# RELATIONSHIP BETWEEN SOCIO-EMOTIONAL DIFFICULTIES WITH 24-HOUR MOVEMENT BEHAVIOR AND OTHER FACTORS AMONG PRESCHOOLS CHILDREN IN KELANTAN, MALAYSIA

## MOHAMAD HAZNI BIN ABD RAHIM

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# RELATIONSHIP BETWEEN SOCIO-EMOTIONAL DIFFICULTIES WITH 24-HOUR MOVEMENT BEHAVIOR AND OTHER FACTORS AMONG PRESCHOOLS CHILDREN IN KELANTAN, MALAYSIA

by

## MOHAMAD HAZNI BIN ABD RAHIM

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# ACKNOWLEDGEMENT

# LIST OF PAPERS AND CONFERENCES

During my Doctor of Public Health (DrPH) course, the following articles were finally successfully published or submitted to the Scopus-indexed Journal and/or presented at the international level. Overall, the thesis comprises three papers, which correspond to the study's four specific objectives:

1. **Translation, Cross-Cultural Adaptation and Validation of Movement Behaviour Questionnaire into Malay Language (MBQ-M) for Measuring Movement Behaviors among Preschool Children in Kelantan, Malaysia**

    Mohamad Hazni Abd Rahim [1], Mohd Ismail Ibrahim [1,*], Azriani Ab Rahman [1] and Najib Majdi Yaacob [2]

    **Conference presentation (POSTER):** Environmental Pollution and Health Impact on Future Generations in Asian Countries International Conference (EPHIF, 2023) on 14th March 2023 at Universiti Sultan Zainal Abidin (UniSZA), Kuala Terengganu, Malaysia.

2. **Emotional and Behavioral problem Among Preschools Children in Northeast, Malaysia: Parent Report Version**

    Mohamad Hazni Abd Rahim [1], Mohd Ismail Ibrahim [1,*], Azriani Ab Rahman [1], Najib Majdi Yaacob [2], Nor Syuhada Farhanis Hashim [3]

### 3. Adherence to 24-Hour Movement Behavior Guidelines and Their Association with Socio-Emotional Difficulties: A Cross-Sectional Analysis Among Preschools Children in Kelantan, Malaysia

Mohamad Hazni Abd Rahim [1], Mohd Ismail Ibrahim [1,*], Azriani Ab Rahman [1], Najib Majdi Yaacob [2], Nor Syuhada Farhanis Hashim[3]

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| H | Number of Hours |
| M | Mean |
| MIN | Number of Minutes |
| MLR | Multiple linear regression |
| MPA | Moderate-Intensity Physical Activity |
| MVP | moderate-to-vigorous physical activity |
| MVPA | Moderate- to Vigorous-Intensity Physical Activity |
| LPA | Light Physical Activities |
| N | Number (of participants, studies, etc.) |
| PA | physical activity |
| SB | sedentary behaviours |
| SD | Standard Deviation |
| SDQ | Strengths and Difficulties Questionnaire |
| SD | Sedentary Time |
| SLR | Simple linear regression |

ST          Screen Time

VPA         Vigorous-Intensity Physical Activity

WHO         World Health Organisation

Yrs.        Years

SED         Socio-emotional problems/difficulties

EBP         Emotional and behaviour problems/difficulties

# LIST OF SYMBOLS

| | |
|---|---|
| > | More than |
| < | Less than |
| ≥ | More than or equal to / at least |
| ≤ | Less than or equal to / at most |
| = | Equal to |
| α | Alpha |
| β | Beta |
| $n$ | Number of populations |
| d | Precision |
| $\chi 2$ | Chi-square |
| % | Percentage |
| P | Proportion |
| Z | Z statistic for a level of confidence (1.96) |

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# ABSTRAK

**Hubungkait antara Kesukaran Sosio-Emosi dengan 24 Jam Tingkahlaku Pergerakan dan Faktor-Faktor lain dalam kalangan Kanak-Kanak Prasekolah di Kelantan, Malaysia.**

**Pendahuluan:** Gangguan kesihatan mental dalam kalangan kanak-kanak adalah sesuatu yang sangat membimbangkan, dan pematuhan kepada garis panduan tingkah laku pergerakan 24-H adalah salah satu faktor penyumbang. Mengukur tingkah laku pergerakan seperti aktiviti fizikal, tingkah laku sedentari (cth. masa skrin), dan masa tidur sepanjang 24 jam adalah penting untuk menilai perkembangan awal kanak-kanak prasekolah dan menentukan hubungkait antara pematuhan kepada garis panduan tingkah laku pergerakan 24 jam. Oleh itu, kajian ini bertujuan untuk mengenal pasti kadar masalah sosioemosi dan faktor yang berkaitan dalam kalangan kanak-kanak prasekolah serta menentukan hubungkait antara pematuhan garis panduan tingkah laku pergerakan 24 jam dengan masalah sosioemosi dalam kumpulan sasaran yang sama di Kelantan, Malaysia.

**Kaedah:** Kajian ini dibahagikan dalam tempoh dua fasa. Fasa pertama ialah menterjemah, penyesuaian silang budaya dan pengesahan soal selidik tingkah laku pergerakan (MBQ). Versi asal MBQ mengandungi instrumen soalan sebanyak 15 item untuk mengukur aktiviti fizikal kanak-kanak prasekolah, masa skrin dan masa tidur. Kebenaran untuk menterjemah telah diperolehi untuk menterjemah ke dalam versi Bahasa Melayu dengan menggunakan kaedah sepuluh langkah menterjemah.

Sepuluh pakar bebas terlibat dalam proses kebolehpercayaan kandungan soalan intrumen, manakala tiga puluh ibu bapa kanak-kanak berumur empat hingga enam tahun dipilih untuk pengesahan kebolehpercayaan soalan secara bersemuka. Fasa kedua telah dijalankan dari November hingga Disember 2022 melalui kaedah hirisan lintang dengan saiz sampel yang diperlukan sebanyak 612 pelajar menggunakan formula nisbah tunggal. Semua peserta dipilih daripada 18 buah prasekolah awam dan swasta menggunakan teknik persampelan rawak pelbagai peringkat. Ibu bapa kanak-kanak berumur empat, lima, dan enam tahun yang menepati kriteria telah dipilih dan dimaklumkan. Setiap prasekolah menghantar wakil ibubapa dengan purata 34 orang kanak-kanak.Wakil proksi iaitu ibubapa akan mengisi sendiri borang kajian yang telah diterjemah ke dalam Bahasa Melayu. Data dianalisis menggunakan SPSS ver 26. Bagi fasa satu pula, nisbah kesahan kandungan (CVR), indeks kesahan kandungan (CVI), perjanjian kappa yang diubah suai dan indeks kesahan muka (FVI) telah dilaporkan; bagi fasa dua, data dianalisis menggunakan kaedah regresi linear dan regresi logistik.

**Keputusan**: Pengesahan penilaian isi kandungan soalan dan maklum balas pakar memaklumkan bahawa semua soalan MBQ-M adalah penting dan perlu. Semua item MBQ-M mempunyai CVR lebih besar daripada 0.62. Skor I-CVI 0.95 untuk kesesuaian, 0.93 untuk kejelasan, 0.95 untuk ayat ringkas dan 0.93 untuk keraguan menunjukkan kesahan kandungan yang sesuai dan boleh diterima. Indeks pengesahan bersemuka bagi komponen kejelasan dan kefahaman adalah 0.95 dan 0.93, masing-masing, menunjukkan tahap yang memuaskan dan boleh diterima. Daripada 612 borang soal selidik yang diedarkan, 557 (91%) ibu bapa bersetuju untuk menyertai kajian dan melengkapkan borang tersebut. Purata umur kanak-

kanak ialah 70.19 bulan; 52.1% adalah lelaki, 56.7% berumur 6 tahun, dan 66.6% responden ibu bapa adalah perempuan. Anggaran kadar masalah sosio-emosi ialah 8.4%, dan masalah rakan sebaya adalah yang paling banyak (19.7%). Kanak-kanak perempuan, seorang ibu bapa bekerja, paling kurang mempuyai dua adik-beradik, dan dari keluarga ibu bapa tunggal mempunyai hubungkait dengan masalah sosio-emosi. Peratusan kanak-kanak yang mematuhi garis panduan cadangan untuk aktiviti fizikal ialah 42.2%, masa skrin 65.5%, tempoh tidur 70.3% dan hanya 17.6% mematuhi ketiga-tiga garis panduan. Kanak-kanak di prasekolah tidak memenuhi garis panduan masa skrin individu, dan gabungan khusus masa skrin dan aktiviti fizikal mempunyai hubungkait peningkatan masalah sosioemosi, termasuk gejala emosi, masalah kelakuan dan hiperaktif ($p<0.05$). Di samping itu, kombinasi khusus masa skrin dan garis panduan tidur dan gabungan umum sekurang-kurangnya dua atau tiga garis panduan dikaitkan dengan gejala emosi di kalangan prasekolah ($p<0.05$) selepas mengambil kita dengan faktor sosio-demografi kanak-kanak dan ibu bapa.

**Kesimpulan:** Masalah sosioemosi terus menjadi kebimbangan yang ketara dan masalah rakan sebaya menjadi keutamaan pihak berkepentingan. Hanya satu daripada sepuluh pelajar prasekolah yang memenuhi garis panduan tingkah laku gerakan selama 24 jam yang disyorkan. Ketidakpatuhan garis panduan masa skrin dan aktviti fizikal mempunyai kaitan dengan kesukaran sosioemosi yang lebih serius seperti gejala emosi, masalah kelakuan, dan hiperaktif. Pencegahan awal yang tidak sesuai terhadap kanak-kanak prasekolah boleh memberi kesan kepada perkembangan sihat kanak-kanak. Hal ini menekankan kepentingan inisiatif dasar

dan program promosi kesihatan untuk kanak-kanak prasekolah bagi menggalakkan

24-jam tingkahlaku pergerakan.


**Kata kunci:** Kesukaran sosio-emosi, Tingkah laku pergerakan Prasekolah,

Garis Panduan, Kanak-kanak, Prasekolah, Malaysia

# ABSTRACT

**Relationship Between Socio-Emotional Difficulties with 24-Hour Movement Behavior and other Factors Among Preschools Children in Kelantan, Malaysia**

**Introduction:** Children's mental health disorders are a serious concern, and adherence to the 24-H movement behaviour guidelines is one of the contributing factors. Measuring movement behaviour such as physical activity, sedentary behaviour, and sleep time throughout 24 hours is critical for assessing early childhood development. Therefore, this study aims to identify socioemotional problems and associated factors among preschool children and determine the association between adherence to 24-hour movement behaviour guidelines and socioemotional problems in the same target group in Kelantan, Malaysia.

**Methods:** This study was conducted in two phases. The first phase was a cross-cultural adaptation of the movement behaviour questionnaire (MBQ). The original version of MBQ contains a 15-item short-form instrument for measuring preschool children's physical activity, screen time, and sleep. Permission was granted to translate into Malay version using a ten-step process. Ten independent experts were involved in the content validity process, while thirty parents of children aged four to six were selected for face validation. The second phase was conducted from November to December 2022 using a cross-sectional design with a sample size of 612 preschools determined using the single proportion formula. All participants were selected from 18 public and private preschools using a multistage random sampling technique. All eligible parents of children aged four, five, and six were contacted, and each preschool was required

to enrol an average of 34 children. The self-administered proxy report Malay validated questionnaire was used. The data was analysed using SPSS ver 26. As for phase one, the content validity ratio (CVR), content validity index (CVI), modified kappa agreement and face validity index (FVI) were reported; for phase two, the data was analysed using logistic and linear regression.

**Results**: The content validation of the experts' ratings and responses revealed that the MBQ-M contained significant and essential questions. All remaining MBQ-M items had a CVR greater than 0.62. I-CVI scores of 0.95 for relevance, 0.93 for clarity, 0.95 for simplicity, and 0.93 for ambiguity indicated adequate and acceptable content validity. The face validity index of clarity and comprehension were 0.95 and 0.93, respectively, indicating a satisfactory and acceptable level. Of the 612 questionnaires distributed, 557 (91%) parents consented to participate in the study and completed the form. The average Children's age was 70.19 months; 52.1% were boys, 56.7% were 6 years old, and 66.6% of parents' respondents were female. The estimated prevalence of socio-emotional problems was 8.4%, and peer problem was the most prevalent attribute (19.7%.). Girls, one parent working, at least two siblings, and single-parent families were associated with socio-emotional problems. The percentage of met guidelines for physical activity was 42.2%, screen time 65.5%, sleep duration 70.3% and only 17.6% adhered to all three guidelines. Children in preschool do not meet individual screen time guidelines, and the specific combination of screen time and physical activity was associated with increased socioemotional problems, including emotional symptoms, conduct problems, and hyperactivity (p<0.05). In addition, a specific combination of screen time and sleep guidelines and a general combination of

at least two or three guidelines was associated with emotional symptoms among preschools (p<0.05) after adjusting for child and parent socio-demographics.

**Conclusions:** Socioemotional problems remain a significant concern, with peer problems as a top priority for stakeholders. Only one in ten preschools children meet the recommended 24-hour movement behaviour guidelines. Non-adherence, screen time and physical inactivity guidelines are linked to more serious socioemotional difficulties like emotional symptoms, conduct problems and hyperactivity. Early inappropriate intervention during early childhood can impact a child's healthy development. This highlights the importance of policy initiatives and health promotion programs for preschoolers to encourage healthy 24-h movement behaviours.

**Keywords**: Social-emotional difficulties, Movement behaviours, Guidelines, Children, Preschool, Malaysia

# CHAPTER 1    INTRODUCTION

## 1.1 Introduction

**Preschool Ages**

As per the World Health Organization (WHO) definition, children aged less than 6 years who have not yet started school are usually referred to as "preschool-aged children," "young children," or "children in the early years" (WHO, 2016). In the context of Malaysia, preschool caters to children between 4 to 6 years old; thus, "preschool-aged children" refer specifically to this age group((MOE), 2022). Early childhood encompasses the period from birth to eight years old(WHO, 2007), which is crucial for developing fundamental behaviours such as engaging in active physical activities, getting sufficient sleep, and limiting sedentary activities(Okely *et al.*, 2018). During this phase of rapid physical and cognitive growth, children's habits and family routines are receptive to change and adaptation. Early lifestyle habits can significantly influence health behaviour levels and patterns throughout an individual's lifetime, including aspects like physical activity and sleep habits(Janz *et al.*, 2005).

**24-Hour Movement Behaviour**

The 24-H movement behaviour concept is a relatively new approach that considers how all types of movement behaviours, including physical activity (PA), sedentary behaviours (SB), and sleep, collectively contribute to children's health development (Tremblay *et al.*, 2016b). Traditionally, these behaviours have been studied separately, but new research shows that the integrated relationship of movement behaviours should be considered (Pedisic *et al.*, 2017). A few nations,

including the World Health Organization (WHO), have produced "24-Hour Movement Behaviour Guidelines for the Early Years."(WHO, 2019), emphasising that meeting all three movement behaviour guidelines was more beneficial for child health and growth than concentrating on a single one (Chaput *et al.*, 2017).
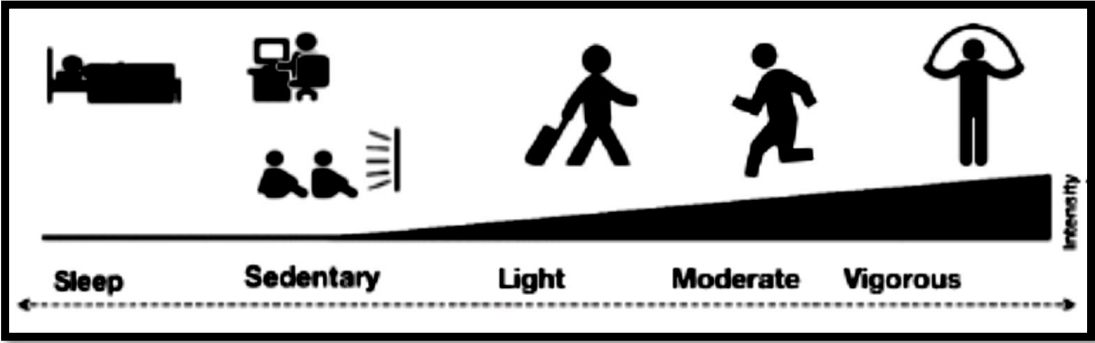


Figure 1.1 Range of movement behaviours during 24 hours. It was adapted from (Rao *et al.*, 2016).

Time spent on movement sequences, physical activity and non-movement behaviours (i.e., sedentary activity and sleep) constitutes a child's whole day (Figure 1-1). Studies showed school-aged children who participate in ideal combinations of regular physical activity or moderate to vigorous physical activity (MVPA), sedentary (e.g., restricted screen time), and sleep time (e.g., adequate duration) are associated with better outcomes than those who participate in less desirable combinations(Carson *et al.*, 2017). In children, movement is an essential determinant of obesity and other health outcomes. Multiple studies have found that higher levels of physical activity, such as MVPA, are linked to a lower risk of obesity and other cardiovascular illnesses. (BOZHI, 2020). Meanwhile, non-movement behaviours (sedentary activity and sleep) contribute independently to the healthiness and well-being of children. For example, sufficient sleep duration was related to lower measures of adiposity(BOZHI, 2020),

while prolonged sedentary activity, particularly excessively screen-based, was related to an elevated risk of childhood obesity(van Ekris *et al.*, 2016)

The guidelines were based on the existing evidence (Tremblay *et al.*, 2016a), summarised through many systematic reviews. Recently developed guidelines for Australians for 3 to 5 years (Okely *et al.*, 2018), Canadian and WHO for 3 to 4 years (Tremblay *et al.*, 2016b; WHO, 2019) recommended that healthy movement behaviour should include: at least 180 min/day (3 hours) of total physical activity (light, moderate and vigorous), with a combination at least 60 min/day MVPA, sedentary screen-time of less than 1 hour; and 10–13 hours/day quality of sleep duration.

According to recent systematic research, only 5% to 24% of preschool children worldwide fulfilled all three Movement Guidelines recommendations (Rollo *et al.*, 2020). Preschoolers exhibited significantly lower adherence than adolescents. Malaysia has a rate of 6.5 percent (Lee *et al.*, 2021b), and Hong Kong has a rate of 2.9 percent (Feng *et al.*, 2021); both are among Asia's lowest rates of studies that meet all three movement Guidelines criteria.

**Socio-emotional difficulties**

The worldwide prevalence of mental health problems was estimated to be 13.4 percent among children, and psychological health problems are becoming more prominent (Polanczyk *et al.*, 2015). Emotional and behavioural difficulties are preschool children's most prevalent psychosocial health problems (Egger and Angold, 2006). Socio-emotional problems (SEP) or emotional and behavioural problems (EBP) may manifest at a very young age and can be classified into two major

categories: internalising (e.g., anxiety, emotional) and externalising (e.g., conduct, hyperactivity, aggressiveness) symptoms. One of the most common and widely used to measure mental health problems in children was the Strengths and Difficulties Questionnaire (SDQ).

Social and emotional development is how kids develop about themselves, their emotions, and how to anticipate interactions with everyone. It can create and maintain positive relationships and understand, regulate, and show emotion (Ashdown and Bernard, 2012). Sufficient sleep, regular physical activity, and limiting screen-based are essential for early childhood social and emotional growth (Carson *et al.*, 2019; Cliff *et al.*, 2017). However, very few studies have investigated the possible health advantages of these adherence movement behaviours together in early childhood focusing on socioemotional, psychosocial, and mental health status. (Hinkley *et al.*, 2020; McNeill *et al.*, 2020).

Therefore, this research objective is to investigate the relationship between socioemotional difficulties and 24-hour movement behaviour, as well as other factors, in preschool children in Kelantan, Malaysia. This evidence is scarce, particularly in Malaysian children. To my knowledge, no research has explored the relationships between 24-H Movement behaviour and socio-emotional health outcomes in preschoolers. These findings will contribute to the limited research on how movement behaviours relate to socioemotional difficulties in early childhood.

## 1.2 Problem Statement and Rationale

Early childhood development is a critical phase for acquiring essential intellectual, physical, social, and communication skills(Carson *et al.*, 2017). However, unfavourable living conditions during this phase can jeopardize healthy development, with far-reaching consequences. Despite advancements in technology and health, evidence-based gaps persist, prompting the need for comprehensive research. The World Health Organization (WHO) and a few nations have announced '24-hour Movement Behavior Guidelines for the Early Years', highlighting the interconnectedness of sedentary behaviours, physical activity, and sleep (Okely *et al.*, 2018).

Research predating the COVID-19 pandemic in Malaysia revealed low adherence to movement behaviour guidelines among preschool children, particularly in screen time limits. Physical activity, sleep patterns, and screen time were reported as 48%, 55.2%, and 25.2%, respectively. Only 6.5% of children met all three guideline criteria (Lee *et al.*, 2021b). This study measured separately physical activity using accelerometers, screen time using a non-validated questionnaire, and sleep time derived from the 'The healthy active preschool and primary years' validated questionnaire(HAPPY) (Lee *et al.*, 2021b). Thus, there are several methods for evaluating movement behaviours, and no reliable and integrated instrument has been culturally modified to the Malay language. The available self-reported and proxy-reported questionnaires, which can measure the behavioural domain of a child and a guardian (e.g., parent, teacher), are commonly used in behavioural research because of the relatively lower costs and lower participant burden(Lubans *et al.*, 2011).

A reliable, culturally modified, and integrated instrument is lacking despite available self-reported and proxy-reported questionnaires for behavioural research. The 'Movement Behavior Questionnaire (MBQ_M)' is proposed to bridge this gap. MBQ_M holds the potential for monitoring obesity-related behaviours and facilitating personalized feedback, benefiting researchers, clinicians, and healthcare workers. A comprehensive understanding of movement behaviour among young Malaysian children can lead to effective health interventions and preventive programs.

The significance of adequate sleep, optimal physical activity, and limited sedentary behaviour for social and emotional development in early childhood has been highlighted (Carson *et al.*, 2019; Cliff *et al.*, 2017). Yet, few studies explore the impact of adhering to 24-hour movement behaviour guidelines on socioemotional difficulties in preschool-aged children (Taylor *et al.*, 2021). Rising screen time concerns amid technological proliferation and easy access to devices have led to potential health impacts. Excessive screen time can displace physical activity and sleep, possibly influencing behaviour and developmental problems (Hale and Guan, 2015; Qu *et al.*, 2023). Given this context, assessing preschoolers' adherence to movement behavior guidelines and their association with socioemotional difficulties is crucial.

The purpose of this study is to understand the intricate relationships between movement behaviours and socioemotional difficulties in preschoolers in Malaysia. It contributes to the early identification of socio-emotional problems and targeted interventions by addressing this gap. The findings will empower child health practitioners, educators, families, non-governmental organisations (NGOs), and other stakeholders to improve policies, services, and cross-sectoral collaboration.

Exploring movement behaviours impact on socioemotional development is essential in early childhood. This first local study will provide a better picture, rooted in the Malaysian context, bringing a holistic understanding of the interplay between movement behaviours and socio-emotional well-being. Addressing this crucial aspect contributes to informed decision-making, fostering healthier developmental outcomes and improved support for young children.

**1.3 Research Questions**

Phase 1

1.  Is the Malay version "Movement Behaviour Questionnaire (MBQ)" a valid tool for measuring 24-hour movement behaviour among preschool children in Kelantan?

Phase 2

2.  What are the socio-emotional difficulties prevalence and their associated factors among preschool children in Kelantan, Malaysia?

3.  What percentage of preschool children in Kelantan, Malaysia, meet 24-hour movement behaviour guidelines for physical activity, screen time, and sleep duration?

4.  Is there any relationship between socio-emotional difficulties with 24-hour movement behaviour among preschool children in Kelantan, Malaysia?

**1.4 Research Hypothesis**

H$_A$:   Malay version of the MBQ_M  is a valid tool to measure 24-hour movement behaviour among preschool children in Kelantan.

H$_A$:   There is a significant relationship between socio-emotional difficulties with 24-hour movement behaviour and other factors among preschool children in Kelantan, Malaysia.

**1.5 Research Objectives**

**1.5.1 General Objective:**

To study the relationship between socio-emotional difficulties and 24-Hour movement behaviour and other factors among preschool children in Kelantan, Malaysia.

**1.5.2 Specific Objectives:**

Phase 1

1.  To translate, culturally adapt, and validate the Malay version of the movement behaviour questionnaire (MBQ).

Phase 2

2.  To determine the prevalence of socio-emotional difficulties and its associated factors.

3.  To determine the proportion of preschool children in Kelantan, Malaysia, who meet 24-hour movement behaviour guidelines for physical activity, screen time, and sleep.

4.  To determine the relationship between socio-emotional difficulties and 24-hour movement behaviour among preschool children in Kelantan, Malaysia.

# CHAPTER 2    LITERATURE REVIEW

## 2.1    Literature Review Strategies

The literature search on socio-emotional difficulties, 24-Hour movement behaviour and other factors were broadly done using search engines such as google scholar, Science Direct, Scopus and PubMed.  The entire literature searches published from 2002 – 2023 were included. Keywords applied for the study were socio-emotional difficulties or emotional and behaviour, movement behaviour, preschools and children.

## 2.2    24-Hour Movement Behaviour Guidelines

Within 24 hours, movement occurs within a continuum from sleep to MVPA. The health advantages of MVPA, which only account for approximately 5% of daily activities, have been the focus of previous studies and past recommendations (Chaput *et al.*, 2014). It is becoming clear that SB and excessive screen viewing can harm one's health (Chaput *et al.*, 2014). Research reveals that collecting together movement behaviours may impact health differently from the effects of individual behaviours assessed in isolation (Chastin *et al.*, 2015). Some of the health advantages of MVPA might be reduced, for instance, if children have insufficient sleep or too much screen time. Furthermore, some studies suggest that reaching optimum levels for several exercise behaviours may have synergistic health advantages (Jetté *et al.*, 1990).

According to a recent systematic review, children (5-17 years) with a regular physical activity, longer sleeps, and low SB had lower risk adiposity and cardiometabolic condition than children with poor movement behaviour (Saunders *et al.*, 2016). On top of the optimal balance over 24 hours, balance movement behaviour could act together. MVPA has been proven to improve sleep quality (Kjeldsen *et al.,* 2012), while inadequate sleep can, in turn, reduce PA and is related to more screen time in children (Chaput, 2016). The effect of screen viewing on PA has been proposed as one underlying mechanism relating screen viewing to obesity (Robinson *et al.*, 2017), indicating that screen time may affect health because it takes up time that would have been spent being more active. Meanwhile, inadequate sleep is another potential mechanism linking screen viewing and health (Chang *et al.*, 2015). Most of the screens viewing related research are from older children. The high prevalence of screen viewing and earlier onset of media use (screen-based devices), particularly among young Asian children, along with the mixed findings on the relations between screen viewing and health outcomes(McClure *et al.*, 2015; Richert *et al.*, 2010) suggest that the future research is necessary to elucidate the relationships between screen viewing on other movement behaviours in young children.

Considering the interdependency and interactions between sleep, SB, and PA, recent studies showed how essential it is to focus on all parts of movement behaviours to get the optimum health benefits and tackle the growing epidemic of obesity in children and other NCDs (Chaput *et al.*, 2014). As such, Canada was the earliest country to produce combination movement guidelines *(Tremblay et al., 2016b).* These recommendations were created by a thorough procedure (Schünemann *et al.,* 2013) and considered all behaviours for the entire day. After the introduction of Canadian

guidelines (Tremblay *et al.*, 2016b), then Australia (Okely *et al.*, 2018), WHO (WHO, 2019), South Africa (Draper *et al.*, 2020) and Asian-Pasific Consensus (Benny Kai Guo *et al.*, 2022) developed and released similar guidelines. Such integrated guidelines are not currently available in Malaysia. While most of these guidelines focus only on children aged up to 5 years, Canada and Australia also provided recommendations for adolescents and older children. In line with WHO NCD strategy, congresses from the Asia-Pacific area developed consensus-integrated 24-hour movement guidelines for Asia- the Pacific region, irrespective of socioeconomic or cultural background as children and adolescents (5-18 years old) in the Asia- Pacific region share common risk factors for NCDs(Loo *et al.*, 2022). Table 2.1 describes a summary of existing 24-hour movement guidelines.

Table 2.1 An overview of recommendations from existing 24-Hour Movement Guidelines for children aged 0-18 years.

| Age group | Physical Activity | Screen time | Sleep |
|---|---|---|---|
| 0-1 years[1] | >= 30 mins/day of tummy time during awake time | no screen time | total sleep:14-17 h/day (0-3month); 12-16 (4-11month), including naps |
| 1-2 years[1] | >=180 mins/day of total physical activity, including energetic play | no screen time | total sleep: 11-14h/day, including naps |
| 3-4/5 years[1] | >=180 mins/day of total physical activity, including >=60 min/day of moderate-to-vigorous physical activity(MVPA) | <=1 h/day of sedentary screen time | total sleep: 10-13h/day, including naps |
| 5-17 years[2][3] | >=60 mins/day of moderate-to-vigorous physical activity | <=2 h/day of recreational screen time | uninterrupted 9 to 11 h/day (3-13 years); uninterrupted 8 to 10 h/day (14-17 years) |

[1] Canada, Australia, South Africa and the WHO have similar recommendations for children aged up to 5 years.
[2] Guidelines for children aged 5-17 years are not available in South Africa and WHO
[3] Asia- Pacific Consensus Statement on Integrated 24-hour activity guidelines for Children and Adolescents

## 2.3    Prevalence of meeting the 24-Hour Movement Behaviour guideline

Growing evidence shows that physically active children spend less time in front of screens, and adequate sleep is healthier overall. However, these three behaviours are interconnected since they occur at various times during the 24-hour period and should be examined collectively(Tapia-Serrano *et al.*, 2022). According to Rollo *et al.* (2020), the advantages of preschoolers or children who adhere to all 24-Hour movement behaviour guidelines have been associated with Physical (e.g., less adiposity), psychosocial (e.g., mental health), and cognitive (e.g., better educational achievement) compared to meeting none guidelines.

A systematic study evaluating the associations between compliance movement Guidelines and different health outcomes revealed that just 5% and 24% of preschoolers met all three Guideline components (Rollo *et al.*, 2020). Other meta-analysis prevalence data (figure 2.1) revealed that 7.12% of children globally met all three 24-Hour Movement Guidelines, and preschool age was 11.26%, particularly among girls. None of the 24-hour movement behaviours were met by 19.21% of the children. The fact that one in every five young people did not satisfy any of the standards for healthy movement behaviours is an issue affecting the public's health. Furthermore, the highest compliance with all Movement Guidelines was found in Africa at 17.20%, Asia second at 9.62%, and South America lowest at 2.93%(Tapia-Serrano *et al.*, 2022).
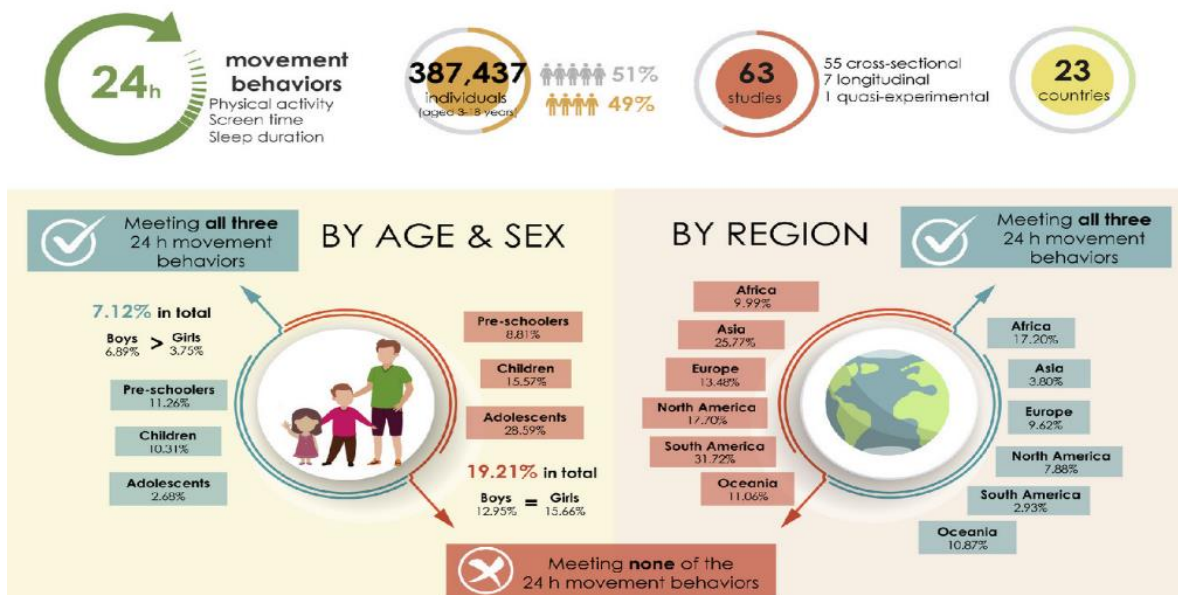
Figure 2.1 Summary of Global prevalence of meeting the 24-h movement guidelines(Tapia-Serrano *et al.*, 2022).

Among Asian countries, Japan has the highest percentage of preschoolers (21.5%) who meet all three PA, ST and sleep guidelines(Kim *et al.*, 2020). Our neighboring country Singapore has 9.6%(Chia *et al.*, 2020), Malaysia has 6.5 percent (Lee *et al.*, 2021b), and Hong Kong has 2.9 percent (Feng *et al.*, 2021), which meets all three criteria. The initial study on movement behavior in Malaysia occurred in Kuala Lumpur's urban area before the COVID-19 pandemic. The study found that the percentages of children following physical activity, screen time, and sleep guidelines were 48.7 percent, 25.2 percent, and 55.2 percent, respectively. The results indicated that Malaysian preschools showed low adherence to all three guidelines, particularly in regards to screen time compliance (Lee *et al.*, 2021b).

**2.4    Questionnaires & Measurements Of 24-Hour Movement Behaviour In Children**

Recent studies indicate the importance of combining all 24-hour movement behaviours, including physical activity, sleep duration and sedentary behaviour (Tremblay *et al.*, 2016a). To measure how young children's movement behaviours 24 hours a day, we need measurement tools that are applicable, reliable, flexible, cost-effective, and practical. These tools need to be adapted to the child's developmental stage (Arts *et al.*, 2022). There are various ways of measuring movement behaviours. The choice of measurement tools can be affected by factors such as the outcome of interest, the population being studied, cost and feasibility, study sample size, etc.(Dollman *et al.*, 2009). In epidemiology, several measurement tools are usually used to capture behavioural data in children during their early years (Loprinzi *et al.*, 2011), including proxy-reported questionnaires/surveys, logs and diaries, direct observations, heart rate monitors, accelerometers, inclinometers, pedometers, other consumers wearable technology. This study uses proxy-reported questionnaires due to large-scale participants, lower cost, lower time consumption and lower participants burden. Our study measured not only 24-hour movement behaviour but also included socioemotional difficulties among preschool children, which might take some time for the participants.

The proxy self-reported questionnaires are used to determine 24-hour movement behaviour in children. This questionnaire is commonly used for behavioural research type because it benefits the researcher in many ways, which include the relatively lower costs, lower participant burden, ability to provide information on the

type (e.g., device-specific screen viewing) and behaviour context in a larger sample of individuals (e.g., family and neighborhood environmental factors). However, this self-reported questionnaire tends to be less reliable for children under the age of ten due to the children's poor recall ability, sporadic activity patterns and short durations of activity bouts (Mattocks *et al.*, 2008). Alternatively, parents or guardians could report these young children's movement behaviours (Puhl *et al.*, 1990). According to previous systematic reviews, parents or teachers who act as proxy respondents in the study could largely reduce the recall bias caused by children's limited cognitive ability and have some promise in providing more accurate estimates of PA and SB in young children (Lubans *et al.*, 2011). Thus, the Movement Behavior Questionnaire (MBQ) was used in the study.

Table 2.2 shows a few other proxy-reported questionnaires commonly used to measure preschool children's movement behaviour. Healthy Kids was developed by (Townsend *et al.*, 2014) and focuses on obesity risk assessment for the nutrition program. Healthy Kids covers physical activity, sleep, screen time, and food diet-related parenting practices. With 10-12 items, the KidActive-Q questionnaire developed by Bonn *et al.* (2012) covers physical activity and screen time. However, it does not include sleep assessment. Another questionnaire is Healthy Active Preschool Years (HAPPY), developed by Hinkley *et al.* (2012). It consists of all movement behaviour with a total of 230 items, making it time-consuming. Besides, a recent questionnaire, namely the SUNRISE study, covers physical activity, sleep time, screen media and sedentary behaviour. The Sunrise questionnaire assesses physical activity using an accelerometer, diet, food and executive function. Using an accelerometer on a large scale of participants is time-consuming and costly. Preschool-

age Children's Physical Activity Questionnaire (Pre-PAQ) only covers physical and sedentary activity without including screen time.

To our knowledge, no Malay-validated of 24-Hour movement behaviour instrument for children integrated with all three components (PA, sleep and ST) meets the 24-H guidelines. The previous first local study measured separately physical activity using accelerometers, screen time using a non-validated questionnaire, and sleep time using a validated questionnaire from the Healthy Active Preschool and Primary Years (HAPPY) Study (Lee *et al.*, 2021a).

In short, self- and proxy-reported questionnaires have strengths in providing contextual information that cannot be obtained using accelerometers. In addition, using questionnaires is related to a lesser participants' burden, which could reduce selection bias due to attrition (Girschik *et al.*, 2012; Lubans *et al.*, 2011). However, they are vulnerable to recall bias with overestimation and underestimation (Girschik *et al.,* 2012).

Table 2.2 Comparison of proxy reported questionnaires measures of movement behaviour for children

| Tools | Citation | Behaviour | Age | Description | Respondent | Limitations |
|---|---|---|---|---|---|---|
| Movement Behaviour Questionnaire (MBQ) | (Trost, 2022) | PA, ST, S | Pre-schoolers (3–6 years old) | 15 items | Parent | |
| Healthy Kids | (Townsend, M.S *et al.,* 2014) | PA, ST, S, Food | Toddlers and pre-schoolers | 45 items | Parent/ Caregiver | Focus on obesity risk assessment(Diet |

| | | | (2–5 years old) | | | and parenting practices) |
|---|---|---|---|---|---|---|
| KidActive-Q | (Bonn SE *et al.,* 2012) | PA, ST | Toddlers and pre-schoolers (2–6 years old) | 10–12 items | Parent | Does not include sleep |
| Healthy Active Preschool Years (HAPPY) | (Hinkley T *et al.,* 2012) | PA, SB, ST, S | Preschoolers (3–5 years old) | Total question naire: 230 items | Parent | Time-consuming (230 items) |
| SUNRISE study | (Okely *et al.*, 2021) | PA, SB, ScT | Toddlers and pre-schoolers | 47 items | Parents and Caregivers / Teachers | Including Measurement of PA using an accelerometer, diet and food,motor, EF |
| Preschool-age Children's Physical Activity Questionnaire (Pre-PAQ) | (Dwyer *et al.*, 2011) | PA, SB | Pre-schoolers (3–5 years old) | 37 items | Parent/ Guardian | Does not Include sleep and screen-time |

**2.4.1    Translation, cultural adaptation and validation of Movement Behaviour Questionnaire (MBQ)**

Understanding the impact of movement behaviours on children's development is so important globally that it has necessitated translating and adapting assessment tools to various cultural contexts. There is substantial variation in how movement behaviours are measured, and no culturally adapted, validated assessment tools for the Malay language exist. Cross-cultural translation and validation necessitate more than a literal translation to develop a questionnaire or instrument suited to a variety of cultures and languages and suitable for diverse target audiences (Banville *et al.*, 2000).

Malay (Bahasa Malaysia) is the most important language in Malaysia, serving as both the national and official language and a lingua franca (Ho and Wong, 2006).

The MBQ was a validated brief assessment tool developed by Trost (2022) that reliably measures physical activity, screen time and sleep in children that are feasible for use in policy and practice settings. MBQ was part of Obesity-related behaviour assessment tools developed in 2022 under the Australian Obesity Prevention Research (EPOCH, 2022). To my knowledge, these new tools were used in Australia, and translation into other languages is still in progress. The MBQ fits the purpose of measuring the movement behaviours of infants, toddlers and preschoolers and available four versions: MBQ-B (open version), MBQ-B (closed version), MBQ-C (open version), and MBQ-C (closed version). This study used the MBQ-C child closed answer version (response options are selected within a range).

Adapting and validating movement behaviour questionnaires successfully requires a systematical and meticulous approach. When using self-reported data to measure movement behaviour, one of the major challenges was the difficulty in estimating and aggregating weekday and weekend screen time, and parents lacked the numeracy skills required to recall and sum their child's exposure to screen time over multiple days (Goncalves *et al.*, 2020). Consequently, these issues must be emphasised by rigorously testing and modifying the measurement scale during the translation process in this study. In addition, researchers, linguists, and local experts must collaborate to achieve a balance between linguistic precision and cultural relevance.

## 2.5    Socio-emotional Difficulties among Children

Socio-emotional development has been identified as "the ability of a child from birth to age five to form relationships and control emotions." Children who lack sufficient social and emotional development are likely unable to learn well and may be isolated from learning environments (Brown *et al.*, 2012). Emotional and behavioural problems(EBP) or socio-emotional problems (SEP) are the most frequent mental health problems among preschool children (Egger and Angold, 2006). According to (Goodman, 1997), emotional difficulties involve but are not restricted to out-of-control tantrums, worry, sadness, anxiety, or fear.

In the past decade, there has been an increase in the global prevalence of psychosocial health diseases regarded as serious public health concerns. In a review of existing research, Teekavanich *et al.* (2017) discovered that the prevalence of socio-emotional problems among preschoolers ranged from 7% - 25%, as reported by psychiatry studies using checklist questionnaires. In recent decades, the increased prevalence of socio-emotional disorders in multiple nations and cultures reflects the global demand for early childhood mental health (Kelleher *et al.*, 2000).

In most European countryside, the rate of mental health among preschoolers ranged from 6.3% to 9.8%  (Elberling *et al.*, 2010). In Asian countries, the prevalence of mental health issues among preschool-aged children varies. In Bangladesh, 11.1% of children aged 3 to 4 years were affected by mental health (Mullick and Islam, 2020), 11.9% of preschool children 4-6 years in Bangkok, Thailand (Teekavanich *et al.*, 2017), and 13.6% among preschool children 3-6 years in China (Chen *et al.*, 2017).

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Based on National Health and Morbidity Survey (NHMS) conducted in Malaysia, generally, there was a rising trend in the prevalence of mental health issues among children (5 to 15 years) from 1996 (13.0%), 2006(19.4%), 2011 (20.0%) and 2015(12.1%) (Sahril *et al.*, 2021). Previous SDQ-based studies in Malaysia revealed a 16.4 % prevalence in the city of Negeri Sembilan (Nadeeya *et al.*, 2021) and a 16.2 % prevalence in Selangor 5-13 year-olds (Farhana, 2012). Previous research also found that peer difficulties were the consistently most prevalent SDQ subscales in national surveys (Sahril *et al.*, 2021) (31.0%), in Negeri Sembilan (Nadeeya *et al.*, 2021)(44.0%) and in Selangor (Farhana, 2012) (23.7%).

Socio-emotional problems are consistent throughout time and may grow more severe (Fergusson *et al.*, 2005). Mental health problems can be caused by both biological (e.g., gene and personality) and environmental factors, such as family and socioeconomic (Arredondo DE., 2003). According to Caspi *et al.* (1996) the early onset of socio-emotional problems was related to unfavourable consequences later in life, such as joblessness, abuse, health problems and low academic.

When all of this is considered, it's clear that early identification and prompt actions may reduce suffering for many families and prevent issues from worsening. Structured and cost-effective surveillance methods for SEB include using survey questionnaires. For this reason, valid and reliable questionnaires are required. The Strengths and Difficulties Questionnaire (SDQ) is one of the frequent questionnaires used to measure children's social and emotional difficulties (Goodman *et al.*, 2000).

It is estimated that the global prevalence of mental diseases is 13.4%, .which is increasingly common among children and adolescents with psychosocial health

problems (Polanczyk *et al.*, 2015). Other epidemiological studies show that children aged 1 to 5 years have a 16–18% prevalence of mental disorders, with somewhat more than half being severely affected. Anxiety and depressive disorders, as well as hyperactivity and behavioural disorders (the latter two primarily in boys), can develop in preschool children. (von Klitzing *et al.*, 2015). Without treatment, youth mental health illness seriously impacts children's growth and their capability to live healthful and meaningful lives in the future (Lyons-Ruth et al., 2017).

**2.6   24-Hour Movement Behaviour  as Predictors for socio-emotional difficulties among children**

Numerous research has demonstrated the relationship between optimal 24-hour movement behaviour and positive socioemotional outcomes in children. In a recent systematic review by Wilhite *et al.* (2023), the excellent physical condition was associated with a mix of movement behaviours, a regular PA, a low level of SB, and sufficient sleep (e.g., psychological health, mental health, emotional and behaviour problems). According to this review, those who were more active, less sedentary, and slept longer than their peers appeared to have the best outcomes. In addition, it emphasises the significance of sleep; all combinations that included a longer sleep duration were related to positive mental health outcomes.

According to a Canadian study conducted by Carson *et al.* (2019), adherence to more movement behaviour guidelines was associated with fewer total difficulties ($\beta = 1.78$), externalising ($\beta = 1.51$), and internalising ($\beta = 1.35$) problems. Certain combinations of PA and screen time ($\beta = 2.19$) and sleep duration and screen time

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produced comparable outcomes. Following this study, factors can be explained; the study that included a measure of social-cognitive development discovered that children who met more guidelines within the guidelines had better social cognition and Theory of Mind (Cliff *et al.*, 2017). This relation was most significant when examining the specific combinations of sleep and physical activity, as well as sleep and screen time.

In addition, levels of movement behaviour (β= 8.93) and recreational screen use (β= 3.68) were related to psychological health outcomes (Chong *et al.*, 2021). Furthermore, there is significant evidence that meeting the sleep duration recommendations is more strongly and consistently associated with improved mental health outcomes than meeting the screen time or physical activity recommendations under the 24-h movement behaviours guidelines (Faulkner *et al.*, 2020) (Faulkner et al., 2020). High levels of recreational screen use (>2 h/day) were related to an increase in externalising problems (β= 2.66), total difficulties (β= 3.68) and psychological distress (β= 3.69). Regardless of movement behaviour, high levels of recreational screen use were negatively connected with externalising problems and psychological problems. This suggests excessive screen-based sedentary leisure activities may be a psychosocial health risk factor (Chong *et al.*, 2021).

In Australian preschools, Christian *et al.* (2022) discovered that adherence to the screen-only or screen-plus-sleep criteria and the physical activity plus sleep requirements was associated with fewer socio-emotional problems. A high percentage of boys than girls met combinations of physical activity-related recommendations (physical activity only, physical activity plus screen, physical activity plus sleep, and

all), but more girls than boys met sleep-only guidelines. In boys, adhering to all guidelines, as compared to none, was associated with a lower total difficulties score ($\beta$= -1.90).

Other research has shown an association between increased screen use and lower social and emotional development outcomes among preschoolers. For example, research conducted in the United Kingdom, Switzerland, and Japan, which also used the SDQ to measure the social-emotional development of preschools, revealed that increased screen usage was associated with hyperactivity, emotional symptoms, conduct problems, and less prosocial behaviour (Christian *et al.*, 2022). The lack of parent or peer relationships in most screen-based activities may be one of the probable pathways by which screen time may negatively affect preschools' social-emotional development.

**2.7     Other Predictors for socio-emotional difficulties among children**

Discovering other modifiable socioemotional problem predictors for early intervention and prevention is essential. In our local study, we found that fathers who did not have a formal education(aOR: 4.34), worked privately(aOR: 3.60), were divorced(aOR: 5.11), came from a lower income(aOR: 1.63), older children (aOR: 0.95) and had parents with mental health illnesses(aOR: 1.93) were a more likely risk for child mental health problems(Sahril *et al.*, 2021). Father's education, working privately, and divorce families were strong predictors 3 to 5 times the risk of mental health problems in Malaysia. Father's education might relate to poor parental educational attainment is independently associated with decreased utilisation of child

mental health resources as well as higher severity and duration of child mental health problems(McLaughlin *et al.*, 2012). Previous studies show that parental occupational stress can result in psychological distress and thereby introduce stress into children's lives especially working in private companies(Heinrich, 2014). Furthermore, children who have experienced family conflict and divorce may contribute to the development of a variety of psychiatric disorders, and such experiences can make children emotionally vulnerable in life(Golombok *et al.*, 2016)

Other local studies demonstrated that the gender of the kid (boys) ($\beta = -0.11$), the father's level of education ($\beta = -0.18$), the child's screen time ($\beta = 0.12$), and parent-child interaction ($\beta = -0.14$ ) significantly influenced psychosocial adjustment (Foo *et al.*, 2022). Previous studies found similar patterns boys were more likely than girls to be developmentally susceptible, notably in social competence and emotional maturity domains(Australian Early Development, 2019). Parent-child interaction has a significant impact on the psychological and mental health of children. According to research findings, inflexible parent-child interactions, such as not engaging in play activities with children, are associated with higher levels of internalising and externalising problems in children(Hollenstein *et al.*, 2004).

Moreover, recent research in Chile found that besides changes in movement behaviours, factors such as child age($\beta = -0.08$), guardian age $\geq 45$ years old($\beta = -0.59$), and emotional stress($\beta = 0.24$) and rural ($\beta = -0.32$), were frequently associated with changes in emotions and behaviours (Aguilar-Farias *et al.*, 2021). In this study, caregivers who were 45 years and older reported that children were less likely to be children with emotional and behavioural changes. A similar study also found younger