Stepping into a New Era – Fundamentals and Efficacy of Telehealth in Occupational Therapy

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Contents

Research Evidence
 on the Application of TH and
 Clinical outcomes in OT practice

Clinical Applications in HK

- asynchronous telehealth for older adults after hip fracture surgery
- telehealth in the field of pediatrics during pandemic

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Hong Kong Journal of Occupational Therapy

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Review

Effects of telerehabilitation in occupational therapy practice: A systematic review

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Goris Hung KN1 @ and Kenneth NK Fong2

Abstract

Objective/background: This study aimed to review the current evidence on the application of telerehabilitation in occupational therapy practice and its clinical outcomes over the last 10 years.

Methods: A systematic review was performed on studies published in English in the decade 2008 to 2017, retrieved from seven electronic databases (MEDLINE, Cochrane Library, CINAHL, Web of Science, SAGE, Science Direct and BMBASE). Only articles evaluating the use of telerehabilitation to provide occupational therapy services from a distance were included, with no restrictions on pathology, impairment, age, or the nature of occupational therapy intervention.

Results: Fifteen articles (three randomised controlled trials, eight quasi-experimental studies, one trial with singlegroup post-intervention and three case studies) were reviewed. Despite various study designs and outcome measures, most studies indicated positive therapeutic effects of using telerehabilitation in occupational therapy practice. There is insufficient evidence, however, to confirm that telerehabilitation is more effective than the face-to-face model. Little evidence was shown on the long-term effect and cost efficacy. Only two studies used smartphones in their applications.

Conclusion: Telerehabilitation offers an alternative service delivery model for occupational therapy, not only bridging distance but also offering user-friendly treatment for patients at home. Further research, particularly on the use of the most cutting-edge mobile technology, is needed to determine effectiveness in occupational therapy practice treating various diseases, conditions and impairments and the characteristics of patients, interventions and therapists that lead to the best fit with this alternative and emerging form of service delivery.

Keywords

Telerehabilitation, occupational therapy, systematic review

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Introduction

Around 55.4% of occupational therapists deliver services directly through face-to-face treatment in a medical setting (American Occupational Therapy Association, 2010). However, face-to-face occupational therapy (OT) services face challenges. Increasing demand for long-term rehabilitation and a dwindling supply of OT services in rural areas limit clients' access (Centers for Disease Control and Prevention, 2015; Criss, 2013; Dorsey et al., 2007; Gardner, Bundy, & Dew, 2016). Long traveling times add to the heavy workloads of occupational therapists (Nix & Comans, 2017). Long travel time and distance, complicated

service structure and the cost of intensive clinic-based interventions hinder clients' access (Chen et al., 2013; Gardner et al., 2016; Shimabukuro, Grosse, & Rice, 2008). An alternative service delivery model for OT is needed to overcome these barriers while also improving accessibility and promoting well-being and recovery.

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Research Evidence



Effects of telerehabilitation in occupational therapy practice: A systematic review

Hong Kong Journal of Occupational Therapy 2019, Vol. 32(1) 3-21 © The Author(s) 2019 Article reuse gaidelines: sagepub.com/journals-per-missions DOI: 10.1177/1569186119849119 journals-sagepub.com/home/hjo-

Inclusive criteria

- Full text published in English from 1/2008 10/2017
- ◆ All clinical trials (class I to IV studies) evaluating use of TH to provide clinical OT services from a distance
- All pathology and impairment
- Study population of all ages
- All nature of OT intervention
- Search keywords include: Telerehabilitation/ Tele-rehabilitation/
 Telemedicine/ Telehealth & Occupational Therapy

Review



2019, Vol. 32(1) 3-21 DOI: 10.1177/1569186119849119 journals sagepub.com/home/h/o

Effects of telerehabilitation in occupational therapy practice: A systematic review

Exclusive criteria

- Overview or perspective of application of TH in OT
- Systematic reviews/ meta-analysis
- Duplicate
- Full text unavailable
- Examine development of technology system/ reliability and validity of assessment
- Application in continuing professional development
- Treatment carried out through multidisciplinary (combined with PT and/or ST or other allied health professionals) which focus on implication in rehabilitation service

Review



Effects of telerehabilitation in occupational therapy practice: A systematic review

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Fifteen fulfilled all the selection criteria (1/2008 – 10/2017)

Reifenberg et al., 2017; Ferre et al., 2017; Nix et al., 2017; Lawson et al., 2017;

Breeden, 2016;

Linder et al., 2015; Boehm et al., 2015;

Criss, 2013; Ng et al., 2013;

Hegel et al., 2011; Gibbs et al., 2011;

Hermann et al., 2010; Golomb et al., 2010;

Yuen et al., 2009;

Bergquist et al., 2008

Studies Characteristics

Characteristics	Details
Participants	Total: 198 •Sample size range: 1 to 99
Age range	 2y.o.6m – elderly aged >65 y.o. <18 y.o.: 5 studies elderly >sixty-five: 3 studies 18 y.o64 y.o.: 7 studies
Pathology	 Hemiplegic cerebral palsy: 3 Stroke: 4 Acquired brain injury: 1 Traumatic brain injury: 1 Breast cancer survivors undergoing chemotherapy:1 Tetraplegia: 1 Community dwelling older adults: 1 Orthopedic: 1 Autism spectrum disorders: 1 Visual motor and/or fine motor deficits that impact handwriting skills:1

Studies Characteristics

Characteristics	Details
Location for using TH	Home: 14 except one participant received in community center (Ng et al., 2013)
Require significant other in assisting participants in receiving TH - Parents - Caregivers	 8 studies Roles of significant other included: conducting assessment assisted in training implementation assisted in monitoring

Technological Used

Technology used	Details		
Hardware	 Internet-based comp iPad and tablet with v Smartphone with wif Telephone Digital camera 		
Software	videoconference	 Specific websites required login Acrobat® ConnectTM Acrobat® ConnectTM Professional VSee software program Computer based or video phone calling apps Skype Instant massaging system 	
	Training, monitoring, recording	 Motion web based game Timocco Telepresence robot Kubi ARMStrokes app Mentor HomeTM website Internet based videogame system that included a 5DT 5 Ultra Glove and PlayStation3 	
	Internet –based Ax tool	 The Print ToolTM Email the photography 	

Prerequisite Preparation



7/14 studies required supply necessary tools, equipment or handout in advance through mail



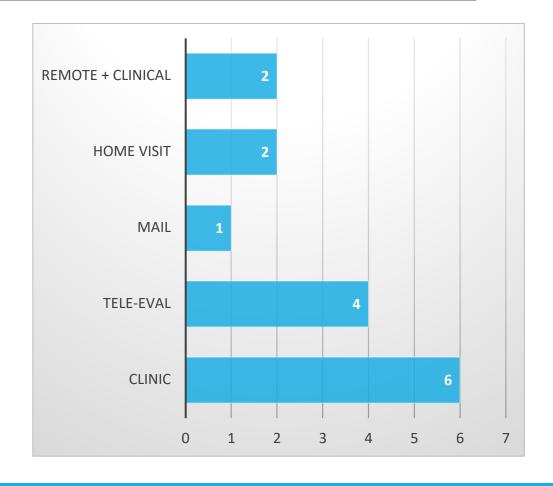
8/14 studies required in-person session for set up or training on the use of equipment



1 study mentioned upgrade staff's phone into smart phone with data plan

Type of Assessments

- Most of the outcomes measures used were questionnaire
- Caregivers were trained to administer the standardized assessment in Ferre et al., (2017) study



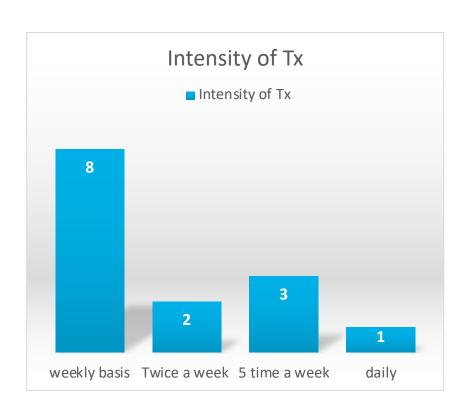
Outcome Measures

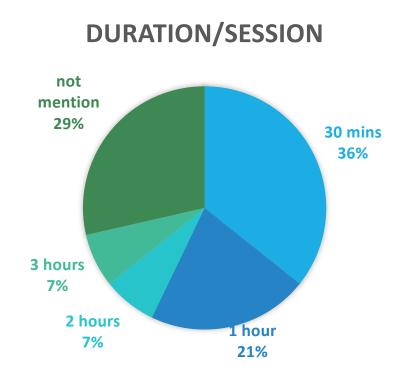
- Included both standardized and non-standardized assessments on cognitive, motor function, functional performance and quality of life
- Level of satisfactory
- Attendance record
- Therapists' progress notes
- Bone dexterity and brain imaging
- Total number of intervention

Application of TH in OT

Application	No	Details
Developing Skills	7	 Fine motor and visual motor training UL & hand function training Cognitive training Oral care training Sensory diet Cognitive Orientation to daily Occupational Performance approach Energy Conservation
Incorporating assistive technology	5	 Web-based videogame for hand fx tx Phone application for stroke hand fx tx Using functional electrical stimulation for functional training Robotic assisted device for hand fx tx
Environment modification	1	· Home modification
Education or creating health-promoting habits and routines	2	 Home safety education Disability prevention program for breast cancer survivors undergoing chemotherapy

Intervention Characteristics





Intervention Characteristics

Follow-up:

- 6 week: Hegel et al., 2011
- 3 months: Ng et al., 2013
- 6 months: Ferre et al., 2017



Effects of Telehealth in OT practice

Effects of TH in OT practice

- ◆3 studies showed significant improvements in functional goals in Canadian Occupational Performance Measure (Ferre et al., 2017; Hermann et al., 2010; Ng et al., 2013)
- ◆1 study showed significant improvement in QoL among stoke survivors (Linder et al., 2015)
- ◆1 study indicated significant increase in total intervention in OT service (Nix et al., 2017)

Studies indicated positive effects in

- ◆ Improving participant's occupational performance (Criss, 2013; Gibbs et al., 2011; Boehm et al., 2015; Lawson et al., 2017; Yuen et al., 2009)
- Increased carryover of home program (Gibbs et al., 2011; Hegel et al., 2011)
- ◆ Increased motivation (Reifenberg et al., 2017; Yuen et al., 2009; Lawson et al., 2017)
- ◆ Enhanced home safety (Breeden, 2016)
- Enhanced hand function (Reifenberg et al., 2017; Ferre et al., 2017; Lawson et al., 2017; Golomb et al., 2010; Hermann et al., 2010)
- Enhanced quality of life (Hegel et al., 2011)
- Improved cognitive function (Bergquist et al., 2008)
- Decreased parent stress (Reifenberg et al., 2017; Gibbs et al., 2011)
- Effective in promoting parent-child interactions, caregiver efficacy, facilitate parents
 empowerment (Graham et al., 2013; Little et al., 2018; Wallisch et al., 2019)

Effects of TH in OT practice

Carry on effect:

- ◆ 1/3 study showed the significant carry-on effect on decreased impact of executive dysfunction on daily life among participants with TBI (Ng et al., 2013)
- ◆ 1/3 study (Hegel et al., 2011) found that TH group scored better in role emotion compare to control group for breast cancer survivors undergoing chemotherapy

Users perspective/ feedback

All Participants and caregivers

satisfaction on quality of program, had positive perception with OT service provided at distance

(Criss, 2013; Hegel et al., 2011; Ng et al.,

2013; Yuen et al., 2009; Linder et al.,

2015; Boehm et al., 2015)

Parent

content and process of the intervention fit within families' natural environments

(Johnston et al., 2019)

Parent

beneficial as a session, but not as a replacement for in-person therapy services

(Johnston et al., 2019)

Parent

would prefer to have a combination of in-person sessions and telehealth sessions

l (Johnston et al., 2019)

Attendance

- ◆ Attendance and compliance were high (Kairy et al., 2009)
- Child's therapy services were 76-100% via telehealth (Graham et al., 2013)



Feasibility to ALL client type?

Feasibility (client type)

- ◆ All the studies demonstrated that applying TH to deliver OT services are feasible among varied pathologies, impairment and age groups
- Bergquist et al., (2008) reported clients with TBI with memory impairment was able to participated in internet-based cognitive rehabilitation independently
- Most studies required involvement of caregiver or participants who have a fundamental knowledge or experience in ICT
- Cautioned against overgeneralization of the results

Potential factors that might prevent individual from accessing TH program

- Those who are older and those with cognitive, intellectual or psychiatric disabilities (Hermann et al., 2010; Jacobs et al., 2015)
- Severe pulmonary hypertension, Unstable cardiovascular disease, Uncontrolled seizure disorder, Poor balance or vestibular control, Sensory and communication problems (Salawu et al., 2020)
- Child who requires more hands-on "involved treatment." (Johnston et al., 2019)
- Parents who are reluctant participants (Johnston et al., 2019)

more traditional approaches enable closer risk management and engagement

Clinical Recommendations

- Communication and coaching skills
- >Strategies to tackle clients' demotivation
- Understand client's preferred means for receiving care (Fiorattil et al., 2020)
- Ensure client's safety during TH (Richmond et al., 2017)
- For group therapy: conduct remotely supervised group therapy sessions (Salawu et al, 2020)
- Integrate different technology











A 3D printing approach toward targeted intervention in telerehabilitation

Dynamical Systems Laboratory 2019





Conclusion

Any successful telehealth activity should adhere to:

- I.Efficiency (decrease costs)
- 2. Enhancing quality of care (client to provider, access to outcomes and specialists)
- 3. Evidence-based practice
- 4. Empowering consumers
- 5. Encouraging new relationships
- 6.Education
- 7. Enabling information exchange
- 8.Extension
- 9. Ethics and Equity
- 10. Easy to use, Entertaining, and Exciting opportunities

Effects of a home-based occupational therapy telerehabilitation via smartphone for outpatients after hip fracture surgery: A feasibility randomised controlled study

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Cabbee TL Li^{1,2}, Goris KN Hung¹, Kenneth NK Fong¹ 0, Pablo Cruz Gonzalez¹, Shu-hong Wah² and Hector WH Tsang¹

Abstract

Introduction: This study aimed to investigate the effects of a home-based occupational therapy telerehabilitation (TR) via smartphone in enhancing functional and motor performance and fall efficacy for outpatients receiving day hospital

Clinical sharing:
Asynchronous
Telehealth for
Older Adults after
Hip Fracture
Surgery



Aims

6/2018-5/2019

- Investigate the effects of a home-based OT programme via TH using smartphone technology compared to paper-and-pencil instructions for outpatients receiving day hospital rehabilitation after hip fracture surgery in Hong Kong
- Acceptance on the use of TH in HK among older population

Treatment in GDH (twice/ week x 3 weeks)



1.5 hr conventional OT training



1.5 hr conventional PT training



Nursing care



doctor consultation





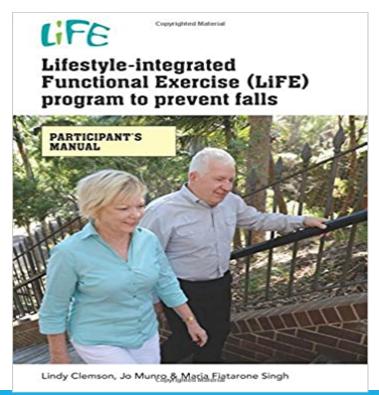


Home-based Telehealth program

- German-designed
- For iOS & Android
- All data are stored exclusively on a server with high-level encryption and transmitted over a secure connection
- Provide traditional Chinese characters with Cantonese dialect speech

Prerequisite preparation

Developed Lifestyle Integrated Functional Exercise (LiFE) Videos



Prerequisite Preparation

Set-up session:

- > Onsite installation
- > Education



Telehealth home program

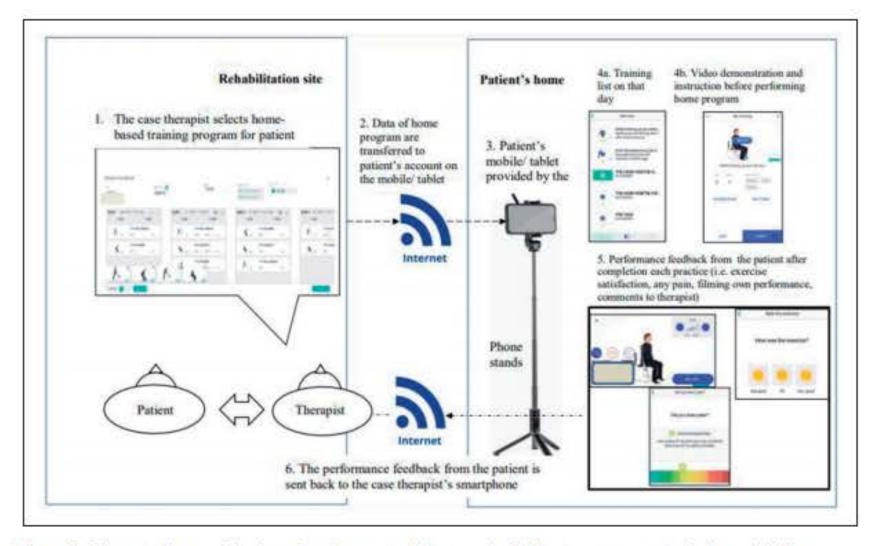


Figure 1. Schematic diagram of the home-based occupational therapy telerehabilitation programme in the Caspar Health e-system.

Result

Number of clients recruited

Total 69 Clients



38 excluded

- Hip fracture was the result of malignancy
- Either participants or caregivers did not understand either Cantonese, English, or Mandarin instructions
 - Unable to read the words on the mobile app or instruction sheet because of difficulty in visual functioning
 - Did not have a smart phone
 - Refusal



Total 31 clients recruited Exp gp: n=15, control: n=16

Assessment

Intake

• Introduce study if cases is eligible



Use SPSS for randomization

- If TH group, ask if they have smart phone
- Send invitation letter and sign consent form

1st Baseline Ax within first 3 sessions in GDH

3 weeks training (TH / paper & pencil tasks)

2nd Post training Ax for 3 weeks

Ax

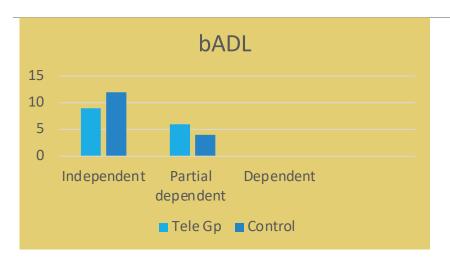
Re-Ax done in hospital

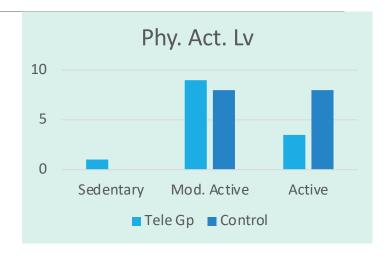
Re-Ax done in hospital

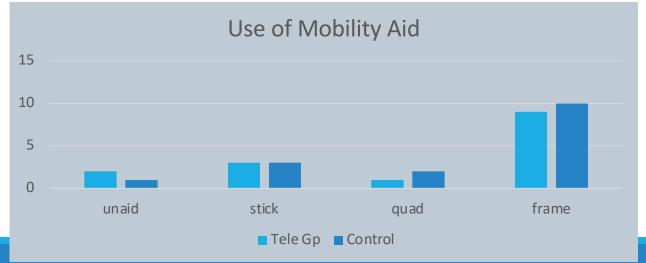
Client Characteristics

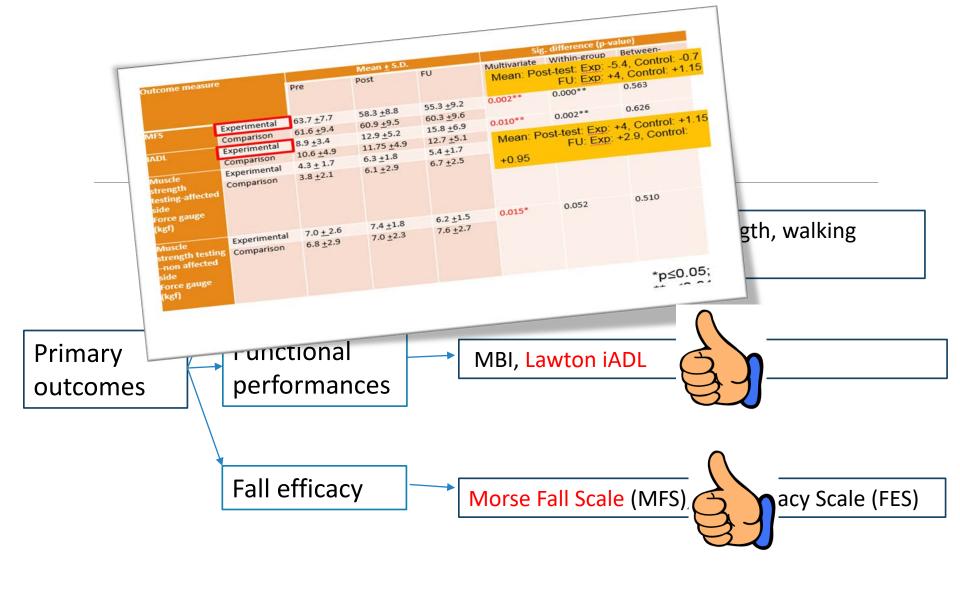
	Comparison (n=16)	Experimental (n=15)	p-value [¶]	
Age (years) (Mean, SD)	82.1 (9.7)	76.5 (8.6)	0.097	
Education level (years) (Mean, SD)	4.5 (4.6)	4.8 (4.5)	0.840	
Gender (No., %)			0.083	
Male	5 (31%)	1 (7%)		
Female	11 (69%)	14 (93%)		
Social support (No., %)			0.049*	
Live alone	4 (25%)	0 (0%)		
Live with family and/or domestic helper	` ,	15 (100%)		
Family relationship (No., %)			0.211	
Good	13 (81%)	15 (100%)		
Fair	2 (13%)	0 (0%)		
Poor	1 (6%)	0 (0%)		

Client Characteristics



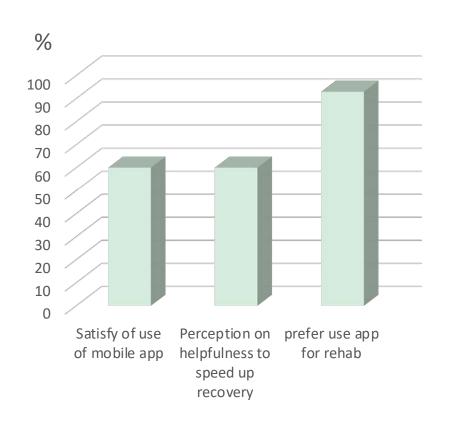






Outcome measures

Acceptance of the use of TH



Travelling to hospital for rehabilitation was time consuming

Preferred not to bother their caregivers for escorting

Using mobile app would give them higher independence and autonomy

More time for rest after performing training through mobile app at home

User-friendly

Other
comments
for Mobile
app

Easy to follow, particularly the demonstration with audio and visual guidance for home exercise

Provided opportunity and cognitive stimulation to learn new things

Fun to use



Challenges faced

- ◆ Technical problems occurred among the participants:
- Difficulty to open the app
- Problems on receiving Wi-Fi signal during the exercises
- High data speed needed for uploading the app or video to the Cloud
- → On-going technical support from the OTs or caregivers were necessary when using TH for OT practice

Clinical Recommendations

Larger cell phone with a bigger screen



Clinical Recommendation



ensure safety and reduce risk



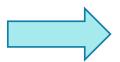


Synchronous Telehealth in the field of Pediatrics during Pandemic

Telehealth Workflow

Assessment
Screening, Parent-child
interaction, ADL,
Home environment





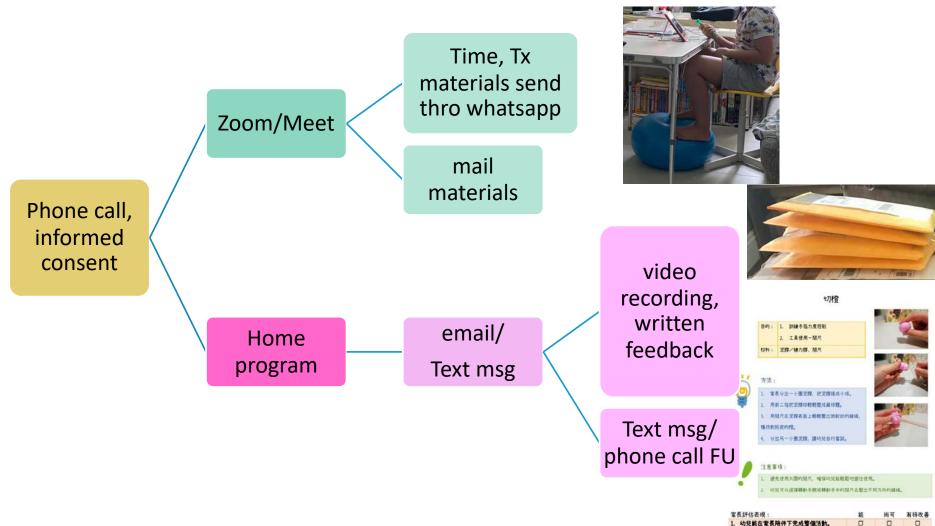
Intervention



OT, PT, ST, Special Ed Teacher, SW

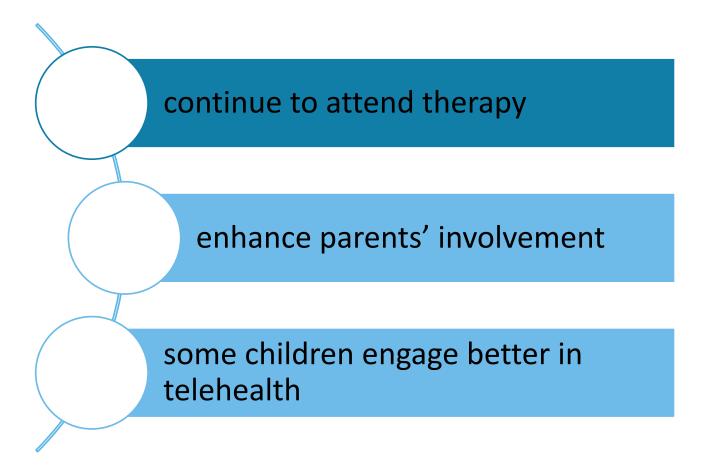
Multidisciplinary Team Conference

Telehealth during Pandemic



幼兒能在活動過程中想興趣及投入參

Benefit of Telehealth during pandemic



Challenges

- Hard to follow up on child's progress when parents/caregiver are reluctant to participate (esp those who choose home program)
- Computer literacy for grandparents
- Harder to build relationship with new clients, esp very young children
- Certain type of training will require center base
- Require lots of preparation and communication time
- Unstable internet
- Limited standardized assessment for telehealth

Recommendations: Younger children (<6 yo)



Parent coaching



Parent education



Use of stuffed Doll



Home a/v materials

Recommendations: Older children(>9 yo)

Materials supply

Date	Materials needs	Attend☑
22/6	筆、剪刀、膠水/白膠漿	
6/7	顏色筆、剪刀	
13/7	文具、筆袋、書包、筆、剪 刀	
20/7	筆、紙	
27/7	筆、紙	



Organized with date, pack acc to Tx session

Novelty



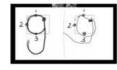
e.g. Treasure hunt

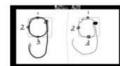
Contingency Plan











Interactive whiteboard and backup activities

Way forward



Standardized Assessments that are **amenable in TH**



Research on the efficacy and effectiveness of clinical services thro TH



Develop Telehealth Technologies

Paradigm shift in OT service

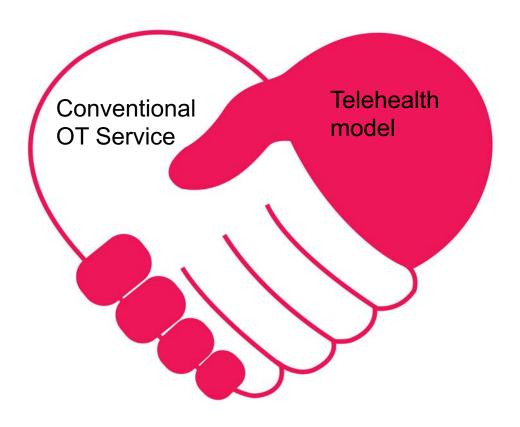
- Center-based
- Face-to-face
- Self-reported home program compliance

Conventional Training

Telehealth

- Home-based
- Remote
- Facilitated monitoring Home Program

Way Forward



To improve Quality of Client-centered Care

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Thank You!





