typically developing children choosing from the nursery and kindergarten, which matched the cognitive ability with the Down syndrome group.

Two sample t-test showed that there is no significant difference on the score of cognitive ability between Down syndrome (M=82.14, SD=15.90) and typically developing (M=88.09, SD=12.40) groups (t=-1.466, p=.149). Compared the chronological age between this two groups, the average age of Down syndrome children is seven months older than the typically developing ones.

4.2 Measure
The current method of assessment was modified from Hawaii Early Learning Profile (HELP) [36] and Behavioral Characteristics Progression Instructional Activities (BCP), which is used to measure the cognitive, gross and fine motor skill, language, socioemotional and self-help ability.

Cognitive ability in this measurement contains perception, concentration, logical thinking and memory. This subscale was used to measure the cognitive ability of both children with Down syndrome and typically developing children in this study, which aimed to match the cognitive ability for both group samples.

5 Results
5.1 Compare Down syndrome and Typical Developing Children
MANOVA was conducted to compare Down syndrome and typically developing children regarding to the five aspects of developmental profile (gross motor, fine motor, language, socioemotion, and self-help), which used the Pillai's Trace criterion and found a significant difference between these two groups ($F=4.855$, $P=0.001$). As showed in Table 1, the source of significant difference between the two groups was in language ability ($F=8.719$, $P=0.005$). Children with Down syndrome performed much worse than typically developing children on language measurement.

**Table 1 MANOVA Analysis of Developmental Profile between DS and TD with Cognitive Ability Matched**

<table>
<thead>
<tr>
<th>mean (SD)</th>
<th>DS</th>
<th>TD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>gross motor</td>
<td>78.08(14.13)</td>
<td>85.47(14.71)</td>
<td>1.42</td>
<td>0.239</td>
</tr>
<tr>
<td>fine motor</td>
<td>76.64(13.56)</td>
<td>83.53(16.11)</td>
<td>0.658</td>
<td>0.421</td>
</tr>
<tr>
<td>language</td>
<td>70.84(17.87)</td>
<td>84.48(17.33)</td>
<td>8.719</td>
<td>0.005</td>
</tr>
<tr>
<td>Socioemotion</td>
<td>80.99(16.15)</td>
<td>86.5(15.18)</td>
<td>0.085</td>
<td>0.772</td>
</tr>
<tr>
<td>self-help</td>
<td>53.15(23.83)</td>
<td>67.52(30.28)</td>
<td>1.62</td>
<td>0.209</td>
</tr>
</tbody>
</table>

DS: Down syndrome group, TD: Typically developing group

### 5.2 Developmental Strength and Weakness

The description data showed that children with Down syndrome achieved a highest score in cognitive ability compared to other developmental aspects, followed by socioemotion, gross motor, fine motor, language, and self-help ability (see figure 1). One-way repeated Measure ANOVA using Greenhouse-Geisser criterion showed a unequilibrium developing on children with Down syndrome ($F=76.35$, $P=0.00$).

Further post hoc tests using Bonferroni indicated that children with Down syndrome scored significantly lower on self-help compared with other five developmental aspects, followed by language ability which achieved a significant lower score than other four aspects (gross motor, fine motor, cognitive, socioemotion). Cognitive, socioemotion and gross motor are found as the strengths for children with Down syndrome in this study, which were reported significant higher score than other three developmental aspects.

![Figure 1. Developmental profile of children Down syndrome](image)

### 6 Discussion

This study compared the children with Down syndrome and typically developing children with cognitive ability matched across five aspects of developmental profiles (gross motor, fine motor, language, socioemotion, self-help), which found children with Down syndrome performed significantly worse than typically developing children on language ability. The finding in this study is consistent with the previous research, which considered the language is the most difficulties to Down syndrome [1], [3], [20], [26].

For the other four developmental aspects, the scores on gross motor, fine motor, and self-help are lower on children with Down syndrome children, but scores on socioemotion is higher on children with Down syndrome. Further statistic analysis using MANOVA did not showed any significant difference between the two groups, which revealed that the abilities on these four developmental aspects in this study are in the similar level between children with Down syndrome and typically developing children. This study examine the developmental profile of early childhood on children with Down syndrome in a Malaysian special education center, the positive finding in this study may due to the early childhood intervention for children with Down syndrome. Previous research support this study findings that children with Down syndrome may get considerable progress if under the efficient and appropriate intervention and training, even achieve to the typically developing level, such as motor skill, socioemotional ability[2],[22],[23],[31]. Children with Down syndrome are developmentally delayed in many aspects compared to typically developing children [1]-[4]. An effective and efficient early intervention is necessary, when a Down syndrome is found. A longitude and descriptive study which compared children with Down syndrome experienced with early intervention programme (EI) and without early
intervention programme confirmed the positive effect of early intervention to children with Down syndrome. The result showed that children with Down syndrome under EI programme have significant higher scores on intellectual and adaptive functioning than those without early intervention [37].

The relative strong socioemotion ability on children with Down syndrome have been well recorded in the prior research [13], [14], [23]. Due to their empathy and strong social ability, Down syndrome get a quite good assessment from the community and their teacher [15], [16]. This study also found their relative strong ability on socioemotion. Despite the physical deficits in nature, the motor ability will be another strength via appropriate activates and training [22]. Previous research indicated that Down syndrome children usually have some difficulties on self-care activates, such as dressing, toileting tasks [33], [34]. This study also found the relative weakness on self-help tasks, which may due to the younger age of this study sample. Leonard et al. (2002) pointed that the self-help skill may improve as children grow up. Both the between group comparing and within developmental comparing indicated the severe language delayed on children with Down syndrome, which suggest to develop more efficient and effective intervention and training for this population [35].

7 Conclusion and Future Study
Compared to typically developing children, children with Down syndrome in this study experienced significantly language delay, which is deemed as the weakness in their early childhood period. Socioemotion ability is found as one of the strength in this Down syndrome group, which achieve the typically developing level. For the future study, bigger sample size was suggested, which can invite more school or education center in Malaysia context.

References


